User's Manual

IS8000
Integrated Software

Thank you for purchasing the IS8000 Integrated Software (hereinafter referred to as the IS8000 Software). This user's manual explains the features, operating procedures, and handling precautions of the software. To ensure correct use, please read this manual thoroughly before operation.

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

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.
- The Math/FFT calculation section of this licensee application uses the following technology.
  MATLAB®. © 1984 - 2021 The MathWorks, Inc.

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 Systems Incorporated.
- Sentinel is a registered trademark of SafeNet, Inc.
- MATLAB is a registered trademark of The MathWorks, Inc. in the United States.
- RAMScope is a registered trademark of DTS INSIGHT Corporation.
- FASTCAM and FASTCAM NOVA are registered trademarks of PHOTRON LIMITED.
- Modbus is a registered trademark of AEG Schneider.
- In this manual, the TM and ® 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: March 2021
- 2nd Edition: May 2021
- 3rd Edition: July 2021
- 4th Edition: September 2021
- 5th Edition: November 2021
- 6th Edition: January 2022
- 7th Edition: March 2022
- 8th Edition: April 2022
- 9th Edition: June 2022
- 10th Edition: August 2022
- 11th Edition: October 2022
- 12th Edition: December 2022
- 13th Edition: February 2023
- 14th Edition: May 2023
- 15th Edition: July 2023
- 16th Edition: October 2023
- 17th Edition: March 2024

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
IS8000 Integrated Software User's Manual	IM IS8000-01EN	This document. Explains the features of the IS8000 Software and how to configure and operate it.
IS8000 Integrated Software Installation Manual	IM IS8000-04EN	Explains how to install and activate the IS8000 Software, which includes this software.
IS8000 Integrated Software High-speed Camera Synchronization Feature (FS1 option) User's Manual	IM IS8000-61EN	Explains the features of the IS8000 Software's High-speed Camera Synchronization Option and how to use it.
IS8000 Integrated Software ECU Monitor Synchronization Feature (EM1 option) User's Manual	IM IS8000-62EN	Explains the features of the IS8000 Software's ECU Monitor Synchronization Option and how to use it.
Harmonic/Flicker Software User's Manual	IM IS8000-63EN	Explains the features of the Harmonic/Flicker Software (a dedicated application that you can start from the IS8000 Software) and how to use it.
IS8000 Integrated Software Modbus/TCP Communication Feature (MB1 option) User's Manual	IM IS8000-64EN	Explains the features of the IS8000 Software's Modbus/TCP Communication Option and how to use it.

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

You can open the above manuals from the **launcher** and **Help** menu of this software. For details on the procedures, see section 9.3.

Conventions Used in This Manual

Prefixes k and K

This manual distinguishes prefixes k and K used before units as follows:

k: Denotes 1000. Example: 100 kS/s (sample rate)

K: Denotes 1024. Example: 720 KB (file size)

Displayed Characters

Bold alphanumeric characters in procedural explanations indicate characters that appear in the menus on the screen.

Notes

This manual uses the following symbol to indicate notes.

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

Contents

Product Overview

The IS8000 software can be used to connect multiple measuring instruments, such as ScopeCorders, oscilloscopes, and power meters, and display, acquire, analyze, integrate, and create reports of data.

1.1 System Configuration

IS8000 Integrated Software (standard features)

- Instrument connection
- Instrument configuration and control
- Online monitoring and analysis
- Data acquisition
- Offline analysis
- File management

Optional features (add-on packages)

- Multi-Unit connection   (SY1 option)
- Waveform math   (MH1 option)
- Serial bus analysis   (SB1 option)
- Report generator   (RP1 option)
- High-speed camera synchronization   (FS1 option)
- ECU monitor synchronization   (EM1 option)
- Modbus/TCP communication   (MB1 option)

Harmonic/Flicker Software (dedicated application)

Target Instruments

Model*	Product Name/Model Name		
DL Series	**ScopeCorder**		
DL950	DL950		
DL850 Series	DL850/DL850V, DL850E/DL850EV		
DL350	DL350		
SL1000	**High-Speed Data Acquisition Unit**		
SL1000	SL1000		
DLM Series	**High Definition Oscilloscope**	**Mixed Signal Oscilloscope**	**Digital Oscilloscope**
DLM5000 Series	DLM5034HD, DLM5038HD, DLM5054HD, DLM5058HD	DLM5034, DLM5038, DLM5054, DLM5058	—
DLM4000 Series	—	DLM4038, DLM4058	—
DLM3000 Series	—	DLM3024, DLM3034, DLM3054	DLM3022, DLM3032, DLM3052
DLM2000 Series	—	DLM2024, DLM2034, DLM2054	DLM2022, DLM2032, DLM2052
WT Series	**Precision Power Analyzer**		
WT5000	WT5000		
WT3000 Series	760301, 760302, 760303, 760304, WT3001E, WT3002E, WT3003E, WT3004E		
WT1800 Series	WT1801, WT1802, WT1803, WT1804, WT1805, WT1806, WT1801E, WT1802E, WT1803E, WT1804E, WT1805E, WT1806E		

* 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.
• For details on the models that support high-speed cameras and ECU monitors, see the Installation Manual and the manuals for the options.

