
**User's
Manual**

**IS8000CDV
Classic Data Viewer**

Classic Data Viewer is a waveform viewer software that can display waveforms and convert data formats of data measured by our instruments* on a personal computer (hereinafter abbreviated as PC).

* DL Series, DLM Series, SL1000, SL2000, and others, see chapter 1.

This manual contains information on the functions and operation of the Classic Data Viewer, as well as precautions that must be observed. To ensure the correct operation of the Classic Data Viewer, read this manual thoroughly before attempting to use the product.

After reading this manual, keep it in a safe place. The manuals for this software are listed on the “Manuals” on page iii. Please read all manuals.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Furthermore, for handling precautions, functions, and operating procedures of the instruments, or for the handling and operating procedures of Windows, please see the manuals for those respective products.

Notes

- The contents of this manual are subject to change without prior notice as a result of improvements to the product’s performance and functionality. Refer to our website to view our latest manuals.
- The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of YOKOGAWA is strictly prohibited.
- The license management section of this licensee application is based on one or more of the following copyrights:
Sentinel® RMS © 2005 SafeNet, Inc. All rights reserved.
Sentinel® EMS © 2009 SafeNet, Inc. All rights reserved.

Trademarks

- Microsoft, Windows, Windows 10, and Windows 11 are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are either registered trademarks or trademarks of Adobe Inc.
- Sentinel is a registered trademark of SafeNet, Inc.
- MATLAB is a registered trademark of The MathWorks, Inc. in the United States.
- In this manual, the ® and TM symbols do not accompany their respective registered trademark or trademark names.
- Other company and product names are trademarks or registered trademarks of their respective holders.

Revisions

- 1st Edition: September 2024
- 2nd Edition: October 2024
- 3rd Edition: May 2025
- 4th Edition: September 2025
- 5th Edition: March 2026

Manuals

The following manuals, including this one, are provided as manuals for this software.

PDF Data of Manuals

The downloaded software contains the following English and Japanese manuals. For details on downloading, see page iv and section 1.2 in the Installation Manual (IM IS8000-04EN).

Manual Title	Manual No.	Description
IS8000CDV Classic Data Viewer User's Manual	IM IS8000CDV-01EN	This manual. Explains this software's features and how to use these features.
IS8000 Integrated Software User's Manual	IM IS8000-01EN	Explains the features of the IS8000 Integrated Software (hereinafter referred to as the IS8000 Software) and how to configure and operate it as well as how to manage the license information of IS8000 software and this software.
IS8000 Integrated Software, IS8000CDV Classic Data Viewer Installation Manual	IM IS8000-04EN	Explains how to install and activate the IS8000 software and this software.

You can view the above manuals using the **Help** button on the **Classic Data Viewer toolbar** or the **Help** menu. For details on the procedures, see section 9.3.

You can open the above manuals from the **launcher** and **Help** menu of the **IS8000 software**.

For details on the procedures, see section 9.3 in the IS8000 Software User's Manual (IM IS8000-01EN).

The "-EN" in the manual number is the language code.

Note

Licenses are activated and managed on the IS8000 License Manager.

- * For managing the license information of this software, the period of license use, and updating the license, see sections 9.5 and 9.6 in the IS8000 Software User's Manual (IM IS8000-01EN).

Conventions Used in This Manual

Unit Prefixes

k: Denotes 1000.

Example: 100 kS/s (sample rate)

K: Denotes 1024.

Example: 720 KB (file size)

Notes

Note Calls attention to information that is important for the proper operation of the software.

Notation

Procedure

Carry out the procedure according to the step numbers. All procedures are written under the assumption that you are starting operation at the beginning of the procedure, so you may not need to carry out all the steps in a procedure when you are changing the settings.

Explanation

This section describes the setup items and the limitations regarding the procedures.

Boldface

Menus, tabs, buttons, and other items displayed on the screen that are to be operated are indicated in bold letters.

Contents

Manuals	iii
Conventions Used in This Manual	iv
Chapter 1 Product Overview	
1.1 Target Instruments	1-1
1.2 Main Features	1-2
Chapter 2 Basic Operations	
2.1 Starting and Exiting Classic Data Viewer	2-1
2.2 Basic Operations Performed From the Start Windows	2-2
2.3 Setting the Language	2-4
Chapter 3 Displaying Waveform Data	
3.1 Loading Waveform Data.....	3-1
3.2 Displaying Waveforms in the Main View	3-6
3.3 Displaying Waveforms in a Zoomed View.....	3-8
3.4 Displaying Waveforms in the History View	3-11
3.5 Displaying a Waveform in the X-Y View	3-13
3.6 Moving or Zooming Waveforms	3-15
3.7 Splitting the Screen	3-17
3.8 Displaying Waveforms Acquired with the DL950, DL850 Series, or SL2000 Dual Capture Feature	3-18
3.9 Switching between Groups	3-20
3.10 Showing Marks.....	3-22
3.11 Displaying Waveform Properties	3-23
Chapter 4 Specifying Display Settings for Waveform Data	
4.1 Loading Display Settings.....	4-1
4.2 Setting Waveforms (Channels) to be Displayed.....	4-2
4.3 Specifying Split Settings.....	4-11
4.4 Specifying Display Settings.....	4-13
4.5 Turning Waveform Interpolation On and Off.....	4-18
4.6 Initializing Display Settings.....	4-20
Chapter 5 Analyzing Waveform Data	
5.1 Displaying Measurement Results.....	5-1
5.2 Analyzing Waveform Data Using Cursors	5-2
5.3 Automated Measurement of Waveform.....	5-5
5.4 Automated Measurement of History Statistics	5-11
5.5 Automated Measurement of Cycle Statistics	5-15
5.6 Analyzing Waveforms by Computations (Waveform Math Option)	5-19
5.7 Inserting Annotations in the Waveform View	5-33
5.8 Transferring a Waveform View to the Clipboard.....	5-48

Chapter 6 Saving Data/Converting Data Formats

6.1	Saving Waveform Data	6-1
6.2	Transferring Waveform Data into Excel	6-9
6.3	Saving Waveform Data in a View.....	6-11
6.4	Saving Automated Measurement Values for Waveform Parameters	6-12
6.5	Saving the Display Settings	6-13
6.6	Converting Multiple Waveform Data Files to CSV Files.....	6-14
6.7	Converting WDF Files to WVF Files	6-17
6.8	Converting WDF/WVF Files to FLD Files.....	6-19

Chapter 7 Product Overview Printing Waveforms in the Displayed View

7.1	Setting Up a Printer.....	7-1
7.2	Printing Displayed Waveforms	7-2

Chapter 8 Communicating with the Instruments

8.1	Connecting to the Instruments	8-1
8.2	Displaying a File List	8-6
8.3	Manipulating Files	8-9
8.4	Operating the Instruments from a PC	8-13
8.5	Downloading the Instruments Waveform Data.....	8-25

Chapter 9 Troubleshooting

9.1	Troubleshooting.....	9-1
9.2	Viewing Version Information.....	9-2
9.3	Viewing the Manuals	9-3
9.4	Viewing the YOKOGAWA Web Page	9-4
9.5	Activation and Deactivation	9-5

Chapter 10 Specifications

10.1	Product Specifications.....	10-1
10.2	Specifications	10-2

Index

Product Overview

1.1 Target Instruments

Model*	Product Name/Model Name		
WE7000	PC-Based Measurement Instruments WE7000 Series		
DL/DLM Series	Mixed Signal Oscilloscope	Digital Oscilloscope	
DL1700 Series	—	DL1720, DL1740	
DL1600 Series	—	DL1620, DL1640, DL1640L	
DL1700E Series	—	DL1720E, DL1735E, DL1740E, DL1740EL	
DL7400 Series	—	DL7440, DL7480	
DL9000 Series			
DL9500/DL9700 Series	DL9505L, DL9510L, DL9705L, DL9710L	—	
DL9040/DL9140/ DL9240 Series	—	DL9040, DL9140, DL9240	
DL6000/DLM6000 Series	DLM6054, DLM6104	DL6054, DL6104, DL6154	
SB5000 Series	Vehicle Serial Bus Analyzer		
SB5000 Series	SB5310, SB5710		
SL1400	ScopeCorder Light		
SL1400	SL1400		
SL1000/SL2000	High-Speed Data Acquisition Unit		
SL1000	SL1000		
SL2000	SL2000		
DLM Series	High Definition Oscilloscope	Mixed Signal Oscilloscope	Digital Oscilloscope
DLM2000 Series	—	DLM2024, DLM2034, DLM2054	DLM2022, DLM2032, DLM2052
DLM3000 Series	—	DLM3024, DLM3034, DLM3054	DLM3022, DLM3032, DLM3052
DLM3000HD Series	DLM3034HD, DLM3054HD	—	—
DLM4000 Series	—	DLM4038, DLM4058	—
DLM5000 Series	—	DLM5034, DLM5038, DLM5054, DLM5058	—
DLM5000HD Series	DLM5034HD, DLM5038HD, DLM5054HD, DLM5058HD	—	—
DL Series	ScopeCorder		
DL750 Series	DL750, DL750P		
DL850 Series	DL850/DL850V, DL850E/DL850EV		
DL350	DL350		
DL950	DL950		

* Hereafter in this manual, the names in the Model column in the above table are used to refer to the types of models appearing in the explanations.

1.2 Main Features

The main features of the Classic Data Viewer are as follows:

- Viewing and Analyzing Data Saved with the Instruments
- Viewing and Transferring Files Saved with the Instruments
- Remote Control of the Instruments
- Downloading the Instruments Acquisition Data

Viewing and Analyzing Data Saved with the Instruments

You can view and analyze data saved with the measuring instruments on a PC.

The formats of the files saved by the measuring instruments are as follows.

Model	File Types (filename extension)				
	CSV ¹ (.csv)	WVF ² (.wvf)	WDF ² (.wdf)	WDF ³ (.wdf)	MAT ⁴ (.mat)
WE7000	Yes	Yes	No	No	No
DL1700 Series	Yes	Yes	No	No	No
DL1600 Series	Yes	Yes	No	No	No
DL1700E Series	Yes	Yes	No	No	No
DL7400 Series	Yes	Yes	No	No	No
DL750 Series	Yes	Yes	No	Yes	No
DL9040/DL9140/DL9240 Series	Yes	No	Yes	No	No
DL9500/DL9700 Series	Yes	No	Yes	No	No
DL6000/DLM6000 Series	Yes	No	Yes	No	No
SB5000 Series	Yes	No	Yes	No	No
SL1400	Yes	Yes	No	Yes	No
SL1000	No	No	Yes	Yes	No
SL2000	Yes	No	Yes ⁵	No	No
DLM2000 Series	Yes	No	Yes	No	No
DLM3000HD Series, DLM3000 Series	Yes	No	Yes	No	No
DLM4000 Series	Yes	No	Yes	No	No
DLM5000HD Series, DLM5000 Series	Yes	No	Yes	No	No
DL850 Series	Yes	No	Yes	Yes	Yes
DL350	Yes	No	Yes	No	Yes
DL950	Yes	No	Yes ⁵	No	Yes

1 Files created and saved in ASCII format

2 Files created and saved in binary format

3 Files created with real-time recording

4 Files saved as MATLAB format

5 If you load a file containing data acquired at multiple sample rates, some channels may not be loaded.

Viewing and Transferring Files Saved with the Instruments

Classic Data Viewer supports the viewing of the instrument files as well as the transfer of files between the instrument and your PC by using the GP-IB, USB, or Ethernet interface.

Available functions ► page 1-4

Available communication interfaces ► table below

Note

Classic Data Viewer file transfer from your PC to the instrument is possible only via the USB interface.

Remote Control of the Instruments

With the GP-IB, USB, or Ethernet interface, Classic Data Viewer supports the display of images (control windows) from the instrument on your PC, as well as the remote-control of the instrument as if you were operating the unit from its own control panel. In addition, to enable the setup of a control window environment, Classic Data Viewer features Environment Setting Keys, which are not found on the DL unit.

Available functions ► page 1-4

Available communication interfaces ► table below

Downloading the Instruments Acquisition Data

The instrument acquisition data can be downloaded to a PC using the GP-IB, USB, or Ethernet interface.

Available functions ► page 1-4

Available communication interfaces ► table below

Available communication interface

Model	Interface		
	GP-IB	USB	Ethernet
WE7000	No	No	No
DL1700 Series	No	No	No
DL1600 Series	Yes	Yes	Yes
DL1700E Series	Yes	Yes	Yes
DL7400 Series	Yes	Yes	Yes
DL750 Series	Yes	Yes	Yes
DL9040/DL9140/DL9240 Series	Yes	Yes ¹	Yes
DL9500/DL9700 Series	Yes	Yes ¹	Yes
DL6000/DLM6000 Series	Yes	Yes ¹	Yes ²
SB5000 Series	Yes	Yes ¹	Yes
SL1400	Yes	Yes	Yes
SL1000	No	Yes ¹	Yes ²
SL2000	No	Yes ¹	Yes ²
DLM2000 Series	Yes	Yes ¹	Yes ²
DLM3000HD Series, DLM3000 Series	Yes	Yes ¹	Yes ²
DLM4000 Series	Yes	Yes ¹	Yes ²
DLM5000HD Series, DLM5000 Series	Yes	Yes ¹	Yes ²
DL850 Series	Yes	Yes ¹	Yes ²
DL350	No	Yes ¹	Yes ²
DL950	No	Yes ¹	Yes ²

1 Control by USB-TMC

2 Control by VXI11

1.2 Main Features

Available function

Model	Communication Function		
	Viewing and Transferring Files	Remote Control	Downloading Acquisition Data
WE7000	No	No	No
DL1700 Series	No	No	No
DL1600 Series	Yes Version 1.12 or later	Yes Version 1.12 or later	Yes Version 1.30 or later
DL1700E Series	Yes	Yes	Yes Version 2.11 or later
DL7400 Series	Yes Version 1.23 or later	Yes Version 1.23 or later	Yes Version 2.11 or later
DL750 Series	Yes Version 2.50 or later	Yes Version 2.50 or later	Yes Version 6.01 or later
DL9040/DL9140/DL9240 Series	Yes Version 1.80 or later	Yes Version 1.64 or later	Yes Version 1.80 or later
DL9500/DL9700 Series	Yes	Yes	Yes
DL6000/DLM6000 Series	Yes	Yes	Yes
SB5000 Series	Yes	Yes	Yes
SL1400	Yes	Yes	Yes
SL1000	Yes	No	No
SL2000	Yes	Yes	Yes
DLM2000 Series	Yes	Yes	Yes
DLM3000HD Series, DLM3000 Series	Yes	Yes	Yes
DLM4000 Series	Yes	Yes	Yes
DLM5000HD Series, DLM5000 Series	Yes	Yes	Yes
DL850 Series	Yes	Yes	Yes
DL350	Yes	Yes	Yes
DL950	Yes	Yes	Yes

Basic Operations

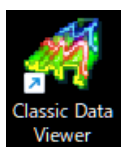
2.1 Starting and Exiting Classic Data Viewer

Procedure

Starting Classic Data Viewer

There are four methods that you can use to start the software.

- Double-click the shortcut icon **Classic Data Viewer** on the desktop.

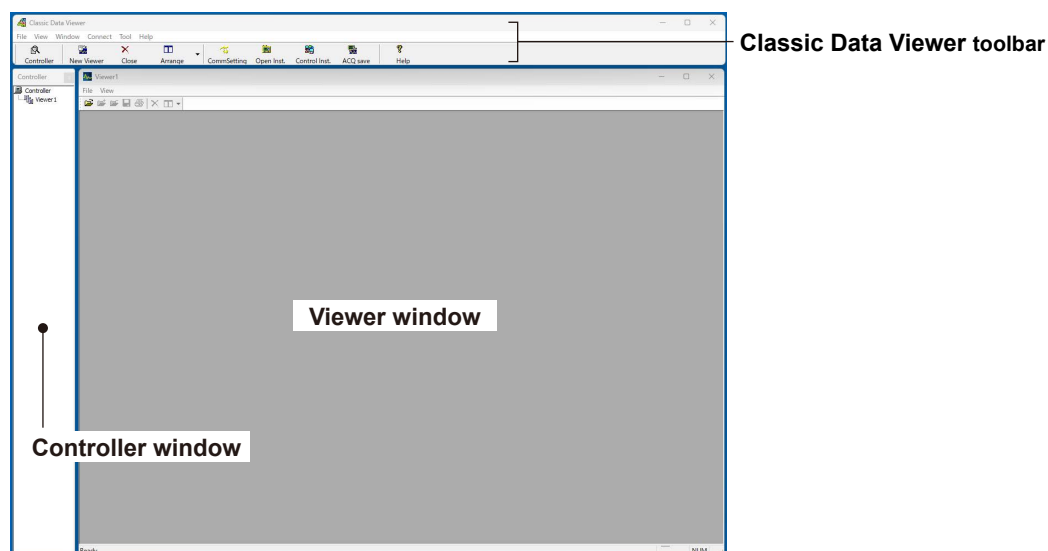


Shortcut icon

- Click **Windows**  (Start) > **All** > **YOKOGAWA** > **Classic Data Viewer**.
- Double-click the file with the associated extension.
- Drop the file with associated extension on the Classic Data Viewer shortcut icon.

Start Windows

When the software starts, the Classic Data Viewer toolbar, controller window, and viewer window will appear as shown below:



Exiting Classic Data Viewer

Select **File** > **Exit Classic Data Viewer** from the Classic Data Viewer toolbar.

2.2 Basic Operations Performed From the Start Windows

Procedure

Classic Data Viewer toolbar

Used to manipulate the controller window and viewer windows and to control the connection with the instrument.

Controller window

Used to make one of the displayed viewer windows active.

Viewer window

Used to load, display, and analyze waveform data. Multiple viewer windows can be displayed and used to load, display, and analyze waveform data in the respective viewer windows.

Classic Data Viewer toolbar

Displays or hides the controller window

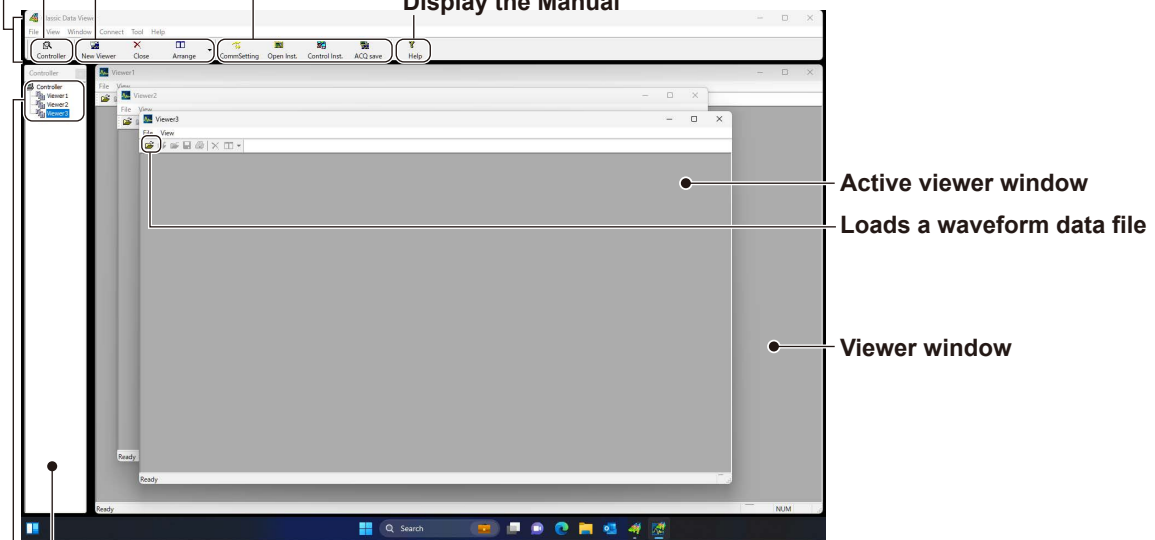
Control viewer windows

- **New Viewer:** Opens a new viewer window
- **Close:** Closes all the displayed viewer windows
- **Arrange:** Arranges the displayed viewer windows in order

Control connection with the instrument*

- **CommSetting:** Allows the specification of the settings for communicating with the instrument
- **Open Inst.:** Makes a connection with the instrument to display and transfer files
- **Control Inst.:** Makes a connection with the instrument and displays a window for handling the target instrument
- **ACQ save:** Downloads the instrument's acquisition data to the PC

Display the Manual



Controller Window

Clicking an icon makes the associated viewer window active
Double-clicking it maximizes the window

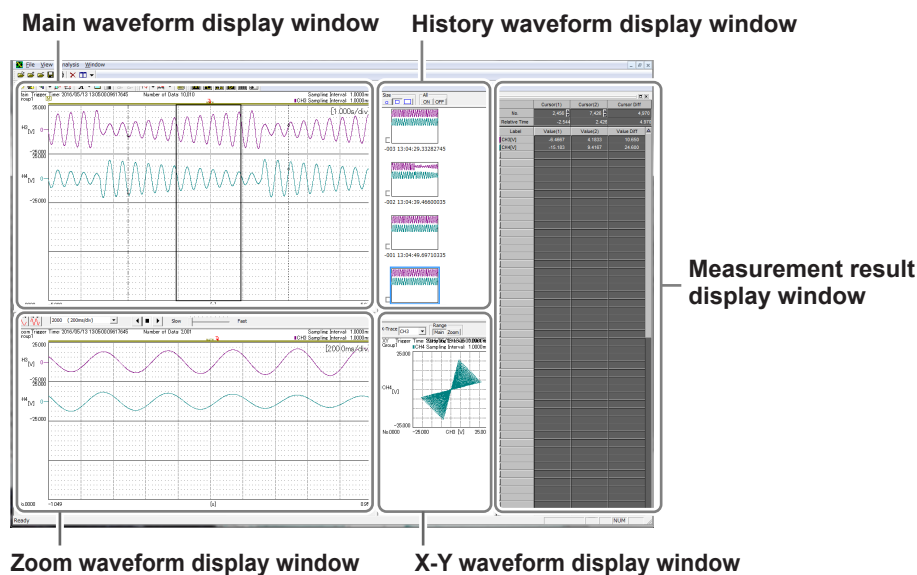
* For the target instruments of each feature, see section 1.2.

Explanation

Types of Viewer Window

There are five types of viewer window:

- **Main waveform display window:** Displays all of the loaded waveform data.
- **Zoom waveform display window:** Zooms the loaded waveform data.
- **History waveform display window:** Displays all the waveform data records obtained by means of the sequential store, single (N) trigger mode, and/or history feature.
- **X-Y waveform display window:** Plots a channel (trace) in the main/zoom window as an X-Y view.
- **Measurement result display window:** Measured values such as cursor measurements, automatic measurements, and measurements through computation are displayed as numerical values.



Resizable Windows

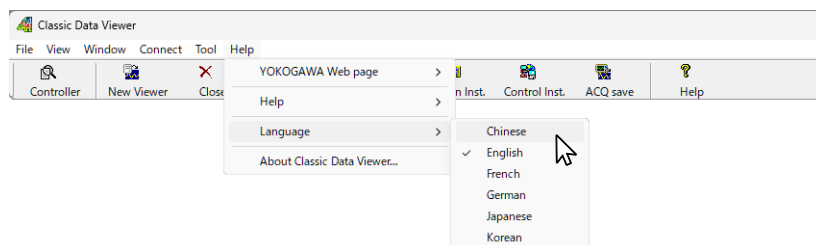
By dragging the borders of the Classic Data Viewer toolbar, Controller window, and Viewer window, you can change the size of the window arbitrarily.

Click **Arrange** on the tool bar to adjust the size of the Viewer window according to that of the Classic Data Viewer toolbar and Controller window.

2.3 Setting the Language

Procedure

1. From the toolbar, select **Help > Language**. From the list of languages that appears, select the language you want to use.



2. Restart the software.

Explanation

You can set the language displayed on the screen.

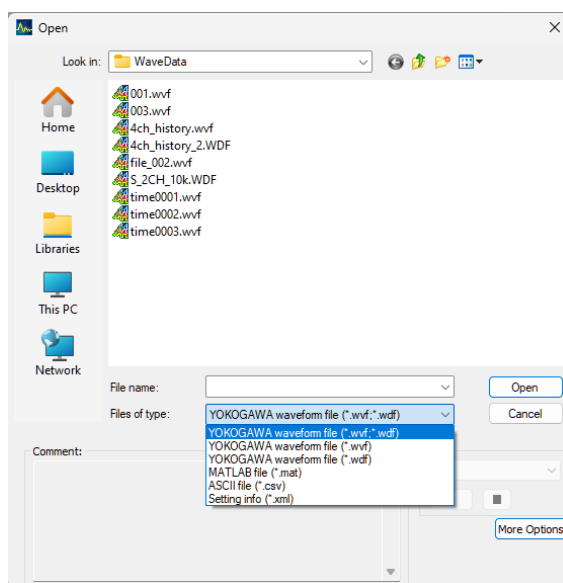
If you select a language that is different from the OS language, it may not be displayed properly.

Displaying Waveform Data

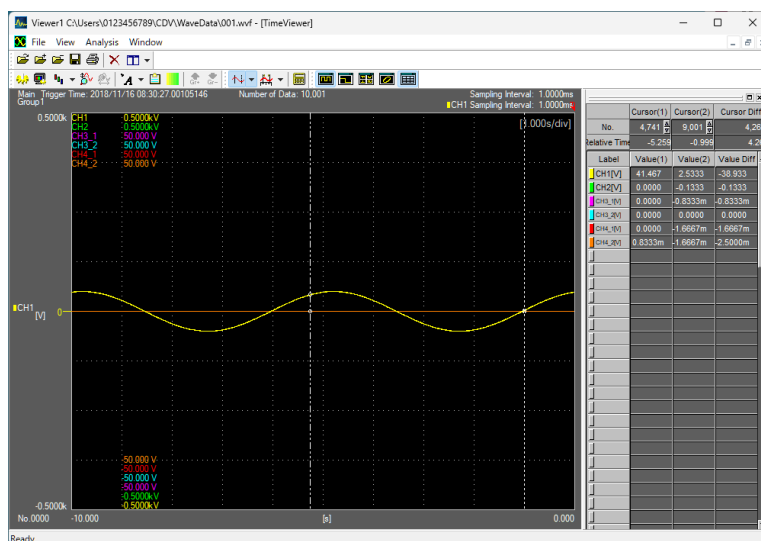
3.1 Loading Waveform Data

Procedure

1. Click  or select **File > Open**. The Open File dialog box appears.

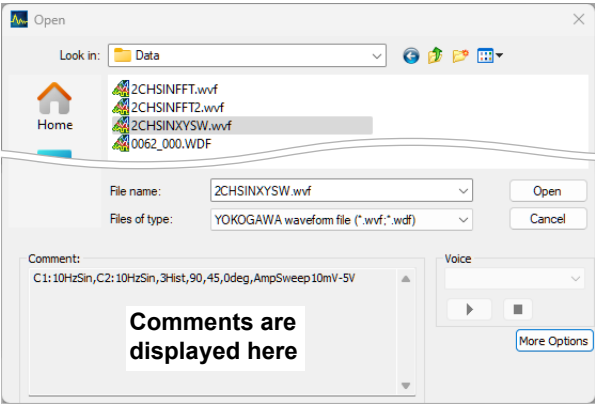


2. To display a waveform, either select the file to open from the File name field, or enter the name of the file and then click **Open**.



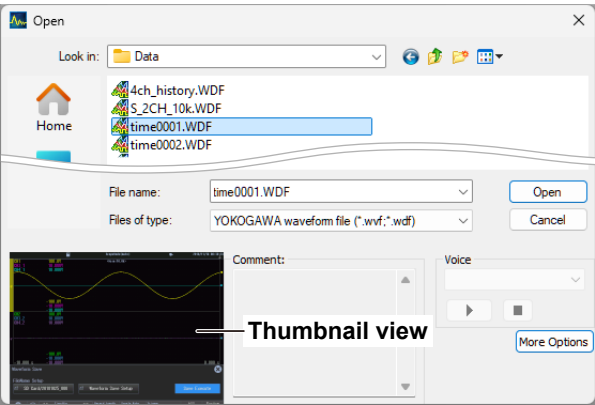
When opening a file with comments

With the DL series, when you open a file that has been saved with comments, those comments appear in the Comment field of the dialog box.



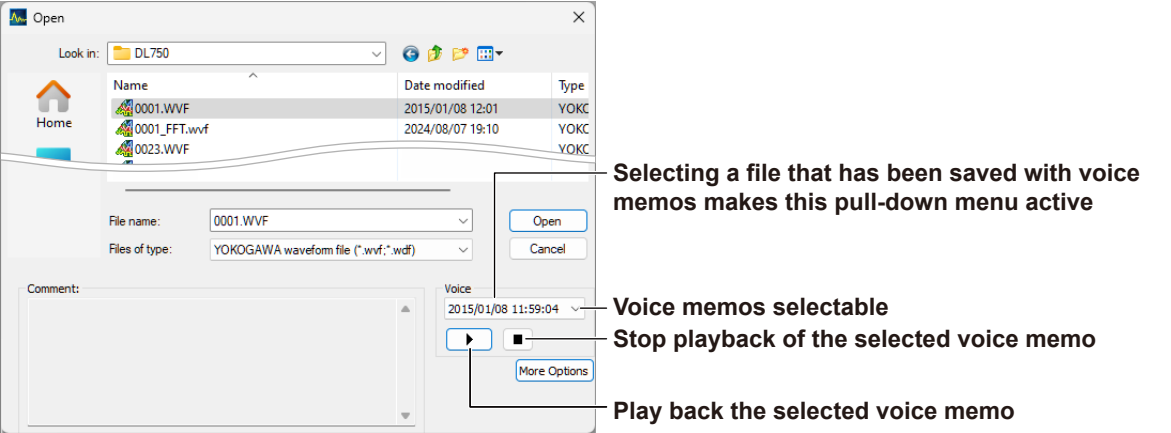
When a WDF file saved by a DL series is selected or entered

When you select a WDF file saved by a DL series, a thumbnail of the waveform data is displayed.



When opening a file with voice memos

With the DL750 series, when you open a file that has been saved with voice memos, those voice memos can be played back.



Note If your PC does not have audio capabilities, the Play and Stop buttons are grayed out.

Explanation

Loadable Files

► page 1-2

Waveform files (.wdf, .mat) that have been saved with this software

Display condition setting information file (.xml) that have been saved with this software

Note

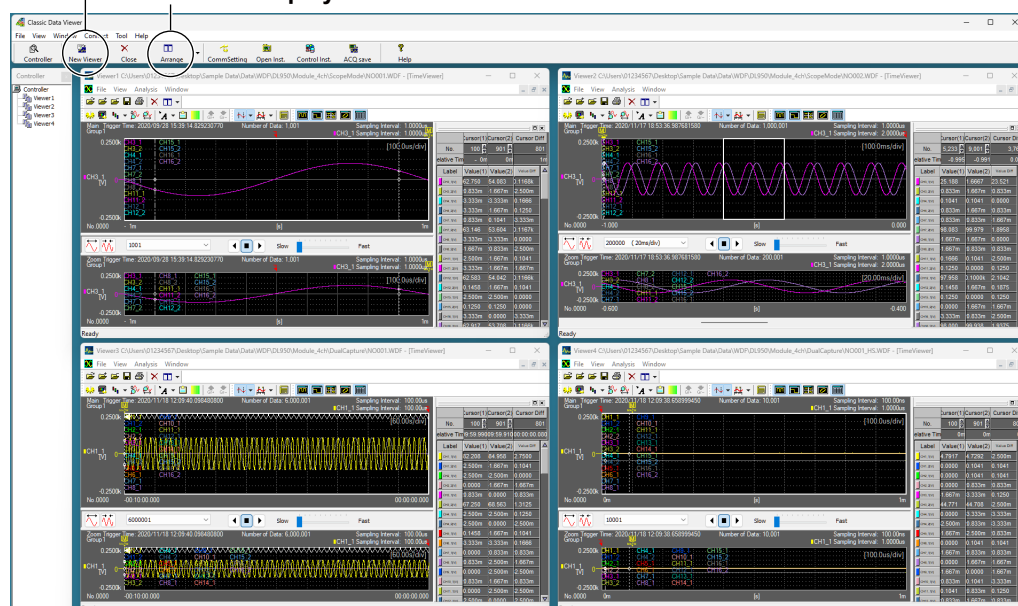
- To open a .wvf file, a header file (.hdr file) having the same name as the file you are trying to open must be placed in the same folder.
- Classic Data Viewer cannot simultaneously display waveforms that are captured with different measurement intervals, memory partitions (blocks), trigger points, or other conditions. If you attempt to load a file with waveforms that were measured under different conditions, an error message is displayed and the file is not loaded into Classic Data Viewer.
- Classic Data Viewer cannot load files with a trace name that includes a space. To load such a file, first replace the spaces in TraceName in the header file (.hdr file) with underscores (_) or other characters.
- Regarding the timestamp (trigger time) displayed in the file open dialog box or on the waveform screen when measured waveform files saved on DLM2000 series instruments of firmware version 1.05 or earlier are opened by Classic Data Viewer.
 - In the case of waveform data having 1 history waveform, the displayed timestamp is the measurement start time (when the RUN/STOP key on the DLM2000 series main unit is pressed).
 - In the case of waveform data having multiple history waveforms, the displayed timestamp differs from the time displayed on the DLM2000 series main unit.

Loading Multiple Files

A new Viewer window can be opened either by clicking  or selecting **Window > Viewer**. Multiple Viewer windows can be open at the same time, allowing you to read and display the contents of multiple files. When multiple Viewer windows are being displayed, you can tile them by clicking  or selecting **Window > Tile**.

Open a new viewer window

Tile the displayed viewer windows



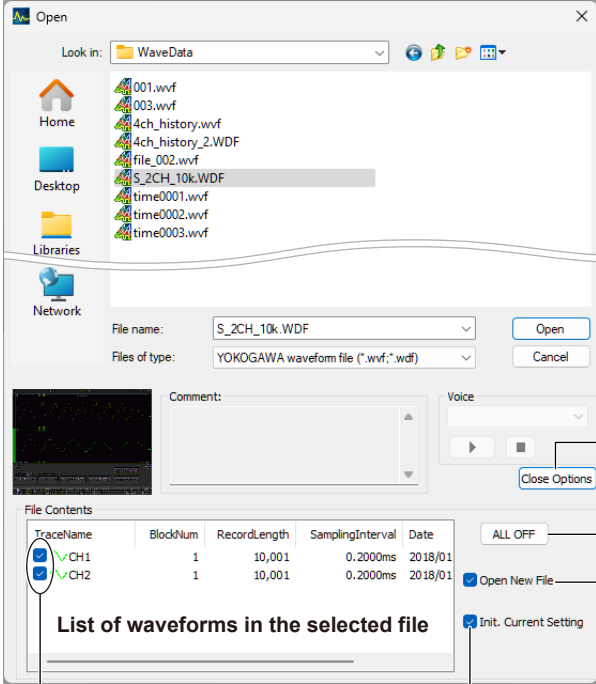
Files that can be dragged

The files with the following extensions can be dragged from the load source window onto the viewer window.

.wvf, .wdf, .csv

Setting Options for Loading Files

Click the **More Options** button to specify supplementary options for loading a file after selecting that file name.



The screenshot shows the 'Open' dialog box with the 'Look in' field set to 'WaveData'. The file list includes: 001.wvf, 003.wvf, 4ch_history.wvf, 4ch_history_2.WDF, file_002.wvf, S_2CH_10k.WDF (selected), time0001.wvf, time0002.wvf, and time0003.wvf. The 'File name' field contains 'S_2CH_10k.WDF' and the 'Files of type' is set to 'YOKOGAWA waveform file (*.wvf;*.wdf)'. Below the file list is a 'File Contents' table with columns: TraceName, BlockNum, RecordLength, SamplingInterval, and Date. The table lists two traces: CH1 and CH2, both with BlockNum 1, RecordLength 10,001, SamplingInterval 0.2000ms, and Date 2018/01. The 'Init. Current Setting' checkbox is checked. The 'Voice' section has a play button and a 'Close Options' button. The 'Open New File' checkbox is checked.

Show or hide loading options
Prevent all waveform data from being loaded.

Open New File
Clears the currently displayed waveform data and loads new waveform data. Uncheck the box to load new waveform data while keeping the current waveform displayed.

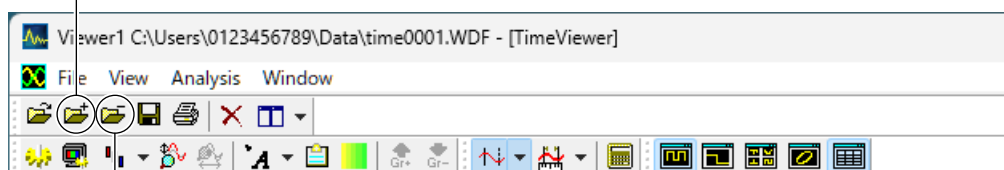
Init. Current Setting
Clears the current display conditions (vertical axis scale, waveform color, screen split, waveform parameters, and computation settings) and loads new waveform data. Uncheck the box to load new waveform data while keeping the current display conditions.

List of waveforms in the selected file
Check the boxes corresponding to the waveform data that you want to load into the viewer

Loading Sequentially Numbered Files

Click either of the buttons shown below to load and display sequentially numbered files in the folder containing the file you are currently viewing, switching the files in ascending or descending order of file numbers.

Switches to the file whose name (number) is incremented by one
(i.e., 0000.wvf → 0001.wvf → 0002.wvf)



Switches to the file whose name (number) is decremented by one
(i.e., 0002.wvf → 0001.wvf → 0000.wvf)

Reference Files in the Instruments

You can directly reference waveform data files saved into the media of the instruments and which are connected to Classic Data Viewer. For details, see Section 8.3.

Automatically Loading Display Settings

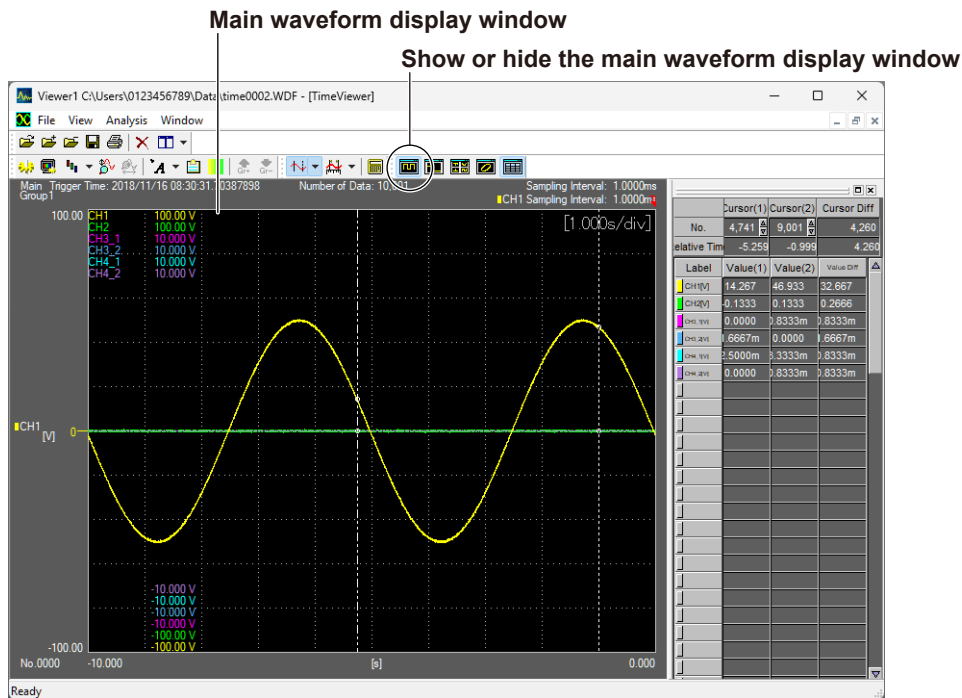
Waveform data is loaded, the corresponding display settings are automatically loaded. For automatic saving and loading of display settings, see section 6.5.

3.2 Displaying Waveforms in the Main View

Procedure

Displaying Waveforms in the Main View

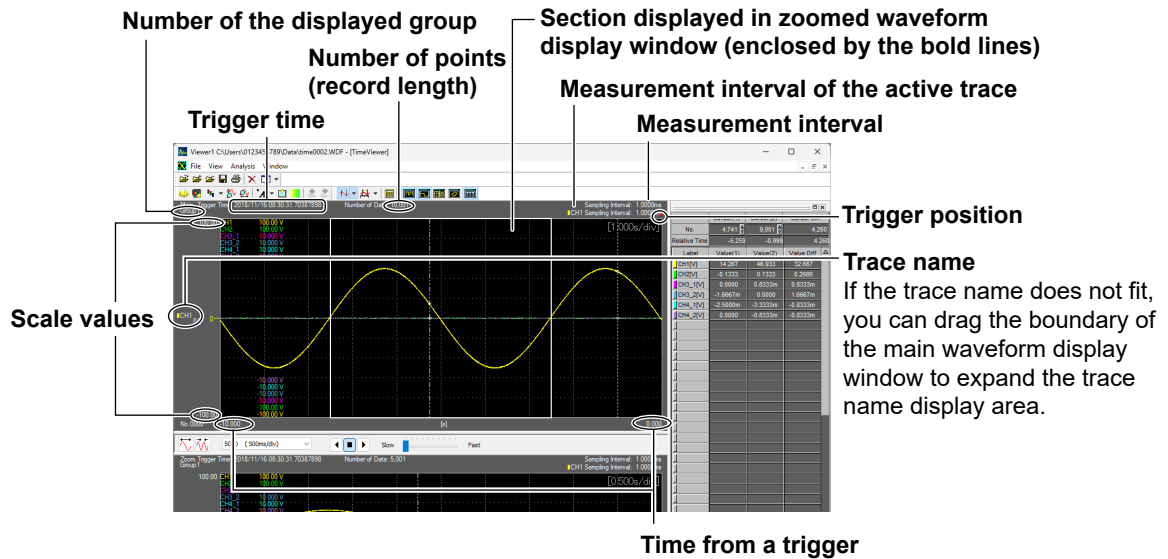
To display waveforms and measurement results, first open a waveform data file. To show or hide the main waveform display window, click  or select **Window > Main Window**.



Explanation

Details of the Main Waveform Display Window

The main waveform display window provides a global view of the waveform data.



When multiple waveforms are displayed, clicking a waveform or vertical scale (for showing and hiding the vertical scale, see section 4.4) causes the clicked waveform to become active and displayed in front. In addition, the scale values and measurement interval for the active waveform are displayed.

Displaying Tooltips

If you place the pointer on the waveform for about one second, the information for that point is displayed. For example, in the case of a time-voltage waveform, the time and voltage are displayed. The information is displayed for the main and zoomed waveforms. It is not displayed for history, XY, or logic waveforms.



3.3 Displaying Waveforms in a Zoomed View

Procedure

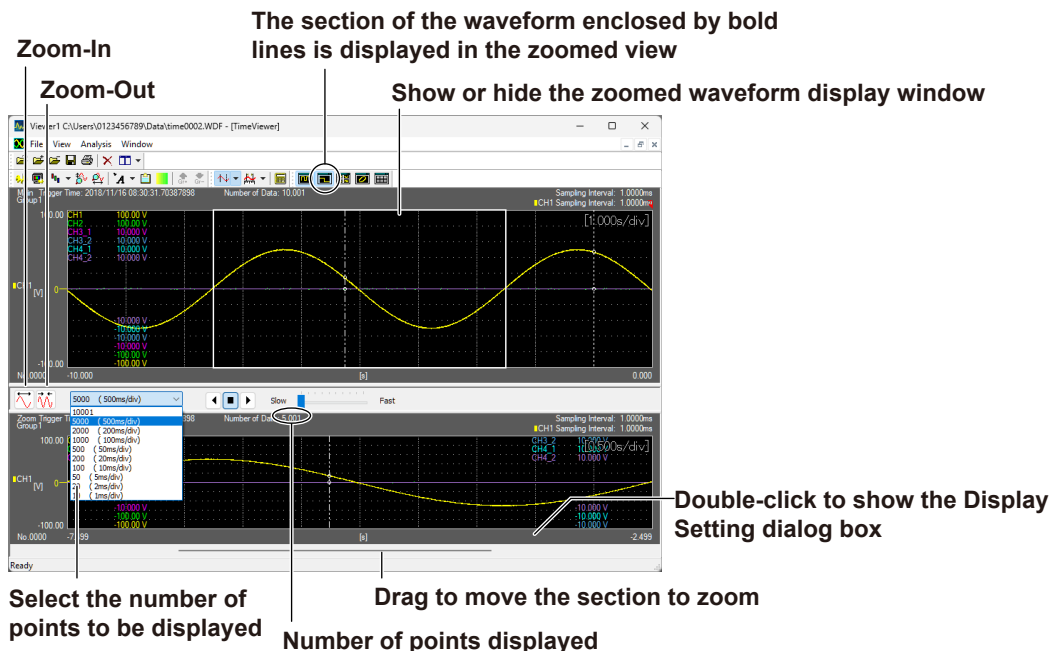
Displaying Waveforms in a Zoomed View

Click  or select **Window > Zoom Window** to display a zoomed view of the section enclosed by the bold lines in the main waveform display window.