Compatible Measuring Instruments and Interfaces

Model	USB		Ethernet	
	USB-TMC	**VISA**	**VXI11**	**HiSLIP**
DL950	Y	Y	Y	Y
DL850 Series	Y	—	Y	—
DL350	Y	—	Y	—
SL1000	Y	—	Y	—
DLM5000 Series	Y	—	Y	—
DLM4000 Series	Y	—	Y	—
DLM3000 Series	Y	—	Y	—
DLM2000 Series	Y	—	Y	—
WT5000	Y	Y	Y	—

Note

Connection with the software may not be possible depending on the firmware version of the instrument. Versions 24.1.1.0 and later of this software are compatible with the following firmware versions.
• WT5000: 3.31 and later
• DL950: 1.50 and later
  When connecting a DL950 with the /MT1 option, update this software to version 23.4.1.0 or later. With older versions, this software will not be able to acquire math waveform data of DL950's real time math and power analysis (equivalent to the /G03, /G05 option).

You can view the version information of the software from the Help menu. ► section 9.4

IS8000 API (Application Programming Interface)

The following functions can be added to this software by using the IS8000 API. They enable you to program your own functions for your own purposes.

- Connect this software to any measuring instrument and acquire data (DAQ).
- Load arbitrary data as waveforms

For details on the interface functions and how to use them, see the *IS8000 Software API User's Manual*, IM D037-01EN.

To use the IS8000 API, you need to purchase IS8001 (IS8000 subscription license) or IS8002 (IS8000 perpetual license).

You cannot use the API on the IS8000 Simple Edition.

For details on the IS8000 Simple Edition, see "Feature Restrictions" under "Notes on Usage" in the Installation Manual (IM IS8000-04EN).

Signal and Data Flow

The signal and data flow between this software and the instruments are described below.

PC (IS8000 Software)
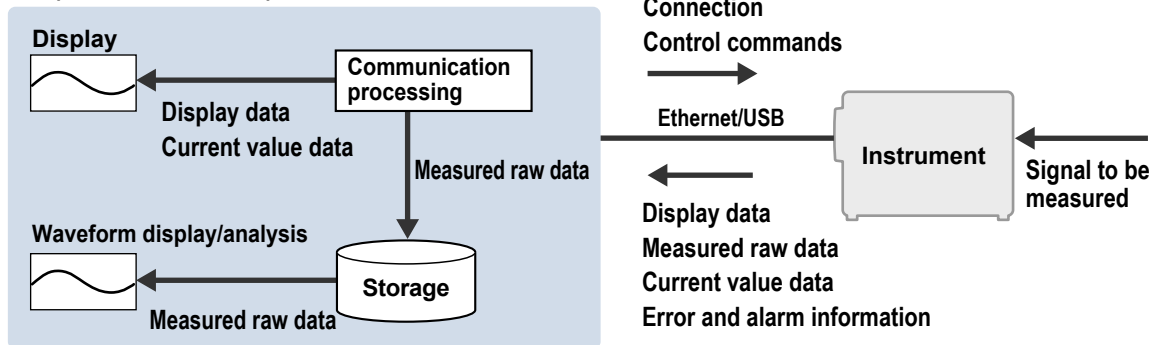
- **Display Data**

  Data that instruments create for displaying waveforms.

- **Measured Raw Data**

  All the measured data that instruments acquired. The data is sent to a PC to be stored in its storage device.

  Waveforms can be displayed, and data can be analyzed.

- **Current Value Data**

  Current value data is instantaneous data that instruments calculate. The data is sent immediately in response to a request from a PC.

- **Error and Alarm Information**

  Errors and alarms that occur while instruments make measurements can be displayed.

Monitoring (Measurement) and Recording (Data Acquisition)

This software refers to the task of acquiring measured data into the internal memory of an instrument and displaying waveforms on this software as **monitoring (measurement)** and the task of saving the measured data that has been acquired to the internal memory of an instrument as files on a PC's storage device or the internal storage device of an instrument while making measurements as **recording** (data acquisition).
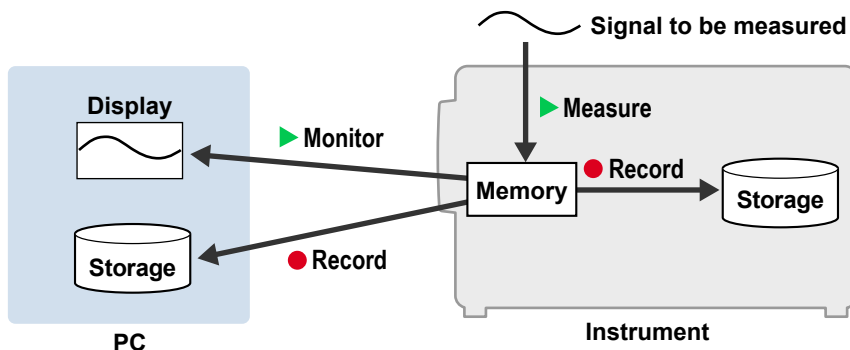
Saving Measured Data

When a measurement is complete, the measured data acquired in the internal memory of a instrument can be saved as a single file on your PC. This task is referred to as **saving**, not recording.

1.2   Main Features

Features and Compatible Instruments

Model	Offline Analysis	Online Measurement			Report Generator[4]	File Management
	Waveform File Loading[1]	Real-time Waveform Monitor	Data Acquisition	Remote Control and ACQ Save[2]		
DL950	Y	Y	Y	Y	Y	Y
DL850 Series	Y	—	—	Y	Y	Y
DL350	Y	—	—	Y	Y	Y
SL1000	Y	—	—	—	Y	—
DLM5000 Series	Y	—	—	Y	Y	Y
DLM4000 Series	Y	—	—	—	Y	—
DLM3000 Series	Y	—	—	Y	Y	Y
DLM2000 Series	Y	—	—	—	Y	—
WT5000	Y	Y	Y	3	Y	—
WT3000 Series	Y	—	—	—	Y	—
WT1800 Series	Y	—	—	—	Y	—

1 For the instrument file formats that this software can load, see page 1-7.

2 ACQ Save is a feature used to obtain measured data accumulated in the acquisition memory of an instrument through remote control. ► section 6.2

3 ACQ Save is not available on the WT5000. Only remote control is possible.

4 Report Generator (RP1 option)

Launcher and Simple Wizard

When you start the software, the launcher appears. If you select an online measurement feature with the launcher, a wizard setup window appears for you to enter the necessary settings.

Launcher

On the launcher, select the feature you want to use.

► section 3.2

Feature	Description
File Open	Loads measurement data files and project files → Opens a file open window
DAQ	Online monitor (measurement), data acquisition (recording) features
Remote Control	Remote control
File Manager	File transfer feature
IEC 61000	Starts the Harmonic/Flicker Software (dedicated application) → Displays the IEC launcher of the Harmonic/Flicker Software 　　For details, see the *Harmonic/Flicker Software User's Manual*, IM IS8000-63EN.
DAQ (WT)	Easy online DAQ measurement for WT When only the WT5000 is connected, a numeric screen appears when the device is selected and data acquisition (DAQ) becomes possible. Online monitor (measurement), data acquisition (recording) features
DAQ (IEC 2k-9kHz)	Harmonic measurements complying with IEC 61000-4-7 Annex B (2k-9kHz) When you connect the WT5000* and select the device, a harmonics bar graph window appears for data acquisition (DAQ). *　IEC harmonics/flicker measurement feature (/G7 option) is required for WT5000 Online monitor (measurement), data acquisition (recording) features

Simple Wizard (Smart Setup)

From the launcher, select **DAQ**, **Remote Control**, **File Manager**, **DAQ (WT),** and **DAQ (IEC 2k-9kHz)** to open the Device Search window.

Device Search Window

On this window, you can search for connectable measuring instruments on the communication line and view them in a list. Then, you can select the devices you want to connect to.

► section 3.4

If you select **DAQ** on the launcher, you can then display the following setting window.

Channel Setting Window

From the measurement channels of connected instruments, select and configure the channels to display on this software.

► section 3.5

DAQ Setting Window

On this window, you can set the monitor and display conditions and specify the record condition settings for acquiring data.

► section 3.6

You can also display the setup window separately using the ribbon commands (icons).

Loading and Saving Files

You can load into this software waveform data that has been saved on DL series, DLM series, and SL1000 instruments and waveform/power data that has been saved on WT series and save it to files. In addition, you can load CSV data that has been saved with this software or Xviewer and other general, simple CSV waveform data.*

 * Xviewer is a YOKOGAWA waveform viewer.

Project Files

Preferences such as the settings of measuring instruments connected to the software, display windows, and panel layout can be saved in a project file. You can save frequently used settings and displays and load them when necessary. The following two types are available.

IS8000 analysis project (.anpjt extension)
Links to offline analysis setup files and waveform files can be saved.
Data source file information and offline analysis information are saved. Waveform files themselves remain unchanged.
You can specify an anpjt file saved in the past and display a different waveform file using the same settings.

IS8000 measurement project (.mepjt extension)
Data source device information, data acquisition information, remote control information, and file manager information for online measurement are saved. Setup files of measuring instruments (DL950) can also be copied from the measuring instrument to the PC.

Loading Waveform Data

Supported file formats: CSV, CSZ, MF4 (MDF4.1), WDF, WVF, project files (anpjt, mepjt), file division link files (wlk).*

 * CSZ files (.csz extension) can be loaded directly. For details, see the next page and page 3-41.

File Formats Saved by Waveform Measuring Instruments

Model	CSV[1]	WDF[2]
DL950	Y	Y
DL850 Series	Y	Y
DL350	Y	Y
SL1000	—	Y
DLM5000 Series	Y	Y
DLM4000 Series	Y	Y
DLM3000 Series	Y	Y
DLM2000 Series	Y	Y

 1 Waveform data saved in ASCII format.
 2 Waveform data saved in binary format.

Note
You can also load arbitrary data as waveforms by creating your own library using the IS8000 API. For details, see the API User's Manual, IM D037-01EN.

Loading Power Values and Waveform Display Data (PP waveforms)

The compatible file format is CSV. Waveform display data can be loaded if the data has been saved by a WT5000, WT3000 series, or WT1800 series.

File Format Saved by Power Measurement Instrument

| Model | CSV | |
	Not compatible with IEEE1588	Compatible with IEEE1588
WT5000	Y[3, 4]	Y[3, 4]
WT3000 Series	Y[5]	—
WT1800 Series	Y[5]	—

3 For numeric data, only data saved in ASCII format with the update mode set to Constant can be loaded.

4 Waveform display data saved by a WT5000 (hereinafter referred to as PP waveforms) refers to waveform sampling data that has been P-P compressed to 2002 points for the purpose of displaying waveforms. It is not the data acquired at the WT5000 sample rate (sampled waveform data).
For details on P-P compression, see the WT5000 User's Manual.

5 • Limited to CSV data whose Model in the first line starts with "WT1800" "WT3000" (includes WT1800E/WT3000E).
• Only up to the first 128 channels can be loaded.
• Data that has been saved with Measurement Mode to Normal Mode (Trg) cannot be loaded because such data is discontinuous. Data that includes harmonic data cannot be loaded either.