Setting the Zoom Factor

To increase or reduce the zoom factor, click  (Zoom-In) or  (Zoom-Out).

You can also use the mouse wheel to change the zoom factor.



Moving the Zoomed-In Section

You can move the section to zoom by:

Dragging the bold line

You can drag the bold line in the main waveform display window to move the section to zoom. Use the arrow buttons to move it automatically.

Designating a point in the Display Setting dialog box

You can double-click the bottom of the zoomed waveform display window to show the Display Setting dialog box in which you can designate a point at which to start the zoomed section display. Click **OK** to apply the point.

Dragging the scroll bar

You can drag the scroll box at the bottom of the zoomed waveform display window to move the section to zoom.

Scrolling Zoomed Waveforms

Arrow Buttons

To start scrolling, click  or  to specify the direction you want to scroll in.

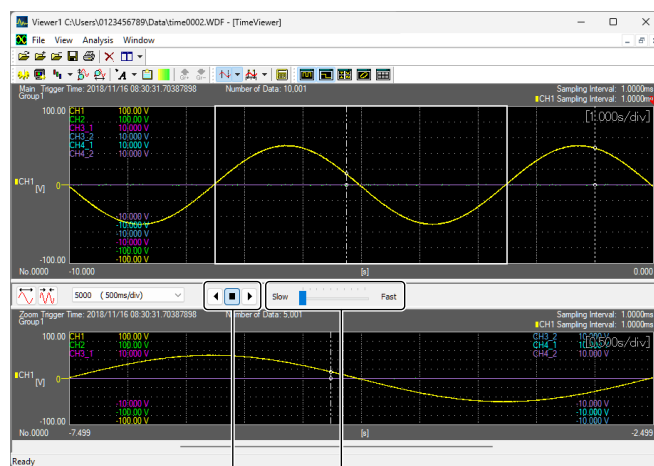
Stop button

To stop scrolling, click .

To resume scrolling, click  or  again.

Note

- Waveforms cannot be scrolled during measurement of waveform parameters or computation.
- You can also scroll by using the arrow keys on the keyboard.



Set the scroll rate using the control bar
Select the scrolling direction or stop scrolling

Explanation

Zoom Rate

The maximum zoom rate depends on the data being displayed. A view with 10 or fewer points cannot be zoomed.

Scrolling the Zoomed Waveform View

The zoomed waveform view can be scrolled automatically.

Use the following buttons to select the scrolling direction and rate:

Scrolling direction

- : Scrolls to the right
- : Scrolls to the left
- : Stops scrolling

Scrolling rate

Set one of the ten scrolling rates, from Slow to Fast.

Designating the Section to be Zoomed

To designate the point at which zooming is to start in the Display Setting dialog box, specify the value of the left most point of the zoomed section that you want to view. The values that can be specified vary with the zoom rate and displayed waveforms.

Inputting the number of data points

Input an integer to start display from that number of data points.

Inputting a time

In relative time display mode, input a real number to start display from that time. At this time, m (10^{-3}), u (10^{-6}), n (10^{-9}), and P (10^{-12}) can be used.

(Example)	1.23	→	1.23 s
	1.23 ms	→	1.23 ms
	1.23E-3	→	1.23 ms
	0.00123	→	1.23 ms

3.4 Displaying Waveforms in the History View

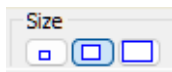
Procedure

Displaying Waveforms in the History View

Click  or select **Window > History Window** to open the history waveform display window.

Changing View Sizes

To change the size of the history waveform view, click any of the three Size buttons.



Selecting the History Waveforms to be Displayed

To display all the history waveforms in the main waveform display window, click **ON** for ALL.

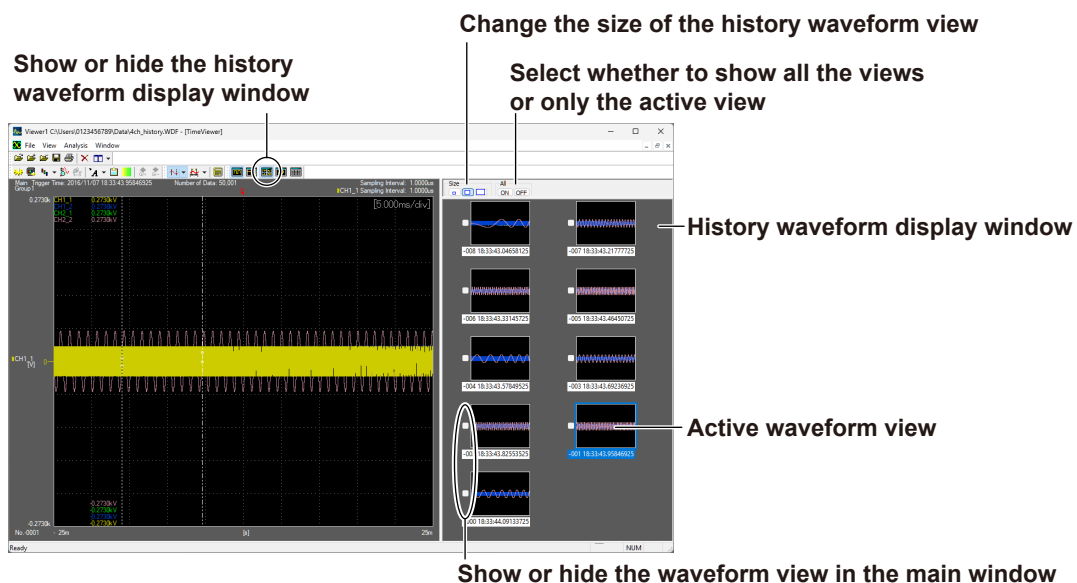
To display only the active history waveforms in the main waveform display window, click **OFF**.

You can place a checkmark in the check box corresponding to individual history waveform views to select specific history waveform views to be displayed in the main waveform display window.

Making a History Waveform Active

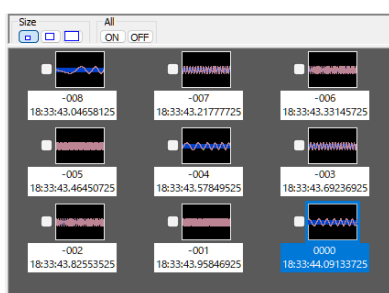
To make a history waveform active in the main waveform display window, click the history waveform view. The history waveform view is enclosed by blue lines and its history waveform number is highlighted.

When other history waveform views are also displayed, the active history waveform view appears brighter than the others.



3.4 Displaying Waveforms in the History View

Sample of minimum-size views



Explanation

Data That Can Be Loaded Using the History Waveform Display Window

The history waveform display window can display waveform records saved with the sequential store, single (N) trigger mode, and/or history waveform handling features of the DL series, SL1400, and SL1000.

Note

An error message will appear if there is insufficient memory.

Sizes of History Waveform Views

You can select one of three sizes for listing the history waveform views.

ALL ON/OFF

You can select whether to display all the history waveform views listed in the history waveform display window in the main waveform display window:

ON: Displays all the history waveform views in the main waveform display window.

OFF: Displays only the active history waveform view.

Active History Waveform View

- Cursor measurements can be applied to active history waveforms.
- The waveforms of the active view appear brighter in the main waveform display window.
- The number of the active view is highlighted in the history waveform display window.

3.5 Displaying a Waveform in the X-Y View

Procedure

Displaying a Waveform in the X-Y View

Click  or select **Window > X-Y Window** to display the X-Y waveform display window.

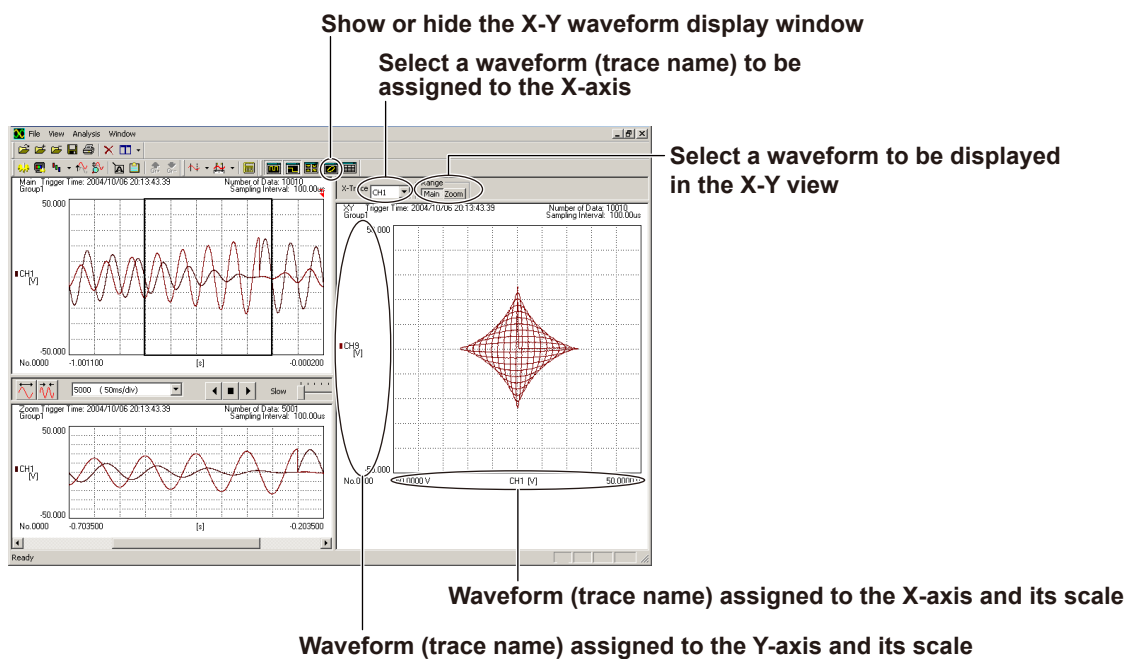
Selecting a Waveform to be Displayed in the X-Y view

To see a waveform displayed in the main waveform display window in the X-Y view, click **Main** under Range.

To see a waveform displayed in the zoomed waveform display window in the X-Y view, click **Zoom** under Range.

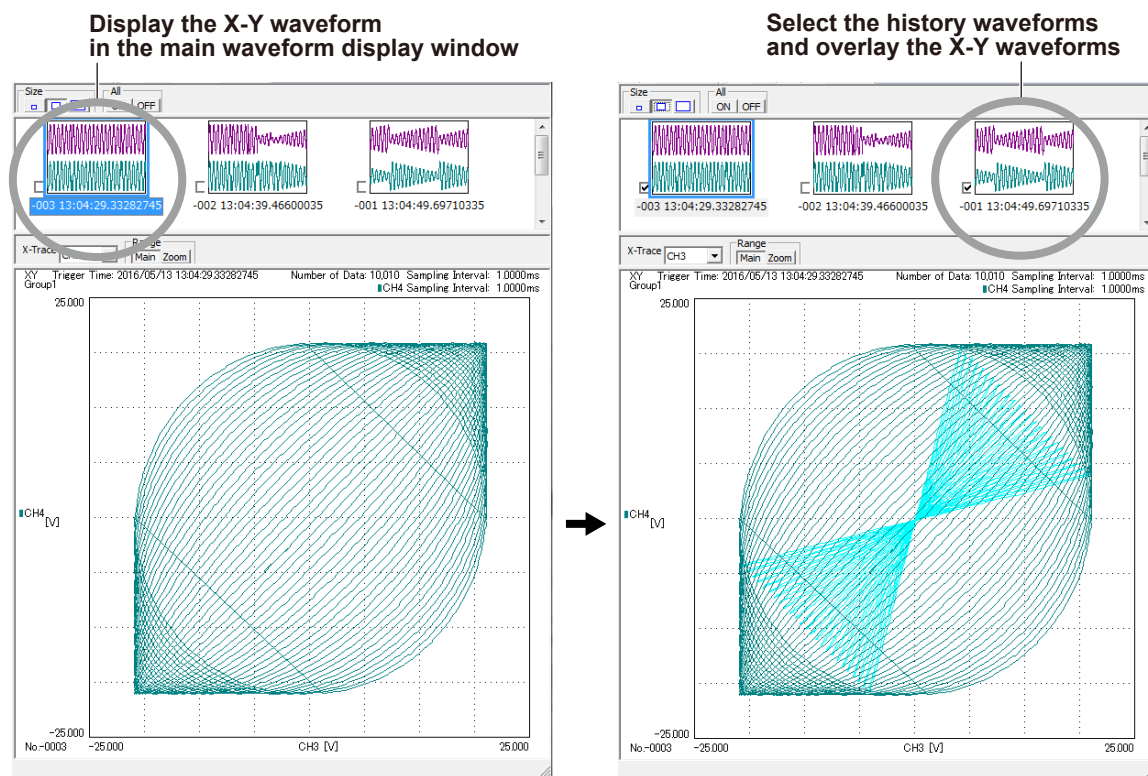
Setting the X-Axis

Select a waveform (trace name) to be assigned to the X-axis by using the X-Trace list box. All waveforms other than that assigned to the X-axis are allocated to the Y-axis.



Overlaying X-Y Waveforms

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



Note

- The X-Y waveform display window plots P-P data displayed in the main, zoom, or history waveform display window into the X-Y view.
- The X-Y view of logic waveforms cannot be shown.

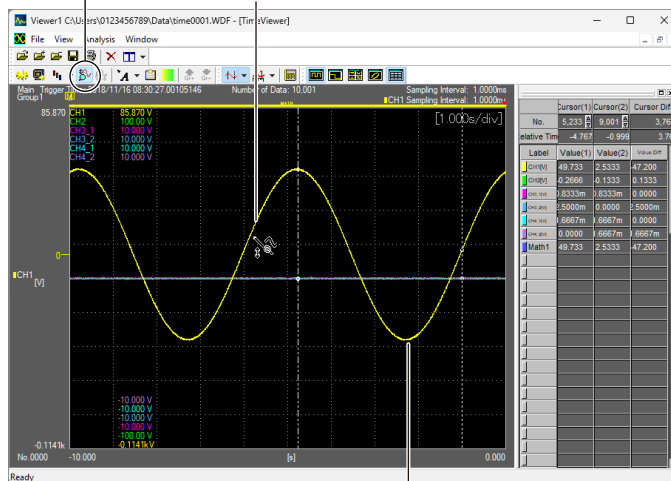
3.6 Moving or Zooming Waveforms

Procedure

Moving or Zooming (Expanding/Reducing) the Waveforms Vertically

1. Click  or select **View > Waveform Vertical Zoom&Move**.
2. Using the mouse, drag the waveform you want to move.
3. Click the waveform you want to expand. The selected waveform expands around the clicked point. Right-click the waveform to reduce the waveform around that point.

Click this icon before moving a waveform
Drag a waveform to move it



- Left-click the waveform to expand
- Right-click the waveform to reduce

Moving or Zooming (Expanding/Reducing) the Waveforms Horizontally

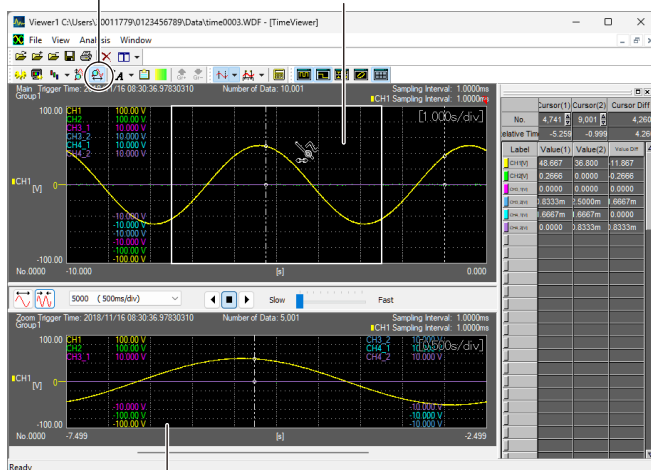
1. Click  or select **View > Waveform Horizontal Zoom&Move**.
2. Drag the frame or a point in the frame in the main waveform display window or the zoom waveform display window.

3.6 Moving or Zooming Waveforms

- Click on the main or zoom waveform display window to expand the zoom display waveform around the clicked point. Right-click the waveform to reduce the waveform around that point.

Click this icon before moving or zooming the waveform

Drag the frame or a point in the frame to move it



- Drag the zoom waveform display window to move it
- Left-click on the zoom waveform display window to expand or right-click to reduce

Note



or View > Waveform Horizontal Zoom&Move is selectable only if the zoom waveform display window is displayed. For the procedure to display the window, see section 3.3.

Explanation

Applicable Windows

Move and zoom can be applied to the main or zoom waveform display window.

3.7 Splitting the Screen

Procedure

Splitting Waveforms by a Trace

Click  or select **View > Split** to overlap the waveforms in the main waveform display window or zoomed waveform display window, splitting them based on the trace name.



Explanation

Split Settings

Default value for the number of split waveforms

The default value for the number of split waveforms depends on the number of waveforms that are automatically identified by Classic Data Viewer, and is used both for the main waveform display window and zoomed waveform display window. The default value can be changed using the split setting dialog box.

Using this dialog box, you can specify different split settings for the main waveform display window and zoomed waveform display window or modify the default split settings.

For details, see section 4.3.

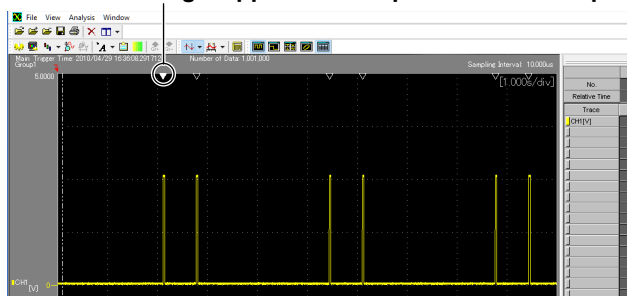
3.8 Displaying Waveforms Acquired with the DL950, DL850 Series, or SL2000 Dual Capture Feature

Main waveforms and captured waveforms acquired using the DL950, DL850 series, or SL2000' dual capture feature can be displayed.

Procedure

Load data captured with the DL950, the DL850 series, or SL2000 Dual Capture feature according to the instructions in section 3.1, "Loading Waveform Data." The main waveform is displayed. A triangle is displayed at the position of the capture waveform.

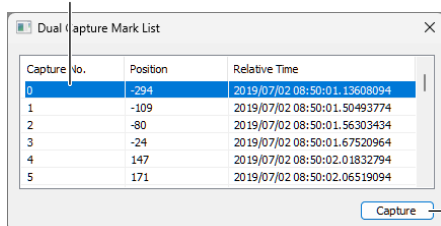
A triangle appears at the position of the capture waveform



Capture Waveform Display

1. Double-click the capture waveform mark, or click **View > Dual Capture Mark List**. The dual capture list is displayed.
2. Double-click the capture waveform to display, or select it and click **Capture**. The selected capture waveform is displayed.

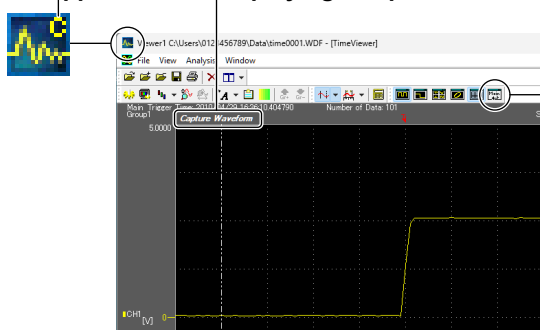
Select the capture waveform to display



Click to display the selected capture waveform

Capture waveform

Appears when displaying a capture waveform



The "return to main waveform" icon

Returning to the Main Waveform

1. Click the “return to main waveform” icon, or click **View > Return to main waveform**. The main waveform is displayed.

Explanation

You can link, analyze, and display the main and capture waveforms acquired with the Dual Capture function.

3.9 Switching between Groups

Procedure

Switching between Groups

When you have already registered groups, you can switch between those groups either by clicking



by selecting **View > Next Group/Previous Group**.

Switch to the group whose number is one greater than that of the current group

Switch to the group whose number is one less than that of the current group

Number of the group currently being displayed

No.	Cursor1	Cursor2	Cursor Diff
1	1981	1385	-596
Relative Time	-9.262000	-9.862200	-0.600200

Trace	Value1	Value2	Value Diff
CH1 [V]	16.688	-7.288	-23.976
CH2 [V]	16.688	8.788	-7.916

Auto Group Setting

Click **View > Auto Group Setting** to open the screen below.

Enter the number of channels in a group.

Auto Group Setting

☒ Initialize Channel Settings

Number of Channels in Group

Explanation

Grouping Channels

In the Channel Setting dialog box, you can group channels by trace name. In addition, the specified number of channels can be automatically allocated to a single group. For details, see Section 3.2.

Note

If there are no groups,  and  are unavailable (no operation even if they are clicked).

Set Auto Group

Enter a value in the **Number of Channels in Group** box and click **OK** to automatically assign the specified number of channels to a single group.

For example, if you enter 30, channels are assigned as follows: CH1 to CH30 to group1, CH31 to CH60 to group 2, and so on.

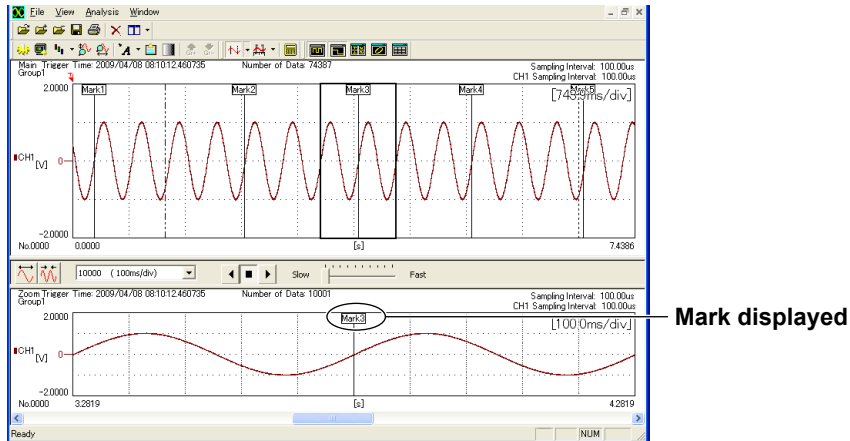
If you select the **Initialize Channel Setting** check box and click **OK**, channel settings such as the ON/OFF condition of the display, scale, and waveform color are initialized.

3.10 Showing Marks

Procedure

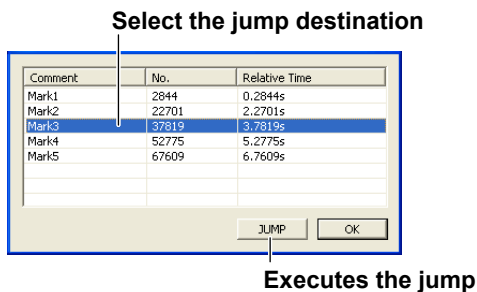
Showing Marks

Click **View > Show Marks**. The marks are displayed.



Mark List and Jump

Click **View > Mark list**. The screen below appears. Select a jump destination, then click **Jump**. The selected mark is displayed in the center of the zoom waveform window.



Explanation

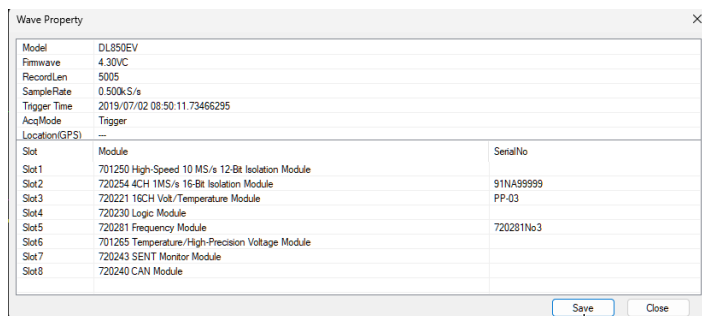
Showing Marks

Marks are displayed when loading waveform data from mark files (extension: .mrk). Also, you can display previously set marks in a list, and jump to any mark you specify. This function is available with waveform data on which marks have been set using version 2.10 or later of the SL1000 acquisition software.

3.11 Displaying Waveform Properties

Displaying Waveform Properties

Click **View > Waveform Property**. The waveform properties are displayed.



The 'Wave Property' dialog box contains the following fields and table:

Model	DL850EV	
Firmwave	4.30VC	
RecordLen	5005	
SampleRate	0.500K-S/s	
Trigger Time	2019/07/02 08:50:11.73466295	
AcqMode	Trigger	
Location(GPS)	---	
Slot	Module	SerialNo
Slot1	701250 High-Speed 10 MS/s 12-Bit Isolation Module	
Slot2	720254 4CH 1MS/s 16-Bit Isolation Module	91NA99999
Slot3	720221 16CH Volt/Temperature Module	PP-03
Slot4	720230 Logic Module	
Slot5	720281 Frequency Module	720281No3
Slot6	701265 Temperature/High-Precision Voltage Module	
Slot7	720243 SENT Monitor Module	
Slot8	720240 CAN Module	

Buttons: Save, Close

Save the waveform properties

Saving Waveform Properties

Click **Save** to save the contents shown on the waveform properties screen to a text file.

Specifying Display Settings for Waveform Data

4.1 Loading Display Settings

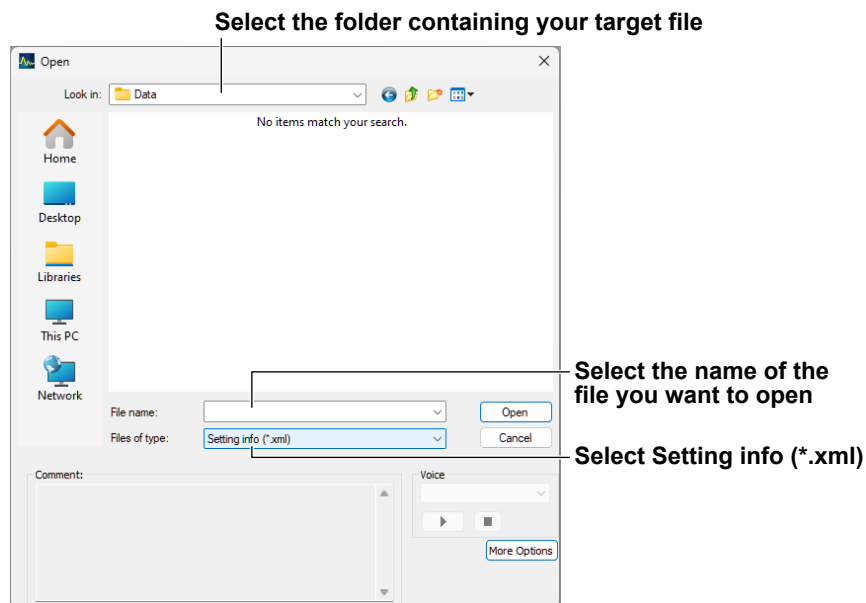
The display conditions specified on the current viewer window can be saved in XML format. You can also include comments when saving the file.

If you load the display conditions that you created, the conditions are applied to the current viewer window. For the procedure to create and save the display conditions, see section 6.5.

Procedure

Loading Display Settings

Click  or select **File > Open** to display the Open File dialog box. Select **Setting info (*.xml)** in Files of type, browse to the folder containing your target file, select the name of the file you want to open, and then click **Open**. The display settings are loaded from the file into the viewer window.



Explanation

Application of Display Settings

Loading a Display Setting file already saved applies the display settings in the file to waveform views.

4.2 Setting Waveforms (Channels) to be Displayed

Procedure

Displaying the Channel Setting Dialog Box

Click  or select **View > Channel** Setting to display the Channel Setting dialog box. Using this dialog box, you can specify the display and group settings for the respective channels.

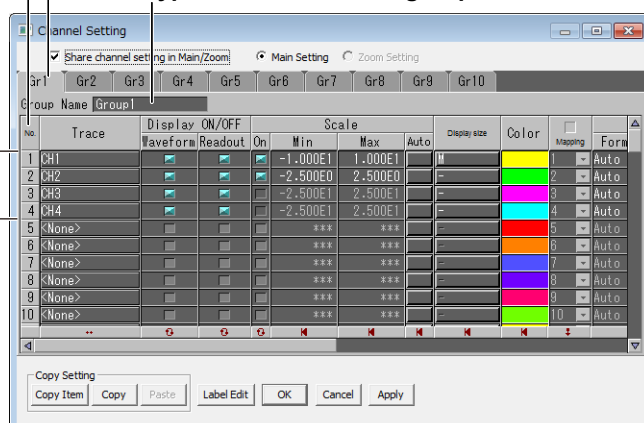
Grouping Channels

You can group the channels (trace names) to be registered. You can handle waveform display settings in units of groups.

Channel number

Select the tab corresponding to the group to be set up

Type in a name for the group



Channels (trace names) registered in the group

Setting Up Channels (Traces)

Set up the channels (traces) for each channel number. Click a trace name to display the Channel dialog box, and then select a channel (trace name) from the dialog box.

Pointing the cursor to a trace shows the detailed information of the selected channel (Sampling Interval, Sampling Rate, Record Length, Module). (Module appears only in WDF files saved with the DL850E, DL850EV, DL350, DL950, and SL2000.)

Specifying whether to Show or Hide Waveforms and Cursor Measurement Values

Specify whether to show or hide the waveform and cursor measurement values for each channel number.

Setting Scales

Set the scale values for each channel number.

Setting the Display Size

This setting is valid when split view is enabled.

For details, see section 4.3.

Setting Waveform Colors

Using the color palette, set the waveform colors for each channel number.

Click the name of a trace to be displayed in the Channel dialog box, and then select a channel (trace name) from the dialog box

Specify whether to show or hide the waveform

Specify whether to show or hide the cursor measurement values

Click to automatically set scale values according to the amplitude

Display size

Using the color palette, set a color for the waveform

Directly input scale values

Place a checkmark in the box to specify scale values

Select the check box to enable log scale (only shown when the waveform to be displayed is FFT)

The screenshot shows the 'Channel Setting' dialog box. It has tabs for 'Main Setting' and 'Zoom Setting'. The 'Main Setting' tab is active. It contains a table with columns: No., Trace, Waveform, Rearout, Log On, Scale (Min, Max, Auto), Display size, and Color. The table has 10 rows (Gr1 to Gr10). The 'Trace' column has a dropdown menu. The 'Waveform' column has a dropdown menu. The 'Rearout' column has a dropdown menu. The 'Log On' column has a checkbox. The 'Scale' column has input fields for Min and Max, and a checkbox for 'Auto'. The 'Display size' column has a dropdown menu. The 'Color' column has a color palette. Annotations point to various elements: 'Click the name of a trace to be displayed in the Channel dialog box, and then select a channel (trace name) from the dialog box' points to the 'Trace' dropdown. 'Specify whether to show or hide the waveform' points to the 'Waveform' dropdown. 'Specify whether to show or hide the cursor measurement values' points to the 'Rearout' dropdown. 'Click to automatically set scale values according to the amplitude' points to the 'Auto' checkbox. 'Display size' points to the 'Display size' dropdown. 'Using the color palette, set a color for the waveform' points to the color palette. 'Directly input scale values' points to the 'Min' and 'Max' input fields. 'Place a checkmark in the box to specify scale values' points to the 'Auto' checkbox. 'Select the check box to enable log scale (only shown when the waveform to be displayed is FFT)' points to the 'Log On' checkbox.

Specifying Waveform Mapping Manually

For each channel, you can manually specify in which screen (when the viewer window is split) to display waveforms using mapping numbers 1 to 32. 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.

Example

If there are 4 splits and the mapping number is 10, the waveform is displayed in the second screen from the top. When 10 is divided by 4, the remainder is 2. This “2” indicates the second split screen. If the remainder is 0, the waveform is displayed in the bottom-most screen.

Setting the Display Format, Distal Line, Mesial Line, Proximal Line, and High and Low Values

For each channel number, you can set (1) the display format and the number of displayed digits of the values on the viewer window, (2) logic waveform display conditions, and (3) the distal line, mesial line, proximal line, and high and low values used in waveform parameter computation.

Manually specify the mapping for the displayed waveform

Specify how numerical values are to be displayed

Specify the number of digits to be used to indicate a numerical value

Select the unit for setting the distal line, mesial line, and proximal line

Setting the distal line.

Setting the high and low.

Setting the proximal line.

Setting the mesial line.

Specify the display settings for logic waveforms in the Bit Setting dialog box

Editing Labels

Displaying the Edit Label Dialog Box

In channel settings, click **Label Edit** to display an Edit Label dialog box. Edit the labels of each channel.

Label Edit button

Editing Labels

Click the label to edit.

Note

For WDF, WVF, and CSV files saved with the DL850E, DL850EV, DL350, DL950, or SL2000, clicking OK or Apply updates the labels of the waveform file and overwrites the file.

Explanation

Channel (Trace Name) Settings Shared

Channel (trace name) settings are shared by the main waveform display window and the zoomed waveform display window. The cursor measurement value is used as the main waveform display setting.

To apply different channel settings to each of the windows, remove the check mark from **Apply Channel Settings in both Main/Zoom**, place a check mark in **Main Window** or **Zoom Window**, and then make the individual channel (trace name) settings.

Number of Groups and Number of Channels (Traces) that Can Be Registered

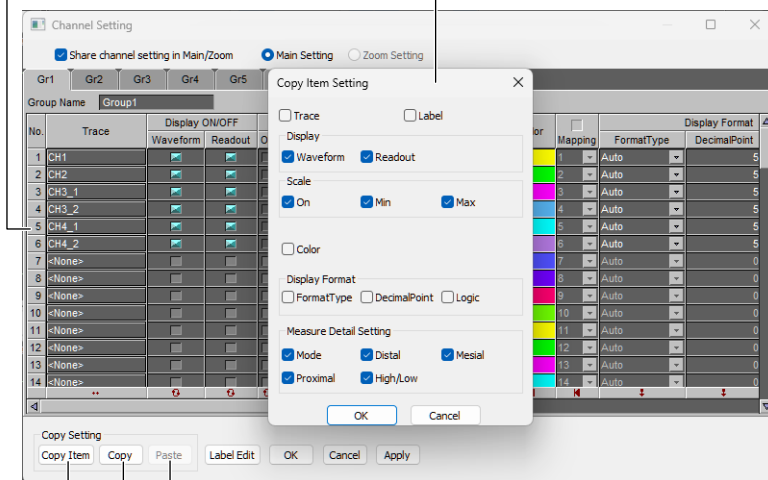
Classic Data Viewer lets you create up to 10 channel (trace name) groups. You can register up to 90 channels per group.

Setting Items to Copy and Paste

Classic Data Viewer lets you copy the settings for a channel (trace) selectively and then paste those settings to another channel. After pressing **Copy Item** to display the Select Copied Items dialog box, you can define the setting items that you want to copy in advance. The Select Copied Items dialog box is also displayed when you execute a paste command, allowing you to remove any unnecessary setting items and paste only those which are required.

Select (or deselect) a channel number

Select Copied Items dialog box



Paste the copied setting items to the selected channel

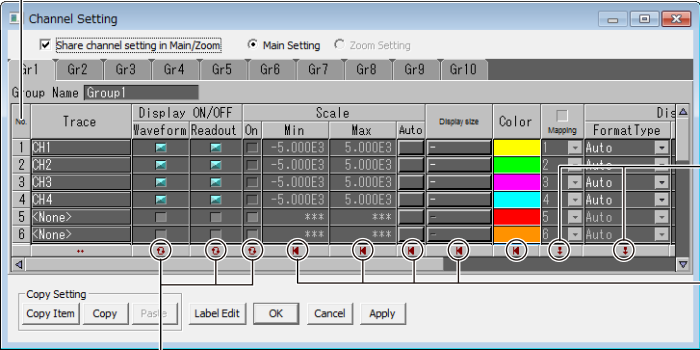
Copy the setting items from the selected channel

Select the setting items to be copied using the Select Copied Items dialog box

Changing All Settings Together

The Channel Setting dialog box provides buttons that allow you to select and change all the settings together.

Select or deselect all the channels



Apply the settings for the channel at the the top of the column to other selected channels

Restore all the settings for the selected channels to their initial values

Turn the settings for all the selected channels on or off together

Notational Format Items

You can specify the following notational format items:

Item	Description
Format Type	- Select Auto, Floating Point, or Exponential - Selecting either Floating Point or Exponential causes the following data to be displayed in the viewer windows, using the selected type of notation: Scale Values, Values of Cursor Measurement, and Waveform Parameters (Amplitude Maximum, Minimum, High Level, Low Level, Peak to peak value, Average, Middle, RMS, Int1TY, and Int2TY)
Decimal Point	Specify the number of decimal places to be displayed for both the floating point and exponential notations.
Logic	Specify the display settings for the logic waveforms in the Bit Setting dialog box. ► next page
Number of bits that can be displayed	
DL9700 series, SB5000 series, DL6000/DLM6000 series, DLM5000HD series, DLM5000 series	Up to 32 bits
DL9500, DL750, SL1400 series, DLM4000 series (with the /L16 option)	Up to 16 bits
DL7400 series, DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DL850 series, DL350, DL950, and SL2000	Up to 8 bits

Bit Setting Dialog Box

Set the display conditions of the logic waveform.

Display the bit name

Displayed when bit names are specified in the loaded logic waveform.

Place a checkmark against those bits that are to be indicated

Turns mapping on and off

Select display positions when there are hidden bits.

- ON: The shown bit waveforms are displayed at regular intervals (the display positions change).
- OFF: The shown bit waveforms are displayed at the positions they would be displayed when all bit waveforms are shown (the display positions do not change).

Location

Display the logic waveforms using the entire window

Display logic waveforms in the upper half of the window

Display logic waveforms in the lower half of the window

Set the order in which the bits are displayed:

MSB: Displays the bits from the most significant bit
LSB: Displays the bits from the least significant bit

Display format of the values displayed in the measurement result display window

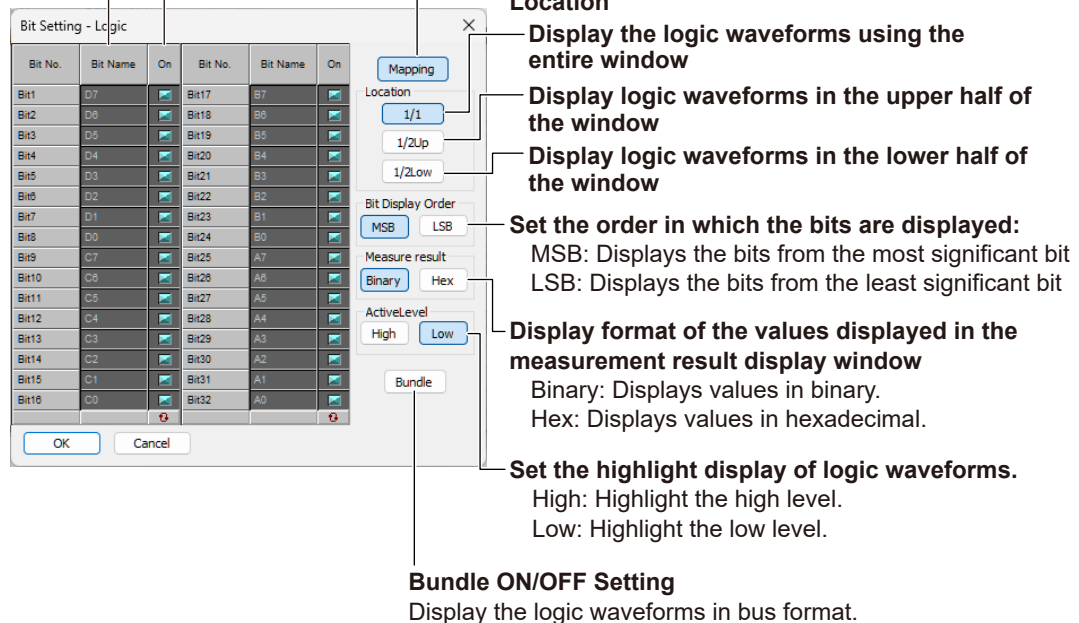
Binary: Displays values in binary.
Hex: Displays values in hexadecimal.

Set the highlight display of logic waveforms.

High: Highlight the high level.
Low: Highlight the low level.

Bundle ON/OFF Setting

Display the logic waveforms in bus format.



Cursor Data Display Method (Measure Result)

The measured values can be displayed in binary or hexadecimal notation.

Binary: Displays values in binary notation.

Hex: Displays values in hexadecimal notation.

Bundle ON/OFF Setting (Bundle)

If you set Bundle to ON, the data of each logic probe (PodA, PodB, PodC, and PodD) can be combined together into up to 32-bit data and processed. If an OFF bit is present, the bit is displayed as a hyphen in binary display. The bit is considered to be not present in hexadecimal display.

4.2 Setting Waveforms (Channels) to be Displayed

Cursor Data Order (Bit Display Order)

You can select the order of the bits of the logic probe. Select MSB to select bit 7 to bit 0 order; select LSB to select bit 0 to bit 7 order. In addition, the displayed order and number vary depending on the model as follows:

DL750 series

Bit No.	Bit Name	On
Bit1	A-1	☐
Bit2	A-2	☐
Bit3	A-3	☐
Bit4	A-4	☐
Bit5	A-5	☐
Bit6	A-6	☐
Bit7	A-7	☐
Bit8	A-8	☐
Bit9	B-1	☐
Bit10	B-2	☐
Bit11	B-3	☐
Bit12	B-4	☐
Bit13	B-5	☐
Bit14	B-6	☐
Bit15	B-7	☐
Bit16	B-8	☐

DL7400 series, DL850 series, DL350, DL950, SL2000

Bit No.	Bit Name	On
Bit1	Bit1	☐
Bit2	Bit2	☐
Bit3	Bit3	☐
Bit4	Bit4	☐
Bit5	Bit5	☐
Bit6	Bit6	☐
Bit7	Bit7	☐
Bit8	Bit8	☐
Bit9	Bit9	☐
Bit10	Bit10	☐
Bit11	Bit11	☐
Bit12	Bit12	☐
Bit13	Bit13	☐
Bit14	Bit14	☐
Bit15	Bit15	☐
Bit16	Bit16	☐

DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series (for 16 bit), DLM5000 series (for 16 bit)

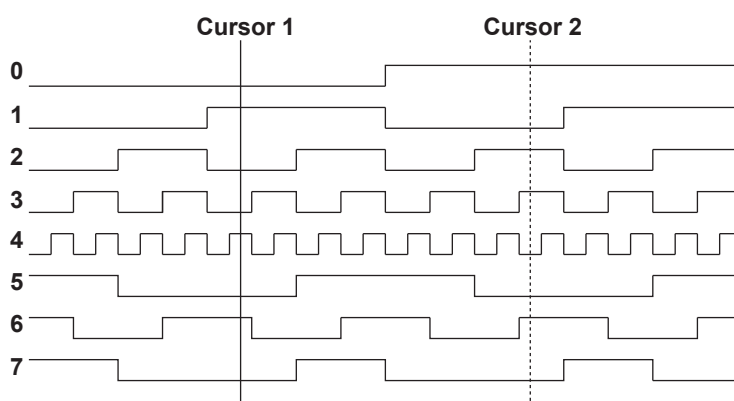
Bit No.	Bit Name	On
Bit15		☐
Bit14		☐
Bit13		☐
Bit12		☐
Bit11		☐
Bit10		☐
Bit9		☐
Bit8		☐
Bit7	A-7	☐
Bit6	A-6	☐
Bit5	A-5	☐
Bit4	A-4	☐
Bit3	A-3	☐
Bit2	A-2	☐
Bit1	A-1	☐
Bit0	A-0	☐

DL9500, DL9700 series, SB5000 series, DL6000/DLM6000 series

Bit No.	Bit Name	On
Bit1	D7	☐
Bit2	D6	☐
Bit3	D5	☐
Bit4	D4	☐
Bit5	D3	☐
Bit6	D2	☐
Bit7	D1	☐
Bit8	D0	☐
Bit9	C7	☐
Bit10	C6	☐
Bit11	C5	☐
Bit12	C4	☐
Bit13	C3	☐
Bit14	C2	☐
Bit15	C1	☐
Bit16	C0	☐

DLM5000HD series (for 32 bit), DLM5000 series (for 32 bit)

Bit No.	Bit Name	On
Bit31	D7	☐
Bit30	D6	☐
Bit29	D5	☐
Bit28	D4	☐
Bit27	D3	☐
Bit26	D2	☐
Bit25	D1	☐
Bit24	D0	☐
Bit23	C7	☐
Bit22	C6	☐
Bit21	C5	☐
Bit20	C4	☐
Bit19	C3	☐
Bit18	C2	☐
Bit17	C1	☐
Bit16	C0	☐

Cursor Measurement Example (for V Cursor)

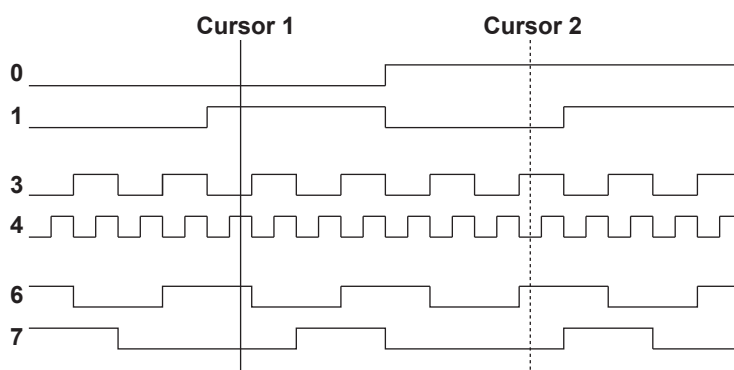
For the case above, if the data bit order is A0 to A7 B0 to B7

Binary	Y1: 01001010	Y2: 10110010
Hexa	Y1: 4A	Y2: B2

If B7 to B0 A7 to A0

Binary	Y1: 01010010	Y2: 01001101
Hexa	Y1: 52	Y2: 4D

If OFF bits are present, the data is displayed as follows:



If A0 to A7 B0 to B7

Binary	Y1: 01*01*10	Y2: 10*10*10
Hexa	Y1: 16	Y2: 2A

If B7 to B0 A7 to A0

Binary	Y1: 01*10*10	Y2: 01*01*01
Hexa	Y1: 1A	Y2: 15

Note

If Bundle is set to ON, the individual bit displays cannot be turned OFF.

- When a waveform that has been saved in roll mode without any waveform data is displayed, logic waveforms are displayed as all zeros.
- When a waveform that has been saved on the DLM4000 with STATE set to ON and with state source bits selected is displayed in Classic Data Viewer, all bits are displayed as state source bits.
- The waveforms of logic A and B (8 bits each) of the DL750 are displayed as a single logic waveform (16 bits) in Classic Data Viewer.
- On the DLM5000, if A0 and B0 are assigned to State, Classic Data Viewer displays only the B7-B0 and A7-A0 state waveforms (not C7-C0 or D7-D0).
- On the DLM3000HD series, DLM3000 series, DLM5000HD series, and DLM5000 series, if the bit display order is changed using a feature (Bit Order) on the measuring instrument, it is not reflected on this software.

Apply Button for Confirmation

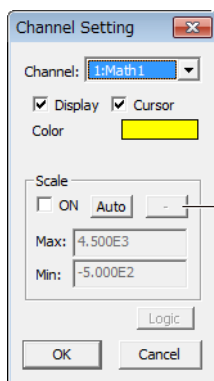
Clicking **Apply** after you have changed the settings applies the previously specified settings to the window(s) while keeping the display setting screen displayed.

Note

If you double-click the scale display area of the vertical axis, a channel setting window (simplified version) appears as shown below.

On this window, you can turn OFF the display or set the scale for channels that have been turned ON in advance on the channel setting window of page 4-2.

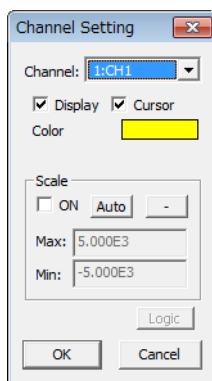
When the displayed waveform is FFT



Channel Setting dialog box for FFT waveform. Channel: 1:Math1. Display and Cursor are checked. Color is yellow. Scale is set to Auto. Max: 4.500E3, Min: -5.000E2. Buttons: OK, Cancel, Logic.

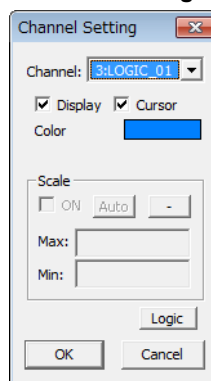
Display size

When the displayed waveform is not FFT



Channel Setting dialog box for non-FFT waveform. Channel: 1:CH1. Display and Cursor are checked. Color is yellow. Scale is set to Auto. Max: 5.000E3, Min: -5.000E3. Buttons: OK, Cancel, Logic.

When the displayed waveform is logic



Channel Setting dialog box for logic waveform. Channel: 3:LOGIC_01. Display and Cursor are checked. Color is blue. Scale is set to Auto. Max and Min are empty. Buttons: OK, Cancel, Logic.

4.3 Specifying Split Settings

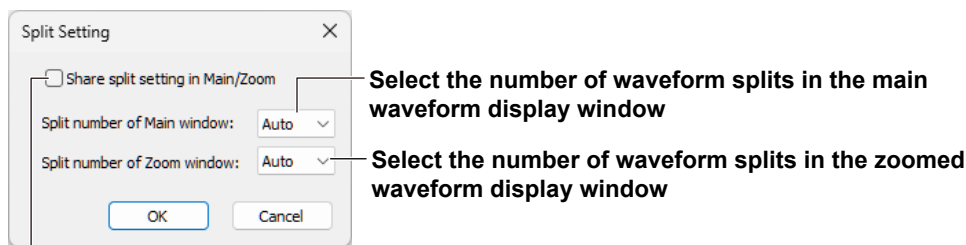
Procedure

Displaying the Split Settings Dialog box

Click ▼ beside  or select **View > Split Setting** to display the Split Setting dialog box.

Specifying Split Settings

In the Split Setting dialog box, specify whether to allow the main waveform display window and zoomed waveform display window to share the split settings and the number of waveform splits in the respective windows, and then click **OK**. The split settings that you have specified are applied to the window(s).



Place a checkmark so as to make the main waveform display window and zoomed waveform display window share the split settings

Waveform Display Size

You can expand the vertical display span of a waveform by double-clicking the waveform displayed in a split window.

- M: Displayed in an area that is 20 % of the entire vertical axis
- L: Displayed in an area that is 40 % of the entire vertical axis
- : Equally divided

Explanation

Number of Waveform Splits that Can Be Specified

For each of the main waveform display window and the zoomed waveform display window, you can specify Auto or any value between 1 and 32. Auto sets the number of waveform splits according to the number of waveforms to be displayed.

Waveform Mapping

When the screen is split, waveforms are mapped in order of channel number, starting from the top-most split screen. You can also specify arbitrary waveform mappings. For instructions on specifying arbitrary mappings, see section 4.2.

Split Settings for the History Waveform Display Window

Split settings made for the main waveform display window are also applied to the history waveform display window.

Waveform Display Size

The display area of up to two waveforms can be expanded vertically. If more than two waveforms are being controlled, the waveform that is being controlled and the waveform displayed above it take precedence.

You can also set this on the channel setting window.

4.4 Specifying Display Settings

Procedure

Displaying the Display Setting dialog box

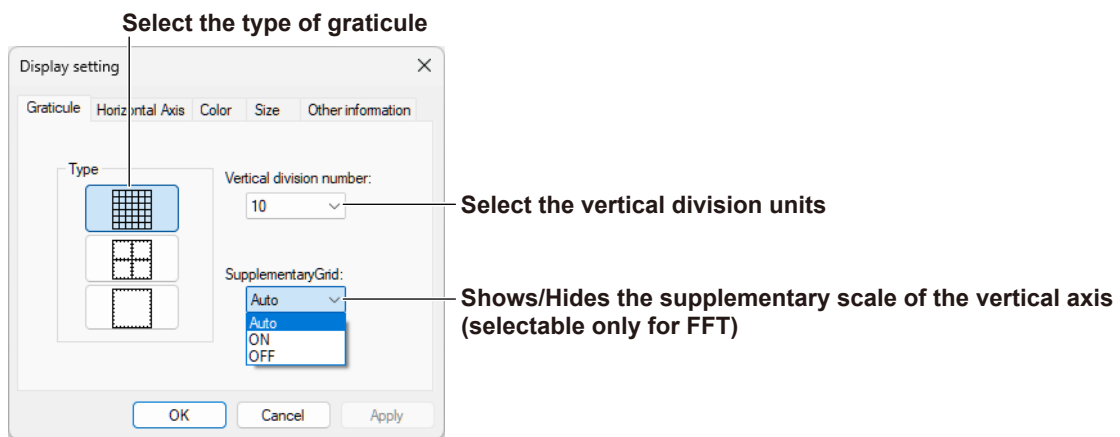
Click  or select **View > Display Setting** to open the Display Setting dialog box.

Click the Graticule, Horizontal Axis, Color, Size, and Other information tabs, and configure the display settings.

Making a Graticule Setting

Click the **Graticule** tab in the Display Setting dialog box. The Graticule pane appears.

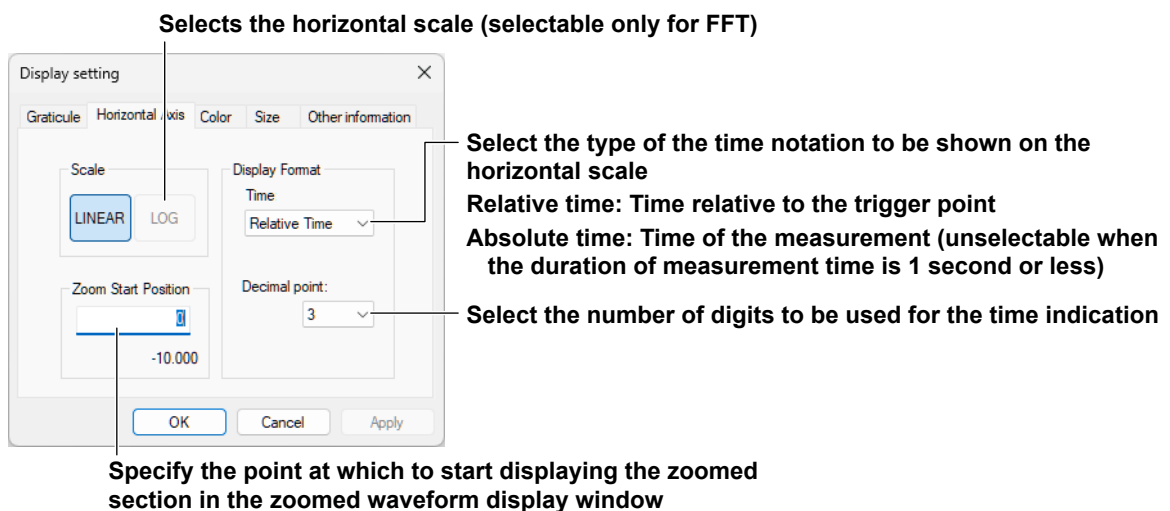
Using this pane, you can specify the graticule type and the units of the divisions on the vertical axis.



Setting the Horizontal Axis

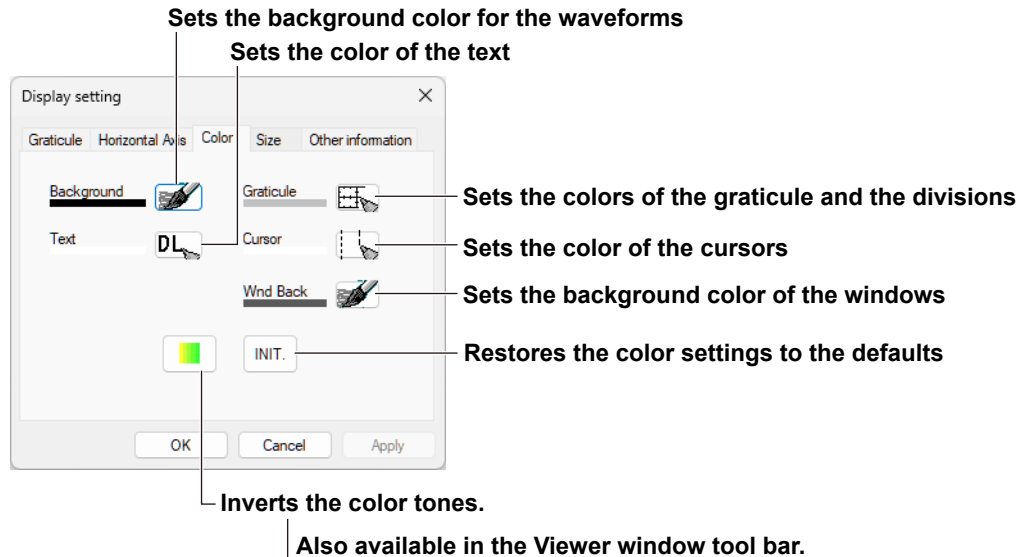
Click the **Horizontal Axis** tab in the Display Setting dialog box to display the Horizontal Axis pane.

Using this pane, you can specify the point at which to start displaying the zoomed section, as well as the notational format for the horizontal axis.



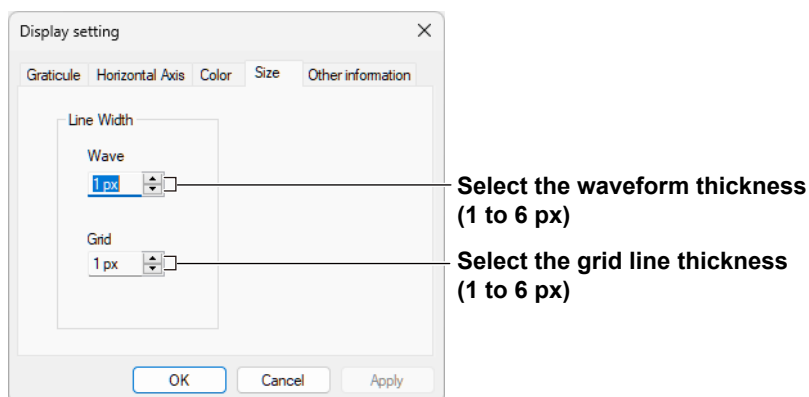
Setting the Colors

Click the **Colors** tab in the Display Setting dialog box to display the Colors pane. In this pane, you can specify the colors for the background, graticule, and text using the color palette.



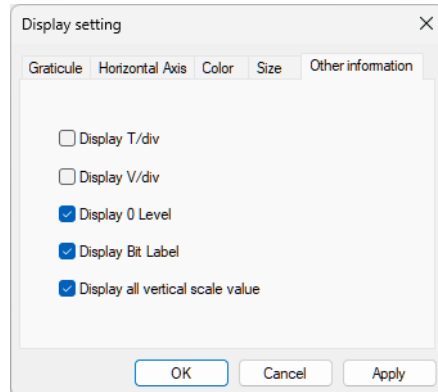
Setting the Waveform Thickness and Grid Line Thickness

Click the **Size** tab in the Display setting dialog box to display the Pane for setting the waveform thickness and grid line thickness.



Displaying Scale Information in the Waveform Display Window

Click the **Other information** tab in the Display setting dialog box to display a panel for setting the T/div, V/div, 0 Level, Bit Label, and multiple vertical scale display settings. Select the check boxes of the desired items to display the corresponding information in the waveform display window.



Note

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

Explanation

Setting the Grid

Supplementary Grid

The supplementary grid can be selected only when the FFT computation waveform is displayed.

Auto: Automatically determines whether to display the supplementary scale on the vertical axis.

ON: Displays the supplementary scale on the vertical axis.

OFF: Does not display the supplementary scale on the vertical axis.

Setting the Horizontal Axis

Display Format

Sets the time type (relative or absolute) and the number of displayed digits. However, the Display Format settings do not appear when the FFT computation waveform is displayed.

Zoom Start Position

When relative times are being displayed, the settings vary depending on whether an integer or a real number is input.

Integer input: Start data position

Real number input: Start time (auxiliary units m, n, u, and P can be input.)

Scale

Set the horizontal scale to LINEAR or LOG. The horizontal scale can be selected only when the FFT computation waveform is displayed.

Setting the Color

You cannot change the waveform colors in the Display Setting dialog box. To change colors of the waveforms, use the Channel Setting dialog box. For details, see section 4.2.

Changing the color tone

Clicking the Color Set button makes the appropriate color settings for monochrome printing. To restore the color settings, click the Color Set button again.

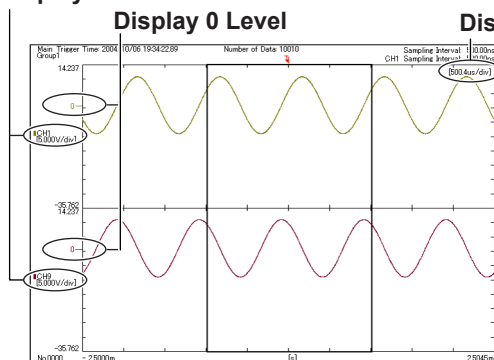
INIT.

Initializes the color settings to the default condition.

T/div, V/div, and 0 Level Display

You can display T/div, V/div, and 0 Level in the waveform display window. The values of the selected items are displayed. If multiple waveforms are displayed in the waveform display window, the V/div and 0 Level of the active waveform are displayed.

Display V/div



Display T/div

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

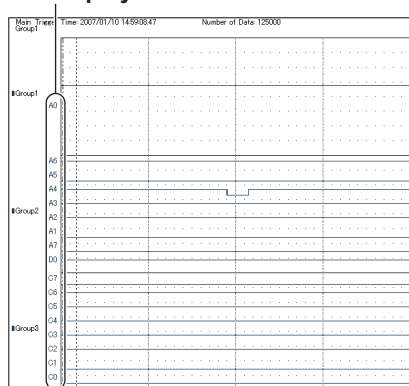


(Not available in Annotation mode. For information on Annotation mode, see section 5.7.)

Displaying the Bit Label

You can display the bit names of the logic waveform in the waveform display window.

Displays the bit names



Note

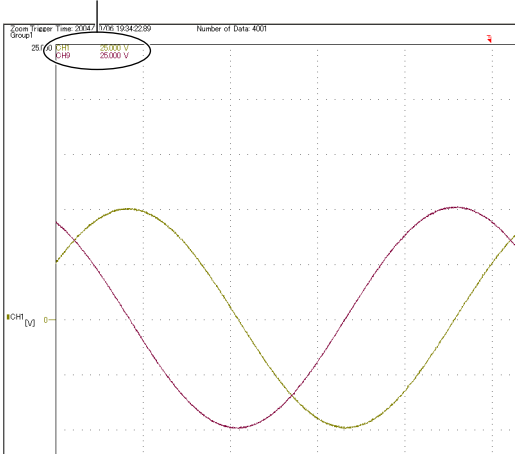
If the display area of the waveform display window is narrow, the bit label is not displayed. Carry out the following to display the bit label.

- Drag and expand the waveform display window vertically.
- Reduce the number of screen divisions.

Displaying the Multiple Vertical Axes

If multiple waveforms are displayed in the waveform display window, the range of the vertical axis of each displayed waveform can be displayed.

Displays multiple vertical scales



Note

Multiple vertical axes are not displayed if only a single waveform is shown in the waveform display window.

Checking the Changed Settings

Clicking **Apply** while you are changing settings applies the settings you have already made for the window(s) to the waveform display, without closing the Display Setting dialog box.

Note

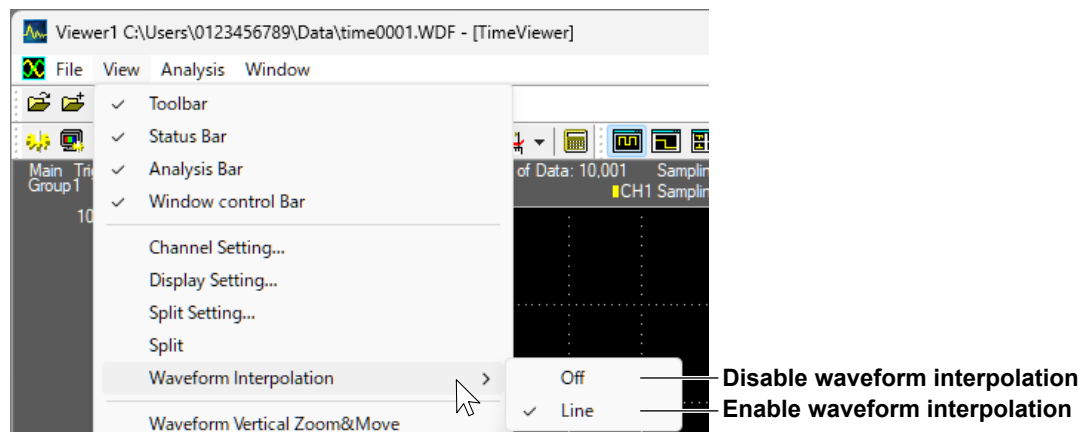
The Supplementary Grid of the Graticule tab and the Scale of the Horizontal Axis tab can be set only on Classic Data Viewer with the computation option if the horizontal axis unit is Hz.

4.5 Turning Waveform Interpolation On and Off

Procedure

Turning Waveform Interpolation Off

Click **View** > **Waveform Interpolation** > **Off** to disable interpolation between sampled data points. Waveforms are displayed using dots.



Turning Waveform Interpolation On

Click **View** > **Waveform Interpolation** > **Line** to display linearly interpolated waveforms.

Explanation

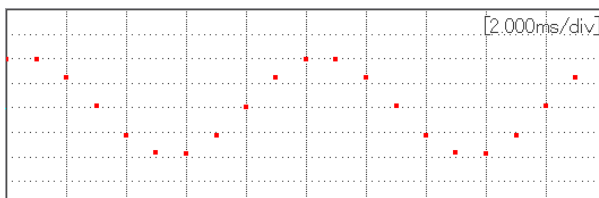
Waveform Interpolation

In interpolation zones in the T-Y waveform display,* Classic Data Viewer can display waveforms by interpolating between sampled data points.

- * Interpolation zone refers to the condition in which a given number of data points are not contained in the 10 div along the time axis. The number of data points that causes the interpolation zone condition to occur varies depending on the display record length and zoom ratio.

Off

Interpolation is disabled, and waveforms are displayed using dots. This mode makes it easy to view the actual data positions.

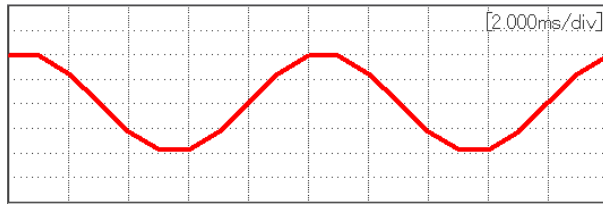


Note

When waveforms that have been saved with P-P Com ON are being displayed and waveform interpolation is turned off, only P-P compressed values (the maximum and minimum sampled data values per given period) are displayed.

Line

Linear interpolation is performed between two points.

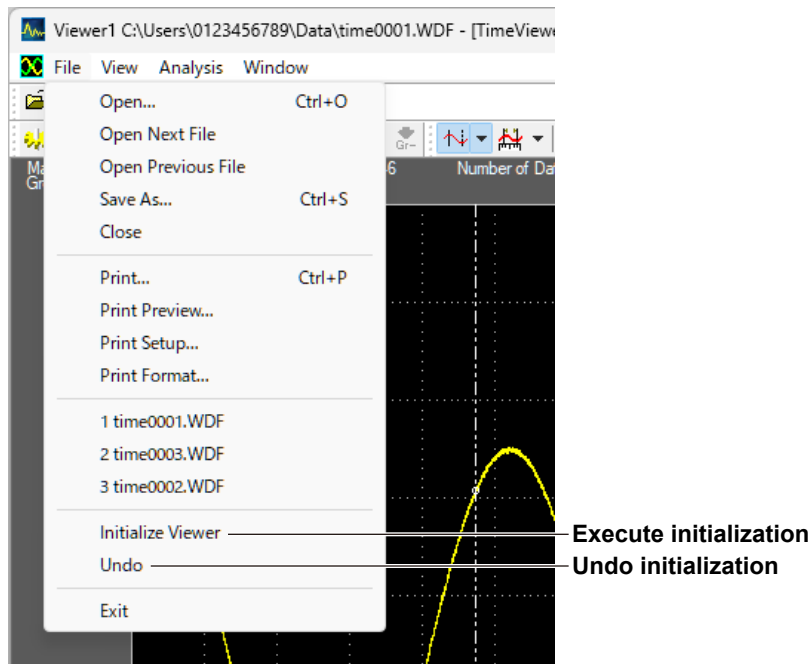


4.6 Initializing Display Settings

Procedure

Executing Initialization

Click **File > Initialize Viewer** to return display conditions to their initial settings.



Undoing Initialization

Click **File > Undo** to restore the settings prior to the initialization.

Explanation

Initialization

Returns various kinds of specified display conditions to the settings immediately after loading the waveform data. This is useful when you wish to cancel all settings previously entered, or wish to reenter settings from the beginning.

Undoing Initialization

If you use the Undo command, the settings prior to the initialization are restored.

Initialized Items

The main items initialized are the following.

- Waveform color
- Color of the background, text, graticule, cursor, and window background
- Vertical axis scale values
- Logic signal display bit
- Number of screen divisions
- Sizes of windows
- Displayed windows (two: the main waveform display window and measurement result display window)
- Zoom position and zoom ratio
- Graticule type
- H and V cursor positions
- Horizontal and vertical axis display format
- Waveform parameter measurement items
- Computation filter, number of FFT computation points, time window, and user-defined computational expressions
- Deletion of all annotations

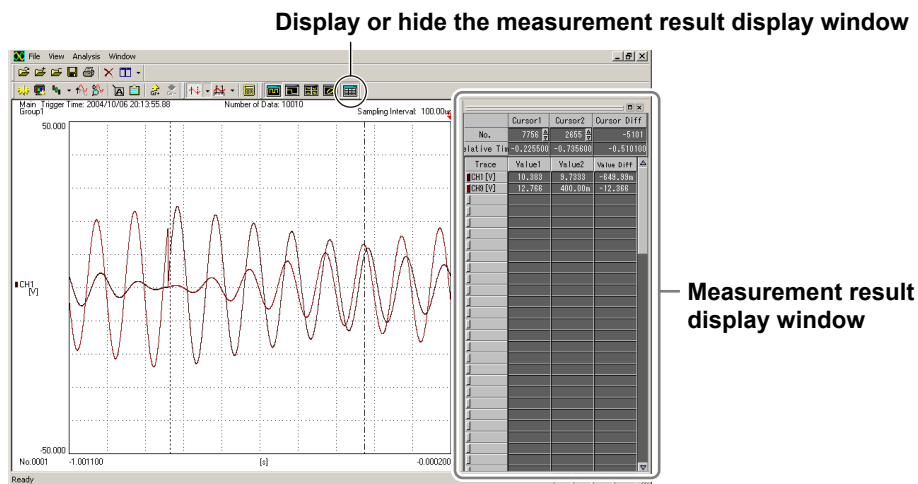
Analyzing Waveform Data

5.1 Displaying Measurement Results

Procedure

Displaying Measurements in the Result View

Open a waveform data file for which waveforms and measurement results are to be displayed. To display or hide the measurement result display window, click  or select **Window > Measure Result**.



Explanation

Items and Measured Values That Are Displayed

The items and measured values that are displayed depend on the measurements and waveforms.

Reference to Cursor Positions

The positions of the cursors are indicated using either of the references below, according to the notational format of the horizontal axis:

- Absolute time: The positions of cursors are indicated as absolute times.
- Relative time: The positions of cursors are indicated as being relative to the trigger position.

Note

When the measurement results display window is not displayed and you execute cursor measurement, automated measurement of waveform parameters, automated measurement of history statistics, or automated measurement of cycle statistics, the measurement results display window will automatically appear.

5.2 Analyzing Waveform Data Using Cursors

Procedure

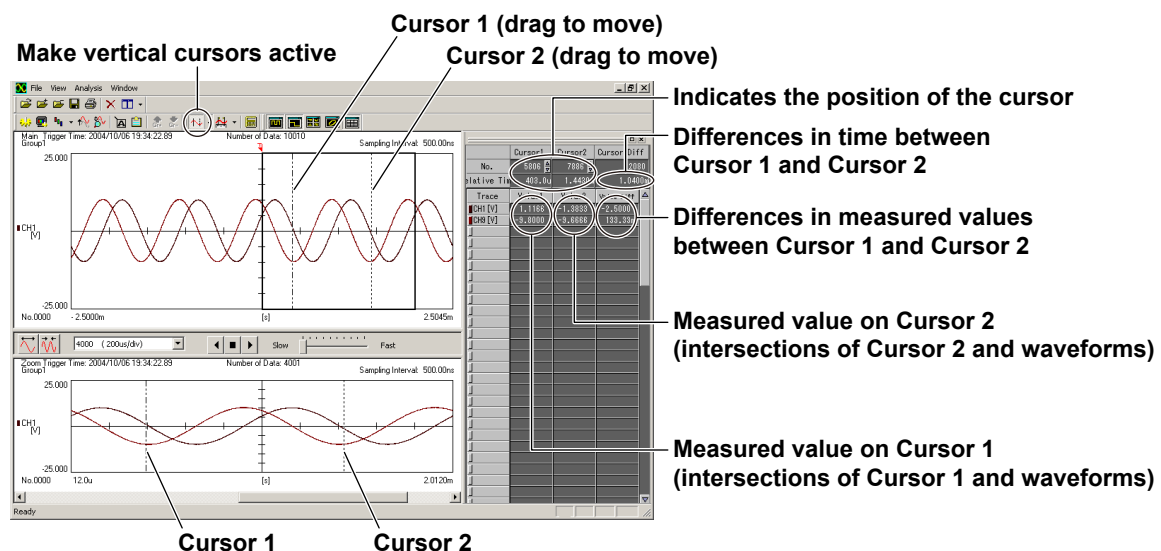
Analyzing Waveform Data Using Cursors

Choose **Vertical Cursor** from the  icon drop-down menu or choose **Analysis > Analysis Mode > Vertical Cursor** to display two vertical cursors in the main waveform display window and the zoomed waveform display window.

The measurement result window displays the cursor positions (time) and measured values as well as the difference in the time and measured values between the cursors.

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

Likewise, you can right-click within the window to move Cursor 2 to that position.



Note

If measured data is present at the cursor position, the intersections between the waveforms and cursor are indicated with circles.

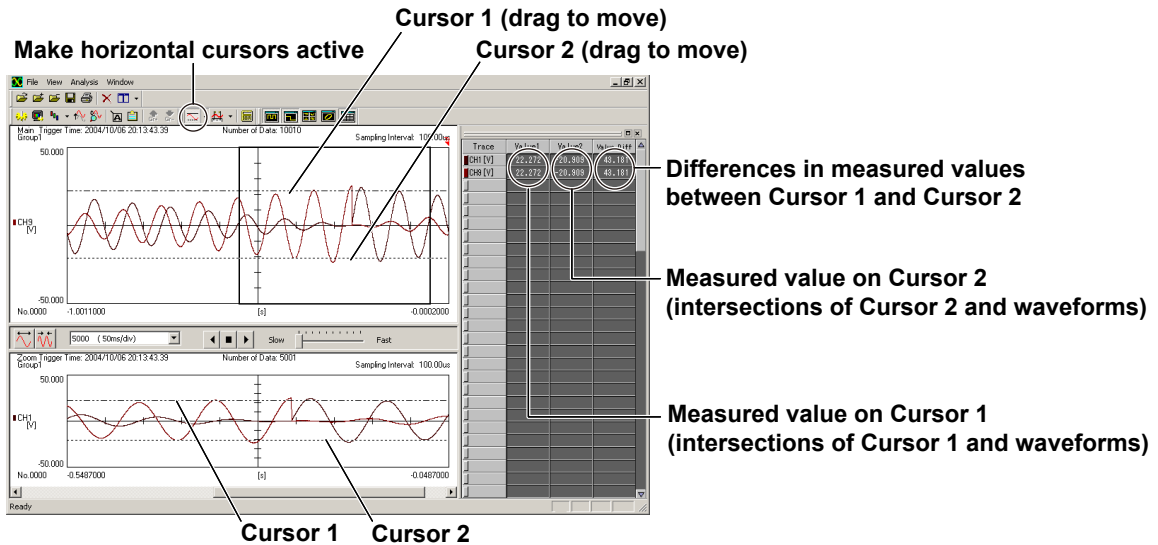
If waveforms measured at different sample rates are displayed in the same window, measured data may not be present at the cursor position. For such a waveform, the circle is not displayed at the intersection between the waveform and cursor. However, measured value is displayed by interpolating from the previous measured value.

Analyzing Waveform Data Using Horizontal Cursors

Choose **Horizontal Cursor** from the  icon drop-down menu or choose **Analysis > Analysis Mode > Horizontal Cursor** to display two horizontal cursors in the main waveform display window and the zoomed waveform display window.

The measurement result window displays the measured value at each cursor.

You can drag each cursor. You can click the cursor value in the measurement result window and enter the value of the position you want to move the cursor to. The cursor will move to the specified position.



Note

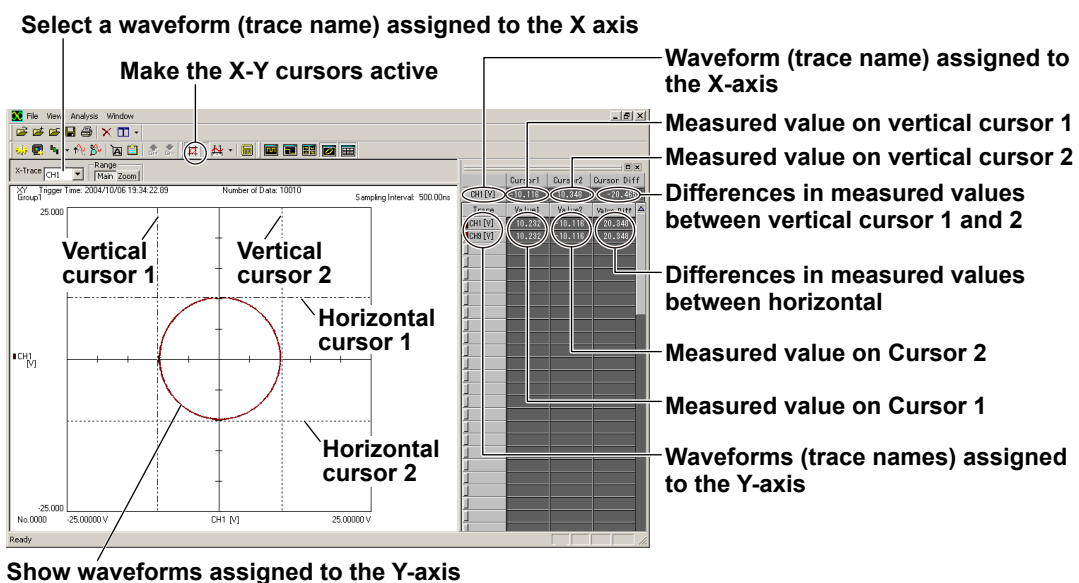
In the following situations, horizontal cursors are not displayed in the zoom waveform display window.

- When the waveform shown in the main waveform display window and that shown in the zoom waveform display window are different (when "Share channel setting in Main/Zoom" is set to off).
- When waveforms are overlaid, the active waveform in the main waveform display window and that in the zoom waveform display window are different.

Analyzing Waveform Data Using X-Y Cursors

Choose **X-Y Cursor** from the  icon drop-down menu or choose **Analysis > Analysis**

Mode > X-Y Cursor to display two vertical cursors and two horizontal cursors in the X-Y waveform display window. You can move a cursor by dragging it. The measurement result display window displays the measured values at the cursor positions at that time, as well as the differences in the measured values.



Analyzing Waveform Data Using H&V Cursors

Choose **H&V Cursor** from the  icon drop-down menu or choose **Analysis > Analysis Mode > H&V Cursor** to display four cursors (two vertical cursors and two horizontal cursors) in the main waveform display window and the zoomed waveform display window. The measurement result window displays the measured value at each cursor and the differences between the measured values between the cursors.

In addition, you can click the horizontal cursor value in the measurement result window and enter the value of the position you want to move the horizontal cursor to. The cursor will move to the specified position.

Note

In the following situations, horizontal cursors are not displayed in the zoom waveform display window.

- When the waveform shown in the main waveform display window and that shown in the zoom waveform display window are different (when “Share channel setting in Main/Zoom” is set to off).
- When waveforms are overlaid, the active waveform in the main waveform display window and that in the zoom waveform display window are different.

Explanation

Cursor Measurements on History Waveform Views

When you are displaying history waveform views, only the active waveform view can be used for measurement using the cursors.

Linking of Vertical Cursors or Horizontal Cursors

If you drag a vertical cursor or horizontal cursor while holding down the Ctrl key, the two vertical or horizontal cursors can be moved simultaneously.

*** Indication

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

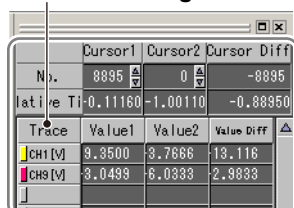
Note

You can copy the contents of the measurement results display window to the clipboard.

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

- Press Ctrl+C without specifying a range to copy:
All contents in the measurement results display window are selected
- Click Trace:
All rows are selected except for the data at the cursor.
- Click the trace names of the items to copy:
The trace name row that you clicked is selected.

**Selects all rows except the cursor information.
Click once again to clear the selection.**



No.	Cursor1	Cursor2	Cursor	Diff
1	8895	0		-8895
2	-0.11160	-1.00110		-0.88950
Trace	Value1	Value2	Value	Diff
CH1 [V]	9.3500	-3.7866		-13.116
CH2 [V]	-3.0499	-6.0333		-2.9833

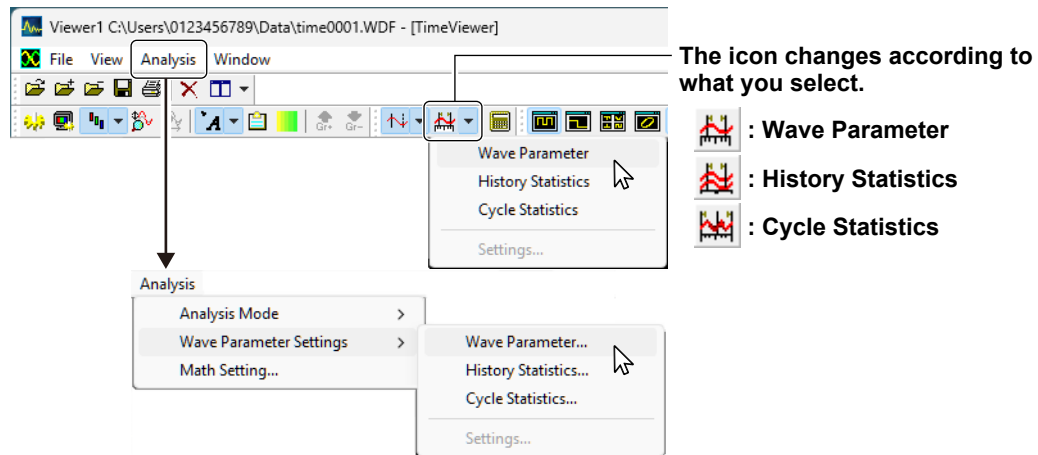
— If no range is specified, all are copied.

5.3 Automated Measurement of Waveform

Procedure

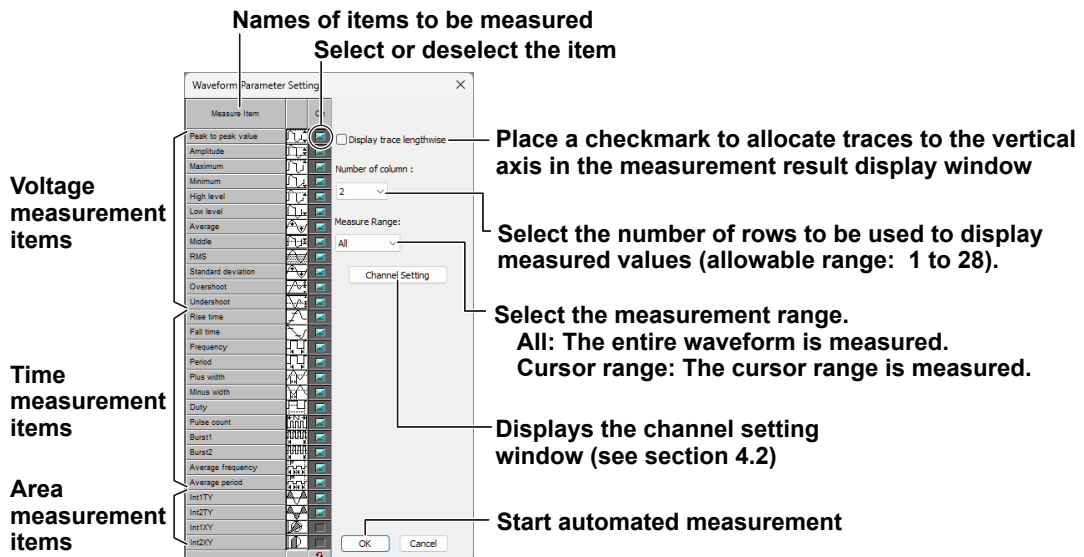
Setting Items That Are Automatically Measured

1. From the  drop-down menu, select the **Wave Parameter**. Or click **Analysis > Waveform Parameter Settings > Wave Parameter**.



The Waveform Parameter Setting dialog box appears.

2. In the Waveform Parameter Setting dialog box, set the measurement items and the conditions for displaying measured results, and then click **OK**.



Automated measurement starts. Two vertical cursors are displayed in the main waveform display window, and the measured results of waveform parameters are displayed in the measurement results display window.

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 waveform parameters. Drag the two vertical cursors to change the measurement start point and the measurement end point. Waveform parameters are remeasured automatically.

When the measurement range is set to All, moving the cursors will not cause waveform parameters to be remeasured.

Operations in the Waveform Parameter's Automated Measurement Screen

The diagram illustrates the operations in the Waveform Parameter's Automated Measurement Screen. It shows a menu with options: Wave Parameter (checked), History Statistics, Cycle Statistics, and Settings... (labeled 'Displays the Waveform Parameter Setting dialog box'). Below the menu, there are two icons: one labeled 'Stop automated measurement of waveform parameters' and another labeled 'Click again to start automated measurement'.

The main screen displays a waveform on a grid. Two vertical cursors are positioned on the waveform, defining the 'Measurement range'. The 'Measurement start point cursor' is on the left, and the 'Measurement end point cursor' is on the right. The 'Measurement range' is indicated by a double-headed arrow between the cursors.

On the right side, there is a 'Measurement results display window' showing 'Cursor positions' and 'Time difference between cursors'. It also displays 'Measured results' for various parameters (P-P, Amp, Max) for CH1 and CH2. The 'Measurement items to measure automatically (set in the Waveform Parameter Setting dialog box)' are listed in a table. At the bottom right, the 'Measurement status' is shown as 'Ready'.

Explanation

Items that Can Be Specified

On the waveform parameters, you can set and measure voltage, time and area items.

You can also set the distal line, mesial line, proximal line, and high and low values for each channel on the channel setting window (see section 4.2).

Note

- When the scope to analyze includes two cycles or more of a waveform, time-axis parameters are analyzed only for the first cycle.
- An FFT computation allows to make measurement only for Max and Min.
- No logic waveform can be automatically analyzed.