Loading CSV Waveform Data

This software can load CSV waveform data that has been saved with this software or Xviewer (see page 3-6). It can also load other general, simple CSV data as waveforms.

Loading General, Simple CSV Data

Data is loaded without a header, and the time axis is indicated by the number of points. Note that the first column is skipped (not loaded).

Note

If information such as waveform times or sampling rate is required when loading CSV or CSZ files, header information is needed.

Saving Files

The compatible file formats are MF4 (MDF4.1), CSV, CSZ, and project files (anpjt, mepjt).

CSZ Files (.csz extension)

This software can save waveform files as zipped CSV files (see page 3-41).

Note

If you want to load a CSV file into Excel, use the **From Text/CSV** button in the Get & Transform Data group on the **Data** tab in Excel.
If you double-click the file icon or use Open on the File tab in Excel, the default data format settings will be applied to the opened sheet, and the data may not be displayed properly.

Offline Data Analysis

Data measured and saved on measuring instruments can be displayed on the PC screen and analyzed. You can display multiple files simultaneously.

Measurement Data Display

- Overview waveform display
- View waveform
- History display
- Dual capture display
- XY waveform display
- Power numeric display
- Harmonic bar graph display (WT5000)*
  - * When the IEC harmonics/flicker measurement feature (/G7 option) is installed in the WT5000, measurement data display complying with IEC 61000-4-7 Annex B (2k-9kHz) is supported.
- Vector display (WT5000)
- Cursor measurement
- Display conditions
- Annotation settings

Measured Data Analysis

You can analyze waveform data that has been saved on DL series, DLM series, and SL1000 instruments and power data that has been saved on WT5000s.

Waveform Math (MH1 option)

The following computation can be performed on loaded waveform data.
- FFT analysis
- Waveform math feature

Serial Bus Analysis (SB1 option)

- Analyzing and searching CAN bus signals
  CAN bus signal analysis/search can be performed on the loaded waveform data.

Online Measurement

You can connect to measuring instruments through USB and Ethernet interfaces and monitor data, acquire data, display integrated power, and remotely control the measuring instruments.

Real-Time Monitoring

Data that the measuring instrument is measuring can be displayed.

- Waveform display
- Numeric Monitor display
- Power trend display
- Power numeric and integral display
- Harmonic bar graph display (WT5000)*

  * When the IEC harmonics/flicker measurement feature (/G7 option) is installed in the WT5000, measurement data display complying with IEC 61000-4-7 Annex B (2k-9kHz) is supported.

- Vector display (WT5000)

Data Acquisition

Acquisition data of measuring instruments can be downloaded to the PC.

  * For details on the available communication interfaces and available instruments, see section 1.1.

- High-speed data acquisition capability
- Real-time recording (waveform data, power values)
- Simultaneous recording of multiple measuring instruments
- File division
- Auto naming
- Comment entry
- Recording status monitoring

Remote Measuring Instrument Control

The measuring instruments in the following table can be controlled from a PC.

The display screen of the connected measuring instrument appears on the PC screen (Remote Control window). You can control instruments from the PC using a mouse in the same manner as using the front panels of instruments.

It is also possible to save waveform data on the remote control window to the PC.

Applicable Instruments and Available Communication Interfaces

Model	USB	Ethernet Control via VXI11	10G Ethernet Control via HiSLIP
DL950	Y	Y	Y[2]
DL850 Series[1]	Y	Y	—
DL350	Y	Y	—
DLM5000 Series	Y	Y	—
DLM3000 Series	Y	Y	—
WT5000	Y	Y	—

  1 The DL850 series instruments do not support touch control. The remote control from this software is limited to the registered control buttons. You can perform panel control by starting XWirepuller by selecting the APPs tab and then XWirepuller.
  2 Available when a 10 Gbps Ethernet Interface (/C60 option) is installed in the DL950. For details, see the DL950 manuals.

File Management

You can connect to measuring instruments and perform the following file operations.

- Download files (instrument → PC)
- Upload files (PC → instrument)
- Create folders
- Rename files and folders
- Display a list of files
- Display overviews of files
- Download data recorded using DL950 flash acquisition* to a PC

    * A dedicated flash memory (/ST2 option) is required in the DL950. For details, see the DL950 manuals.

Note

The DL950's 10G Ethernet (/C60 option) is supported. Files and recorded data can be transferred quickly to the PC for management purposes.

CSV Batch Converter

Multiple files can be converted into CSV or CSZ files collectively.* Files can be processed without having to open them.

    * CSZ files (.csz extension) are zipped CSV files. See pages 1-8 and 3-48.

Note

If you want to load a CSV file into Excel, use the **From Text/CSV** button in the Get & Transform Data group on the **Data** tab in Excel.

If you double-click the file icon or use Open on the File tab in Excel, the default data format settings will be applied to the opened sheet, and the data may not be displayed properly.

1.3 Optional Features and Dedicated Applications

You can add the following optional features (add-on analysis features) and dedicated applications.

Multi-Unit Connection (SY1 option)

Up to five measuring instruments can be connected simultaneously. It is also possible to record data by synchronizing the simultaneously connected measuring instruments.

Waveform Math (MH1 option)

You can set up to 32 math waveforms (Math1 to 16, FFT1 to 16).

Serial Bus Analysis (SB1 option)

CAN bus signals can be analyzed/searched.
The instrument can decode frames, fields, and other information from the loaded waveform data. Then, it can display the decoded results along with the waveform on the screen or display a list of detailed decoded results.
If you set search conditions and perform searches, the waveform can be displayed expanded, with the detected frame's or field's first data byte at the center of the window. Up to 100000 items can be searched.

Report Generator (RP1 option)

You can create your own layouts by combining the necessary display items. You can make frequently used layouts into templates and use them to generate reports in standard formats. Reports can be printed on a printer or exported to files (Word, Excel, PDF).
You can also process multiple sets of data collectively under the same conditions.
► chapter 8

High-speed Camera Synchronization Measurement (FS1 option)

By acquiring and synchronously displaying the video taken by a high-speed camera and the waveform data measured by a measuring instrument, you can analyze and visualize the causal relationship between the waveform and the video.
For details, see the User's Manual, IM IS8000-61EN.

ECU Monitor Synchronization Measurement (EM1 option)

By connecting a RAM monitor, you can analyze the correlation between the waveform data acquired by a measuring instrument and the RAM data acquired from the RAM monitor.
For details, see the User's Manual, IM IS8000-62EN.

Modbus/TCP Communication (MB1 option)

Measurement data can be collected by connecting to a Modbus/TCP-compatible device. Correlation can be analyzed by synchronously displaying waveform data measured with other measuring instruments.
For details, see the User's Manual, IM IS8000-64EN.

Harmonic/Flicker Software

This is a dedicated application (IS8011, IS8012) that you can use to connect to a WT5000 power analyzer, measure and analyze harmonics and flicker according to the IEC standards, and generate reports.
You can start the IEC launcher from the launcher of this software and choose the following measurement software applications.
*   IEC 61000-3-2   Harmonic Measurement Software
*   IEC 61000-3-3   Voltage Fluctuation/Flicker Measurement Software
*   IEC 61000-3-11 Voltage Fluctuation/Flicker Measurement Software
*   IEC 61000-3-12 Harmonic Measurement Software

For details, see the User's Manual, IM IS8000-63EN.

Workflows for Various Objectives

2.1 Measuring and Recording Waveforms or Power Values Online

This is an example of connecting a DL950 or WT5000 and performing real-time monitoring (measurement) and recording.

Connect the instruments.	Connect the measuring instrument and PC via Ethernet or USB. See the user's manual of the measuring instrument.

Start the software.	See section 3.1.

Configure the connection.

• **From the launcher**

Select the function.	Select **DAQ**.	See section 3.2.

Smart setup	• In the **Device Search** window, search for the measuring instrument and connect.	See section 3.4.
	• In the **Channel Setting** window, check the display conditions.	See section 3.5.
	• In the **DAQ Setting** window, set the display conditions and recording conditions.	See section 3.6.

• **From the start window**

Open the launcher.	On the **File** tab, select **New** to open the launcher. From here, refer to the procedure in "From the launcher" described earlier.	See section 3.2.

Set the display and measurement conditions.   **Monitor > Monitor tab**

Set the display conditions.	On the **Channel Control** panel,* set the monitor (measurement) display conditions. * The operation here directly changes the parameters of the connected measuring instrument itself.	See section 5.3

Set the measurement conditions.	In the **Device Control** panel, set the measurement conditions.	See section 5.6.

Configure the measured data display.	• Under **Display Setting**, set the waveform color, grid, and other items. • Under **Numeric Setting**, set the numeric display of power values.	See section 5.7.

Continue to the next page.

Execute measurement and recording.		Monitor > Control tab
Start and stop measuring.	Click **Monitor Start/Monitor Stop**.	See section 5.8.
Set the record conditions.	**DAQ Setting** (Specify the recording start, stop, division, and save destination settings.)	See sections 3.6 and 5.9.
Start and stop recording.	Click **Record Start/Record Stop**.	See section 5.9.

- When Using a Project File
  Tab window and panel positions and various waveform display information can be saved in a project file. The next time you open this file, the display conditions will be restored to what they were when the software was last closed.

2.2 Controlling an Instrument from a PC

This is an example of connecting to a DL950 or WT5000 and controlling it remotely from a PC.

Connect the instruments.	Connect the measuring instrument and PC via Ethernet or USB. See the user's manual of the measuring instrument.

Start the software.	See section 3.1.

Configure the connection.

- **From the launcher**

Select the function.	Select **Remote Control**.	See section 3.2.

Smart setup	In the **Device Search** window, search for the measuring instrument and connect.	See section 3.4.

- **From the start window**

Open the launcher.	On the **File** tab, select **New** to open the launcher. From here, refer to the procedure in "From the launcher" described above.	See section 3.2.

When the instrument is already connected

When the instrument is connected through the DAQ or File Manager feature

From [...] in the device list

Select the function.	Select **Remote Control**.	See section 3.7.

Open the remote control window.		**File tab**
Transfers and displays the screen of the instrument on the PC	• A control window is displayed in the Remote Control panel. • Control buttons appear on the keypad panel.	See section 6.1.
Operation and control	Operate the Remote Control window using the PC mouse, the touch panel (if the PC has a touch panel), or keypad.	See section 6.1.

Save waveform data to the PC.*		**Remote Control > Tool tab**
Save measured data.	You can download (save) waveform data to the PC by using **Save** group > **Waveform**.	See section 6.2.

* When a DL950, DL350, DL850 series, DLM3000 series, or DLM5000 series is connected, you can download (ACQ save) the measured data accumulated in the acquisition memory of the measuring instrument as a single file to the PC.