Voltage measurement items

Maximum: Maximum voltage [V]

Minimum: Minimum voltage [V]

High level: High voltage [V]

Low level: Low voltage [V]

Peak to peak value: P-P value (Max - Min) [V]

Overshoot: Amount of overshoot (Max - High)/(High - Low) × 100 [%]

Undershoot: Amount of undershoot (Low - Min)/(High - Low) × 100 [%]

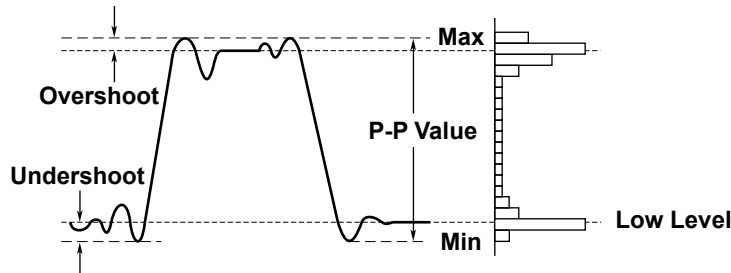
Average: Average voltage $(1/n)\sum x_i$ [V]

RMS: Root-mean-square value $(1/\sqrt{n})(\sum x_i^2)^{1/2}$ [V]

Middle: Mean value for amplitude (Max + Min)/2 [V]

Standard deviation: Standard deviation $(1/n(\sum x^2 - (\sum x)^2/n))^{1/2}$

Amplitude: Amplitude (High - Low) [V]



Time measurement items

Rise time: Rise time [s]

Fall time: Fall time [s]

Frequency: Frequency [Hz]

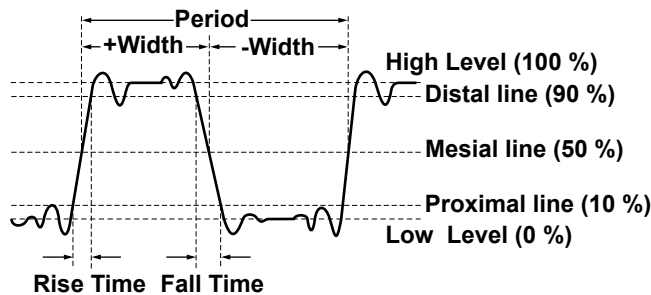
Period: Cycle [s]

Plus duty: Duty ratio, Width1/Period × 100 [%]

Minus duty: Duty ratio, Width2/Period × 100 [%]

Plus width: Time width greater than the mesial value [s]

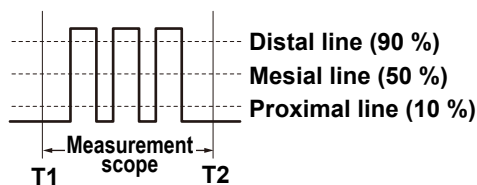
Minus width: Time width less than the mesial value [s]



Pulse: Pulse count

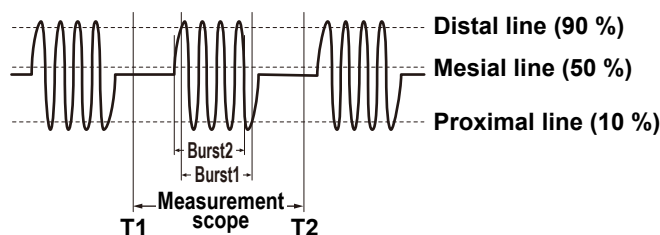
Adjust the measurement scope to the pulses you want to measure.

When Pulse=3



Burst1, Burst2: Burst width [s]

Adjust the measurement scope to the burst widths you want to measure.

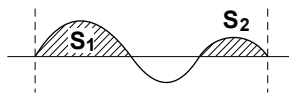


Area measurement items

- Int1TY: Size of the positive portion of an amplitude
- Int2TY: Size of the positive portion of an amplitude - Size of the negative portion of an amplitude
- 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 an "8"
• Area in which the start and stop points trace a closed curve in a spiral loop
- Int2XY: • When 1 Y data point corresponds to 1 X data point
• When the amplitude contains negative sections
• When multiple Y data points correspond to 1 X data point

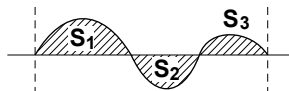
Int1TY

Size of only the positive areas: $S_1 + S_2$



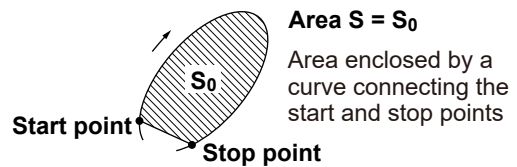
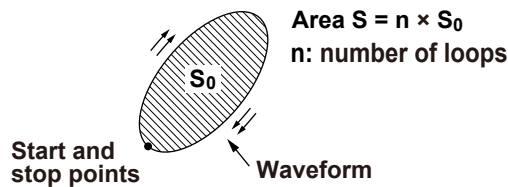
Int2TY

Size of both positive and negative areas: $S_1 + S_3 - S_2$

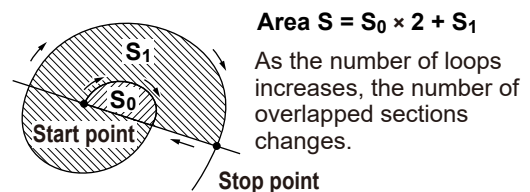
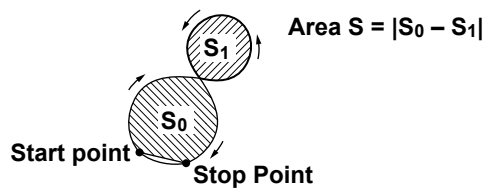


Int1XY

- Multiple loops
- Non-closed curve



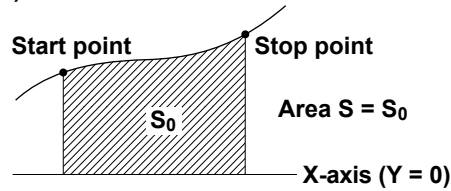
- Loop tracing the shape of an "8"
- Spiral loop



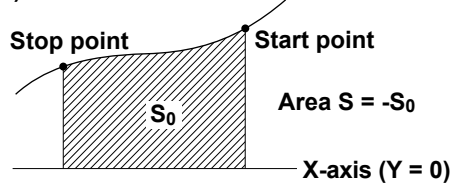
Int2XY

- When 1 Y data point corresponds to 1 X data point

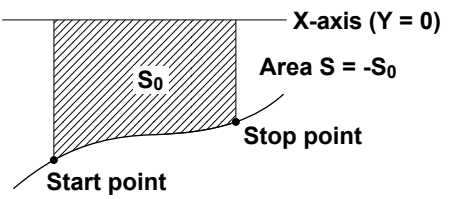
(1)



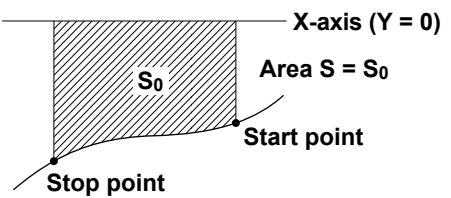
(2)



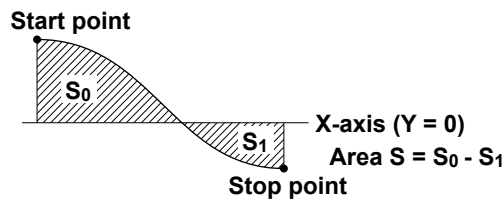
(3)



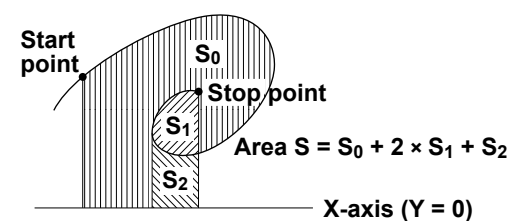
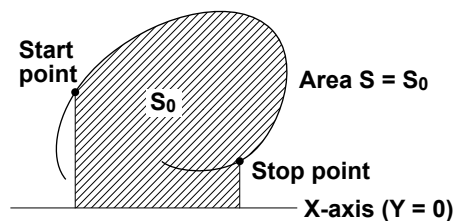
(4)



- When the waveform contains negative amplitude



- When multiple Y data points correspond to 1 X data point

***** 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

Channels with a sample rate different from that of the X-axis channel are excluded from the measurement (indicated by ***).

Icon Displayed during Automatic Measurement

While automatic measurement is being performed, the icon shown below appears in the status bar.

 : Performing automatic measurement (blinks on and off)

Note

- It may take a long time to automatically analyze a waveform with some conditions for the scope, number of items, and/or waveforms to analyze.
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
While automated measurement is in progress, a cancel button and a progress bar are displayed in the status bar. Click the Cancel button to cancel automated measurement.



Data Obtained through Automatic Measurements with Waveform Parameters

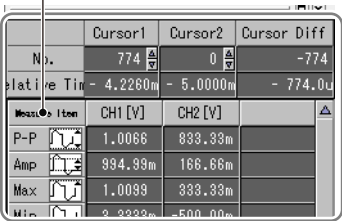
To keep the obtained data, save it into a file. For details, see section 6.4.

Note

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

- Press Ctrl+C without specifying a range to copy:
All the contents in the measurement results display window are selected
- Click Measure Item:
All rows are selected except for the data at the cursor.
- Click the measurement items of the items to copy:
The rows of the clicked items are selected

**Click here to select all rows except the cursor information.
Click once again to clear the selection.**



	Cursor1	Cursor2	Cursor Diff
No.	774	0	-774
Relative Time	4.2260m	5.0000m	- 774.0u
Measurement	CH1 [V]	CH2 [V]	
P-P	1.0086	833.33m	
Amp	994.99m	166.66m	
Max	1.0089	333.33m	
Min	0.0000	-500.00m	

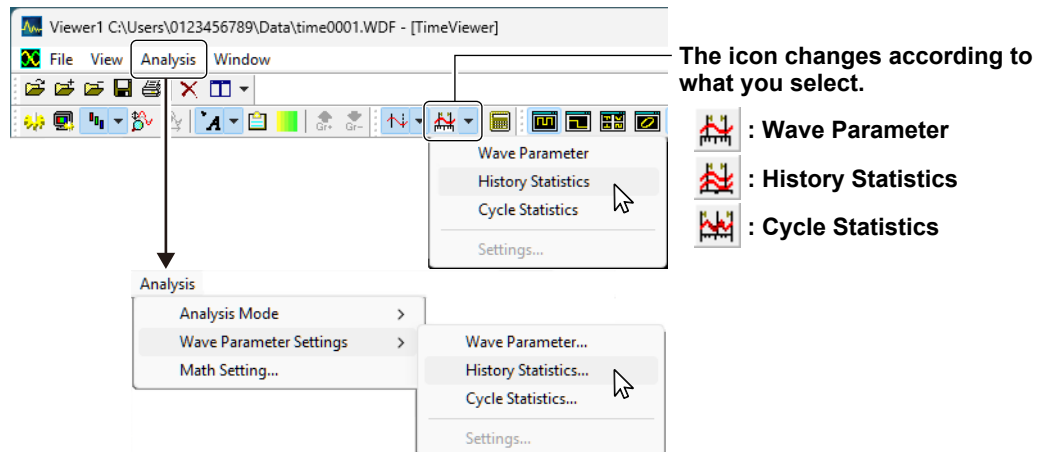
— If no range is specified, all contents are copied

5.4 Automated Measurement of History Statistics

Procedure

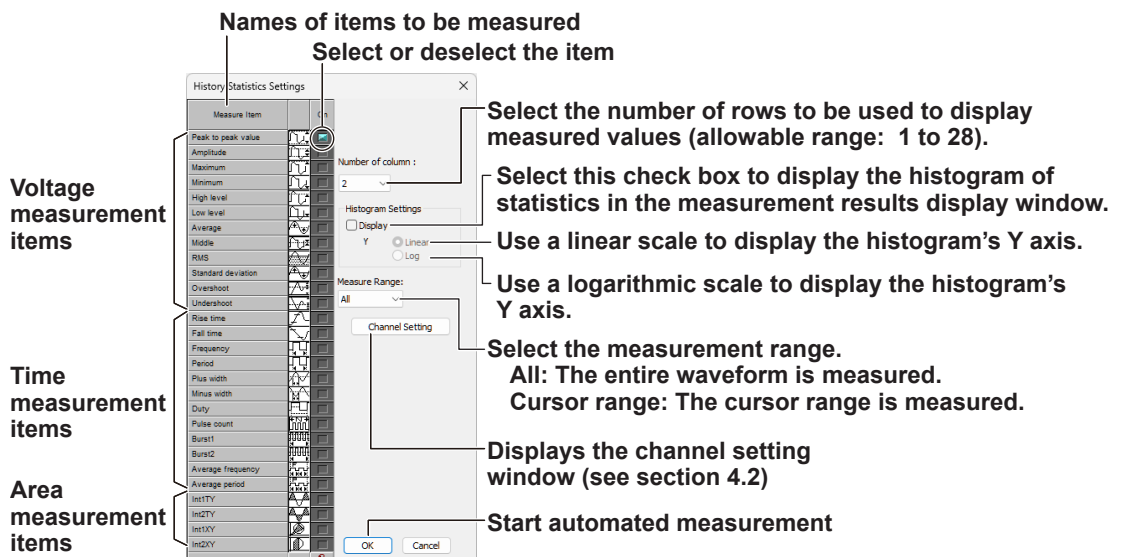
Setting Items That Are Automatically Measured

1. From the  drop-down menu, select **History Statistics**. Or click **Analysis > Waveform Parameter Settings > History Statistics**.



The History Statistics Settings dialog box appears.

2. In the History Statistics Settings dialog box, set the measurement items and the conditions for displaying measured results, and then click **OK**.



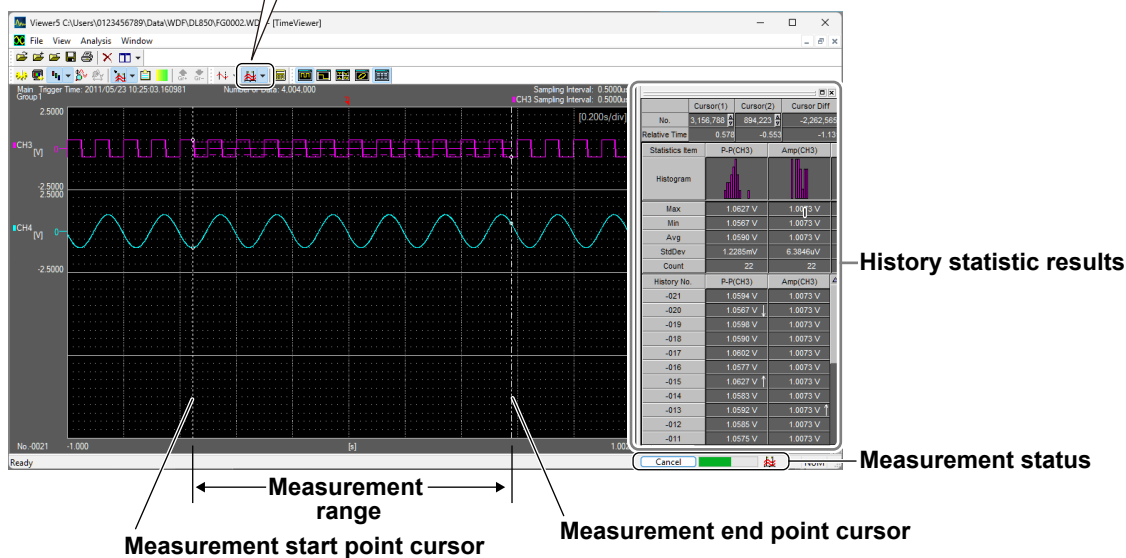
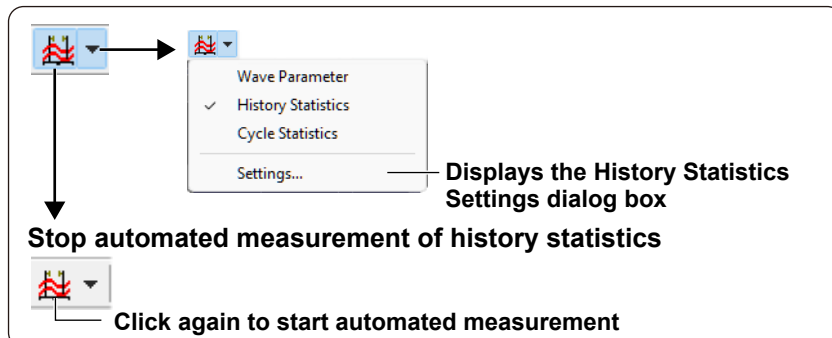
Automated measurement starts. Two vertical cursors appear in the main waveform display window, and the measured history statistics are displayed in the measurement results display window.

Specifying the Automated Measurement Range

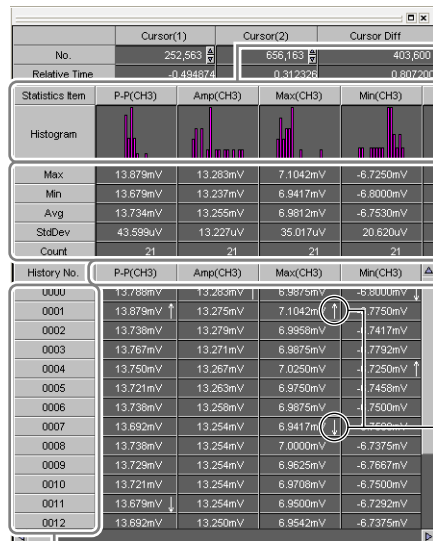
When the measurement range is set to Cursor range, you can change the range over which to perform automated measurement of history statistics. Drag the two vertical cursors to change the measurement start point and the measurement end point. History statistics are remeasured automatically.

When the measurement range is set to All, moving the cursors will not cause history statistics to be remeasured.

Operations in the History Statistics' Automated Measurement Screen



Displaying History Statistic Results



Histogram of statistic results

In the History Statistics Settings dialog box, set whether to show or hide this area (see the previous page).

History statistics values

Max: Maximum value

Min: Minimum value

Avg: Average value

StdDev: Standard deviation

Count: Number of cycles

Measurement items and channels

Maximum and minimum markers

↑: Displayed next to the maximum value of each measurement item

↓: Displayed next to the minimum value of each measurement item

History numbers

Double-click a history number to display the corresponding history waveform.

Explanation

Items That Can Be Measured

On the history 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 5-6 to 5-10).

*** 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.

Icon Displayed during Automated Measurement

While automatic measurement is being performed, the icon shown below appears in the status bar.



: Performing automate measurement (blinking)

Note

- Canceling history statistic measurement

While history statistic measurement is in progress, a cancel button and a progress bar are displayed in the status bar. 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 them to a file. For details, see section 6.4.

Note

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

- Press Ctrl+C without specifying a range to copy: All the contents in the measurement results display window are selected.
- Click Trace: All rows are selected except for the cursor position information and the histograms.
- Click or drag the trace names of the items to copy: The rows of the clicked or dragged traces are selected.

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

Cursor(1)Cursor(2)Cursor Diff				
No.	252,563	656,163	403,600	
Relative Time	-0.494874	0.312326	0.807200	
Statistics Item	P-P(CH3)	Amp(CH3)	Max(CH3)	Min(CH3)
Histogram				
Max	13.879mV	13.263mV	7.1042mV	-6.7250mV
Min	13.679mV	13.237mV	6.9417mV	-6.8000mV
Avg	13.734mV	13.255mV	6.9812mV	-6.7530mV
StdDev	43.599uV	13.227uV	35.017uV	20.620uV
Count	21	21	21	21
History No.	P-P(CH3)	Amp(CH3)	Max(CH3)	Min(CH3)
0000	13.788mV	13.283mV	6.9875mV	-6.8000mV
0001	13.879mV	13.275mV	7.1042mV	-6.7750mV
0002	13.738mV	13.279mV	6.9958mV	-6.7417mV

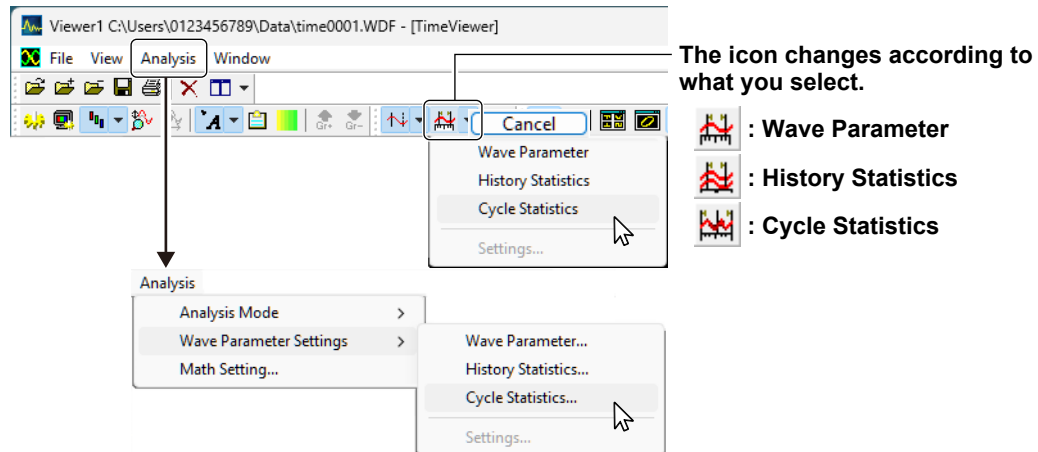
If no range is specified,
all contents are copied

5.5 Automated Measurement of Cycle Statistics

Procedure

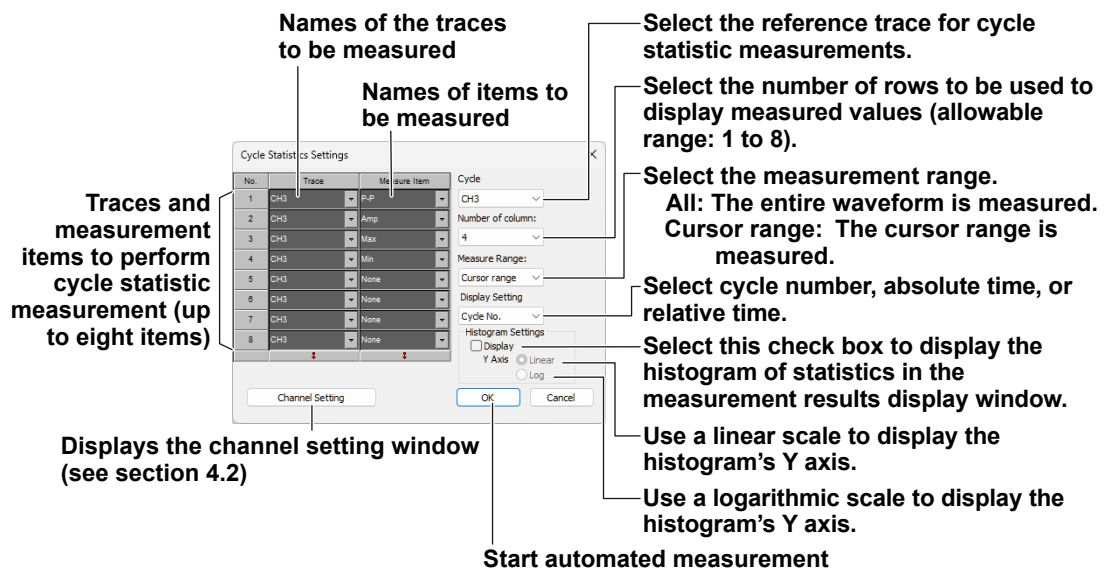
Setting Items That Are Automatically Measured

1. From the  drop-down menu, select **Cycle Statistics**. Or click **Analysis > Waveform Parameter Settings > Cycle Statistics**.



The Cycle Statistics Settings dialog box appears.

2. In the Cycle Statistics Settings dialog box, set the measurement items and the conditions for displaying measured results, and then click **OK**.



Automated measurement starts. Two vertical cursors appear in the main waveform display window, and the measured cycle statistics are displayed in the measurement results display window.

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.

Operations in the Cycle Statistics' Automated Measurement Screen

Stop automated measurement of cycle statistics

Click again to start automated measurement

Measurement range

Measurement start point cursor

Measurement end point cursor

Cycle statistic results

Measurement status

Displaying Cycle Statistic Results

Histogram of statistic results

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

Cycle statistic values

Max: Maximum value **StdDev:** Standard deviation
Min: Minimum value **Count:** Number of cycles
Avg: Average value

Measurement items and channels

Maximum and minimum markers

↑: Displayed next to the maximum value of each measurement item
 ↓: Displayed next to the minimum value of each measurement item

Cycle number/measurement time

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

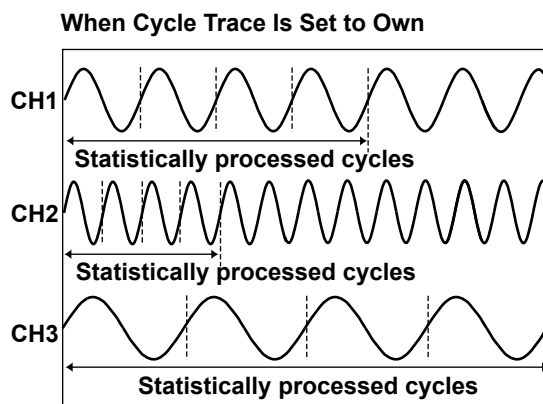
Explanation

Items That Can Be Measured

On each period 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 5-6 to 5-10).

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 window will show the measured results over the time period for the least number of cycles.



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

If the trace to perform cycle statistic measurement on is set to a waveform whose measurement interval is different from the waveform assigned to the cycle trace, measured results will be "***."

Icon Displayed during Automated Measurement

While automatic measurement is being performed, the icon shown below appears in the status bar.



: Performing automate measurement (blinking)

Note

- Canceling cycle statistic measurement

While cycle statistic measurement is in progress, a cancel button and a progress bar are displayed in the status bar. 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 range and the number of measurement items so that 100000 is not exceeded.

Saving Cycle Statistics' Automated Measurement Data

To save the measured results, save them to a file. For details, see section 6.4.

Note

You can copy the contents of the measurement results display window to the clipboard.

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

- Press Ctrl+C without specifying a range to copy: All the contents in the measurement results display window are selected.
- Click Trace: All rows are selected except for the cursor position information and the histograms.
- Click or drag the trace names of the items to copy: The rows of the clicked or dragged traces are selected.

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

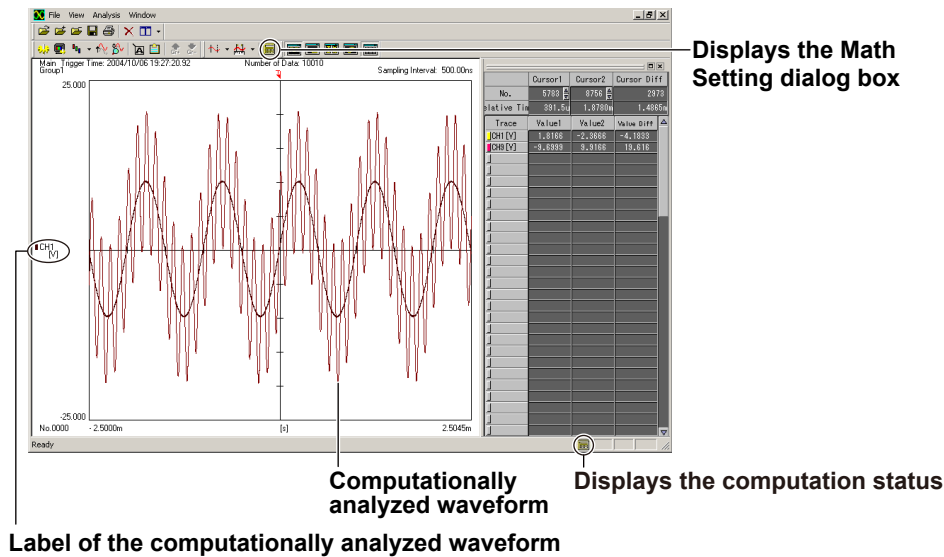
Show one again to clear the selection.						
	Cursor(1)		Cursor(2)		Cursor Diff	
No.	252,563		737,683		485,120	
Relative Time	-0.494874		0.475368		0.970240	
Statistics Item	P-P(CH3)	Amp(CH3)	Max(CH3)	Min(CH3)		
Histogram						
Max	13.775mV	13.283mV	7.0083mV	-6.6833mV		
Min	13.633mV	13.275mV	6.9292mV	-6.8000mV		
Avg	13.694mV	13.280mV	6.9597mV	-6.7343mV		
StdDev	54.117uV	2.6001uV	23.895uV	34.626uV		
Count	9	9	9	9		
Cycle No.	P-P(CH3)	Amp(CH3)	Max(CH3)	Min(CH3)		
0000	13.683mV	13.283mV	6.9500mV	-6.7333mV		
0001	13.671mV	13.283mV	6.9500mV	-6.7208mV		
0002	13.637mV	13.279mV	6.9542mV	-6.6833mV		

If no range is specified,
all contents are copied

5.6 Analyzing Waveforms by Computations (Waveform Math Option)

Displaying Waveforms in the Computation View

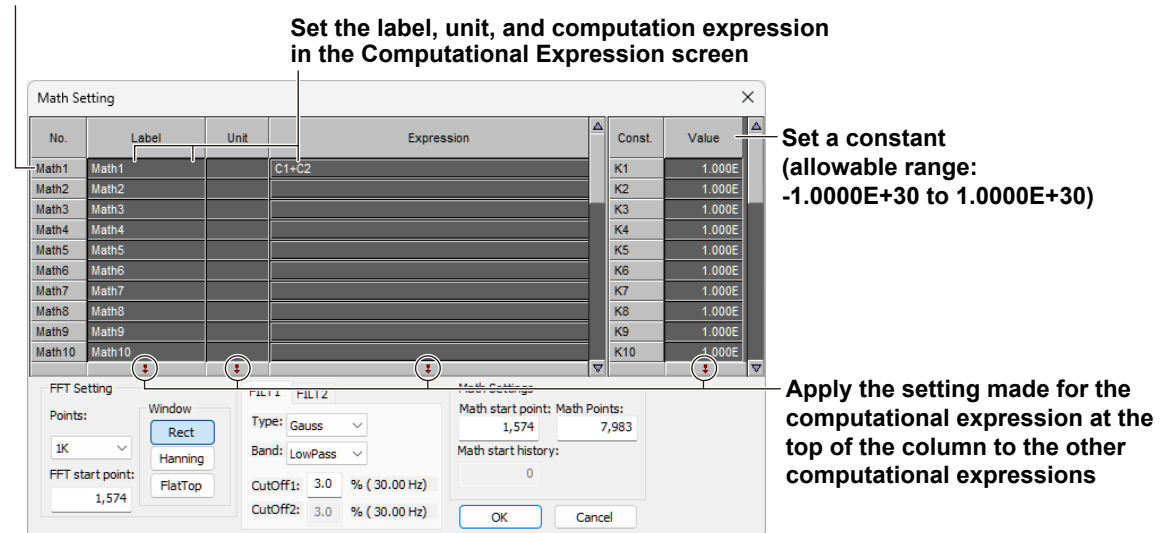
Click  or select **Analysis > Math Setting** to display the Math Setting dialog box for analyzing waveforms by computational expressions. The Math Setting dialog box allows you to set computational expressions, filters, FFT computations, and other computations for waveforms.



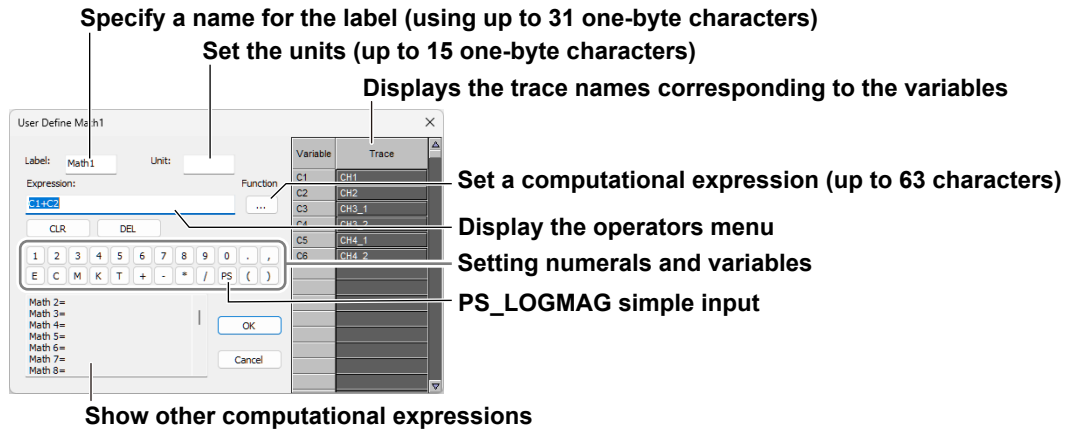
Setting Computational Expressions

Click **Expression** in the Math Setting dialog box to display the Computational Expression screen, which allows you to specify user-defined computation settings. Set up a required computational expression by using variables and operators.

Computational expression number



5.6 Analyzing Waveforms by Computations (Waveform Math Option)



Setting Filters

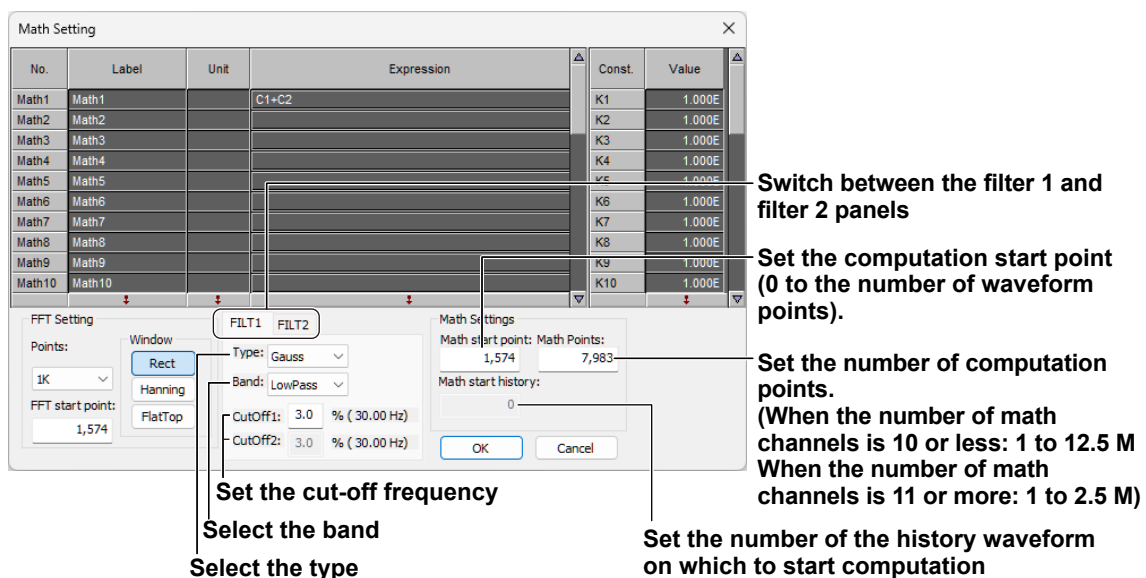
Use the FILT1 and FILT2 tabs on the Math Setting dialog box to set up the filters.

Setting the Computation Start Point, the number of Computation Points and Start History

- You can set the computation range by specifying the computation start point and the number of computation points. You can also change the computation range by adjusting the computation range bar, which is displayed in the waveform display window.
- With history waveforms, you can set the number of the history waveform on which to start computation (computation start history), the computation start point, and the number of computed 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 computed points is 12.5 Mpoints (2.5 Mpoints if there are 11 or more MATH channels).



Specifying FFT Settings

Use FFT Setting on the Math Setting dialog box to specify the FFT settings.

Select a time window type

Select the number of points to be used for FFT computations

Set the FFT start point

Explanation

Function Menu Button

The Function menu button of the Computational Expression dialog box contains operators that can be specified for user-defined computational expressions, as follows:

Basic	SHIFT, ABS, SQRT, LOG, EXP, RMS, NEG, P2, P3, F1, F2	
Trigonometric	SIN, COS, TAN, ATAN, PH	
Pulse Width	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

Restrictions Imposed on Computational Expressions

- When $m \leq n$, a computational expression for Math m cannot include the variable M n (Operations for Math n).
Example of an expression that is not allowed: Math5 = M6 + M3
- One FFT computation allows the specification of one waveform.
Example of an expression that is not allowed: PS-MAG(C1+C2)
- A computation cannot be performed on the result of an FFT computation.
Example of an expression that is not allowed: PS-MAG(C1)+C2

Cautions on Computations

An FFT computation that does not have a record length that is sufficient for the required number of points for computation in the target view cannot be performed.

Settings for the Filters

Type/Band

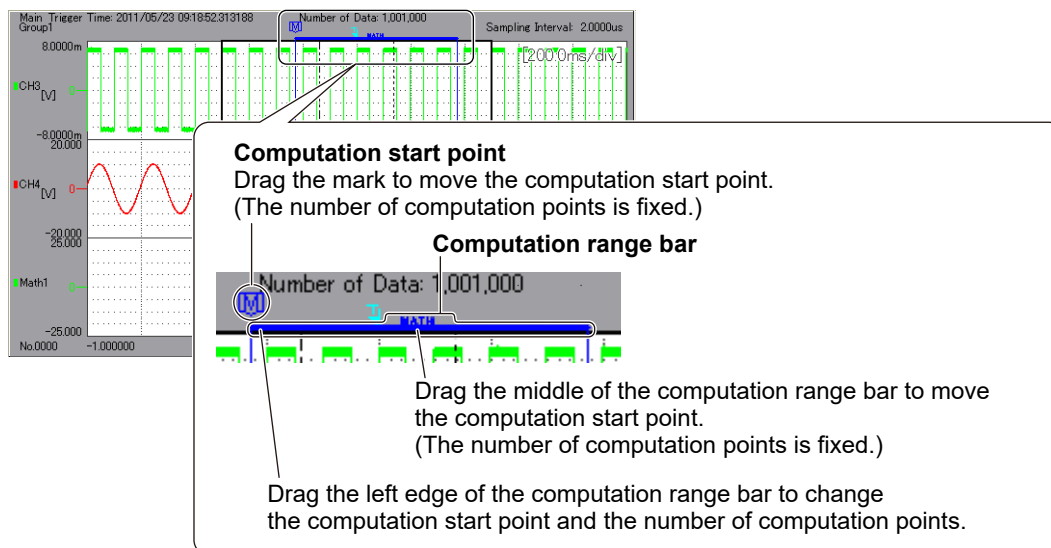
Gauss (gauss): Lowpass
 Sharp (sharp): Lowpass/Highpass/Bandpass
 IIR (butterworth): Lowpass/Highpass/Bandpass

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). When you specify Bandpass for Band, specify the orders of both CutOff1 and CutOff2. The higher the order, the longer the computation.

Computation Start Point

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



Number of Points for Computation

- When you click the left edge of the computation range bar, a horizontal arrow cursor appears. You can drag the edge to change the computation start point and the number of computation points. When you click the right edge of the computation range bar, a horizontal arrow cursor appears. In this situation, you can only change the number of computation points.
- When computing waveforms with different sample rates, the data of waveforms that are not measured at the highest sample rate is interpolated using the data immediately before it so that the waveform is at the highest sample rate.

Variables and Operators

The variables and operators that can be used in computational expressions are listed below. You can use up to 63 characters to define a computational expression. You can register up to 32 computational expressions.

Variables

Variable	Sample Use	Description
Cx	C1+C2	Value measured on channel CHx
My	ABS(M1)	Value of computation (Math)
A	BIN(C1,A,B)	Upper threshold level
B	BIN(C1,A,B)	Lower threshold level
N	SHIFT(C1,N)	Integrated value for the number of data points to the time axis
T	RMS(C1,T)	Computation time (ms)

x: stands for a number, However, 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: stands for a number

Operator

Operator	Sample Use	Description
+, -, *, /	C1+C2	Four arithmetical Operations on two specified waveforms
SHIFT	SHIFT(C1,N)	Phase shift
ABS	ABS(M1)	Absolute value of a specified waveform
SQRT	SQRT(C2)	Square root of a specified waveform
LOG	LOG(C1)	Logarithm of a specified waveform
EXP	EXP(C1)	Exponent of a specified waveform
RMS	RMS(C1,T)	RMS value of the specified waveform
NEG	NEG(C1)	Inversion
SIN	SIN(C1)	Sine of a specified waveform
COS	COS(C1)	Cosine of a specified waveform
TAN	TAN(C1)	Tangent of a specified waveform
ATAN	ATAN(C1,C2)	Arctangent of two specified waveforms (value within $\pm \pi$)
P2	P2(C1)	Square of a specified waveform
P3	P3(C1)	Cube of a specified waveform
F1	F1(C1,C2)	$\sqrt{(C1^2 + C2^2)}$ of a specified waveform
F2	F2(C1,C2)	$\sqrt{(C1^2 - C2^2)}$ of a specified waveform
K1toK10	C1 + K1	Constant (any value specified)
BIN	BIN(C1,A,B)	Binarization of a specified waveform
PWHH	PWHH(M1,A,B)	Computation of a pulse width between a rising edge and the next rising edge
PWHL	PWHL(C2,A,B)	Computation of a pulse width between a rising edge and the next falling edge
PWLH	PWLH(C1,A,B)	Computation of a pulse width between a falling edge and the next rising edge
PWLL	PWLL(C1,A,B)	Computation of a pulse width between a falling edge and the next falling edge
PWXX	PWXX(C2,A,B)	Computation of a pulse width between a raising/falling edge and the next rising/falling edge
FV	FV(C1,A,B)	PWHH reciprocal
DUTYH	DUTYH(C1,A,B)	Duty cycle between a rising edge and the next rising edge
DUTYL	DUTYL(C1,A,B)	Duty cycle between a falling edge and the next falling edge
MEAN	MEAN(C1)	10th moving average of a specified waveform
DIF	DIF(C1)	Differentiation of a specified waveform
DDIF	DDIF(C1)	Second-order derivative of a specified waveform
INTG	INTG(C1)	Integration of a specified waveform

5.6 Analyzing Waveforms by Computations (Waveform Math Option)

Operator	Sample Use	Description
IINTG	IINTG(C1)	Second-order integration of a specified waveform
PH	PH(C1,C2)	Phases of two specified waveforms
HLBT	HLBT(C1)	Hilbert function of a specified waveform
FILT1	FILT1(C1)	Filter for a specified waveform
FILT2	FILT2(C1)	Filter for a specified waveform
LS-REAL	LS-REAL(C1)	Real part of the linear spectrum of a specified waveform
LS-IMAG	LS-IMAG(C1)	Imaginary part of the linear spectrum of a specified waveform
LS-MAG	LS-MAG(C1)	Amplitude of the linear spectrum of a specified waveform
LS-LOGMAG	LS-LOGMAG(C1)	Logarithmic amplitude of the linear spectrum of a specified waveform
LS-PHASE	LS-PHASE(C1)	Phase of the linear spectrum of a specified waveform
RS-MAG	RS-MAG(C1)	Amplitude of the effective spectrum of a specified waveform
RS-LOGMAG	RS-LOGMAG(C1)	Logarithmic amplitude of the effective spectrum of a specified waveform
PS-MAG	PS-MAG(C1)	Amplitude of the power spectrum of a specified waveform
PS-LOGMAG	PS-LOGMAG(C1)	Logarithmic amplitude of the power spectrum of a specified waveform
PSD-MAG	PSD-MAG(C1)	Amplitude of the power spectrum density of a specified waveform
PSD-LOGMAG	PSD-LOGMAG(C1)	Logarithmic amplitude of the power spectrum density of a specified waveform
CS-REAL	CS-REAL(C1,C2)	Real part of the cross spectrum of two specified waveforms
CS-IMAG	CS-IMAG(C1,C2)	Imaginary part of the cross spectrum of two specified waveforms
CS-MAG	CS-MAG(C1,C2)	Amplitude of the cross spectrum of two specified waveforms
CS-LOGMAG	CS-LOGMAG(C1,C2)	Logarithmic amplitude of the cross spectrum of two specified waveforms
CS-PHASE	CS-PHASE(C1,C2)	Phase of the cross spectrum of two specified waveforms
TF-REAL	TF-REAL(C1,C2)	Real part of the transfer function of two specified waveforms
TF-IMAG	TF-IMAG(C1,C2)	Imaginary part of the transfer function of two specified waveforms
TF-MAG	TF-MAG(C1,C2)	Amplitude of the transfer function of two specified waveforms
TF-LOGMAG	TF-LOGMAG(C1,C2)	Logarithmic amplitude of the transfer function of two specified waveforms
TF-PHASE	TF-PHASE(C1,C2)	Phase of the transfer function of two specified waveforms
CH-MAG	CH-MAG(C1,C2)	Amplitude of the coherence function of two specified waveforms

Settings for FFT

Points (number of points used for computation)

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

Note

Executing an FFT calculation with 1000000 points or more, only M1 is calculated and the result is displayed.

FFT start point

When the number of loaded points is less than 10M: Specify 0 to “Number of loaded points - no. of FFT computation points”

When larger than 10M: set between computation start point and “computation start point + 10M - no. of FFT points”

Window (time window)

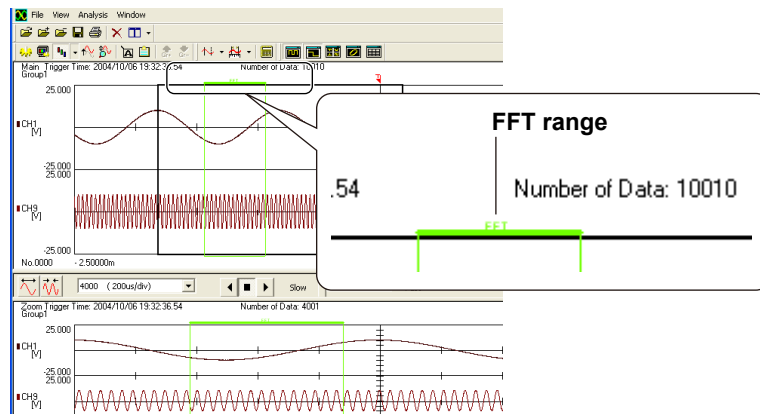
Select the Rect (rectangle), Hanning (hanning), or FlatTop (flat-top) window.

Displaying the FFT Range

The FFT range is indicated with a green bar on the main waveform display window and the zoomed waveform display window.

Drag the bar to move the computation range.

If FFT cannot be performed, the bar indicating the range and the word “FFT” turn red.



Icon displayed during measurement through computation

While measurement through computation is being performed, the icon shown below appears in the status bar.



: Computing (blinks on and off)



: Accessing file

Note

- Canceling computation

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

If you cancel the computation, nothing will be displayed in the waveform display window and measurement result window.



Computational accuracy

Single-precision floating-point type

Details of Various Computations

Phase Shift (SHIFT)

Shifts the phase of the specified waveform. Set the amount of shift as follows.

Expression: SHIFT(C1,N)

N: Integrated value for the number of data points to the time axis

RMS Value (RMS)

Calculates the RMS value of the waveform that has been assigned.

$$\sqrt{\frac{1}{N} \sum_{n=1}^N s(n)^2}$$

s: Sampling data

N: Integrated value for the number of data points to the time axis

In the expression, set the target trace number and time.

Expression: RMS(C1,T)

T: Computation time (ms)

T = (N/sample rate) × 1000

Filter (FILT1/FILT2)

Type

Type	Bandwidth
Gauss	Lowpass
Sharp	Lowpass/Highpass/Bandpass
IIR (Butterworth)	Lowpass/Highpass/Bandpass

Filter Orders

See the following table for the filter orders.

Cutoff frequency/sampling frequency × 100		2 %	5 %	10 %	20 %	30 %
Gauss	Lowpass	49	21	9	5	5
Sharp	Lowpass	88	36	18	9	8
	Highpass	159	65	33	17	13
IIR	Lowpass	4	4	4	3	2
	Highpass	4	4	4	4	3

Note

- You can set the cutoff frequency in the range from 2 to 30% of the sampling frequency (in 0.2% steps).
- The higher the filter order, the longer computation takes.

Filter Characteristics

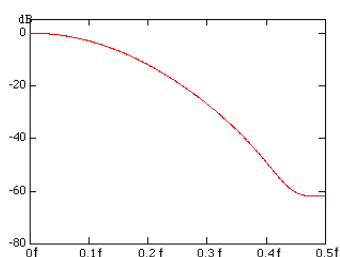
Filter	Pass band Ripple	Attenuation slope	Attenuation in the Stop band	Phase
Gauss	0 dB	*	—	Linear
Sharp	±0.3 dB	–40 dB at 1 oct (Lowpass), –40 dB at –1 oct (Highpass)	–40 dB	Linear
IIR	0 dB	–5 dB at 1/6 oct (Lowpass), –20 dB at –1 oct (Highpass)	—	Non-linear

* Attenuation for a Gauss filter is $-3.0 \times (f/f_c)^2$ dB (where f is the frequency and f_c is the cutoff frequency).

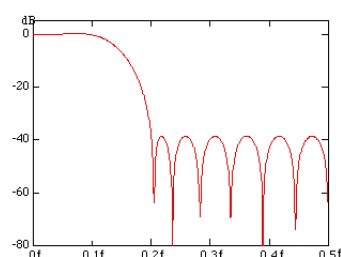
Examples of Frequency Characteristics for Various Filters

Gauss

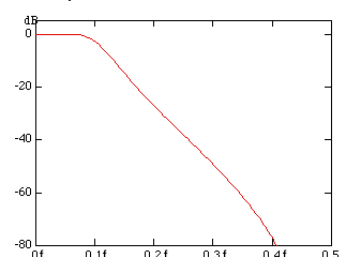
Cutoff 10 %

**Sharp**

Lowpass, cutoff 10 %

**IIR**

Lowpass, cutoff 10 %

**f : Sampling Frequency****Hilbert Function (HLBT)**

Normally, when we analyze a real time signal, it is convenient to think of the signal as the real part of a complex valued signal. Analysis is often more convenient when done using the complex signal. Given that the real time signal is considered to be the real part of the complex signal, the imaginary part is then equal to the Hilbert transform of the real part. When performing a Hilbert transform on a signal in the time domain, the signal is first transformed into the frequency domain using the Fourier transform. Next, the phase of each frequency component is shifted by -90 degrees if the frequency is positive and $+90$ degrees if negative. Lastly, the Hilbert transform is completed by taking the inverse Fourier transform. As can be seen from the above description, the Hilbert transform does not change the order of the individual variables. The Hilbert transform of a time signal results in another time signal.

Application Example

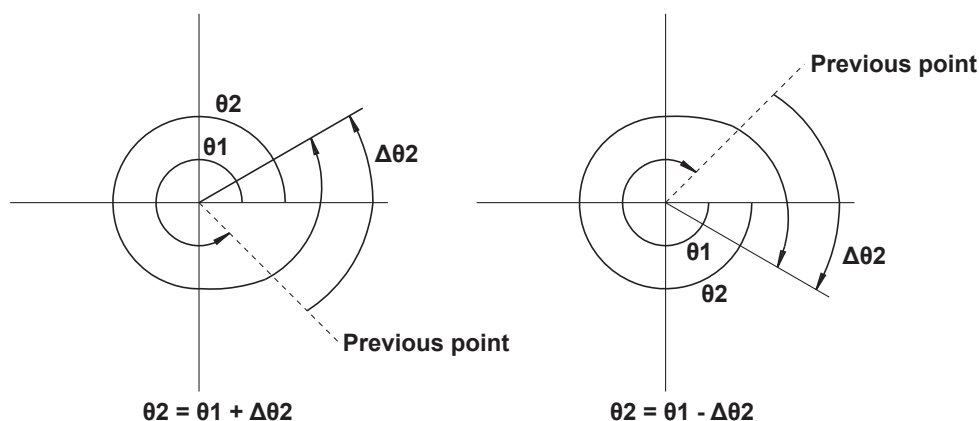
The Hilbert transform can be used to analyze an envelope waveform.

AM (amplitude modulation): $\text{SQRT}(C1 * C1 + \text{HLBT}(C1) * \text{HLBT}(C1))$

Demodulation of a FM signal: $\text{DIF}(\text{PH}(C1, \text{HLBT}(C1)))$

Phase Function (PH)

Phase function $\text{PH}(C1, C2)$ computes $\tan^{-1}(C1/C2)$. However, the phase function takes the phase of the previous point into consideration and continues to sum even when the value exceeds $\pm\pi$ (The ATAN function reflects at $\pm\pi$). The unit is radians.



Binary Conversion (BIN)

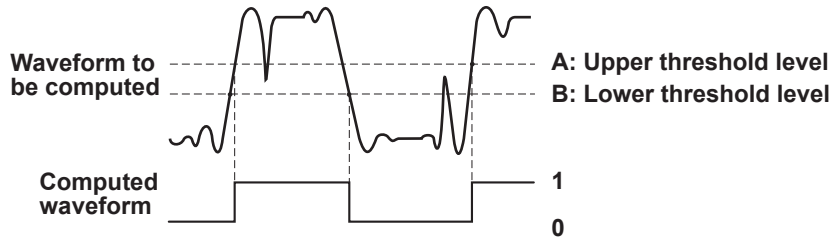
Performs binary conversion with respect to the specified threshold level.

The threshold level is specified as follows:

Expression: BIN(C1, A, B)

A: Upper threshold level

B: Lower threshold level



Pulse Width Computation (PWHH/PWHL/PWLH/PWLL/PWXX)

The signal is converted into binary values by comparing to a preset threshold level, and the time of the pulse width is plotted as the Y-axis value for that interval.

The following 4 intervals are available:

PWHH: From the rising edge to the next rising edge.

PWHL: From the rising edge to the next falling edge.

PWLH: From the falling edge to the next rising edge.

PWLL: From the falling edge to the next falling edge.

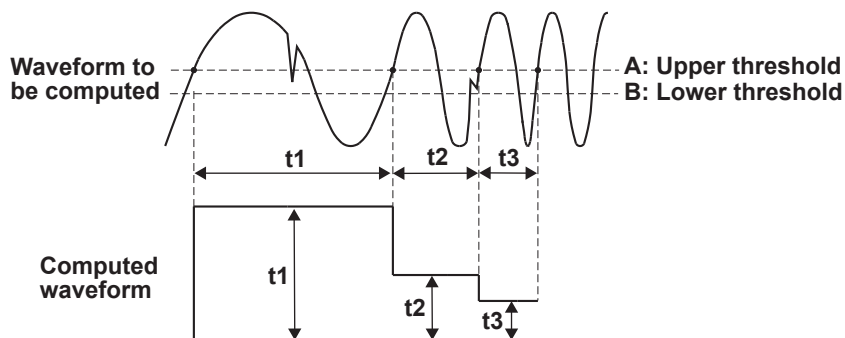
PWXX: From the rising or falling edge to the next rising or falling edge.

The threshold level is specified as follows:

Expression: PWHH (C1, A, B)

A: Upper threshold level

B: Lower threshold level



FFT Functions

Linear Spectrum (LS-REAL/LS-IMAG/LS-MAG/LS-LOGMAG/LS-PHASE)

The linear spectrum is directly determined by the FFT. The power spectrum and cross spectrum can be determined from one or two linear spectra.

The FFT is a complex function, and thus the linear spectrum is composed of both a real and an imaginary part. The magnitude and phase of the frequency components of the measured waveform can be derived from the real and imaginary parts of the FFT result.

The following spectra can be determined:

Item	Expression	Computation
Real part	LS-REAL	R
Imaginary part	LS-IMAG	I
Magnitude	LS-MAG	$\sqrt{R^2 + I^2}$
Log magnitude	LS-LOGMAG	$20 \times \log \sqrt{R^2 + I^2}$
Phase	LS-PHASE	$\tan^{-1}(I/R)$

Log magnitude reference (0 dB): 1 V_{peak}

R, I: R and I represent the real part and the imaginary part, respectively, when each frequency component G of a linear spectrum is represented by "R + jI."

Rms Value Spectrum (RS-MAG/RS-LOGMAG)

Rms value spectrum expresses the rms value of the magnitude of the linear spectrum. It does not contain phase information.

The following spectra can be determined:

Item	Expression	Computation
Magnitude	RS-MAG	$\sqrt{(R^2 + I^2)/2}$
Log magnitude	RS-LOGMAG	$20 \times \log \sqrt{(R^2 + I^2)/2}$

Log magnitude reference (0 dB): 1 V_{rms}

Power Spectrum (PS-MAG/PS-LOGMAG/PSD-MAG/PSD-LOGMAG)

The power spectrum expresses the power of each frequency component included in the measured signal. It is determined by taking the product of the linear spectrum and its complex conjugate. It does not contain phase information.

The following spectra can be determined:

Item	Expression	Computation
Amplitude	PS-MAG	DC component
		$R^2 + I^2$
Log magnitude	LS-MAG	AC component
		$(R^2 + I^2)/2$
		DC component
		$10 \times \log(R^2 + I^2)$
		AC component
		$10 \times \log\{(R^2 + I^2)/2\}$

Log magnitude reference (0 dB): 1 V_{rms}²

Power Spectral Density (PSD-MAG/PSD-LOGMAG)

The power spectral density (PSD) expresses the power spectrum per unit frequency. It is determined by dividing the power spectrum by the frequency resolution Δf found during the analysis of the power spectrum. The results of the PSD computation vary depending on the window function chosen. The power spectral density is used to compare power spectra analyzed at different frequency bands. However, it is not necessary for signals having a line spectrum such as a sine wave.

The following spectra can be determined:

Item	Expression	Computation
Magnitude	PSD-MAG	PS-MAG/ Δf (for rectangular window) PS-MAG/1.5 Δf (for Hanning window)
Log magnitude	PSD-LOGMAG	10 × logPS-MAG/ Δf (for rectangular window) 10 × logPS-MAG/1.5 Δf (for Hanning window)

Log magnitude reference (0 dB): 1 Vrms²

Cross Spectrum (CS-REAL/CS-IMAG/CS-MAG/CS-LOGMAG/CS-PHASE)

The cross spectrum is determined from 2 signals. It is found by taking the product of the linear spectrum of one signal (G_x) and the complex conjugate (G_x^*) of the linear spectrum of the other signal (G_y).

If the linear spectra of the 2 signals are represented by

$$G_x = R_x + jI_x$$

$$G_y = R_y + jI_y$$

then the cross spectrum G_{yx} is

$$\begin{aligned} G_{yx} &= G_y \times G_x^* \\ &= (R_y + jI_y)(R_x - jI_x) = R_{yx} + jI_{yx} \end{aligned}$$

where $R_{yx} = R_y R_x + I_y I_x$

$$I_{yx} = R_x I_y - R_y I_x$$

The following spectra can be determined:

Item	Expression	Computation
Real part	CS-REAL	DC component
		AC component
Imaginary part	CS-IMAG	DC component
		AC component
Amplitude	CS-MAG	DC component
		AC component
Log magnitude	CS-LOGMAG	DC component
		AC component
Phase	CS-PHASE	—

Transfer Function (TF-REAL/TF-IMAG/TF-MAG/TF-LOGMAG/TF-PHASE)

The transfer function expresses the frequency characteristics between the input and the output of a system. The transfer function is given by the ratio of the linear spectrum of the output (G_y) to the spectrum of the input (G_x) at each frequency. Also, as can be seen from the equation below, the transfer function can be defined as the ratio of the cross spectrum of the input and output (G_{yx}) and the input power spectrum (G_{xx}).

$$\text{Transfer Function} = G_y/G_x = (G_y \times G_x^*)/(G_x \times G_x^*) = G_{yx}/G_{xx} = (R_{yx} + jI_{yx})/(R_{xx} + I_{xx})$$

The following items can be determined:

Item	Expression	Computation
Real part	TF-REAL	$R_{yx}/(R_{xx} + I_{xx})$
Imaginary part	TF-IMAG	$I_{yx}/(R_{xx} + I_{xx})$
Magnitude	TF-MAG	$\sqrt{(R_{yx}^2 + I_{yx}^2)/(R_{xx} + I_{xx})}$
Log magnitude	TF-LOGMAG	$20 \times \log \sqrt{(R_{yx}^2 + I_{yx}^2)/(R_{xx} + I_{xx})}$
Phase	TF-PHASE	$\tan^{-1}(I_{yx}/R_{yx})$

The magnitude of the transfer function gives the ratio of the magnitudes of the linear spectra of the output and input, whereas phase of the transfer function gives the phase difference between the two.

Coherence Function (CH-MAG)

This function expresses the ratio of the output power generated by the input to the system to the total output power.

$$\text{Coherence function} = G_{yx} \times G_{yx}^*/(G_{xx} \times G_{yy})$$

Item	Expression	Computation
Magnitude	CH-MAG	$(R_{yx}^2 + I_{yx}^2)/(G_{xx} \times G_{yy})$

If the output signal is due entirely to the input signal, the coherence function becomes 1.

As the ratio decreases, it falls below 1. Thus, the coherence function always takes on a value between 0 and 1.

Note

- On one data acquisition, the coherence function becomes 1 across all frequencies.
- The computed waveform must be averaged.

Number of FFT Computed Points

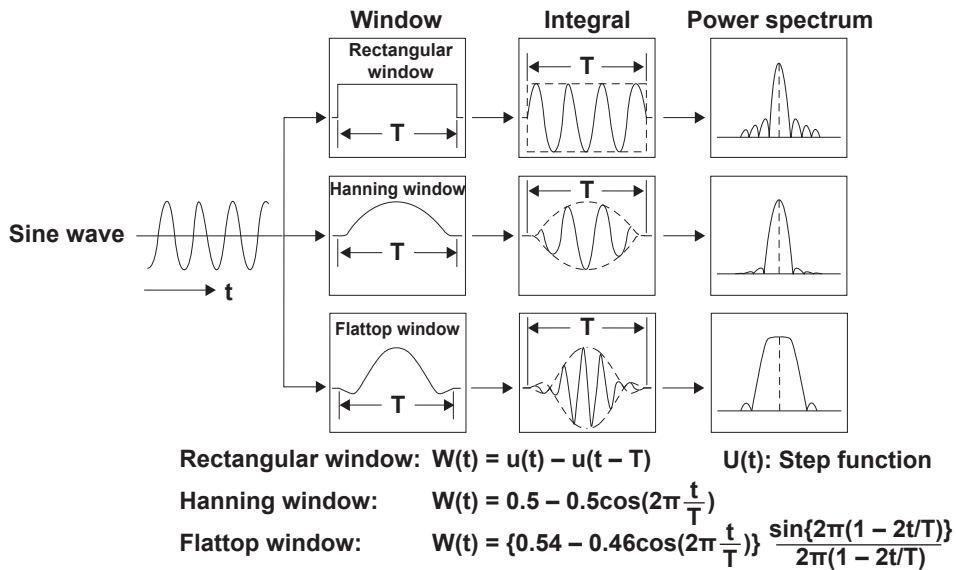
You can select 100 points, 200 points, 500 points, 1000 points, 2000 points, 5000 points, 10000 points, 20000 points, 50000 points, 100000 points, 200000 points, 500000 points, 1000000 points, or 2000000 points.

About Time Windows

You can select rectangular, Hanning, or flattop as the time window.

The rectangular window is best suited to transient signals, such as an impulse wave, that attenuate completely within the time window. The Hanning window allows continuity of the signal by gradually attenuating the parts of the signal located near the ends of the time window down to the “0” level. Hence, it is best suited to continuous signals. The frequency resolution of the Hanning window is higher compared with the Flattop window.

However, the flattop window has a higher level of accuracy of the spectrum. When the waveform being analyzed is a continuous signal, consider the above characteristics when selecting the proper window to use.

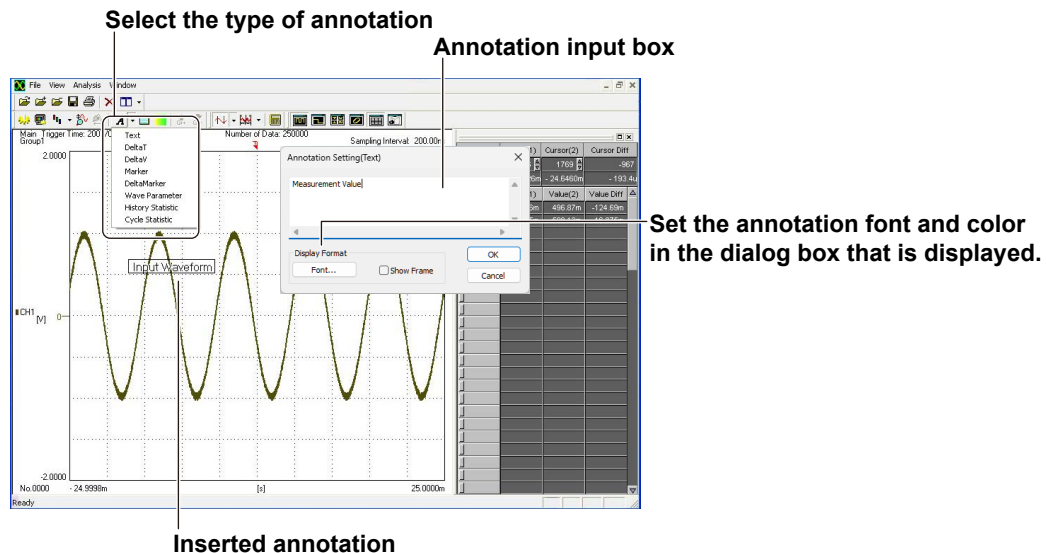


5.7 Inserting Annotations in the Waveform View

Procedure

Inserting Annotations

1. Click  of , or click **View > Add Annotation** and select Annotation Type. There are eight types of annotations: text, DeltaT, DeltaV, marker, Delta marker, waveform parameter, history statistics, and cycle statistics. The pointer icon displayed in the tool bar or waveform view changes according to the selected annotation. For details, see the explanation starting on the next page.
2. Insert the annotation using the appropriate procedure for the selected annotation. For details, see the explanation starting on the next page. When selecting an annotation of a particular type while in Annotation mode, if you click a different type of annotation that was previously inserted, the selected annotation changes to the clicked type. Select the type of annotation

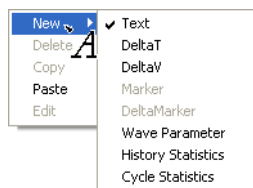


Inserting Annotations Using the (Right-Click) Shortcut Menu

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.

Right-click in the waveform display

Right-click to display the shortcut menu.



You can set the type of annotation to Text, DeltaT, DeltaV, Waveform Parameter, History Statistics, and Cycle Statistics.

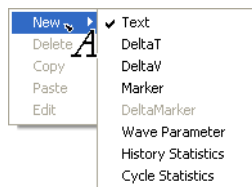
Marker and Delta marker cannot be selected.

Right-click a waveform

If you place the pointer on the waveform, the information for that point is displayed.



Right-click to display the shortcut menu.



You can set the type of annotation to Text, DeltaT, DeltaV, Marker, Waveform Parameter, History Statistics, and Cycle Statistics.

Delta marker cannot be selected.

Copying and Pasting Annotations

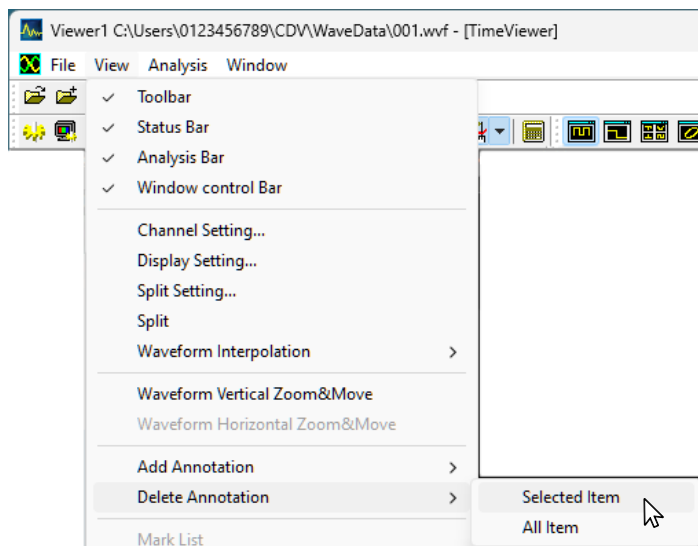
Click to select the annotation to copy, then right-click to display the same shortcut menu mentioned on the previous page. Select **Copy**. Right-click the location onto which you wish to paste the annotation, then select **Paste** in the shortcut menu that is displayed.

Editing Annotations

Click to select the annotation to edit, then right-click to display the same shortcut menu mentioned on the previous page. Select **Edit**. A dialog box corresponding to the selected annotation is displayed. Edit the annotation, then click **OK** or **Apply**.

Deleting Annotations

To delete annotations, click **View > Delete Annotation > Selected Item** or **All Items**.



You can also click to select an annotation you wish to delete and press the **Delete** key. Or, you can click to select the annotation to delete, right-click to display the same shortcut menu mentioned on the previous page, and then select **Delete**.

Explanation

Annotation Types

There are eight types of annotations.

- Text
- Marker
- History statistics
- DeltaT
- Delta marker
- Cycle statistics
- DeltaV
- Waveform parameter

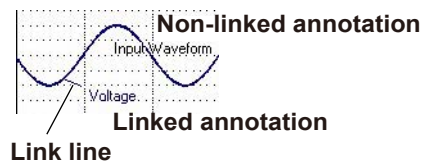
Linked Annotations

- DeltaT, DeltaV, marker, Delta marker, waveform parameter, history statistics, and cycle statistics are annotations that are linked to waveforms.
- If the text annotations is linked to a waveform, they are connected by link lines.
- You can insert annotations into individual waveforms. Links to each waveform are preserved even if you switch the displayed group.

Non-Linked Annotations

Text annotations without link lines are non-linked annotations. Their positions change relative to the size of the screen.

Example of a Text Annotation



Annotation-Compatible Windows

- Text, DeltaT, and DeltaV annotations can be inserted into the main waveform display window, zoom waveform display window, and XY waveform display window.
- Marker, delta marker, waveform parameter, history statistics, and cycle statistics annotations can be inserted into the main waveform display window and zoom waveform display window.
- Only text annotation can be inserted into logic waveforms.

Note

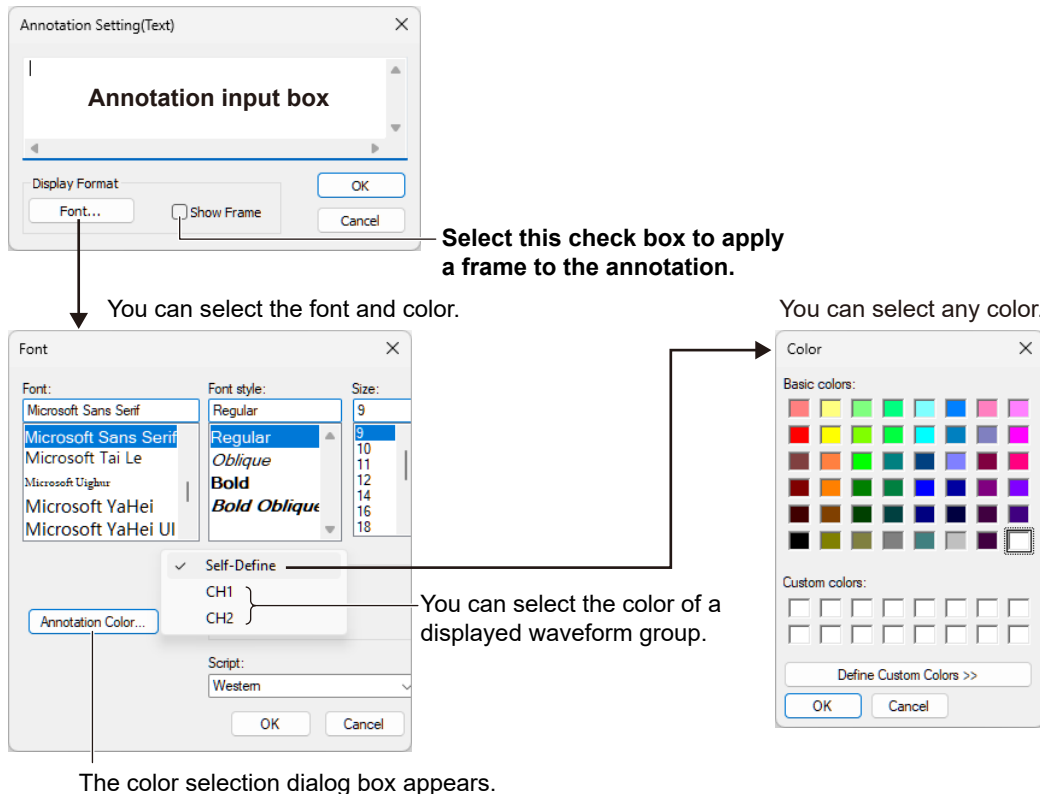
In the following situations, annotations cannot be inserted in the zoom waveform display window.

- When the waveform shown in the main waveform display window and that shown in the zoom waveform display window are different (when "Share channel setting in Main/Zoom" is set to off).
- When waveforms are overlaid, the active waveform in the main waveform display window and that in the zoom waveform display window are different.

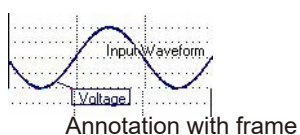
Text Pointer Icon:

If you select a text annotation and double-click in the waveform view or on a waveform, the following settings dialog box is displayed. You can set the annotation display format.

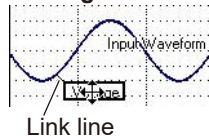
If you double-clicked on the waveform, a waveform-linked annotation is inserted.



Display Example



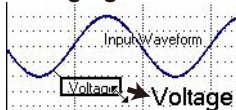
Moving an Annotation



Select the annotation, then drag it.

If a link line flows outside of the waveform view when zooming or changing the scale, the link line disappears.

Changing the Character Size

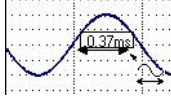


When you select an annotation, a frame appears. Drag one of the four corners of the frame.

DeltaT Pointer Icon:

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

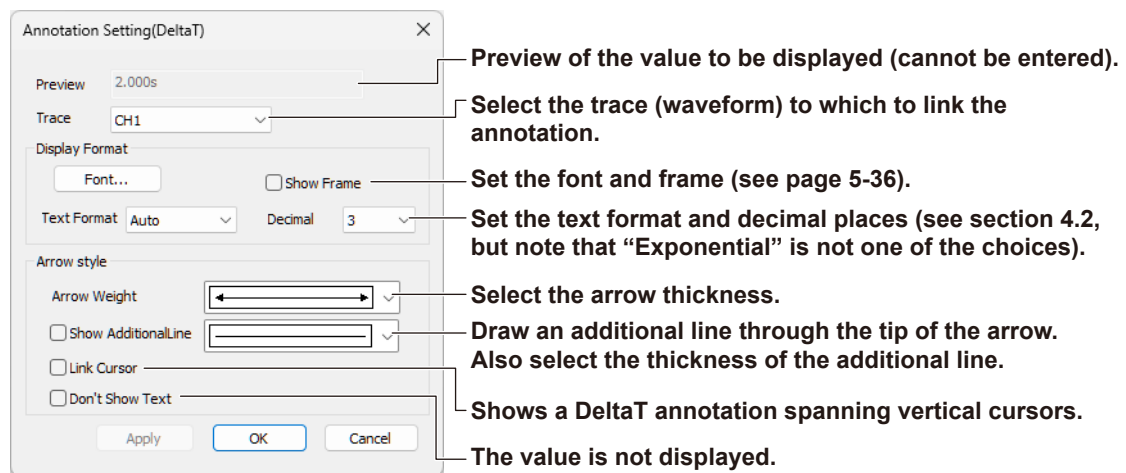
Drag horizontally.



Double-click

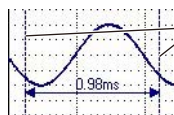
Double-click to display the dialog box below. You can set the trace (waveform) to which the annotation is linked, the display format, the arrow style, and other items.

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



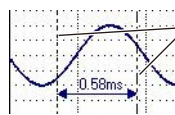
Display Examples

DeltaT annotation with additional line



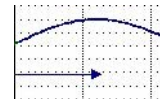
Additional line

DeltaT annotation spanning vertical cursors



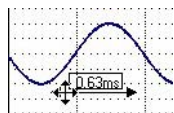
Vertical cursors

If the arrow flows outside of the waveform view



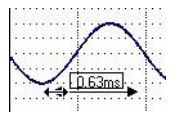
If an arrow flows outside of the waveform view when zooming or changing the scale, the value is not displayed.

Moving a DeltaT annotation



Select an arrow, then drag it. To move just the value, use the same procedure as for moving a text annotation.

Resizing arrows



Select the tip of the arrow, then drag it. The value is updated according to the length of the arrow.

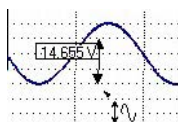
Changing the character size

Same procedure as for text annotations.

DeltaV Pointer Icon:

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

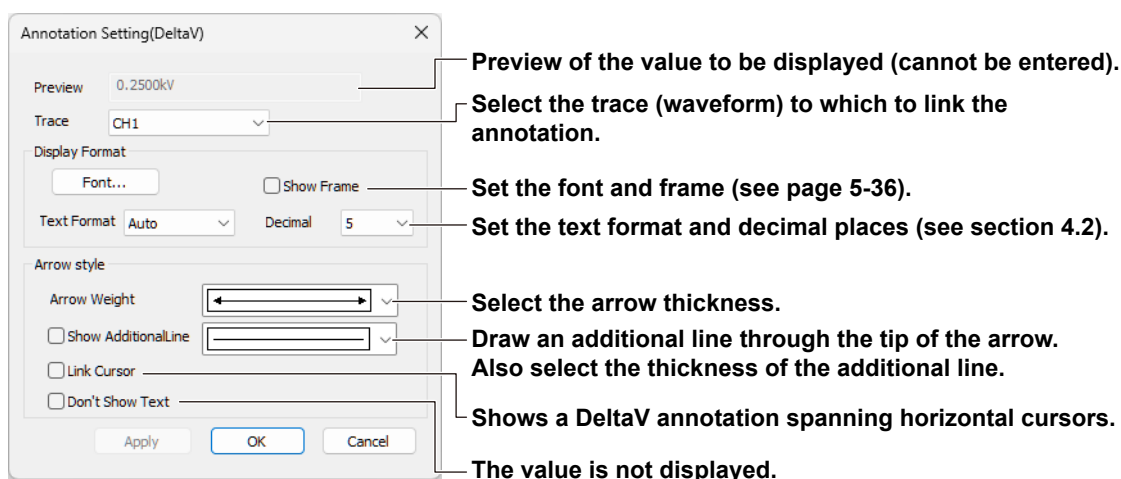
Drag vertically.



Double-click

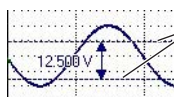
Double-click to display the dialog box below. You can set the trace (waveform) to which the annotation is linked, the display format, the arrow style, and other items.

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



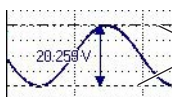
Display Examples

DeltaV annotation with additional line



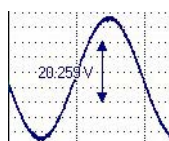
Additional line

DeltaV annotation spanning horizontal cursors



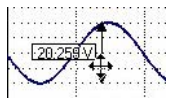
Horizontal cursors

When zooming the waveform vertically



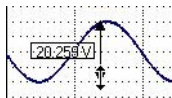
The length of the arrow does not change even when zoomed.
The value is updated according to the zoom ratio.

Moving a DeltaV



Select an arrow, then drag it. To move just the value, use the same procedure as for moving a text annotation.

Resizing arrows



Select the tip of the arrow, then drag it. The value is updated according to the length of the arrow.

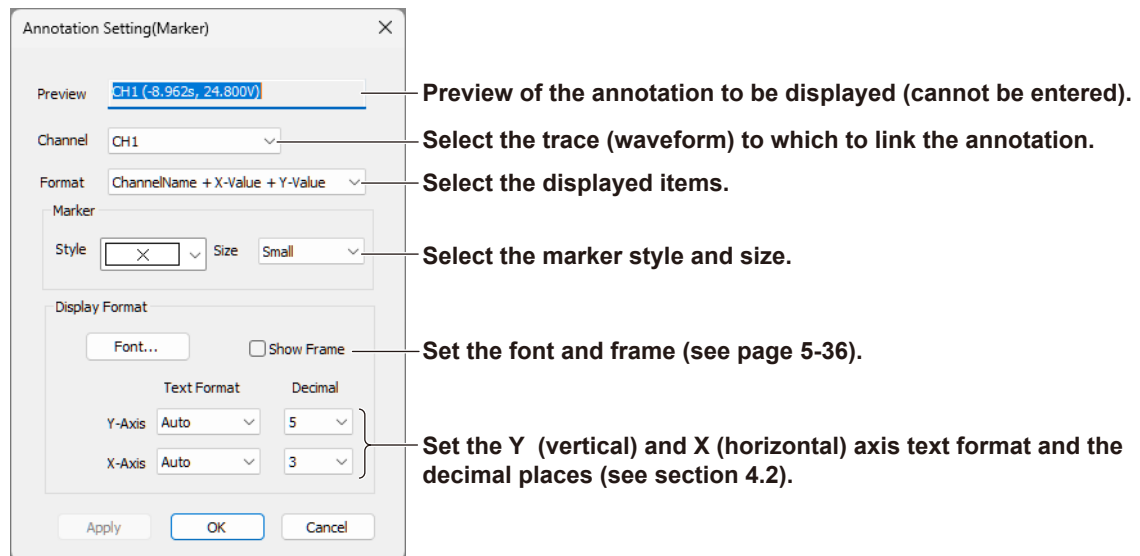
Changing the character size

Same procedure as for text annotations.

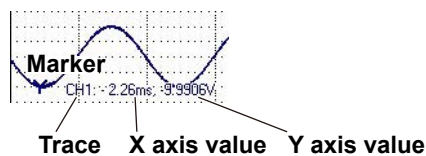
Markers

With marker annotations, the trace, X axis value, and Y axis value at the double-clicked point are displayed. If you select a marker annotation and double-click the waveform, the settings dialog box below is displayed.

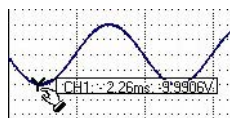
- You can set the trace (waveform) to which the annotation is linked, the format, the marker style, and other items.
- There are four marker styles. Each time you insert a marker annotation, a new style is used.



Display Examples

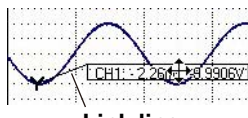


Moving markers



Select the marker, then drag it. Only the marker moves. The value is updated according to the new marker location.

Moving an annotation



Link line

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

Changing the character size

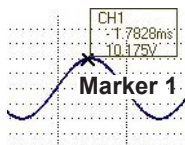
Same procedure as for text annotations.

Delta Marker

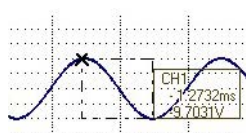
With Delta marker annotations, the DeltaT annotation (X axis value) and DeltaV annotation (Y axis value) are displayed between two markers.

- Select the Delta marker annotation, then drag starting from any one point on the waveform to any other point on the waveform. A DeltaT annotation and DeltaV annotation appear between the two markers.
- If a Delta marker is placed between two different traces, only the Delta T annotation is displayed.

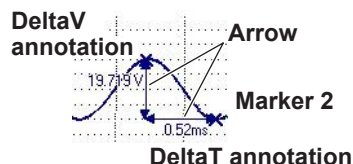
Click the waveform



Drag



Release the mouse button at the second point



Double-click on an annotation to display the settings dialog box below.

- The target trace (waveform), marker style, and other items relating to markers can be set.
- There are four marker styles. Each time you insert a marker annotation, a new style is used.
- You can set the display format, arrow style, and other items relating to DeltaT and DeltaV annotations. Click the DeltaT or DeltaV tab to display the corresponding settings.

Select the target trace (waveform) for each marker.

Select the marker style and size. The style and size of paired markers 1 and 2 are the same.

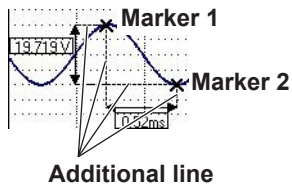
Configure the settings of DeltaT and DeltaV annotations that are used in Delta marker annotations.

See the explanation of each annotation on the previous page.

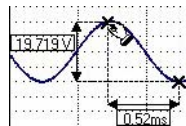
- Clear the Show Arrow check box to hide the annotation's arrow and value.
- There are no cursor linking and hide value options such as those for DeltaT and DeltaV annotations on the previous page.

Display Examples

Delta marker annotation with additional line

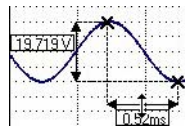


Moving markers



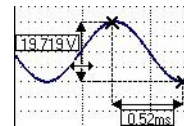
Select the marker, then drag it. The arrow length, value, and additional line are updated according to the new marker location.

Moving a DeltaT



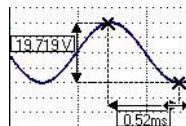
Select the arrow of the DeltaT annotation, then drag it. To move just the value, use the same procedure as for moving a text annotation.

Moving a DeltaV



Select the arrow of the DeltaV annotation, then drag it. To move just the value, use the same procedure as for moving a text annotation.

Resizing arrows (DeltaT annotation only)



Select the tip of the arrow, then drag it. The marker is moved and the value is updated according to the length of the arrow.

If the arrow flows outside of the waveform view

With Delta marker annotations, if a DeltaT or DeltaV annotation arrow flows outside of the waveform view when zooming or changing the scale, the value is not displayed.

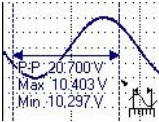
Changing the character size

Same procedure as for text annotations.

Waveform Parameters Pointer Icon:

When you select a waveform annotation and perform procedure a or b below in the waveform view, the measured value of the waveform parameter is displayed.

Drag horizontally.



Double-click

Double-click to display the dialog box below. You can set the measured 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 parameter displayed when you double click is 2 div.

Select the trace (waveform) to which to link the annotation.

Select the number of horizontally-displayed items (columns).

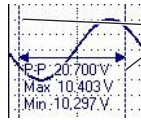
Configure the settings of fonts and arrows that are used in waveform parameter annotations.

- See the explanation of the DeltaT and DeltaV annotations on the previous page.
- Under Vertical axis parameters, set the vertical axis waveform parameter text format and decimal places.
Under Horizontal axis parameters, set the horizontal axis waveform parameter text format and decimal places.
 - There are no cursor linking and hide value options such as those for DeltaT and DeltaV annotations.

Measurement items Int1XY and Int2XY cannot be selected.

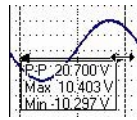
Display Examples

Waveform parameter annotation with additional line



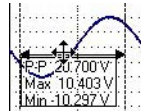
Additional line

Resizing arrows

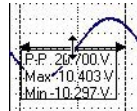


Select the tip of the arrow, then drag it. The value is updated according to the length of the arrow.

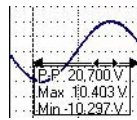
Moving a waveform parameter annotation



Select the arrow of a waveform parameter annotation, then drag it. To move just the value, use the same procedure as for moving a text annotation.



As you begin to move it vertically, the mark indicating the direction of motion becomes ↓.



As you begin to move it horizontally, the mark indicating the direction of motion becomes ↔. The value is updated according to the measurement range of 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 character size

Same procedure as for text annotations.

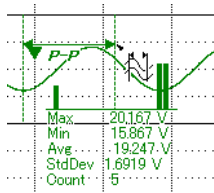
Note

If you click an annotation inserted with the annotation insertion pointer, the annotation turns white, and the distal line, mesial line, and proximal line are displayed in the annotation area. You can move the distal line, mesial line, and proximal line to change their values.

History Statistic

When you select a history statistic annotation and perform procedure a or b below in the waveform view, the measured value of the history statistics is displayed.

Drag horizontally.



Double-click

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.

Select the trace (waveform) to which to link the annotation.

Select the number of horizontally-displayed items (columns).

Select the check box to display histograms in annotations.

Select whether to display the histogram's Y axis using a linear or logarithmic scale.

Configure the settings of fonts and arrows that are used in history statistic annotations

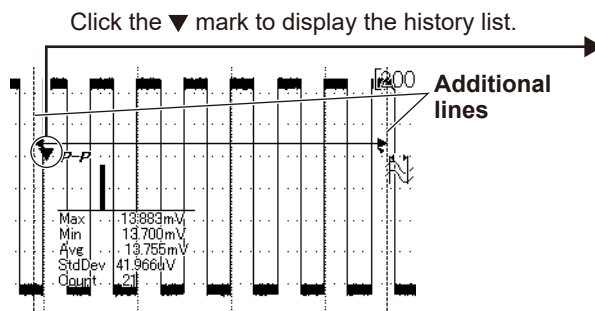
See the descriptions of the DeltaT and DeltaV annotations on the previous page.

- Use the boxes next to Y axis param to set the text format and the number of decimal places for the vertical axis.
- Use the boxes next to X axis param to set the text format and the number of decimal places for the horizontal axis.
- There are no Link Cursor and Don't Show Text options, which are available for DeltaT and DeltaV annotations.

Measurement items Int1XY and Int2XY cannot be selected.