2.3 Analyzing Measured Data Offline

This is an example of loading and analyzing DL950 measurement waveform data saved in the PC using this software.

Start the software.		See section 3.1.

Load waveform data.		

• From the launcher

Select the function.	Select **File Open**.	See sections 3.2 and 3.3.

• From the start window

Select the function.	Select **Open** on the **File** tab	See section 3.8.

Open a file.	Select and open a file.	See section 4.1.

Display measured data.		**Waveform Analysis > View tab**
Set the display conditions.	Waveforms are displayed on the **Overview** panel. • Under **Overview - Properties** at the right side of the window, select the split style and display channels. • Set display groups. • Set the scale. • History waveform display • Dual capture display • XY Display • Cursor measurement	See sections 4.2 to 4.4.
Configure the measured data display.	Under **Display Setting**, set the grid and other items.	See section 4.5.

Analyze measured data.		**Waveform Analysis > Analysis tab**
Display the measured results.	• The results of waveform parameter measurement are displayed in the **Measure Result** panel. • **Math Setting** (option)	See sections 4.7 to 4.8.
Set annotations.	• Insert annotations in the waveform view.	See section 4.10.

Perform FFT analysis of measured data (option).		**Waveform Analysis > FFT View tab**
Display the measured results.	• Waveforms are displayed on the **FFT View** panel. • FFT view and FFT history waveform display • Cursor measurement	See section 4.11.
Set the measurement conditions.	**FFT Setting** (FFT math, window function, etc.)	See section 4.11.

Export to file		**File tab**
Export to a file.	Use **Export to File** to save data to an MDF file.	See section 3.8.

Tab window and panel positions and various waveform display information can be saved in a project file. The next time you open this file, the display conditions will be restored to what they were when the software was last closed.

2.4 Generating Reports (RP1 option)

Creating a Report on Data Measured or Analyzed Online

This is an example of creating a new template and generating report while acquiring the images displayed in the software window and measurement results.

Measure and record waveforms of power values online.		See section 2.1.

▼

Analyze waveforms or power values offline.		See section 2.3.

▼

Select the function.		APPs tab
Select Report.		

▼

Create a new template.		Report Editor > layout window
Create a new layout.	Click **New Template**. • Report size and orientation (portrait, landscape) • Enter the report title. • Set the template name.	See sections 8.1 and 8.2.

▼

Set the layout.	• Arrange, move, and delete parts. • Add layouts when necessary. • Click **Go to Preview**.	See section 8.3.

▼

Edit the measurement or analysis data to display in the report.		Monitor > View tab
Edit the display window.	• Execute a measurement. • Move the cursor position and so on.	See section 8.3.

▼

Edit the report contents.		Report Editor > preview window
Display the preview window.	• Update and view the display on the preview panel. • Select the part you want to edit.	See section 8.4.

▼

Set the part items.	• Set the displayed content of each item on the preview setup panel.	See section 8.4.

▼

Generate a report.		Report Editor > preview window
Select the output format.	• Click **Print**, or click **Export to File** to select the output format (Excel, Word, PDF). • Execute the output.	See section 8.5.

Creating a Report Using an Existing Layout

Measure and record waveforms of power values online.	See section 2.1.

▼

Select the function.	**APPs tab**
Select **Report**.	

▼

Create a layout.	**Report Editor > preview window**
Select a template.	

▼

Edit the report contents.	**Report Editor > preview window**

Show the report preview window.	• Check the display on the preview panel. • Select the part you want to edit.	See section 8.3.

▼

Set report part items.	• Set the displayed content of each item on the preview setup panel.	See section 8.4.

▼

Generate a report.	**Report Editor > preview window**

Select the output format.	• Click **Print**, or click **Export to File** to select the output format (Excel, Word, PDF). • Execute the output.	See section 8.5.

Generating Multiple Reports Collectively

This is an example of selecting a new or existing layout and collectively generating (batch processing) reports with the same layout from several waveform files with the same configuration.

Display the waveform file or monitor.	See sections 2.1, 2.3.

▼

Select the function.	**APPs tab**
Select **Report**.	

▼

Select a layout.	**Report Editor > preview window**
Open a new or existing template.	

▼

Display and edit the measurement or analysis data to display in the report.	**Analysis > View tab**
• Execute measurement, move the cursor position, and so on.	

▼

Edit the report contents.		**Report Editor > preview window**
Show the report preview window.	• Check the display on the preview panel. • Select the part you want to edit.	See section 8.3.
▼		
Set report part items.	Set the displayed content of each item on the preview setup panel.	See section 8.3.
▼		
Batch processing	Select **Batch**.	See section 8.6.

▼

Generate reports through batch processing.		**Report Editor > preview window**
Add files to list.	Add files that you want to output to the output file list.	See section 8.6.
▼		
Update the display in the report preview window.	Select each file to update the preview, and check the display in the preview setting panel.	See section 8.6.
▼		
Select the output format.	Click **Export to File** to select the output format (Excel, Word, PDF).	See section 8.6.
▼		
Specify the export destination.	Click **Select Folder**, and export.	See section 8.6.

Common Operations

3-1

This chapter explains operations common to all the features of this software.