Display Example

History statistic annotation with additional lines



History List			
History No.	P-P	Amp	Max
-021	1.0581 V	1.0073 V	0.5291
-020	1.0550 V ↓	1.0073 V	0.5279
-019	1.0562 V	1.0073 V	0.5300
-018	1.0590 V	1.0073 V	0.5297
-017	1.0592 V	1.0071 V ↓	0.5295
-016	1.0577 V	1.0073 V	0.5285
-015	1.0604 V ↑	1.0073 V	0.5287
-014	1.0583 V	1.0073 V ↑	0.5302
-013	1.0579 V	1.0073 V	0.5297
-012	1.0585 V	1.0073 V	0.5300
-011	1.0569 V	1.0073 V	0.5289
-010	1.0569 V	1.0073 V	0.5291
-009	1.0598 V	1.0073 V	0.5289
-008	1.0575 V	1.0073 V	0.5297
-007	1.0577 V	1.0073 V	0.5291

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 character size

Same procedure as for text annotations

Note

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

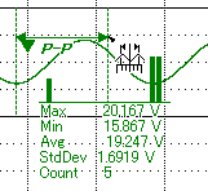


- If you click an annotation inserted with the annotation insertion pointer, the annotation turns white, and the distal line, mesial line, and proximal line are displayed in the annotation area. You can move the distal line, mesial line, and proximal line to change their values.

Cycle Statistic

When you select a cycle statistic annotation and perform procedure a or b below in the waveform view, the measured value of the cycle statistics is displayed.

Drag horizontally.



Double-click

Double-click to display the dialog box below. You can set the measured 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.

Annotation Settings(Cycle Statistics)

Measure Item	On
Peak to peak value	
Amplitude	
Maximum	
Minimum	
High level	
Low level	
Average	
Middle	
RMS	
Standard deviation	
Overshoot	
Undershoot	
Rise time	
Fall time	
Frequency	
Period	
Plus width	
Minus width	
Duty	
Pulse count	
Burst1	
Burst2	
Average frequency	
Average period	
Int1TY	
Int2TY	
Int1XY	
Int2XY	

Cycle Trace CH4

Trace CH4

Number of column 1

Histogram Settings

☐ Display

Y ☒ Linear ☐ Log

Display format

Font...

☐ Show Frame

Y axis param

Text Auto Decimal 5

X axis param

Text Auto Decimal 5

Arrow style

Arrow

☒ Show AdditionalLin

Apply

OK

Cancel

Select the reference trace for cycle statistic measurements.

Select the trace (waveform) to which to link the annotation.

Select the number of horizontally-displayed items (columns).

Select the check box to display histograms in annotations.

Select whether to display the histogram's Y axis using a linear or logarithmic scale.

Configure the settings of fonts and arrows that are used in cycle statistic annotations

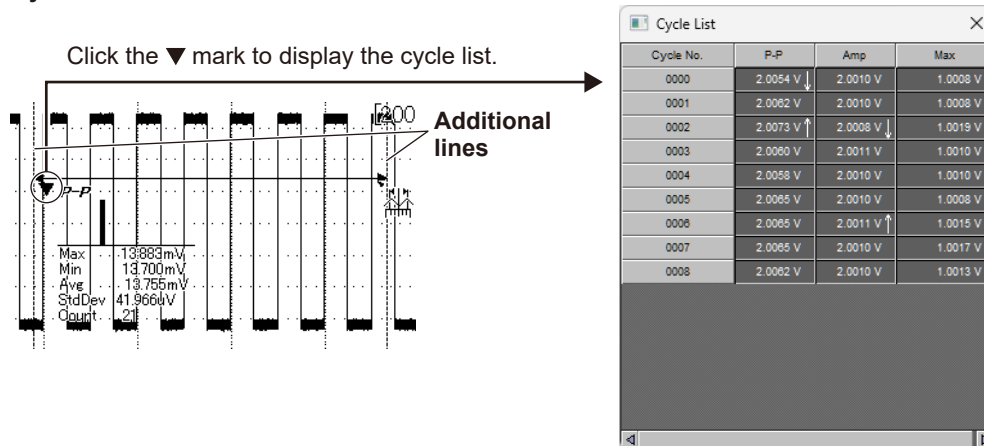
See the descriptions of the DeltaT and DeltaV annotations on the previous page.

- Use the boxes next to Y axis param to set the text format and the number of decimal places for the vertical axis.
- Use the boxes next to X axis param to set the text format and the number of decimal places for the horizontal axis.
- There are no Link Cursor and Don't Show Text options, which are available for DeltaT and DeltaV annotations.

Measurement items Int1XY and Int2XY cannot be selected.

Display Example

Cycle statistic annotation with additional lines



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 character size

Same procedure as for text annotations

Note

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



- If you click an annotation inserted with the annotation insertion pointer, the annotation turns white, and the distal line, mesial line, and proximal line are displayed in the annotation area. You can move the distal line, mesial line, and proximal line to change their values.

Copying and Pasting Annotations

Place the pointer on an annotation or window and right-click to carry out the following operations.

Operation	When pointing to an annotation	When pointing on the window
New	No	Yes
Delete	Yes	No
Copy	Yes	No
Paste	No	Yes
Edit	Yes	No

5.8 Transferring a Waveform View to the Clipboard

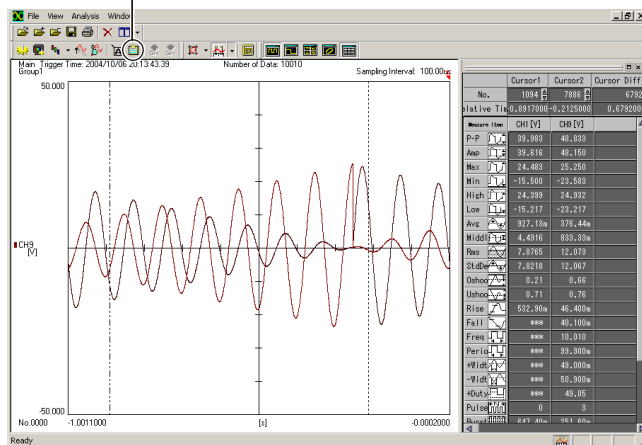
Procedure

Transferring a Waveform View to the Clipboard

Click  to transfer the viewer window you are viewing as image data to the clipboard.

You can see the image by executing a paste command in an application that can handle image data.

Transfer to Clipboard



Note

Only the waveform view is transferred to the clipboard without any image of the menu bars and other functional components.

Saving Data/Converting Data Formats

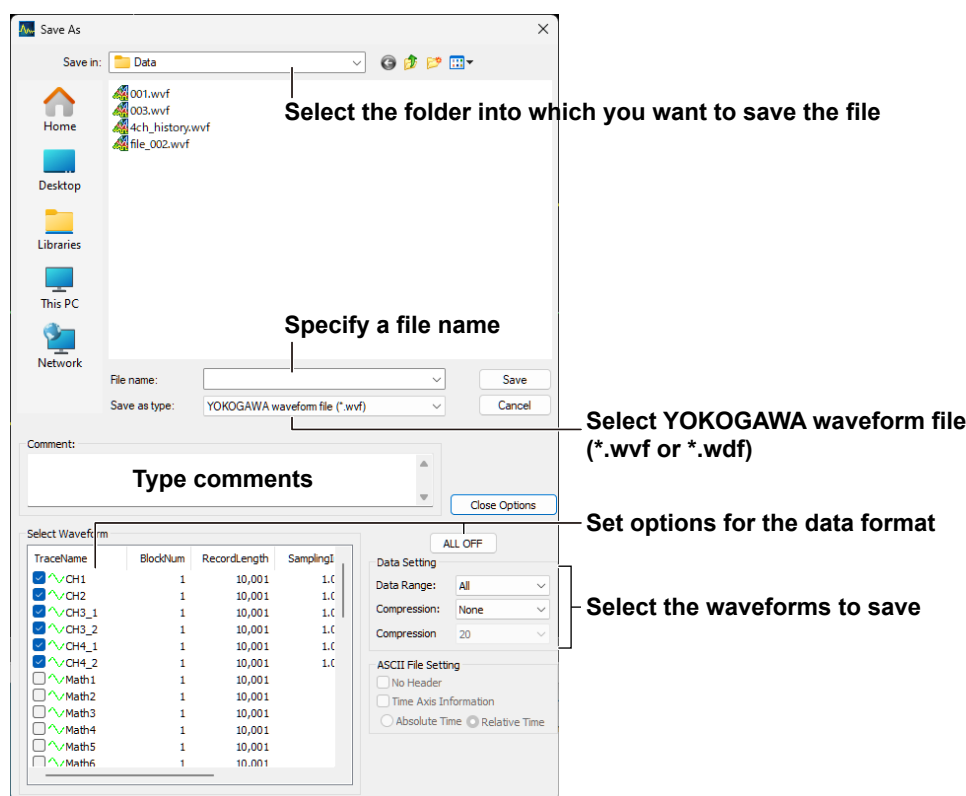
6.1 Saving Waveform Data

Procedure

Saving Waveform Data in Binary Format

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Set the save destination and the file name, set Save as type to **YOKOGAWA waveform file (*.wvf)** or **YOKOGAWA waveform file (*.wdf)**, set comments and necessary options, and click **Save**.

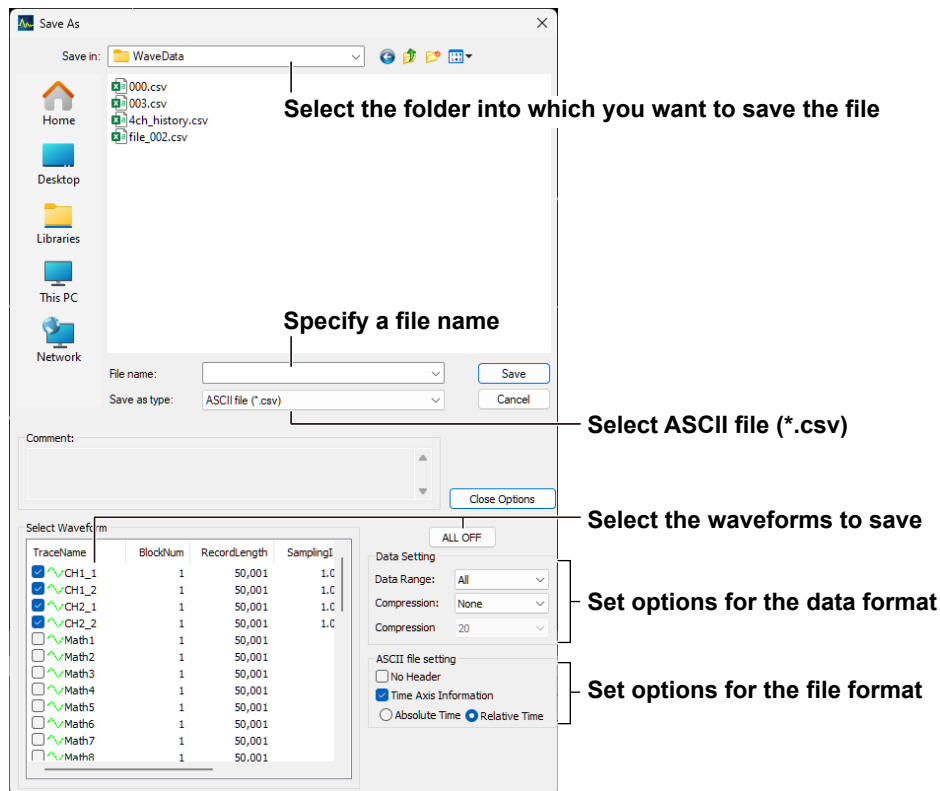
To set the options, click **More Options**.



- **WVF Files** Saved WVF files can not be loaded on the measuring instrument*.
* DL series, SL1400, SL1000, SL2000
- **WDF Files** WDF files cannot be loaded on the measuring instrument.

Saving Waveform Data in ASCII Format

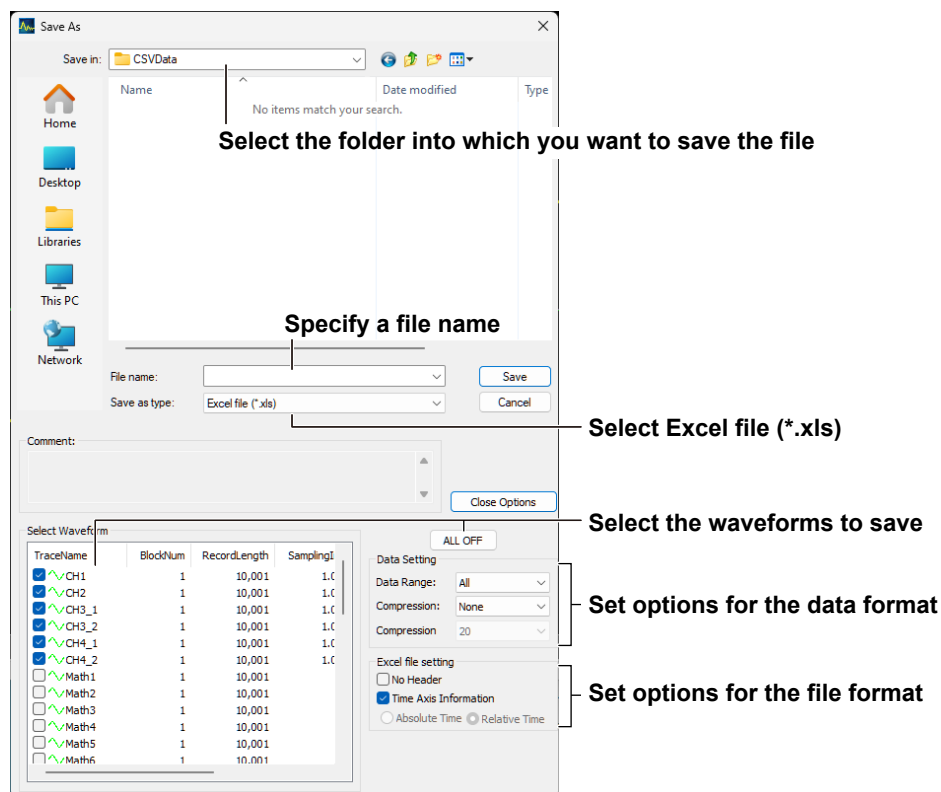
1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **ASCII file (*.csv)** in Files of type, set any other required options, and then click **Save**.
To set the options, click **More Options**.



Saving Waveform Data in XLS Format

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **Excel file (*.xls)** in Files of type, set any other required options, and then click **Save**.

To set the options, click **More Options**.

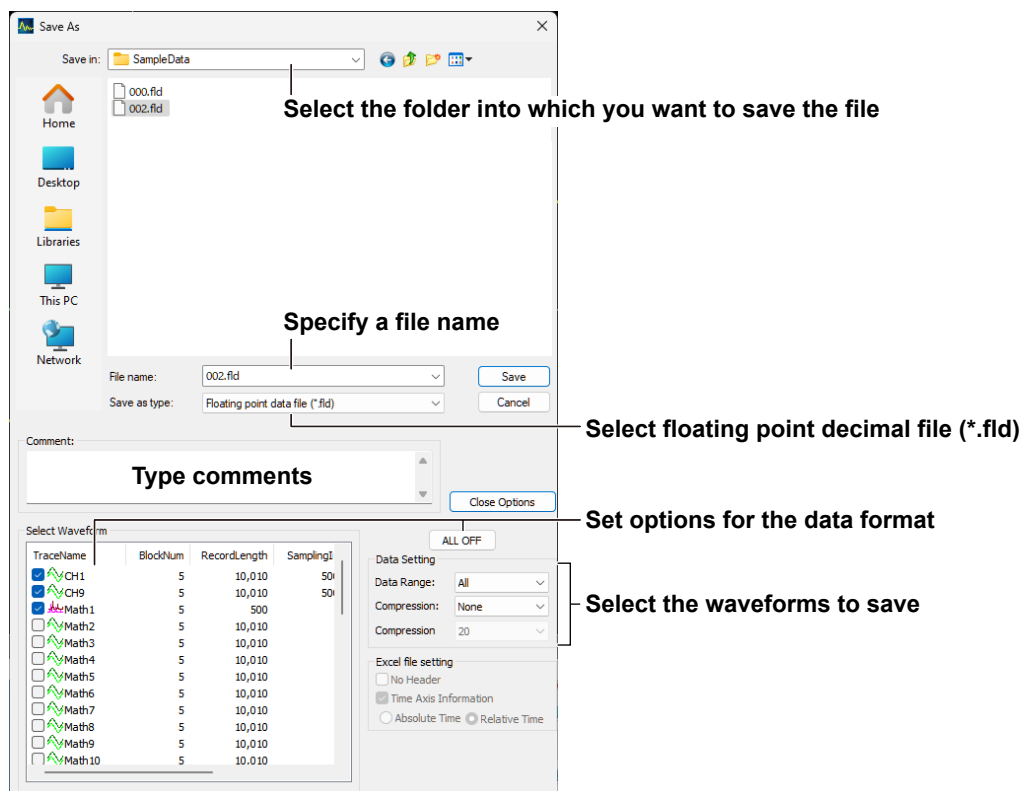


Saving as a Floating Point Decimal File

You can save waveform data as a floating point decimal file.

1. Click , or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **Floating Decimal Point (*.fld)** in Files of type, set any other required options, and then click **Save**.

To set the options, click **More Options**.

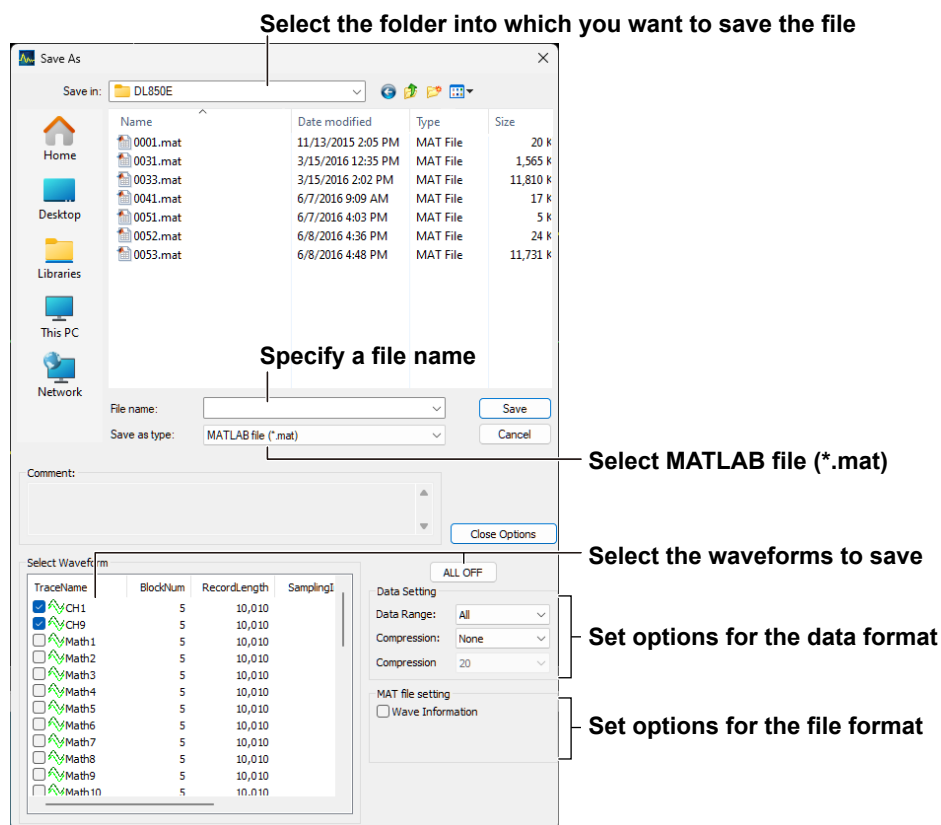


Saving Waveform Data in MATLAB Format

You can save waveform data as a floating point decimal file.

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **MATLAB file (*.mat)** in Files of type, set any other required options, and then click **Save**.

To set the options, click **More Options**.



Explanation

Files Saved in Binary Format

Displayed waveform data are saved in WVF format (a Yokogawa proprietary format) and WDF format (a Yokogawa proprietary format).

The saved data consists of the active waveform data and that for the block checked in the history window.

Options for Saving Binary Files

When you save waveform data in WVF format or WDF format, you can not only select the waveforms to save but you can also set the following options:

- Range to save: Select All, Zoom Range, or Cursor Range
- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified. Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
 - * Only when the Compression is set to 'Decim', you can select the compression rate 2.

Note

Data cannot be saved to WVF format if the file size exceeds 2 GB.

Files Saved in ASCII Format

Files saved in ASCII format conform to CSV format.

Options for Saving CSV Files

When you save waveform data in CSV format, you can not only select the waveforms to save but also set the following options:

- **Data Settings**
 - Range to save: Select All, Zoom Range, or Cursor Range
 - Compression: Select None, PP Comp, or Decim
 - Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
 - * Only when the Compression is set to 'Decim', you can select the compression rate 2.

Note

For waveform data that is divided into blocks, you can save only one block in ASCII format (CSV file).

- **File Settings**

- Header: Select whether to set a header
- Time-Axis: Select whether to set information about the time-axis
- Relative Time/Absolute Time: Selecting Absolute or Relative Time (Available When the Time Axis Information Check Box Is Selected)
 - Relative Time: Displays the measurement time relative to the trigger position. Displays and saves data to the left of the on-screen trigger position as negative values, and data to the right as positive values.
Example: -0.00499984, 0 (Trigger position), 0.00499984
 - Absolute Time: Displays and saves data at the actual measured time (per the clock). Year/Month/Day Hour:Minute:Second
Example: 2007/07/07 18:03:47.4750002, 2007/07/07 18:03:47.48, 2007/07/07 18:03:47.4849998

Files Saved in XLS Format

Files saved in XLS format conform to MS Excel format.

Options for Saving XLS Files

When you save waveform data in XLS format, you can not only select waveforms to save but also set the following options:

- **Data Settings**

- Range to save: Select All, Zoom Range, or Cursor Range
- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
* Only when the Compression is set to 'Decim', you can select the compression rate 2.

- **File Settings**

- Header: Select whether to set a header
- Time-Axis: Select whether to set information about the time-axis

Note

For waveform data divided by the block, you can save only one block you focus on into the XLS format.

- **File names**

The following file names cannot be used.

AUX, CON, PRN, NUL, CLOCK, COM0 to COM9, and LPT0 to LPT9

File Saved in Floating Point Decimal Format

File saved in floating point decimal format (FLD format).

FLD files can be loaded by general purpose analysis software such as MATLAB.

Options for Saving FLD Files

When saving waveform data to FLD format, you can not only select the waveforms to save but also set the following options:

- **Data Settings**

- Range to save: Select All, Zoom Range, or Cursor Range
- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
* Only when the Compression is set to 'Decim', you can select the compression rate 2.

- **File names**

The following file names cannot be used.

AUX, CON, PRN, NUL, CLOCK, COM0 to COM9, and LPT0 to LPT9

Files Saved in MATLAB Format

Files saved in MATLAB format.

Options for Saving MATLAB Files

When you save waveform data in MATLAB format, you can not only select waveforms to save but also set the following options:

- **Data Settings**

- Range to save: Select All, Zoom Range, or Cursor Range
- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
* Only when the Compression is set to 'Decim', you can select the compression rate 2.

- **MAT File Settings**

Variables that store time settings and other waveform information are included in the file.

When a file that includes waveform information is opened with Classic Data Viewer, time axis information and other measurement information can be displayed.

Note

- Data cannot be saved to MATLAB format if the file size exceeds 2 GB.
 - Depending on the tool that you use, you may not be able to load files that were saved with waveform information.
 - If multiple blocks are selected in the history window, only the waveform data of the first block is saved.
 - MATLAB files saved with this software is in Level 5 MAT-File Format.
They can be loaded into MATLAB Version 5 (R8) and later.
-

- **File names**

The following file names cannot be used.

AUX, CON, PRN, NUL, CLOCK, COM0 to COM9, and LPT0 to LPT9

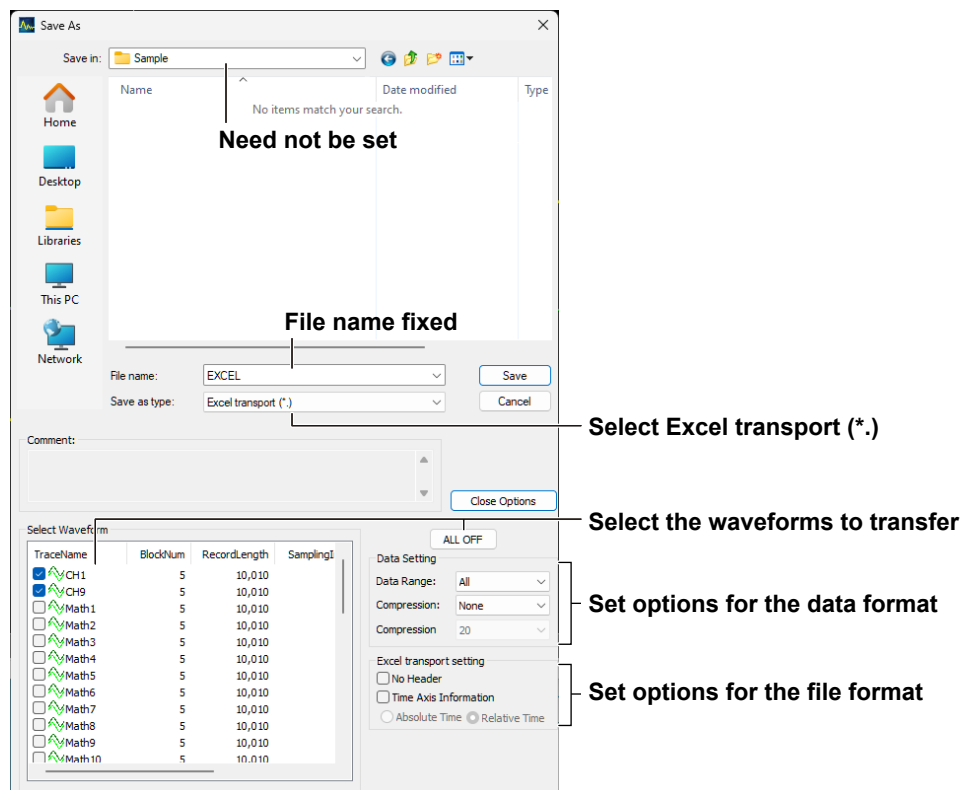
6.2 Transferring Waveform Data into Excel

Procedure

Transferring Waveform Data into Excel

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select **Excel transport (*.*)** in Files of type, set any other required options, and then click **Save**.

To set the options, click **More Options**.



Explanation

Transfer to Excel

The Transfer to Excel command directly redirects data for the selected waveforms to an Excel sheet. Clicking the **Save** button automatically starts up Excel and then plots the waveform data onto an Excel sheet according to the specified format options.

Note

- If there are a number of channels, Transfer to Excel may take a long time to complete in some operating environments. In such a case, save the data into a CSV file, and then read the file into Excel.
 - Using the mouse to close the sheet opened by the Transfer to Excel feature causes Classic Data Viewer to malfunction when you execute Transfer to Excel again. If you need to close the sheet and execute Transfer to Excel again, close the first sheet, quit Classic Data Viewer, and then execute Transfer to Excel again.
 - When the measured values exceed the measurement range, or the size of the computed waveform data is smaller than that of the measured waveform data, the waveform data is not saved. In this case, a value of "65535" is written into each cell.
-

Options for Transfer to Excel

When you transfer waveform data to Excel, you can not only select the waveforms to transfer but also set the following options:

Data Settings

- Range to save: Select All, Zoom Range or Cursor Range
- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
* Only when the Compression is set to 'Decim', you can select the compression rate 2.

File Settings

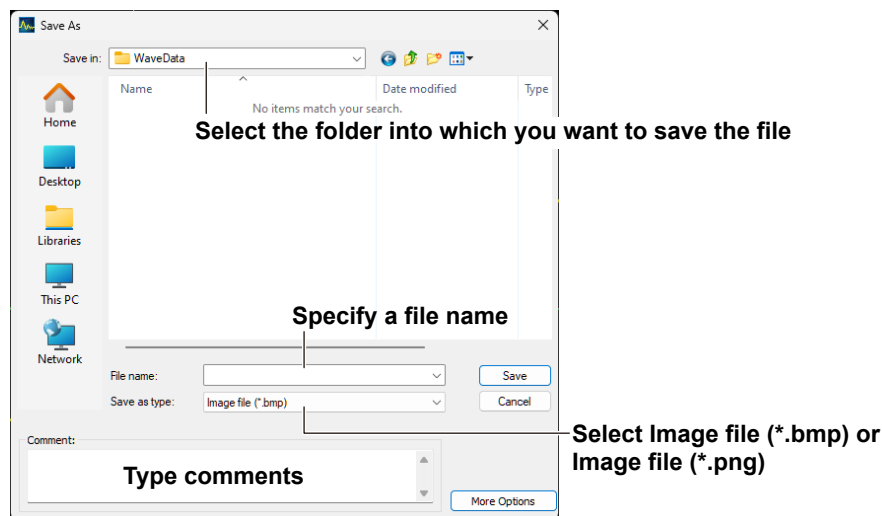
- Header: Select whether to set a header
- Time-Axis: Select whether to set information about the time-axis

6.3 Saving Waveform Data in a View

Procedure

Saving Waveform Data in a View

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **Image file (*.bmp)** or **Image file (*.png)** in Files of type, and then click **Save**.



Explanation

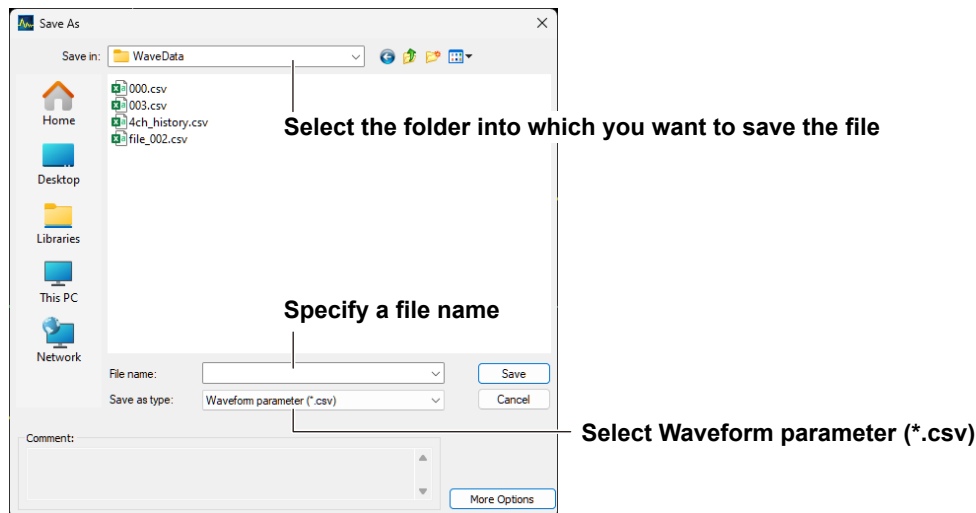
Files Saved in BMP/PNG Format

You can save the viewer window you are viewing into an image data file in either BMP or PNG format. You can attach comments to the file, but the file can include only one line of comments.

6.4 Saving Automated Measurement Values for Waveform Parameters

Saving Values Automated Measurement Waveform Parameters

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **Waveform parameter (*.csv)** in Files of type, and then click **Save**.



Explanation

Files Saved in Waveform Parameters (*.csv) Format

You can save the automated measurement values for the specified waveform parameters, history statistics, and cycle statistics (values displayed in the measurement result display window) in a .csv file.

Saved Data

Among the automated measurement values, the following data is saved.

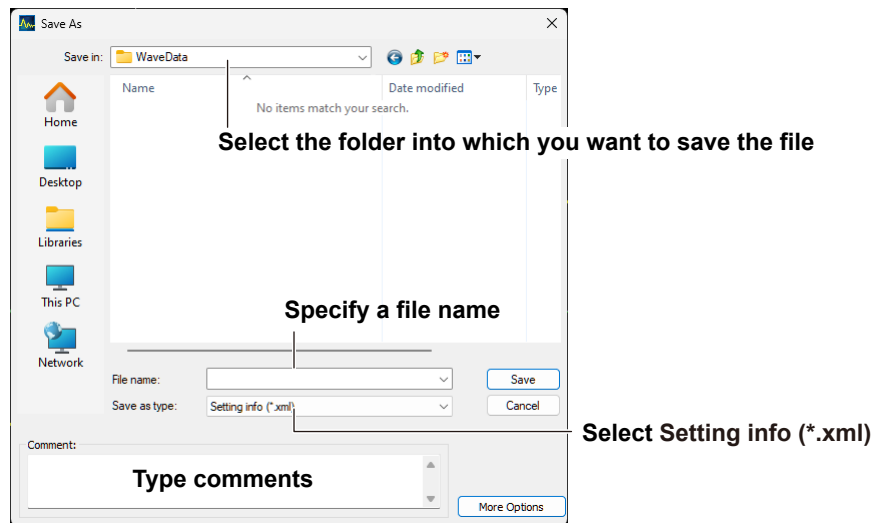
- Measurement results for block selected in the history window
- Trace measurement results for channel setting for which the cursor display is ON

6.5 Saving the Display Settings

Procedure

Saving the Display Settings

1. Click  or select **File > Save As** to display the Save File dialog box.
2. Select the folder into which you want to save the file, specify the file name, select **Setting info (*.xml)** in Files of type, and then click **Save**.



Explanation

Files Saved in Setting info (*.xml) Format

You can save the display settings specified for the viewer window you are viewing into a .xml file. You can also include comments. Loading a Display Setting file already saved applies the display settings in the file to waveform views.

Automatically Saving Display Settings

With software products of version 1.34 or later, when waveform data analysis is finished, the corresponding display settings are automatically saved.

The next time waveform data is loaded, the corresponding display settings are automatically loaded.

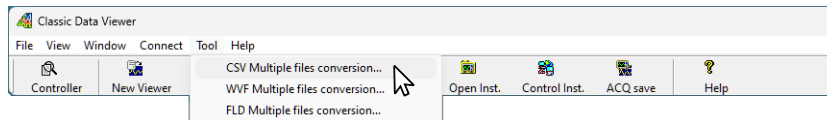
Note

The function that saves display settings automatically uses the MD5 Message Digest Algorithm by RSA Data Security, Inc.

6.6 Converting Multiple Waveform Data Files to CSV Files

Procedure

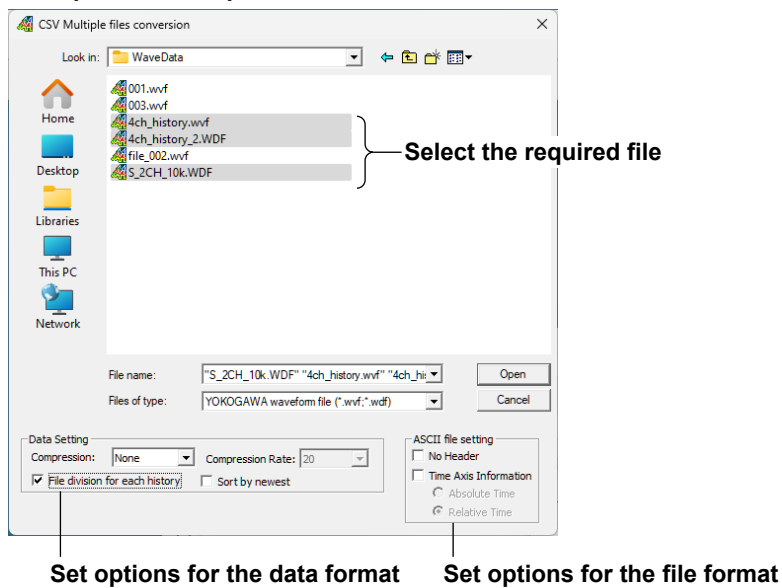
1. Close the viewer window.
2. Click **Tool > CSV Multiple files conversion** on the Classic Data Viewer tool bar to display the CSV Multiple files conversion dialog box.



3. Select the files (WVF or WDF files)* to convert and options and click **Open**.

* You can select one or more WVF and WDF files for conversion. To select multiple files, hold down the Ctrl key while clicking to select them. When multiple files are selected, all are converted to CSV files collectively.

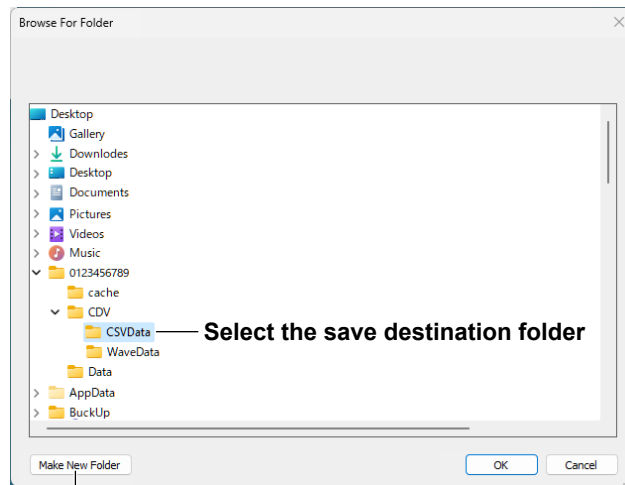
Example with multiple selected files



The Browse For Folder dialog box opens.

4. Select a save destination folder and click **OK**. The converted CSV files are saved in the selected folder.

Converted files are only given the csv file name extension.



Select to create a new folder

Explanation

Option Settings

You can specify the following two options for waveform data files to convert to the CSV format:

Data Settings

- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
- Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
- * Only when the Compression is set to 'Decim', you can select the compression rate 2.
- File division for each history: Select whether to divide file into every history waveform.
- Sort by newest: When selected, data is saved in increasing order by history number.

File Settings

- Header: Select whether to set a header
- Time-Axis: Select whether to set information about the time-axis
- Relative Time/Absolute Time: Selecting Absolute or Relative Time (Available When the Time Axis Information Check Box Is Selected)

Relative Time: Displays the measurement time relative to the trigger position. Displays and saves data to the left of the on-screen trigger position as negative values, and data to the right as positive values.

Example: -0.00499984, 0 (Trigger position), 0.00499984

Absolute Time: Displays and saves data at the actual measured time (per the clock).
Year/Month/Day Hour:Minute:Second

Example: 2007/07/07 18:03:47.4750002,
2007/07/07 18:03:47.48,
2007/07/07 18:03:47.4849998

Records Horizontally Arranged

```
CH1-Record1-data001, CH2-Record1-data001
CH1-Record1-data002, CH2-Record1-data002
CH1-Record1-data003, CH2-Record1-data003
      :                      :
CH1-Record1-data100, CH2-Record1-data100

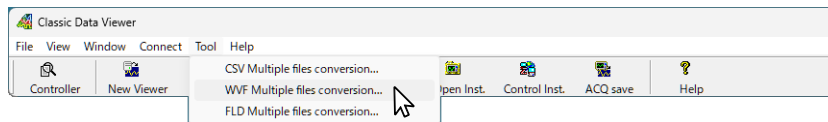
CH1-Record2-data001, CH2-Record2-data001
CH1-Record2-data002, CH2-Record2-data002
CH1-Record2-data003, CH2-Record2-data003
      :                      :
CH1-Record2-data100, CH2-Record2-data100

CH1-Record3-data001, CH2-Record3-data001
CH1-Record3-data002, CH2-Record3-data002
CH1-Record3-data003, CH2-Record3-data003
      :                      :
CH1-Record3-data100, CH2-Record3-data100
```

6.7 Converting WDF Files to WVF Files

Procedure

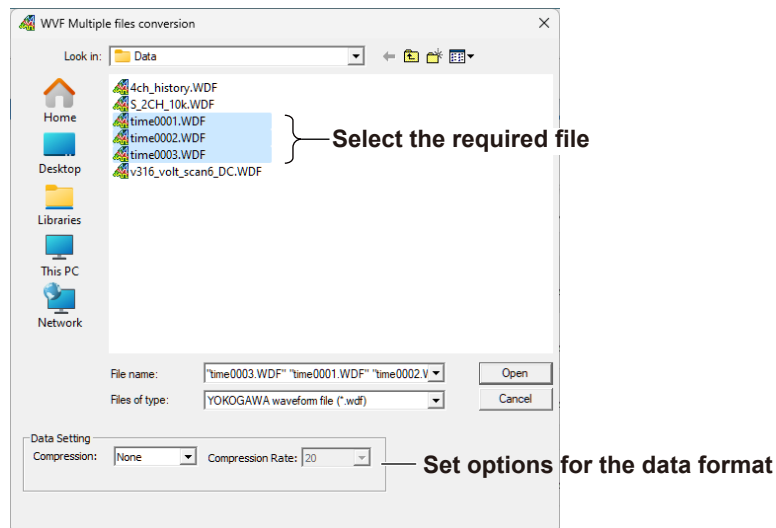
1. Close the viewer window.
2. Click **Tool > WVF Multiple files conversion** on the Classic Data Viewer tool bar to display the WVF Multiple files conversion dialog box.



3. Select the WDF files* to convert and options and click **Open**.

* You can select one or more WDF files for conversion. To select multiple files, hold down the Ctrl key while clicking to select them. When multiple files are selected, all are converted to WVF files collectively.

Example with multiple selected files



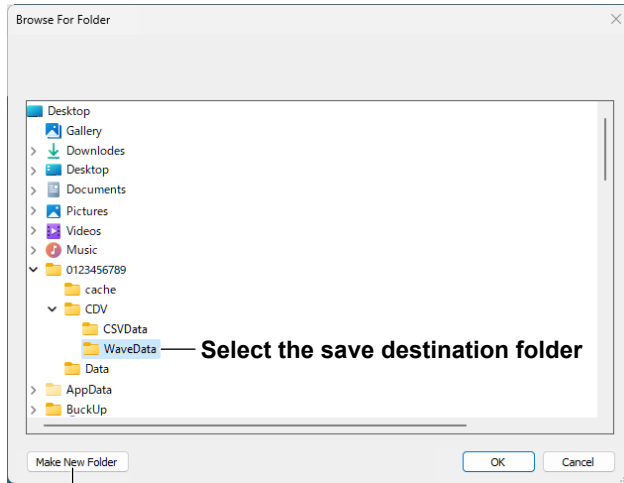
The Browse For Folder dialog box opens.

6.7 Converting WDF Files to WVF Files

4. Select a save destination folder and click **OK**. The converted WVF files are saved in the selected folder.

Converted files are only given the wvf file name extension.

Converted WVF files can not be loaded on the measuring instrument.



Select to create a new folder

Explanation

Option Settings

When converting a WDF file containing measured waveform data to WVF format, you can select WVF format options. The options that can be specified are as follows.

Data Settings

- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000.
* Only when the Compression is set to 'Decim', you can select the compression rate 2.

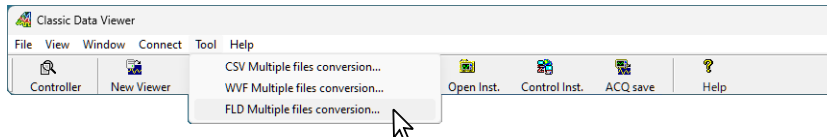
Note

- Data cannot be saved to WVF format if the file size exceeds 2 GB.
 - If WVF batch conversion is applied to WDF files measured and saved on a DL950 or SL2000, the conversion of some files containing data acquired at multiple sample rates may be skipped. (A dialog will appear showing the number of files that will not be converted.)
-

6.8 Converting WDF/WVF Files to FLD Files

Procedure

1. Close the viewer window.
2. Click **Tool > FLD Multiple files conversion** on the Classic Data Viewer tool bar to display the FLD Multiple files conversion dialog box.



3. Select the WDF/WVF files to convert* and any options, then click **Open**.
 - * You can select one or more WDF/WVF files for conversion. To select multiple files, hold down the Ctrl key while clicking to select them. When multiple files are selected, all are converted to FLD files collectively.
The browse folders dialog box is displayed.
4. Select a save destination and click **OK**. The converted FLD file is saved in the selected folder.
Converted files are only given the fld file name extension.
Converted FLD files can not be loaded on the measuring instrument.

Explanation

Option Settings

When converting a WDF file containing waveform data to FLD format, you can select FLD format options.

Data Settings

- Compression: Select None, PP Comp, or Decim
- Compression Rate: Selectable when Compression is specified.
Select 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10000
 - * Only when the Compression is set to 'Decim', you can select the compression rate 2.

Note

- Data cannot be saved to FLD format if the file size exceeds 2 GB.
- FLD files are in single precision floating point decimal format.
- FLD files can be loaded by general purpose analysis software such as MATLAB.