3.1 Starting and Exiting the Software

Procedure

Starting the Software

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

- Double-click the shortcut icon **IS8000** on the desktop.
- Click **Windows** ⊞ (Start) > **Yokogawa** > **IS8000**.
- Double-click the file with the associated extension.
- Drop the file with associated extension on the IS8000 shortcut icon.
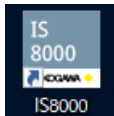
Shortcut icon

Start-up Operation
- When you start the software for the first time, a start window appears. Refer to chapter 2 in the Installation Manual (IM IS8000-04EN), and complete the activation.
- When the activation is complete, the launcher or start window will appear the next time you start the software.

  Details of the launcher ► section 3.2

  Details of the start window ► section 3.7

Note
The specifications of the IS8000 application do not apply to connection of instruments and data collection when multiple instances of the application are running on the same PC.

Closing the Software

There are two methods that you can use to close the software.

- Right-click the title bar, and from the drop-down menu, select **Close**.
- Click [**x**] at the right edge of the title bar.

Title bar

Closes the window (software)
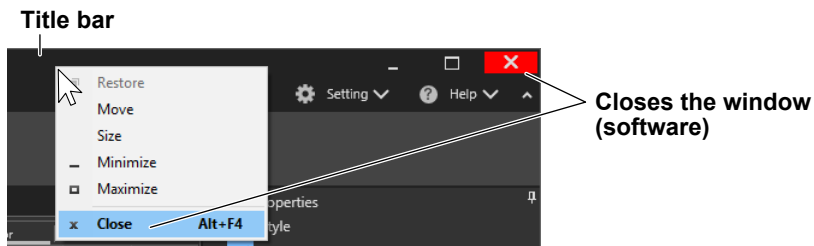
Operation at Closing

The software closes.

Note

You can specify whether to display a confirmation for saving the window settings to a project file when the software is closed.
Procedure ▶ section 3.11

When "Confirm saving to Project file when finished" is selected, a Save As dialog box will appear when an offline analysis is finished or when the online monitor is closed. The settings of the window that you are closing can be saved to an IS8000 analysis project file (.anpjt) or IS8000 measurement project file (.mepjt).

3.2   Selecting a Feature on the Launcher

On the launcher, select the feature you want to use or a file you want to load.

Procedure

Launcher

By default, when you start the software, the launcher appears.

Closes the launcher
Opens the manual folder
Select the function.
File history list
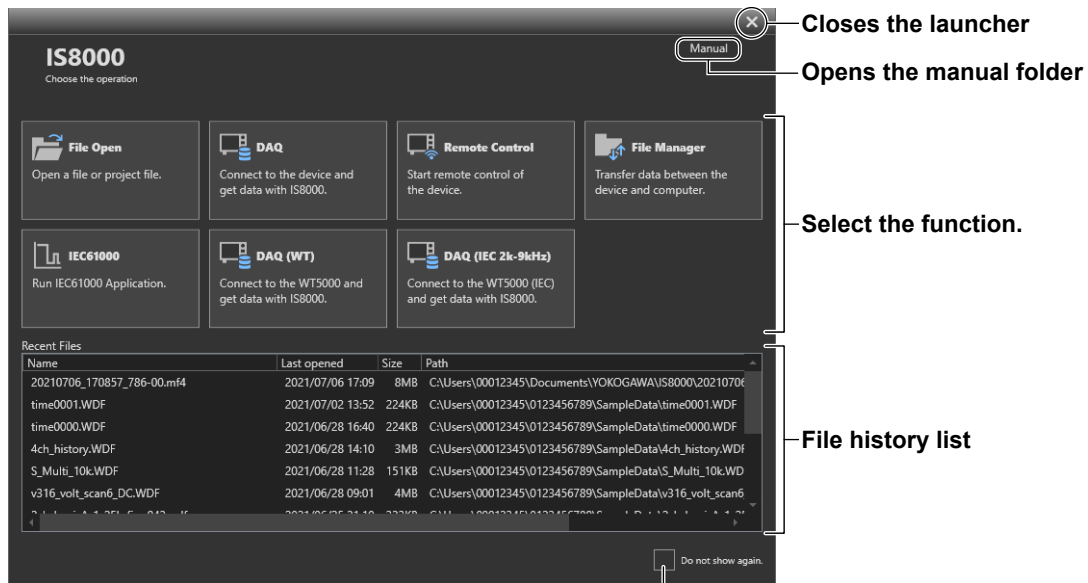
Select this check box to not display the launcher at the next
startup and display the start window (see section 3.7) instead.

Feature Name	Description
File Open	Loads measurement data files and project files → Opens a window for opening the file window ► section 3.3, chapter 7
DAQ	Online monitor (measurement), data acquisition (recording) features → Opens the wizard's Device Search window ► section 3.4
Remote Control	A feature used to remotely control measuring instruments on the communication line → Opens the wizard's Device Search window ► section 3.4
File Manager	File transfer feature between devices on the communication line and the PC → Opens the wizard's Device Search window ► section 3.4
IEC 61000	Starts the Harmonic/Flicker Software → Displays the IEC launcher of the Harmonic/Flicker Software ► User's Manual (IM IS8000-63EN)
DAQ (WT)	Easy online DAQ measurement for WT When only the WT5000 is connected, a numeric screen appears when the device is selected and data acquisition (DAQ) becomes possible. Online monitor (measurement), data acquisition (recording) features → Opens the wizard's Device Search window ► section 3.4
DAQ (IEC 2k-9kHz)	IEC 61000-4-7 Annex B (2k-9kHz) harmonic measurement When you connect the WT5000* and select the device, a harmonics bar graph window appears for data acquisition (DAQ). * IEC harmonics/flicker measurement feature (/G7 option) is required for WT5000. Online monitor (measurement), data acquisition (recording) features → Opens the wizard's Device Search window ► section 3.4

File History List

Recently used files are listed in reverse chronological order. Files (.wlk extension) that were divided during data acquisition are also listed.