Product Overview Printing Waveforms in the Displayed View

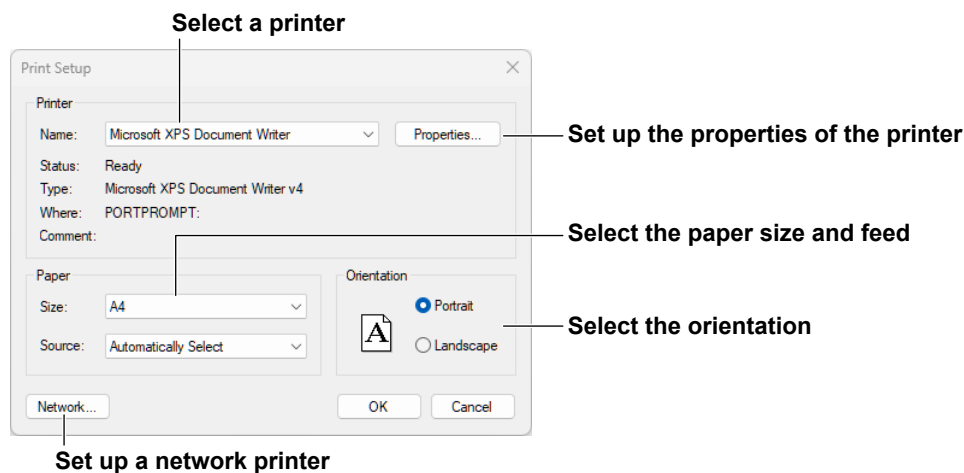
7.1 Setting Up a Printer

Procedure

Setting Up a Printer

Select **File > Printer Setup....** to display the Printer Setup dialog box.

Select a printer and specify the paper size, orientation, and other settings in the dialog box, and then click **OK**.



Explanation

Set up the printer according to your system configuration.

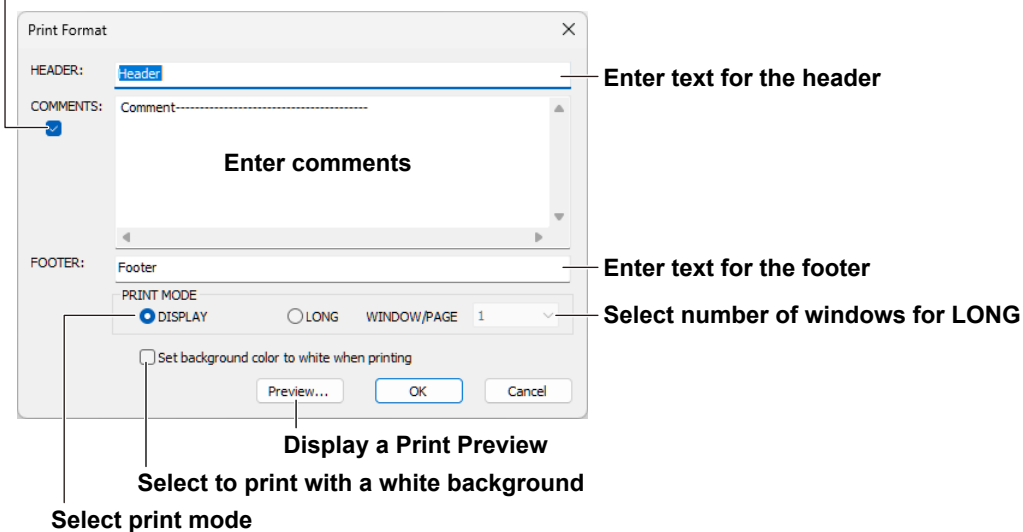
7.2 Printing Displayed Waveforms

Procedure

Setting Up the Print Format

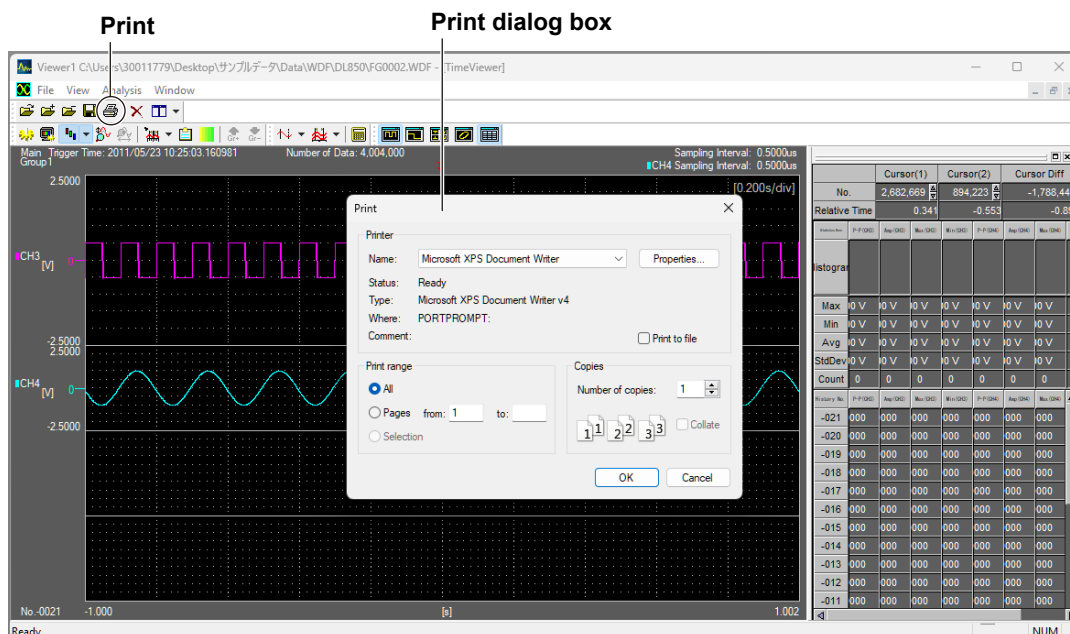
Select **File > Print Format** to display the Print Format dialog box. Fill in the comment, header, and footer fields, specify the print mode settings, and then Click **OK**.

Check to print the comments on the printout



Printing

Click  to display the Print dialog box. Click **OK** to start printing with the settings you specified in the Print Format dialog box.



Explanation

Printable Information

You can specify the printing of the following types of information on printouts:

- **COMMENTS:** Comments (printed under the waveforms.)
- **HEADER:** Page header
- **FOOTER:** Page footer

Print Mode

Set the following items for the PRINT MODE selections:

- **DISPLAY:** Mode in which the display on the screen is printed as is
- **LONG:** Prints the waveforms (main waveform display window), separating them by the zoom rate specified for the zoomed waveform display window. (The entire waveform view is printed by the zoomed waveform display window, starting from the left end. In the dialog box, the size of the zoomed waveform display window is in units of one window*.) Set a value of 1 to 10 for "WINDOW/PAGE" for the number of windows to be printed on one page.

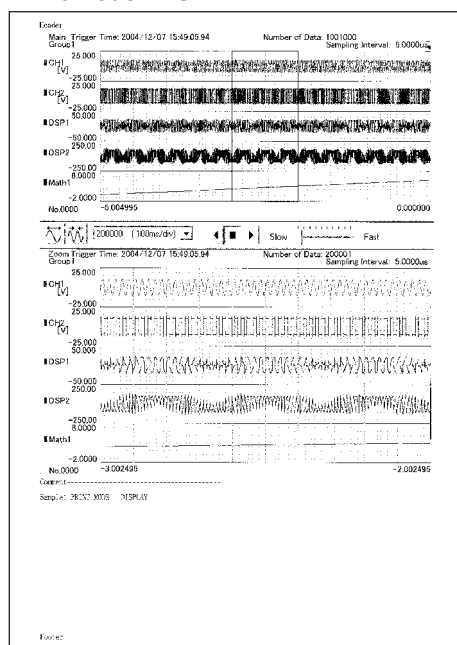
* The number of windows printed equals (the number of points displayed in the main waveform display windows) divided by (the number of points displayed in the zoomed waveform display windows), or (quotient of the division) + 1.

Print Preview

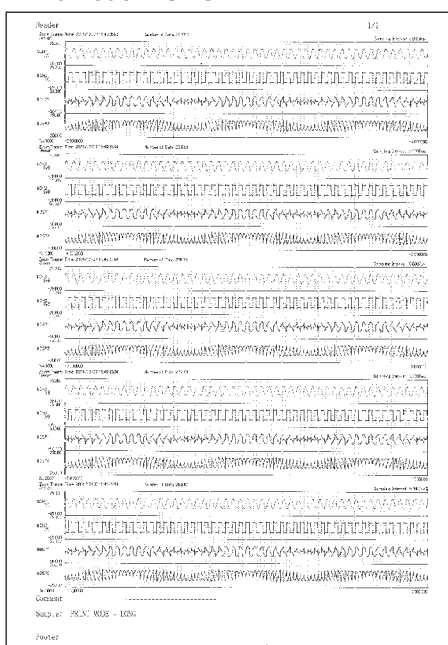
Click Preview or select **File > Print Preview** to switch the viewer window to the print preview. This lets you check the layout of the sheet you are going to print. To proceed with printing, click **Print**.

Printout Sample

Print Mode: DISPLAY



Print Mode: LONG



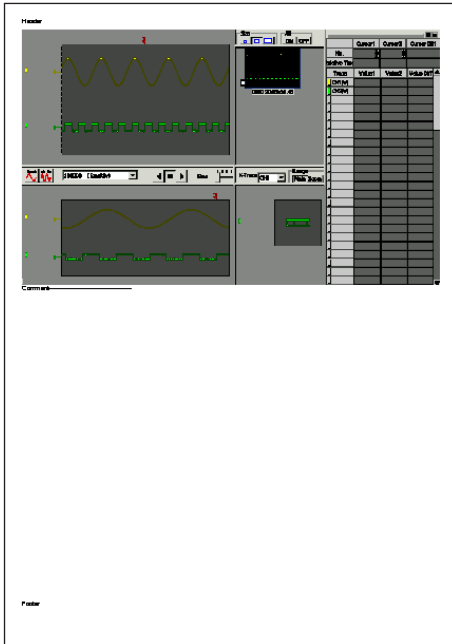
Printing Background

Select a background color to use when printing.

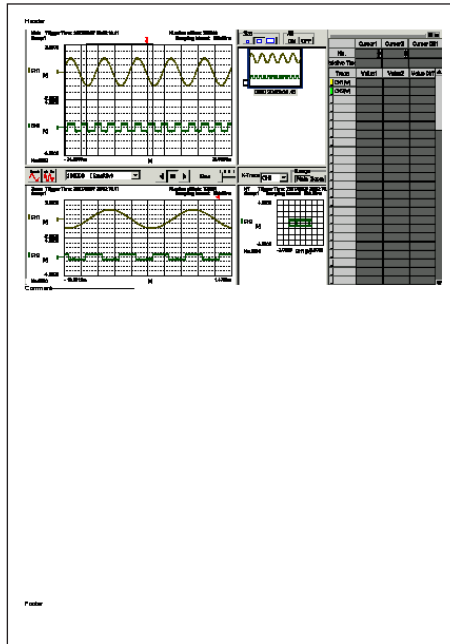
- **Select:** Prints with a white background.
- **Clear:** Prints with the background color displayed on screen.

Printing Example

When printing with the on-screen background color



When printing with the background color set to white



Communicating with the Instruments

8.1 Connecting to the Instruments

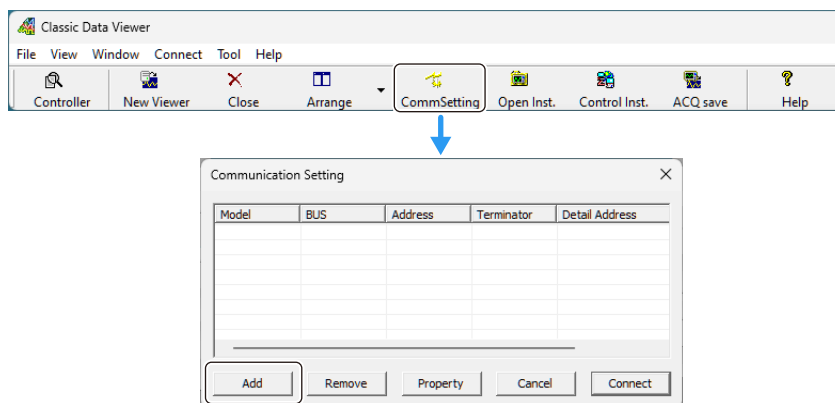
Note

Before attempting to use this function, connect the PC to the instrument using an appropriate communications cable. For details on how to make this connection, see the manual provided with your instrument.

Procedure

Setting Up/Adding a Connection

1. On the Classic Data Viewer tool bar, click **CommSetting** to open the Communication Setting dialog box.

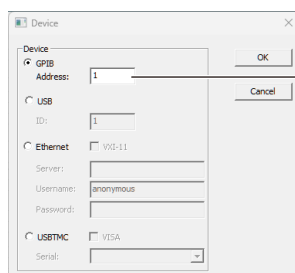


2. Click **Add** to open the Devices dialog box.
3. Make the settings for the connection interface and communications conditions, click **OK**.

Note

- If connections to instruments have already been registered, those connections will be displayed as a list. Select the required instrument and then click **Connect** to establish the connection with the instrument.
- Up to 16 connections can be registered.

GP-IB connection

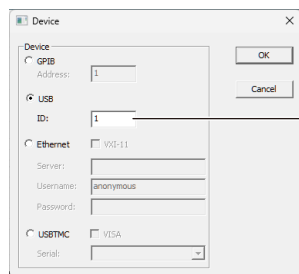


Input the GP-IB address of the instrument to be connected (0 to 30)

8.1 Connecting to the Instruments

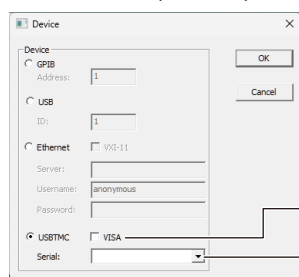
USB connection

DL1600 series, DL1700E series, DL7400 series, DL750 series, SL1400



Input the USB ID number of the instrument to be connected (1 to 127)

**DL9000 series, DL6000/DLM6000 series, SB5000 series, SL1000, SL2000
DLM2000 series, DLM3000HD series, DLM3000 series,
DLM4000 series, DLM5000HD series, DLM5000 series,
DL850 series, DL350, DL950**

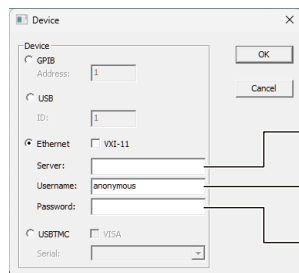


Select VISA when connect to the instrument using IVI driver.

Select the serial number of the instrument to be connected (9-digit)

Network connection

**DL1600 series, DL1700E series, DL7400 series, DL750 series,
DL9000 series, SB5000 series, SL1400**

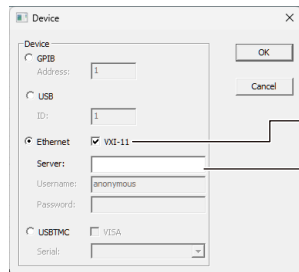


Input the IP address of the instrument to be connected

Input the network user name for the instrument to be connected

Input the network password for the instrument to be connected

**DL6000/DLM6000 series, SL1000, SL2000
DLM2000 series, DLM3000HD series, DLM3000 series,
DLM4000 series, DLM5000HD series, DLM5000 series,
DL850 series, DL350, DL950**



Check the VXI11

Input the IP address of the instrument to be connected

Modifying a Connection

On the Classic Data Viewer tool bar, click **CommSetting** to open the Communication Setting dialog box. Select the required instrument and then click **Properties** to open the Devices dialog box, change the settings as needed and then click **OK**.

Removing a Connection

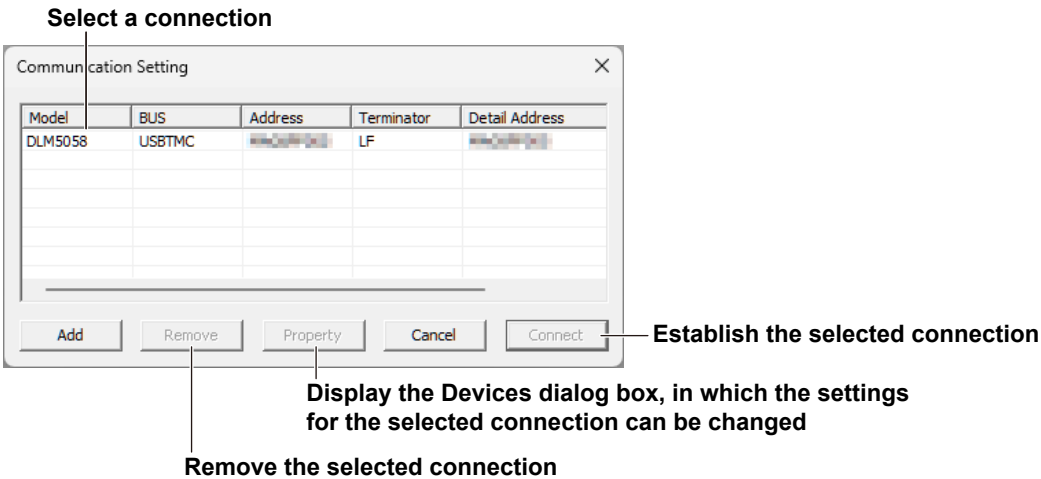
On the Classic Data Viewer tool bar, click **CommSetting** to open the Communication Setting dialog box. Select the required instrument and then click **Remove** to remove the selected connection.

Establishing a Connection

On the Classic Data Viewer tool bar, click **CommSetting** to open the Communication Setting dialog box. Select the required instrument and then click **Connect** to establish the connection with the instrument.

Note

If the instrument contains a very large number of files, it may take some time to establish the connection.



Ending a Connection

A connection with the instrument is ended when you exit from Classic Data Viewer.

Note

The connection with the instrument cannot be ended while a file is being transferred.

Explanation

Setting Contents

Ensure that the interface settings and communication conditions are the same as for the instrument to which you want to connect. Check the setting contents using the following menu.

Address/ID Number

DL1600 series, DL1700E series, DL750 series	MISC > Remote Cntl
DL7400 series	MISC > Remote Control
DL9000 series, SB5000 series	SYSTEM > Remote Control > GPIB
DL6000/DLM6000 series	UTILITY > Remote Control > GPIB
SL1400	MENU > Remote Cntl
DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series	UTILITY>Remote Control > Device>GPIB
DL850 series	UTILITY > Remote Ctrl > Device > GPIB

Server

DL1600 series, DL1700E series, DL7400 series, DL750 series	MISC > Network > TCP/IP Setup
DL9000 series, SB5000 series	SYSTEM > Network > TCP/IP Setup > Configuration
DL6000/DLM6000 series	UTILITY > Network > TCP/IP Configuration
SL1400	MENU > Network > TCP/IP Setup
SL1000	DISPLAY key (Displays the communication parameter screen)
DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series	UTILITY > Network
DL850 series, DL350, DL950, SL2000	UTILITY > Network > TCP/IP
DL950, SL2000 When the /C60 (10G) option is installed	UTILITY > Network > TCP/IP 10G Set whether to use 1G (TCP/IP) or 10G from UTILITY > Remote Control (Network) Interface 1G/10G.
SL2000 When configuring or viewing on the front panel LCD	Set the items below in the Setup display. • Network > TCP/IP • Network > TCP/IP 10G • Network > RemoteControlI/F You can view the 1G/10G IP address in the Communication display.

User Name (for the Network interface)

For the Network interface

DL1600 series, DL1700E series, DL750 series	MISC > Remote Cntl > User Account
DL7400 series	MISC > Remote Control > User Account
DL9000 series, SB5000 series	SYSTEM > Remote Control > Network (UserName/Password)
SL1400	MENU > Remote Cntl > User Account
DL6000/DLM6000 series	UTILITY > Network
DL850 series, DL350	

Serial No.

When any of the following measuring instruments is connected and the interface is USB

DL 9000 series, SB5000 series	SYSTEM > Overview
SL1000	The number (instrument number) marked on the name plate of the SL1000.
DL6000/DLM6000 series	
DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series	UTILITY > Overview
DL850 series, DL350, DL950, SL2000	
SL2000	
When configuring or viewing on the front panel LCD	You can view the instrument number (No) in the Communication display.

“unknown” Model Name Display

Once you have made the connection settings and, using those settings, a connection is made successfully, the “model name” of the connected device will appear under Model in the Communication Setting dialog box. If a connection cannot be established, however, an error message is displayed and “unknown” appears as the model name.

Firmware Versions

Classic Data Viewer may not be able to establish a connection with the instrument, depending on the firmware version of the software installed in that unit. Classic Data Viewer is compatible with the following firmware versions.

DL1600 series	Firmware versions 1.12 and later
DL1700E series	Firmware versions 1.23 and later
DL7400 series	All firmware versions
DL750 series	Firmware versions 2.50 and later
DL9040/DL9140/DL9240 series	
Control Inst.	Firmware versions 1.64 and later
DL file display and transfer, load and save	Firmware versions 1.8 and later.
DL9500/DL9700 series	
DL6000/DLM6000 series	
SB5000 series	All firmware versions
SL1400, SL1000	
DLM2000 series	
Control Inst., load and save, DLM file display and transfer (USB upload and GP-IB download)	Firmware versions 1.06 and later
DLM file display and transfer (USB download and VXI-11 download)	All firmware versions
DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series	All firmware versions
DL850 series, DL350, DL950, SL2000	

8.2 Displaying a File List

Procedure

Displaying a File List

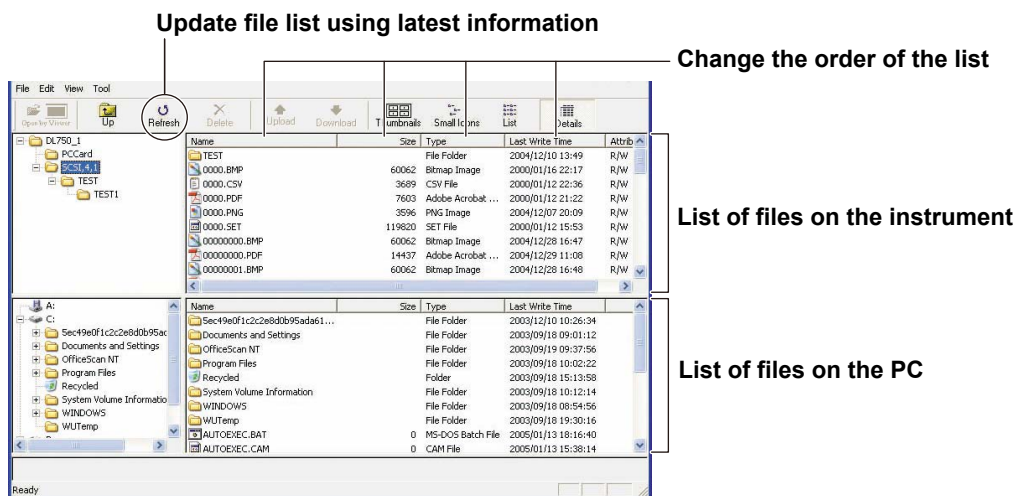
On the Classic Data Viewer tool bar, click **Open Inst.** to open the Communication Setting dialog box. Select the required instrument and then click **Connect** to establish the connection with the instrument and display a file list.

Note

- If a connection has already been established with the required instrument, the Communication Setting dialog box does not appear and the file list appears immediately.
- When you click Control Inst to enable operation of the instrument from a PC, Open Inst is grayed out.
- If the instrument contains a very large number of files, it may take some time for the file list to appear.

Changing the Order of/Updating the File List

When you click **Name**, **Size**, **Type**, or **Last Write Time** in the file list, the file list is sorted based on that clicked item. Clicking **Refresh** on the tool bar causes the file list to be refreshed based on the latest information.

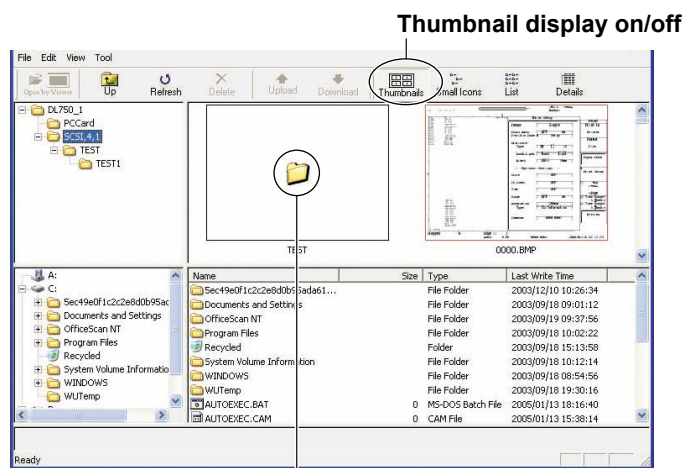


Thumbnails Image Files

Clicking **Thumbnails** on the tool bar causes the image files stored on the instrument to be displayed as thumbnails.

Note

- Files other than image files will be displayed as icons.
- Those image files for which there is no thumbnail file to display will be displayed as icons.

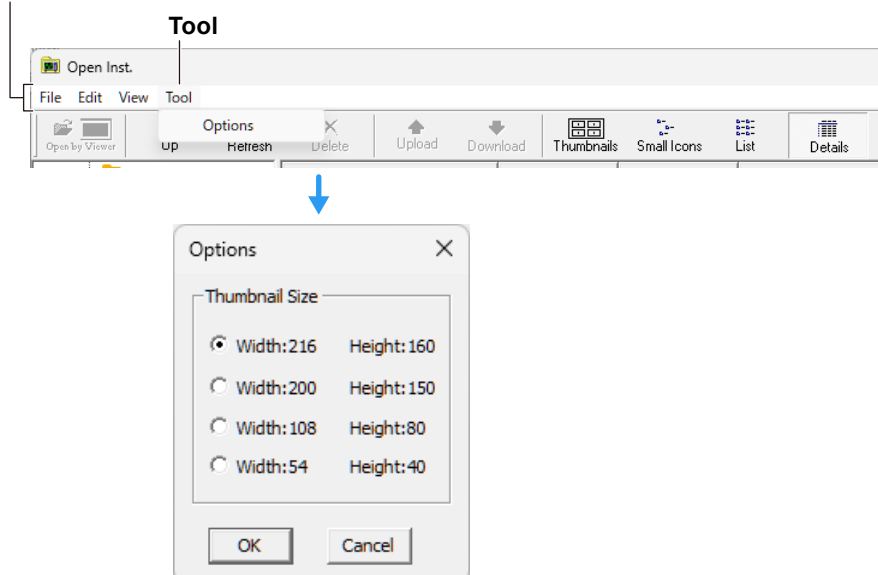


Icon display (Example)

Changing the Size of the Displayed Thumbnails

Select **Tool > Options** on the file list menu bar to display the Option dialog box. Select a size for the thumbnails (width and height), and then click **OK**.

File list menu bar

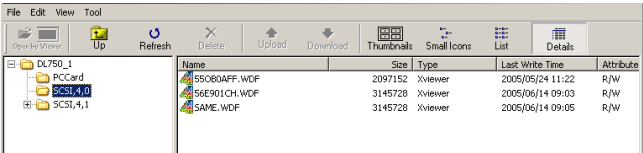


Explanation

Displaying Realtime Recording Data

For the SL1400 and DL750/DL750P

On the SL1400 and DL750/DL750P with firmware version 6.01 or later, the file list of the [SCSI,4,0] folder on the SL1400 and DL750/DL750P can be displayed. The [SCSI,4,0] folder contains data that has been real-time recorded on the SL1400 and DL750/DL750P (.wdf data).



For the SL1000, SL2000, DL850 series, DL350, and DL950

For files saved through real-time recording on the SL1000, SL2000, DL850 series, or DL950 and files saved through SD recording on the DL350, only the first file (****_000.WDF) is displayed.

8.3 Manipulating Files

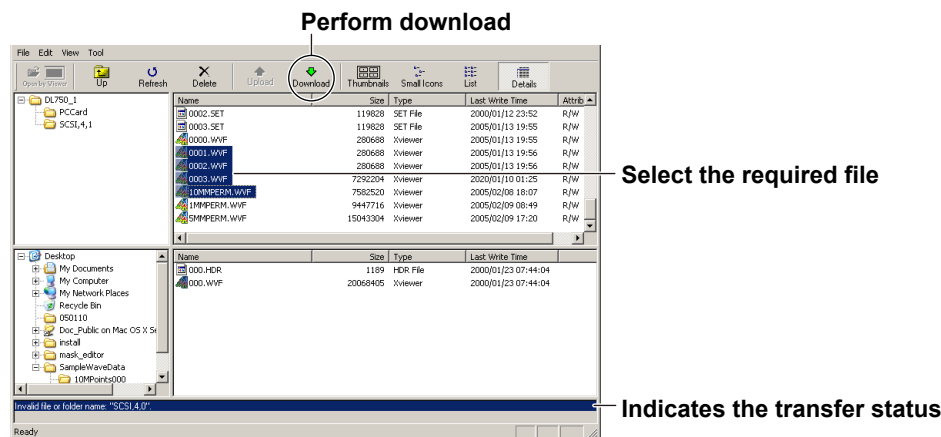
Procedure

Downloading from the Instrument to the PC

If you select a file from the list of files stored on the instrument, Download is enabled. If you then click **Download**, the selected file is transferred to the PC.

Note

- Multiple files can be specified for transfer.
- While files are being transferred, the connection to the instrument cannot be terminated.
- On the DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, or DLM5000 series, perform file operations after stopping waveform acquisition if waveform acquisition is in progress.*
 - * Uploading files to the measuring instrument, downloading files to your PC, deleting files, deleting folders, making new folders, etc
- For files saved through real-time recording on the SL1000, SL2000, DL850 series, or DL950 and files saved through SD recording on the DL350, if the displayed first file (****_000.WDF) is downloaded, all the divided files will be downloaded.

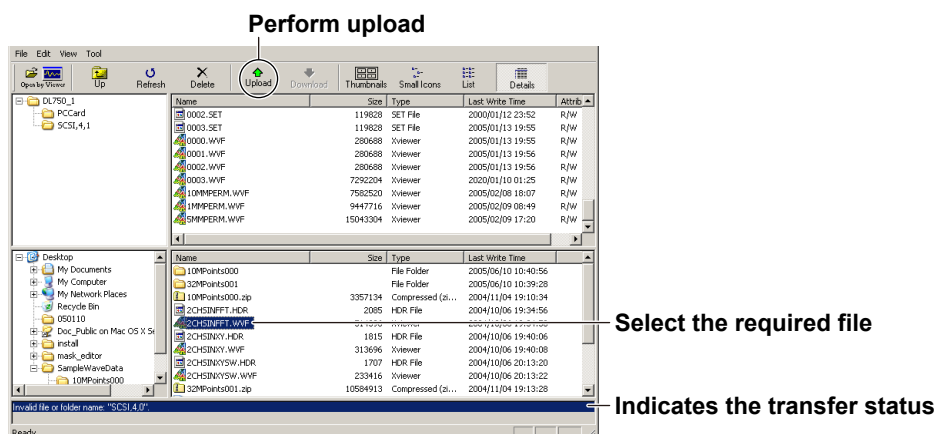


Uploading from the PC to the Instrument

If you select a file from the list of files stored on the PC, Upload is enabled. If you then click **Upload**, the selected file is transferred to the instrument.

Note

- Files can be transferred from the PC to the instrument (upload) only when the USB interface is being used for the connection. However, if the product version is version 1.78 or later, Ethernet can also be used to connect to a DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series, DL850 series, DL350, DL950 or SL2000.
- Multiple files can be specified for transfer.
- While files are being transferred, the connection to the instrument cannot be terminated.
- The data in the [SCSI,4,0] folder in which the realtime recording data (DL750 series and SL1400) can be downloaded to the PC. However, you cannot create a directory in the folder or upload data to the folder.
- With the DL9000 series, DL6000/DLM6000 series, and SB5000 series files cannot be uploaded to a USB memory connected to the instrument.
- For files saved through real-time recording on the SL1000, SL2000, DL850 series, or DL950 and files saved through SD recording on the DL350, if the displayed first file (****_000.WDF) is uploaded, all the divided files will be uploaded.



Deleting a File

If you select a file from the file list and then click **Delete**, the selected file is deleted.

Note

- When you delete an image file, the corresponding thumbnail file is deleted at the same time.
- A folder cannot be deleted.
- For files saved through real-time recording on the SL1000, SL2000, DL850 series, or DL950 and files saved through SD recording on the DL350, if the displayed first file (****_000.WDF) is deleted, all the divided files will be deleted.

Deleting a Folder (SL1000)

With the SL1000, If you select a folder from the file list and click **Delete**, the selected folder is deleted.

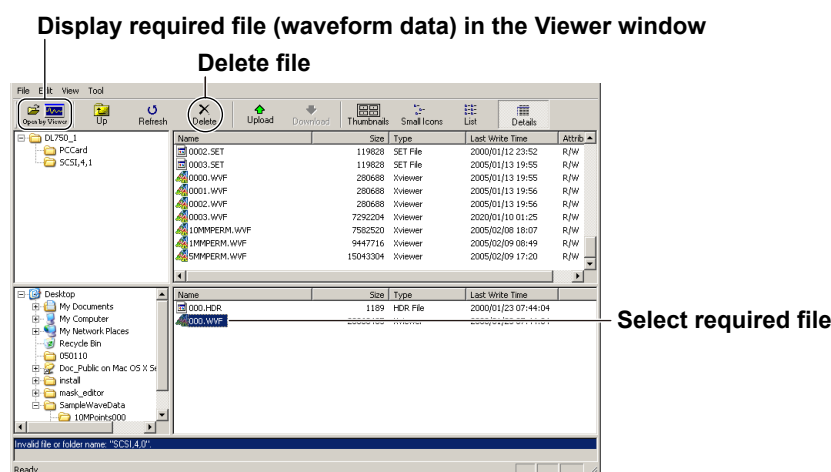
Note

If you delete a folder, all files within the folder are also deleted at the same time.

Reading a Waveform Data File

If you select a WVF-format waveform data file (*.wvf / *.wdf) from the file list on the PC, Open by Viewer is enabled. If you then click **Open by Viewer**, the selected file is read and the waveform data that it contains is displayed in the Viewer window.

Display required file (waveform data) in the Viewer window



Creating a Folder

Select **File > New Folder** on the file list menu bar to display the folder creation dialog box. Input a name for the new folder, and then click **OK**.

Note

- The new folder will be created under the current directory of the file list.
- For the folder name and upload file name, you can specify ASCII characters (alphanumerics, etc.) only.

Explanation

Cautions to Observe When Transferring a Waveform Data File

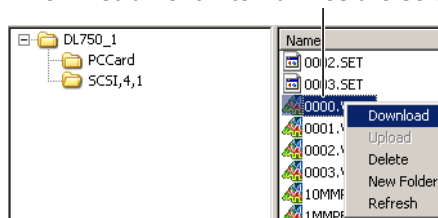
A WVF-format waveform data file (*.wvf) cannot be opened unless there is an .hdr file with the same name in the same folder. Therefore, when transferring a WVF-format file, be careful to also transfer the corresponding .hdr file.

Note

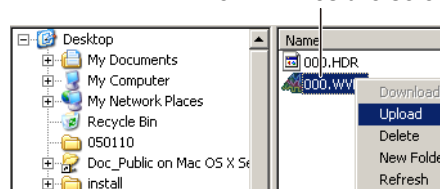
Right click the files selected to be manipulated, and select one of the following from the shortcut menu.

- **Download** Available when the instrument internal files or folders are selected
- **Upload** Available when PC files or folders are selected
- **Delete** Available when a file is selected
(With the SL1000, you can also select and delete a folder.)
- **Create folder** Available whether a file, folder, or nothing is selected
The following folder names cannot be used.
AUX, CON, PRN, NUL, CLOCK, COM0 to COM9, and LPT0 to LPT99
- **Update to Latest Information** Available whether a file, folder, or nothing is selected

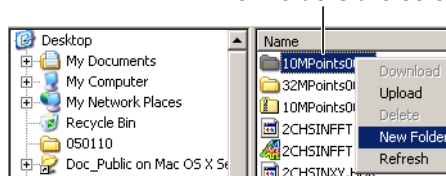
When instrument internal files are selected



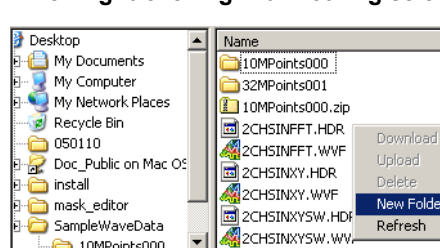
When PC files are selected



When folders are selected



When right-clicking with nothing selected



8.4 Operating the Instruments from a PC

The following groups of measuring instruments are described separately.

- DL1600 Series, DL1700E Series, DL7400 Series, DL750 Series, SL1400 ► see below
- DL9000 series, DL6000/DLM6000 series, SB5000 series, DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series, DL850 series, DL350, DL950, SL2000 ► page 8-18

DL1600 Series, DL1700E Series, DL7400 Series, DL750 Series, SL1400

Procedure

Displaying the Control Screen

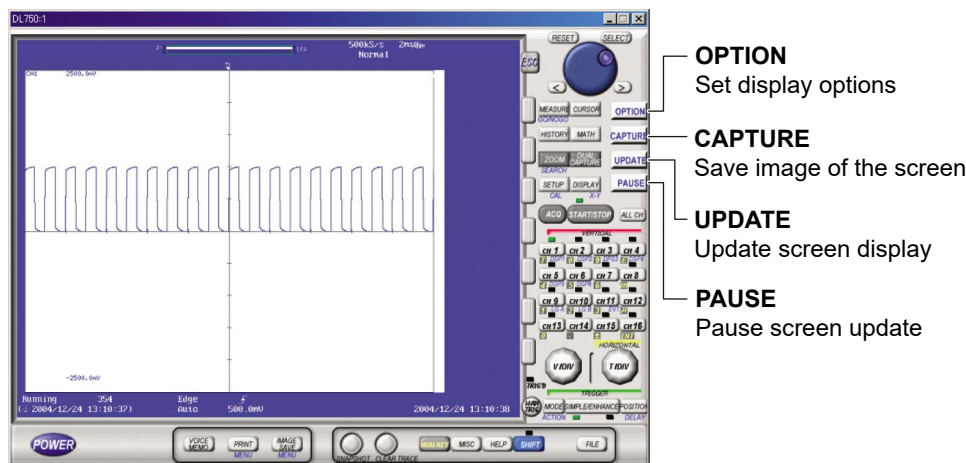
Click **Control Inst** on the **Classic Data Viewer tool bar** to display the Communication Setting dialog box. If you then select the required instrument and then click **Connect**, a connection with the instrument is established and the control screen (an image of the front panel) appears.

Note

- If a connection has already been established with the required instrument, the Communication Setting dialog box does not appear and the control screen appears immediately.
- When you click Open Inst to display a list of files on the instrument, Control Inst is grayed out.

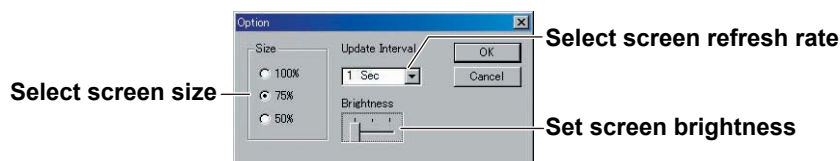
Operation of the Control Screen

The control screen allows you to operate or control a DL unit using the PC's mouse or keyboard.



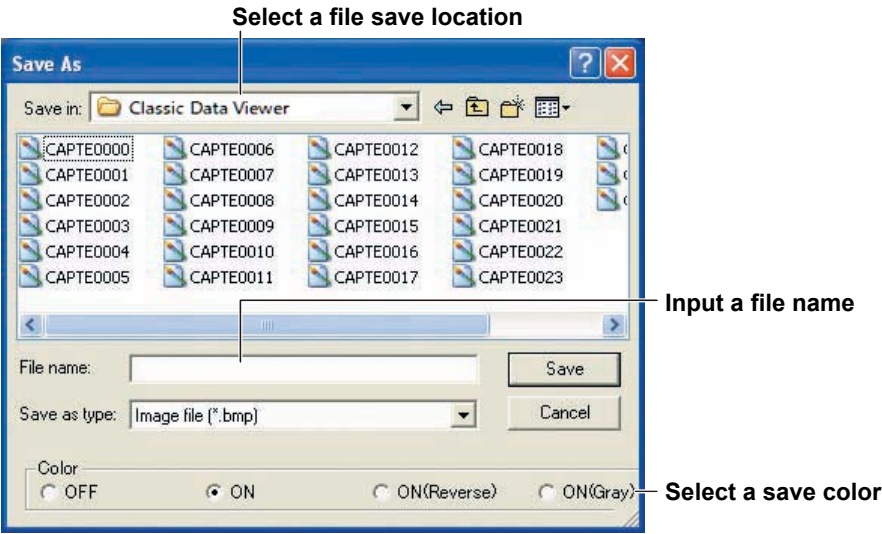
Setting Screen Display Options (OPTION)

Click **OPTION** on the control screen to display the Option dialog box. Set the control screen display size, the refresh rate, and display brightness, and then click **OK**.



Saving an Image of the Screen (CAPTURE)

Click **CAPTURE** on the control screen to display the file save dialog box. Select the folder into which you want to save the file, specify the file name, select a save color and then click **OK**.



Note Press the SHIFT key (keyboard) and click the CAPTURE button (control screen) to copy the screen to the clipboard.

Controlling the Update of the Display (UPDATE, PAUSE)

Click **UPDATE** on the control screen to forcibly update the control screen display. If you click **PAUSE**, the update of the control screen is stopped temporarily. Clicking **PAUSE** again restarts the update of the screen display.

Explanation

Option Settings

The following settings can be made for the screen display options.

Display size (Size)	Select 100 %, 75 %, or 50 %
Display refresh rate (Update Interval)	Select 1 sec, 2 sec, 5 sec, 10 sec, 30 sec, 1 Min, 5 Min, 10 Min, 20 Min, 30 Min, 1 hr, or Minimum
Brightness (Brightness)	Adjust using the slide bar

Note

- Depending on the network transmission method or the communications load, the actual display refresh rate may be slower than the set value.
- When you select **Minimum** for the screen refresh rate, the fastest possible refresh rate for your environment is set automatically. Note that if the connection to the instrument is made via a network, the network load may affect the refresh rate.

Using the Display Update Button

Button Name	Description
UPDATE	This button is used to forcibly refresh the display when, for example, a slow refresh rate has been set or refresh has been temporarily stopped (when the PAUSE button is available).
PAUSE	This button is used to temporarily stop refresh when the ON/OFF settings of many items must be changed, values must be entered using the keyboard, or when better system response is needed.

Screen Image Save Format

When you click the **CAPTURE** button to save a screen image, an image of the currently displayed screen is saved as a BMP-format file.

Screen Image Save Color

When you save a screen image, you can select and of the following colors.

OFF	Screen image is saved in monochrome
ON	Screen image colors are saved as is
ON (Reverse)	Other than the channel colors are saved in monochrome
ON (Gray)	Other than monochrome colors are saved as grays

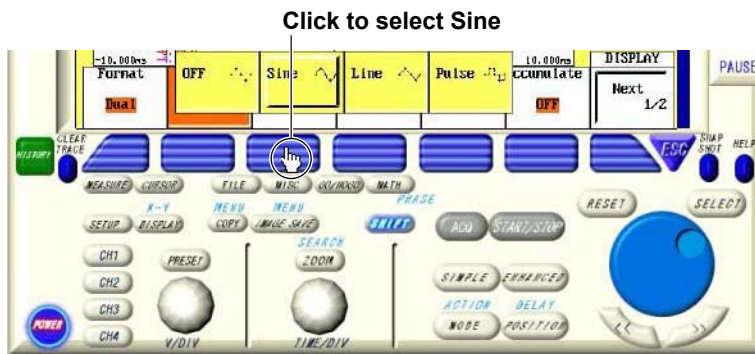
Using the Mouse

If you position the mouse cursor to a control key or knob on the control screen, the mouse pointer (icon) changes, indicating that key or knob on the screen can be operated. The displayed icon and the action of the mouse changes depending on where on the control screen it is positioned.

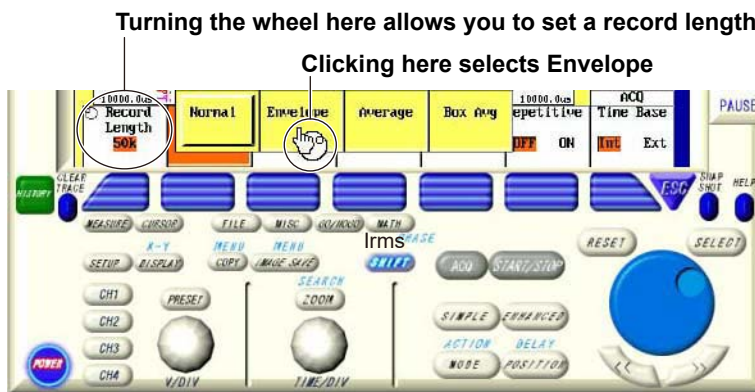
Mouse Pointer Position	Displayed Icon	Mouse Action	Setting Operation
Operation key		Click	Same as pressing an operation key
Soft key menu or dialog box		Click	Same as pressing a soft key or a button
		Wheel	Same as turning the jog shuttle
Voltage axis information display area		Click	Same as pressing a channel key
		Wheel	Same as turning the V/DIV knob
Time axis information display area		Wheel	Same as turning the T/DIV knob
Jog shuttle left- and right-hand areas		Click	Same as turning the jog shuttle to the left of the right
		Wheel	Same as turning the jog shuttle
V/DIV knob left- and right-hand areas		Click	Same as turning the V/DIV knob to the left or the right
		Wheel	Same as turning the V/DIV knob
T/DIV knob left- and right-hand areas		Click	Same as turning the T/DIV knob to the left or the right
		Wheel	Same as turning the T/DIV knob

Example of Using the Control Screen

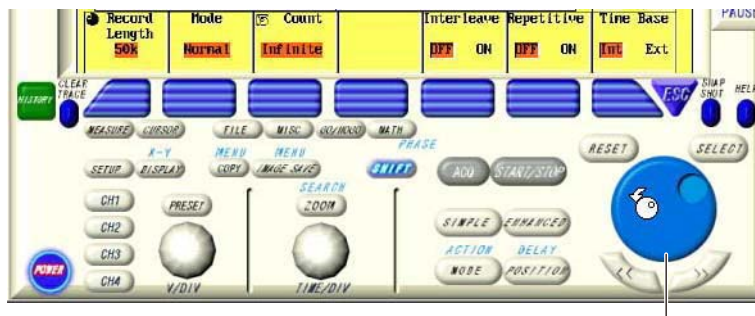
Using the Operation Keys



Soft Key Menu Operation

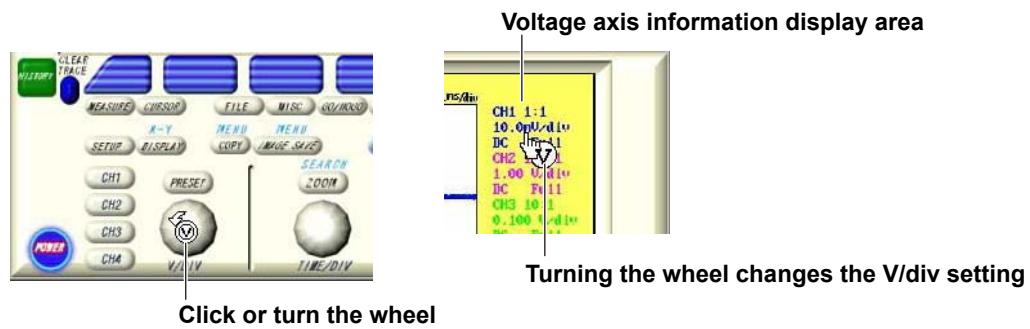


Jog Shuttle Operation

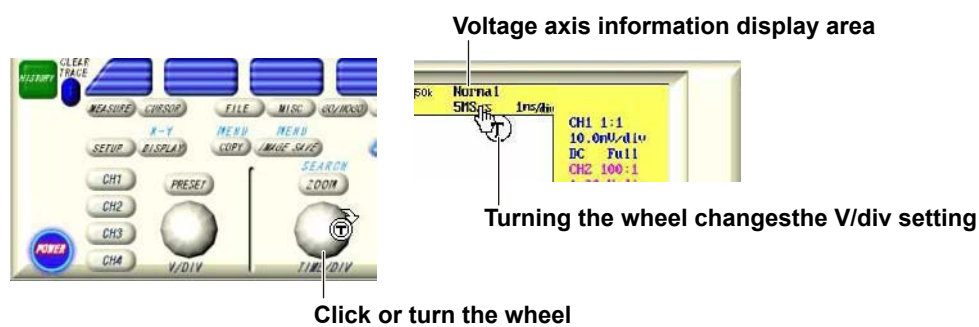


Clicking or turning the wheel here lets you set a record length

V/DIV Knob Operation

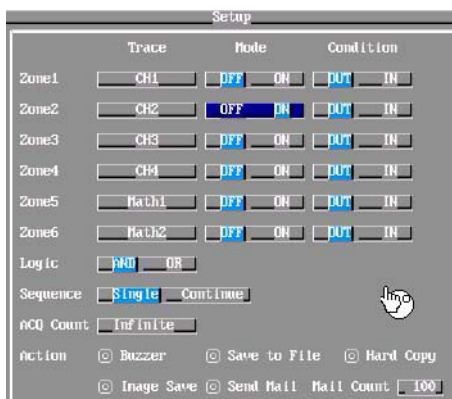


T/DIV Knob Operation



Dialog Box Operation

- **Position the mouse cursor to the item you want to turn ON:** Click the **jog shuttle** or turn the wheel
- **ON/OFF setting:** Click **SELECT** or click the item directly, as shown below



DL9000 series, DL6000/DLM6000 series, SB5000 series, DLM2000 series, DLM3000HD series, DLM3000 series, DLM4000 series, DLM5000HD series, DLM5000 series, DL850 series, DL350, DL950, SL2000

Procedure

Displaying the Control Screen

Click **Control Inst** on the **Classic Data Viewer** tool bar to display the Communication Setting dialog box. Select the target measuring instrument, and click **Connect**. A connection will be established with the instrument, and a control screen (a menu bar and an image of the front panel) will appear.

Note

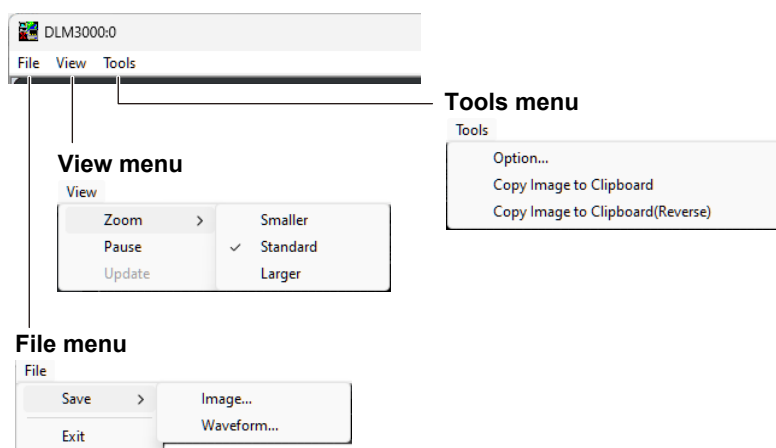
- If a connection has already been established with the required instrument, the Communication Setting dialog box does not appear and the control screen appears immediately.
- When you click Open Inst. to display a list of files on the instrument, the “Control Inst” is grayed out.
- In the following cases, the control screen display cannot be updated:
 - While editing waveform, square, or polygon zones
 - During processing of cycle statistics
 - During statistical processing of history data

Operation of the Control Screen

The control screen allows you to operate or control the instrument using the PC's mouse or keyboard. On the control screens of the DLM3000HD series, DLM3000 series, DL350, DL950, and SL2000, you can control the screen area by clicking with a mouse or other device.

You can control the DLM3000HD series, DLM3000 series, DL350, and DL950 in the same way as the product's touch panel. The SL2000 does not have a touch panel.

Menu Bar

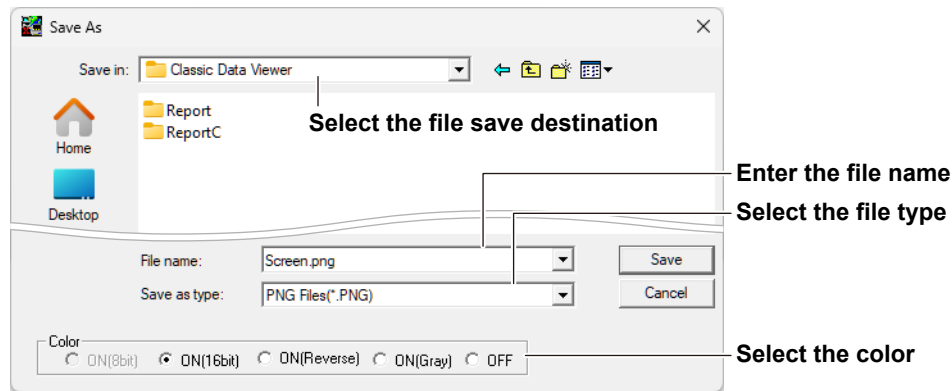


* The menu bar language depends on the display language of your operating system.

Saving Screen Images and Waveform Data

On the **File** menu, click **Save** and then **Image...** or select **Waveform...** to display a file save dialog box. Set the save location, file name, file type, and color,* and then click **Save**.

* When saving screen images, you can select the color mode (see page 8-22).



Screen Display Size

Choose **View** menu > **Zoom** > **Smaller**, **Standard**, or **Larger**. The control screen changes to the selected size.

Smaller	Displays the measuring instrument's screen image area using 50 % of the total number of pixels of the connected measuring instrument
Standard	Displays the measuring instrument's screen image area using about 70 % of the total number of pixels of the connected measuring instrument
Larger	Displays the measuring instrument's screen image area using the same number of pixels as the total number of pixels of the connected measuring instrument

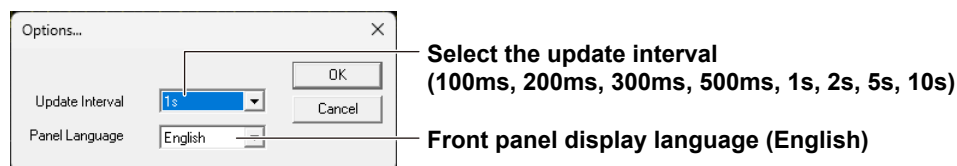
Controlling the Update of the Display

Choose **View** menu > **Update** in the control screen to force an update of the control screen.

Choose **View** menu > **Pause** to pause updating of the control screen. To restart display updating, choose **View** menu > **Pause** again.

Update Interval and Panel Language

Choose **Tools** menu > **Options...**. The following dialog box appears.



Copying the Image to the Clipboard

Select **Tools** menu > **Copy Image to Clipboard** or **Copy Image to Clipboard (Reverse)**.

- **Copy Image to Clipboard**

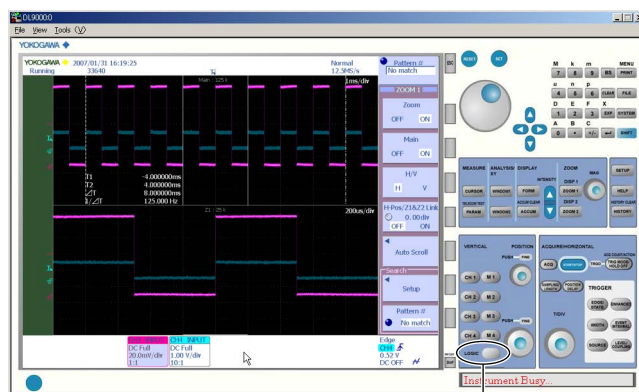
The image of the display section of the control window is copied to the clipboard.

- **Copy Image to Clipboard (Reverse)**

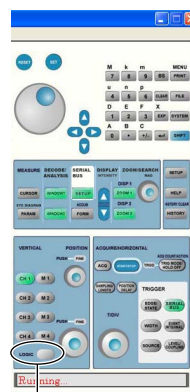
The image of the display section of the control window is copied to the clipboard without the background color.

Examples of Control Screens by Model

DL9000 series



SB5000 series



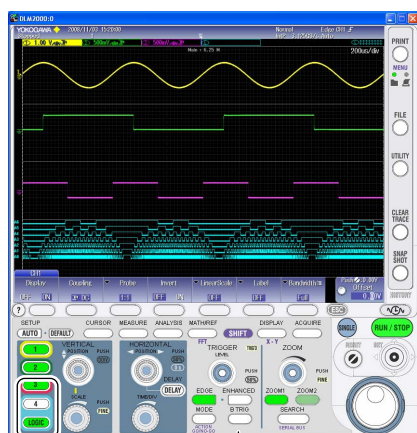
The LOGIC button is displayed for the DL9500/DL9700 series or SB5000 series.

DL6000/DLM6000 series



English panel sheet

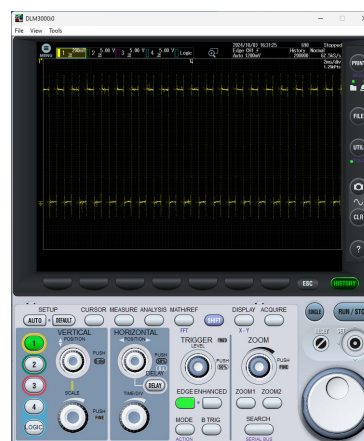
DLM2000 series



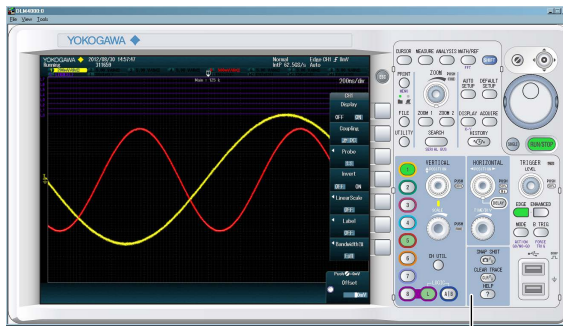
English panel sheet

Displayed on 4-channel models and models with a logic input terminal.

DLM3000HD series, DLM3000 series



DLM4000 series

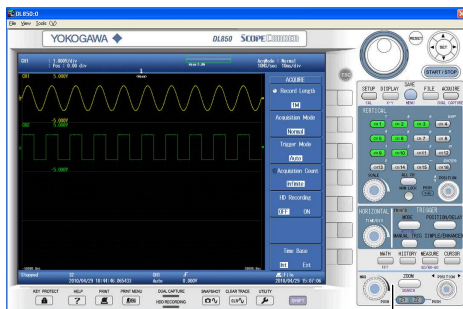


English panel sheet

DLM5000HD series, DLM5000 series



DL850 series



English panel sheet

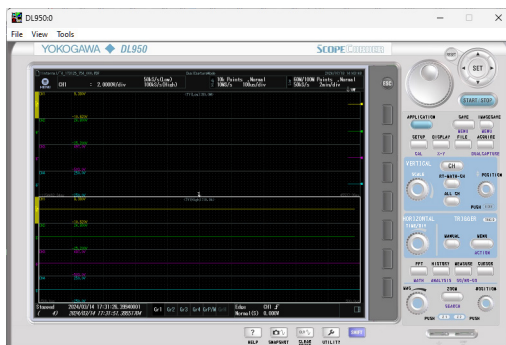
DL350 (Scope mode)



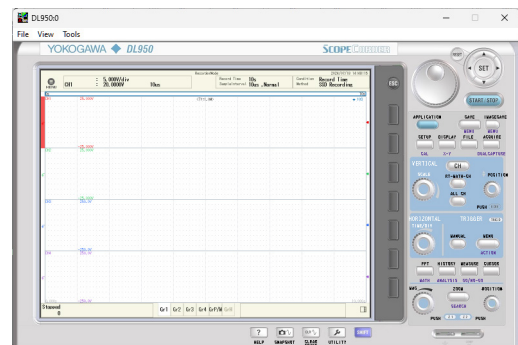
DL350 (Recorder mode)



DL950, SL2000 (Scope mode)



DL950, SL2000 (Recorder mode)



Note

- Do not connect from the PC while hard disk recording is occurring on the DL850 series.
- When controlling the DL850 series from the PC, do not start hard disk recording on the DL850 series. Doing so can overload the DL850 series internal processing, resulting in malfunction.
- Auto setup cannot be executed on the DLM5000HD series or DLM5000 series serial bus using Control Inst on the Classic Data Viewer toolbar.

Explanation

Display Update Interval

You can select the zone from below.

100 ms, 200 ms, 300 ms, 500 ms, 1 s, 2 s, 5 s, 10 s

Note

- Depending on the network transmission method or the communications load, the actual display update interval may be slower than the set value.
- With the DLM2000 series, the image on the PC may be disrupted immediately after transferring waveform screens or saving screen images. This does not affect the data. The image will recover automatically after the next screen update.

Display Update Operation Control

- Forced updating is used when setting a slow display update rate or when pausing display updating (by choosing **View** menu and selecting **Pause**).
- Pause is used to improve the response when turning many items ON/OFF at once, or when entering numerical and other values with the keyboard.

Screen Image Save Format

An image of the currently displayed screen is saved as a BMP-format file.

Selecting the Color Mode

You can select the color mode. The selectable color modes vary between BMP and PNG formats.

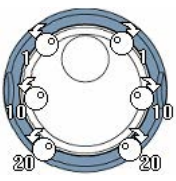
BMP	8 bit, 16 bit, reverse, grayscale, and color OFF (black and white)
PNG	16 bit, reverse, grayscale, and color OFF (black and white)

Using the Mouse

If you position the mouse cursor to a control key or knob on the control screen, the mouse pointer (icon) changes, indicating that key or knob on the screen can be operated. The displayed icon and the action of the mouse changes depending on where on the control screen it is positioned.

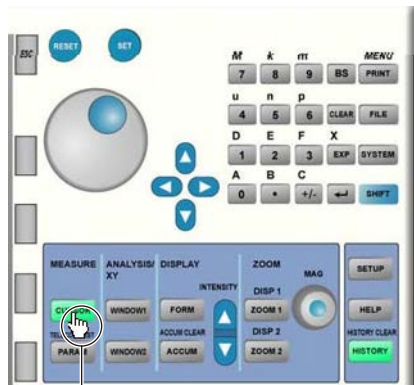
Mouse Pointer Position	Displayed Icon	Mouse Action	Setting Operation
Operation key		Click	Same as pressing an operation key
Rotary-knob left- and right-hand areas		Click	Same as turning the rotary knob to the left of the right
		Wheel	Same as turning the rotary knob
Center of POSITION, SCALE knob		Click	Same as pushing the POSITION knob or SCALE knob
POSITION, SCALE, T/DIV, and MAG knob left- and right-hand areas		Click	Same as turning the POSITION, SCALE, T/DIV, and MAG knob to the left or the right
		Wheel	Same as turning the POSITION, SCALE, T/DIV, and MAG knob

DL6000/DLM6000 Series, DLM2000 Series, DLM3000HD Series, DLM3000 Series, DLM4000 Series, DLM5000HD Series, DLM5000 Series, DL850 Series, DL350, DL950, SL2000

Mouse Pointer Position	Displayed Icon	Mouse Action	Setting Operation
Operation key		Click	Same as pressing an operation key
Around the left or right side of the jog shuttle		Click	- Same as turning the jog shuttle to the left or right. - The setting can be changed at a setting resolution of 1, 10, or 20 times depending on the location of the mouse pointer. - Hold down the mouse button to change the setting repeatedly.
		Wheel	Same as turning the jog shuttle.
Center of POSITION, SCALE, TRIGGER LEVEL, or ZOOM knob		Click	Same as pushing the corresponding knob.
Around the left, right, or bottom of POSITION or TRIGGER LEVEL knob		Click	- Same as turning the corresponding knob to the left or right. - The setting can be changed at a setting resolution of 1 or 10 times depending on the location of the mouse pointer. - If you click in the bottom area where the number 123 appears, an input box is displayed for direct input of a setting value. - Hold down the mouse button to change the setting repeatedly.
		Wheel	Same as turning the corresponding knob.
Around the left or right of SCALE, TIME/DIV, or ZOOM knob		Click	Same as turning the corresponding knob to the left or right. The setting can be changed at a setting resolution of 1 time.
		Wheel	Same as turning the corresponding knob.
Center of the SET key		Click	Same as pressing the SET key.
Around the left, right, top, or bottom of the SET key		Click	Same as pushing the SET key in the direction of the arrow.

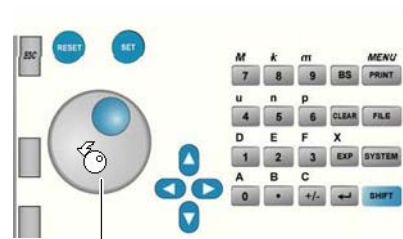
Example of Using the Control Screen

Using the Operation Keys



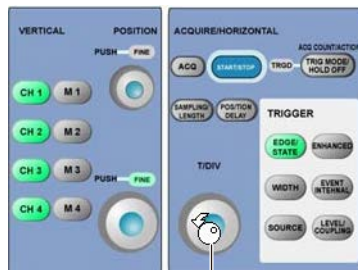
Click to display the cursor menu.

Rotary Knob Operation



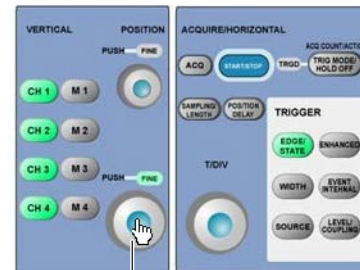
Click or turn the wheel

T/DIV Knob Operation



Click or turn the wheel

SCALE Knob Pushing Operation



Click

Note

If you hold down the ctrl key and right click in the control screen, you can select from the following settings menu.

- Save (Image, Waveform)
- Zoom (Smaller, Standard, Larger)
- Pause
- Update
- Options

8.5 Downloading the Instruments Waveform Data

The following groups of measuring instruments are described separately.

- DL1600 Series, DL1700E Series, DL7400 Series, DL750 Series, SL1400 ► see below
- DL9000 Series, DL6000/DLM6000 Series, SB5000 Series, DLM2000 Series, DLM3000HD Series, DLM3000 Series, DLM4000 Series, DLM5000HD Series, DLM5000 Series, DL850 Series, DL350, DL950, SL2000 ► page 8-26

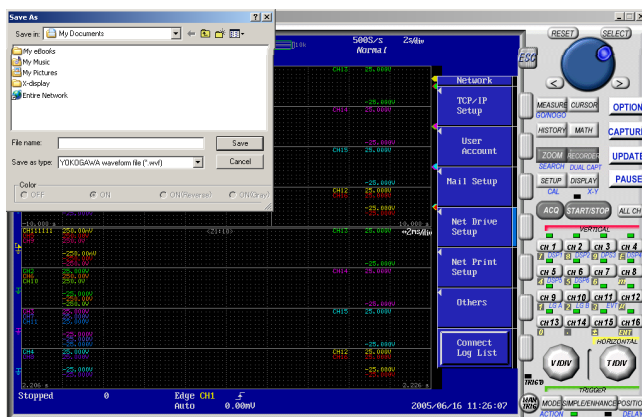
DL1600 Series, DL1700E Series, DL7400 Series, DL750 Series, SL1400

Procedure

Click **ACQ save** on the Classic Data Viewer toolbar. A control screen and file save dialog box open. If the connection with the instrument is not established, the Communication Setting dialog box opens. Establish a connection with the instrument according to the operations given in section 8.1.

Saving the Waveform Data

Set the destination and file name and click **OK**. The extension is .wvf.



Explanation

Waveform data can be downloaded (saved) to the PC.

Click **CAPTURE** on the control screen to display the file save dialog box. Set Save as type to *.wvf, specify the file name, and select Save to download (save) the waveform data.

Waveforms That Are Saved

All waveforms including computed waveforms displayed on the control screen are saved.

However, if multiple history waveforms are displayed with the history memory function, only the waveform selected with Select Record is saved.

Applicable Models

- DL1600 series (firmware version 1.30 or later)
- DL1700E series (firmware version 2.11 or later)
- DL7400 series (firmware version 2.11 or later)
- DL750 series (software version 6.01 or later)
- SL1400

Note

- If the data compression setting of the instrument (P-P Comp, Decim, etc.) is ON, turn data compression OFF before saving the waveform data.
- On the DL1600 series, waveform data cannot be downloaded if the record length is greater than or equal to 8 MW.
- When multiple history waveforms are displayed, the instrument settings are changed when downloading is executed as follows:
DL7400 series, DL750 series, SL1400: HISTORY > DisplayMode > One
DL1600 series, DL1700E series: HISTORY > Display > One
- Sub waveforms acquired using the dual capture function on the DL750 are not saved.

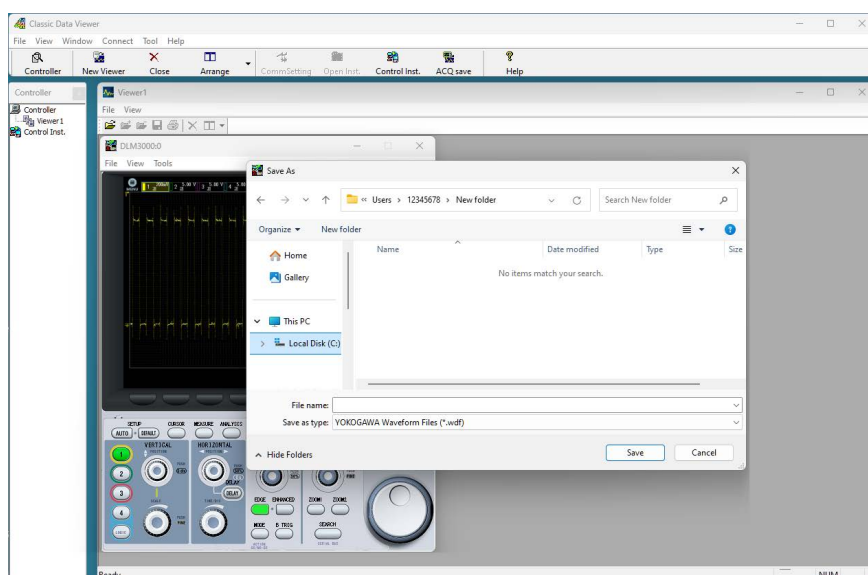
DL9000 Series, DL6000/DLM6000 Series, SB5000 Series, DLM2000 Series, DLM3000HD Series, DLM3000 Series, DLM4000 Series, DLM5000HD Series, DLM5000 Series, DL850 Series, DL350, DL950, SL2000

Procedure

Click **ACQ save** on the Classic Data Viewer toolbar. A control screen and file save dialog box open. If the connection with the instrument is not established, the Communication Setting dialog box opens. Establish a connection with the instrument according to the operations given in section 8.1.

Saving the Waveform Data

Set the destination and file name and click **OK**. The extension is .wdf.



Explanation

Waveform data can be downloaded (saved) to the PC.

From the **File** menu on the control screen, point to **Save** and choose **Waveform...** to display the file save dialog box. Set Save as type to *.wdf, specify the file name, and select Save to download (save) the waveform data.

Waveforms That Are Saved

All waveforms including computed waveforms displayed on the control screen are saved.

Applicable Models

- DL9000 series (firmware version 1.80 or later)
- DL6000/DLM6000 series
- SB5000 series
- DLM2000 series (firmware version 1.06 or later)
- DLM3000HD series
- DLM3000 series
- DLM4000 series
- DLM5000HD series
- DLM5000 series
- DL850 series
- DL350
- DL950
- SL2000

Note

The image on the PC may be disrupted immediately after downloading waveform data. This does not affect the data. The image will recover automatically after the next screen update.

Troubleshooting

9.1 Troubleshooting

Problem	Probable Cause/Corrective Action
An error occurs when installing	Another version of Classic Data Viewer is already installed. Uninstall the other version of Classic Data Viewer, then reinstall.
Classic Data Viewer cannot communicate with the instruments	- The GP-IB, USB or Ethernet interface cable is incorrectly connected. Connect the cable correctly. - The address specified for the GP-IB interface is incorrect. The ID of the USB interface might be set incorrectly. - The serial number of the USB interface might be set incorrectly. - A USB driver might not be installed. - The IP address, subnet mask, and default gateway of the Ethernet interface might not be set correctly. - The VXI11 check box might not be selected.
A file cannot be opened	A .hdr file having the same name as the file you are trying to open is not present in the same folder. Place the header file in the folder. The file is not of a type that the instrument Classic Data Viewer can handle.
A trace name is incorrectly displayed	If a trace name includes a space, it may not appear correctly.
A voice memo cannot be played back	Your PC does not support audio playback Use Classic Data Viewer on a PC with sound capabilities.
Comments in files saved on the DL750 series are not displayed	DL750.dll does not exist in the folder in which Classic Data Viewer is installed, or an old version of DL750.dll exists. Install the latest version of DL750.dll.
The Yokogawa web page is inaccessible	Your PC is connected with the Internet.
A message stating "Insufficient memory. Terminate any unnecessary applications." appears.	There is insufficient memory Reduce the number of waveforms to be loaded, or terminate another application.
Unable to load files saved through real-time recording on the DL850 series, DL950, SL1000, or SL2000 and files saved through SD recording on the DL350.	A file other than the first file of the divided files saved through real-time recording or SD recording may have been specified. Try loading the first file (****_0000.WDF).

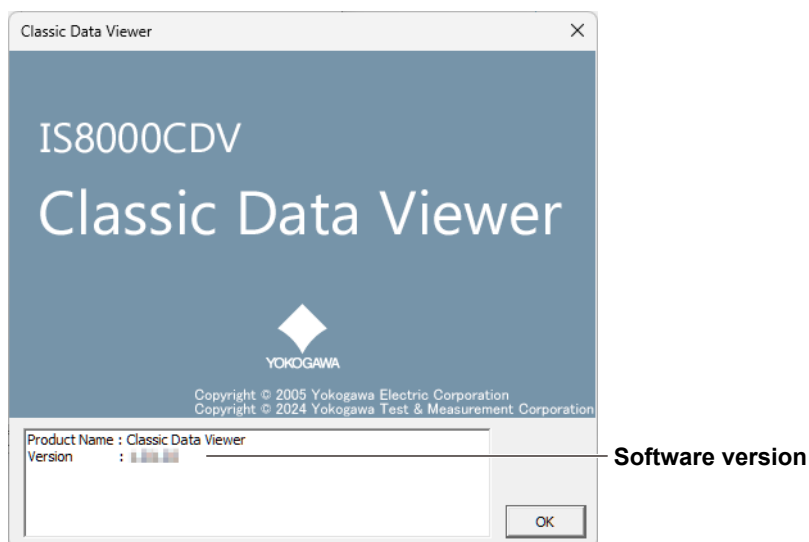
Note

For up-to-date information on the Classic Data Viewer, check the YOKOGAWA Web page (see section 9.4).

9.2 Viewing Version Information

Procedure

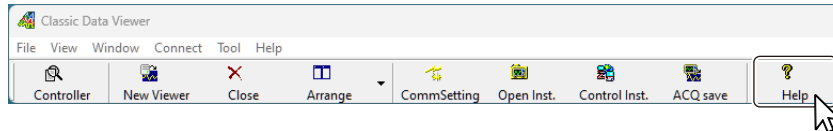
Select **Help > About Classic Data Viewer...** The version of Classic Data Viewer you are currently using is displayed.



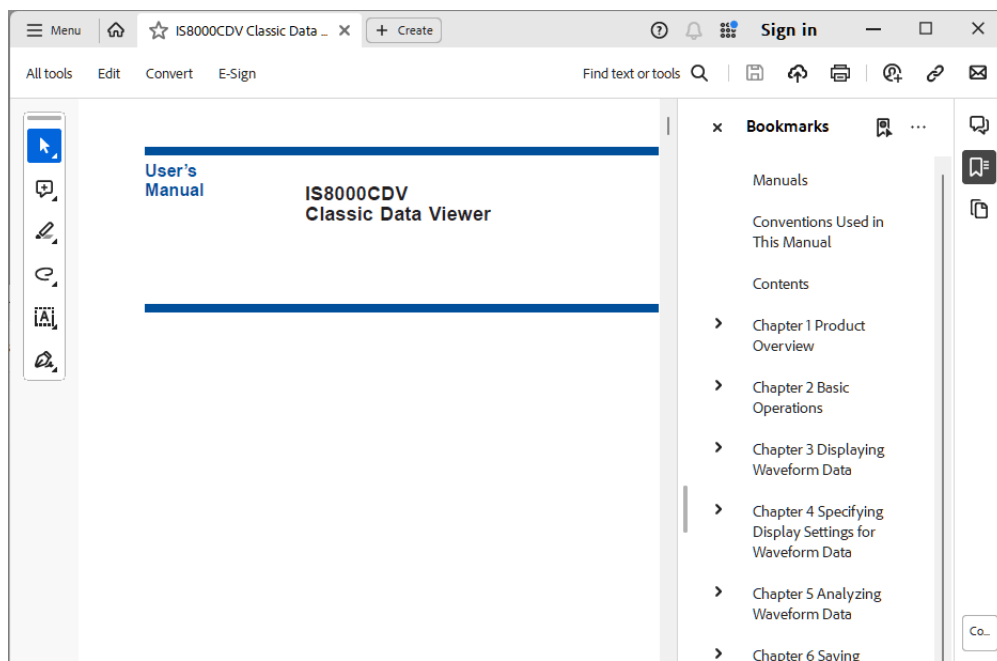
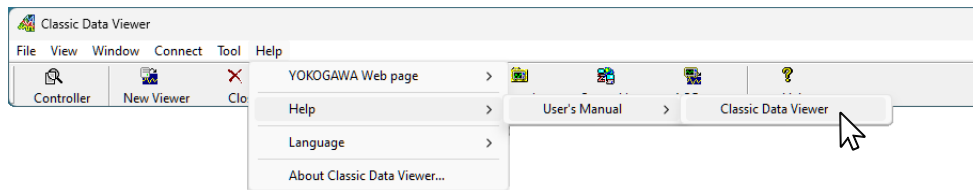
9.3 Viewing the Manuals

Procedure

Click  **Help** or choose **Help > Help > User's Manual > Classic Data Viewer** on the tool bar. You can view the PDF data of the user's manual.



or



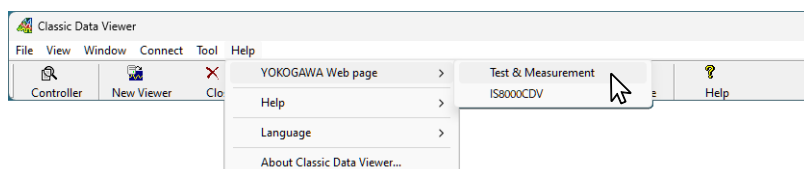
Note

To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

9.4 Viewing the YOKOGAWA Web Page

Procedure

On the **Help** menu, click **YOKOGAWA Web page** and then **Test & Measurement**. Or, on the **Help** menu, click **YOKOGAWA Web page** and then **IS8000CDV**. YOKOGAWA Web page is displayed.



Explanation

When your PC is connected to the Internet, you can visit our web page.

Test & Measurement: Displays our Test & Measurement top page.

IS8000CDV: Information about this software is shown on the library page.

9.5 Activation and Deactivation

Procedure

Note

- The license for this software application is activated and managed using the IS8000 License Manager. If IS8000 Software, Harmonic/Flicker Software, CSV Batch Converter, or Classic Data Viewer is running, close it.
If any of the above applications is running, you cannot use Update, Activate, Deactivate, or Start trial on IS8000 License Manager.
- For the software installation and uninstallation Procedures, see the Installation manual (IM IS8000-04EN).
- For the procedure to update this software to the latest version, see section 1.4 in the Installation Manual (IM IS8000-04EN).

Activation (activating the license)

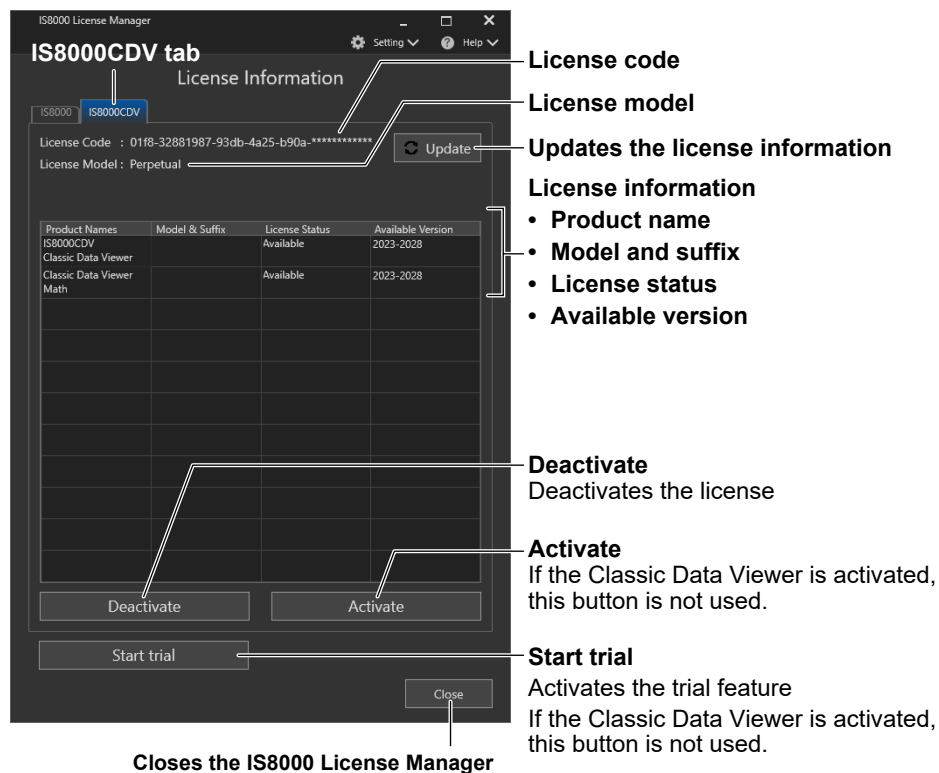
Deactivation (deactivating the license)

Perform deactivation using IS8000 License Manager.

For details, see section 9.5 in the IS8000 Software User's Manual (IM IS8000-01EN).

IS8000 License Manager

1. Click **Windows**  (Start) > **All apps** > **YOKOGAWA** > **IS8000 License Manager**.
IS8000 License Manager will open.
2. Click the **IS8000CDV** tab to view the Classic Data Viewer license information.



Specifications

This chapter explains the specifications of this software.

10.1 Product Specifications

Classic Data Viewer

Model	Suffix Code	Description
IS8002CDV		Classic Data Viewer Perpetual
	-P01	Standard Function for 1 PC
	-P05	Standard Function for 5 PCs
	-P10	Standard Function for 10 PCs
	-P20	Standard Function for 20 PCs
Options	/M01	Math Function for 1 PC
	/M05	Math Function for 5 PCs
	/M10	Math Function for 10 PCs
	/M20	Math Function for 20 PCs

10.2 Specifications

Item	Specifications
Target instruments (remote control, file loading)	DLM3000HD series, DLM3000 series, DLM5000HD series, DLM50000 series, DL850 series, DL350, DL950, DL/DLM series, SL1000, SL2000
Language	Japanese, English, Chinese, Korean, French, German
PC requirements	Windows 10 or Windows 11 Intel Core i5 11th-generation or later processor for notebook PCs, 4 GB memory or more
Operating system	Windows 10 64 bit, Windows 11
Communication interface	GP-IB, ¹ USB (USBTMC), Ethernet (VXI-11)
Display resolution	1366×768 dots or higher, 100% zoom
Loadable files	Binary data files (*.wvf, *.wdf) ASCII data files (*.csv) MATLAB files (*.mat) saved on a DL850 Series, DL350, DL950, or SL2000 MATLAB files (*.mat) saved with this software
Maximum number of displayed waveforms	90 waveforms per group, 10 groups total (T-Y display)
Display format	Main, zoom, history, X-Y
Main window divisions	Up to 32 divisions
Cursors	Vertical, horizontal, X-Y
Annotation feature	Insert at any position on the main, zoom, and X-Y windows
Waveform parameter measurement	Up to 28 types including P-P, Amp, RMS, and Freq; cycle statistics; history statistics
Data saving	Save waveform data files (*.wvf, *.csv, *.xls, *.fld, *.mat) Transfer waveform data to Excel Save screen image data files (*.bmp, *.png) Save automated measurement values of waveform parameters (*.csv) Save display condition data (*.csv)
Printing	Print displayed waveforms
Waveform data conversion	Convert waveform data files (*.wvf, *.wdf) to *.csv files Convert waveform data files (*.wdf) to *.wvf files Convert waveform data files (*.wvf, *.wdf) to *.fld files
Waveform math (option)	Math channels Up to 32 waveforms (Math1 to Math32)
	Calculation accuracy Single-precision floating-point
	Operators +, -, ×, /, phase shift, ABS, SQRT, LOG, EXP, RMS, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLB, MEAN, LS, RS, PS, PSD, CS, TF, CH * For details on each operator, see our website.
	FFT points Up to 2 Mpoints
	FFT window function Rect, Hanning, Flat top
	Digital filter Gauss, Sharp, IIR
	Maximum calculable record length 12.5 Mpoints (depends on the number of math channels)

¹ SL1000, SL2000, DL350, and DL950 are not supported.

Index

A	Page
About Classic Data viewer.....	9-2
activation	9-5
Address	8-4
Analyzing	1-2
ASCII format	6-2, 6-6

B	Page
binary format.....	6-1, 6-6

C	Page
Clipboard	5-48
Closing Xviewer.....	2-1
Color	4-14
comment.....	3-2
CommSetting.....	8-1
Communication Setting	8-1
Computational Expression.....	5-19, 5-21
Connecting to the Instrument	8-1
Controller window	2-2
Control Screen.....	8-13, 8-18
conversion	6-14, 6-17, 6-19
CSV	6-14
CSV format	6-6
Cursor	5-2
Cursor Data Order	4-8
cycle statistic results, saving	6-12
Cycle Statistics	5-15

D	Page
Data Save.....	1-2
deactivation	9-6
Display Setting.....	4-13, 6-13
Display Size.....	4-3, 4-10, 4-11
Download.....	8-9
Dual Capture	3-18

E	Page
Example of Using the Control Screen	8-16, 8-24

F	Page
FFT	5-21
File List	8-6
Filter.....	5-20
FLD.....	6-19
FLD format.....	6-8
floating point decimal file	6-4

G	Page
Graticule	4-13
Grouping Channels.....	3-21, 4-2

H	Page
History statistic results, saving	6-12
History Statistics	5-11
History View.....	3-11
History waveform display window.....	2-3
History Window.....	3-11
Horizontal Axis.....	4-13

Horizontal Cursor.....	5-2
H&V Cursor	5-4

I	Page
Image file	6-11
Initialize Viewer.....	4-20
Int1TY:	5-8
Int1XY	5-8
Int2TY	5-8
Int2XY	5-8
IS8000 License Manager.....	9-5, 9-6

L	Page
Label Edit.....	4-4
Loading Display Settings	4-1
Loading Waveform Data	3-1

M	Page
Main waveform display window	2-3
Main Window	3-6
Mark List.....	3-22
Math Setting	5-19
MATLAB format	6-5, 6-8
Measurement result display window.....	2-3
Measure Result	4-7, 5-1

N	Page
Notational Format	4-6

O	Page
Operation of the Control Screen.....	8-13, 8-18
Operator	5-23

P	Page
Printer Setup.....	7-1
Print Format.....	7-2
Printing Background	7-4
Print Mode	
DISPLAY	7-3
LONG	7-3
Printout Sample	7-3
Print Preview	7-3

R	Page
remote control.....	1-3

S	Page
Saving the Display Setting.....	6-13
Saving Waveform Data.....	6-1
Scale.....	4-3
Setting info.....	6-13
Setting Up a Printer	7-1
Setting Up the Print Format.....	7-2
Show or Hide.....	4-2
Split.....	3-17
Split Setting	4-11
Starting Xviewer	2-1
Switching between Groups.....	3-20

Index

T	Page
target instruments.....	1-1
Thumbnails.....	8-7
toolbar.....	2-2
Tooltip.....	3-7
transferring files.....	1-3
Transferring Waveform.....	6-9
Transfer to Excel.....	6-10

U	Page
Upload.....	8-10
User Name.....	8-4
Using the Mouse.....	8-15

V	Page
Version.....	9-2
Viewer window.....	2-2
viewing files.....	1-3
voice memo.....	3-2

W	Page
Waveform Color.....	4-3
Waveform in the Computation View.....	5-19
waveform property.....	3-23
Waveform Vertical Zoom&Move.....	3-15
Wave Parameter.....	5-5
WDF.....	6-19
Web Page.....	9-4
WVF.....	6-19
WVF format.....	6-6

X	Page
X-Axis.....	3-13
XLS format.....	6-3, 6-7
X-Y Cursor.....	5-3
X-Y waveform display window.....	2-3
X-Y Window.....	3-13

Z	Page
Zoom.....	3-8
Zoom Factor.....	3-8
Zoom Rate.....	3-9
Zoom waveform display window.....	2-3