When you click a file in the list, the file is loaded, and a measured data window appears.

3.3   Opening Files

When you want to analyze data offline, specify a file (measured data, project file) on the PC.

Procedure

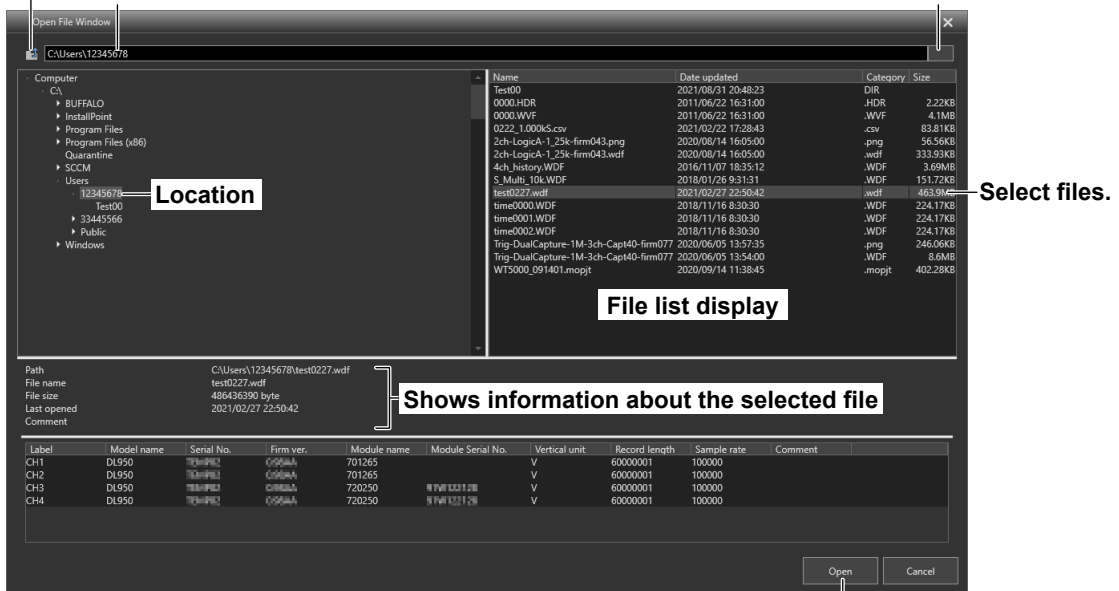### Window for Opening the File Window

1. On the launcher, select **File Open**.

The following window appears.

* You can also display this window by accessing the **File** tab > **Open** or **Add File**.
   ► sections 3.7, 3.8

Moves to the higher level

Enter the file location.

Lists the files at the entered location

Location

Select files.

File list display

Path   C:\Users\12345678\test0227.wdf
File name   test0227.wdf
File size   486436390 byte
Last opened   2021/02/27 22:50:42
Comment

Shows information about the selected file

Opens the files

2. Specify the folder, and select the file from the file list.

Displaying Multiple Waveforms on the Same Axis
If you want to display multiple waveforms on the same axis, hold down Shift and click multiple files.

3. Click **Open** to load the files.

If you selected multiple files in step 2, multiple waveforms are displayed on the same axis.

Explanation

Loadable File Formats

• MF4 (MDF4.1)

MF4 Loading Conditions
MDF Version: 4.1
fixed length data channel(cn_type=0)/master channel(cn_type=2)/virtual master channel(cn_type=3)
Data Type: UIntLE(cn_data_type=0)/UIntBE(cn_data_type=1)/IntLE(cn_data_type=2)/IntBE(cn_data_type=3)/FloatLE(cn_data_type=4)/FloatBE(cn_data_type=5)
Data Size Int: 8/16/32/64bit, Float: 32/64bit
Conversion type: 1:1 conversion(cc_type=0)/linear conversion(cc_type=1)/rational conversion(cc_type=2)

• WDF
• WVF (YOKOGAWA's old file format)
• CSV
   - CSV files that have been saved with this software
     Only CSV files saved with IS8000 software version 22.6.1.0 or later can be loaded (file version 0.2).
   - CSV files that have been saved with YOKOGAWA's Waveform Viewer Xviewer
   - CSV files that have been saved with DL950, DL850 series, DL350, DLM5000 series, DLM4000 series, DLM3000 series, DLM2000 series, WT5000, WT3000 series, and WT1800 series*
     * Data saved on a WT5000, WT3000 series, and WT1800 series are only available with the update mode set to Constant.
   - General, simple CSV data
• CSZ
   CSV files that have been zipped and saved with this software. These files can be loaded directly, without unzipping.
• IEEE1588-compatible CSV (saved using the WT5000's IEEE1588 synchronization feature)
• Project files created with this software
   - anpjt (IS8000 analysis project file)
   - mepjt (IS8000 measurement project file)
• wlk (link file created when recording is divided with this software) ► page 5-36

Creating and saving project files ► section 3.8
Details of various file formats ► page 1-7

Note

Loading files divided and saved by a measuring instrument
When a file is divided and saved with a measuring instrument such as the DL950, an underscore "_" and a 3-digit serial number (000 to 999) are added to the end of the file name.
To load files that have been divided and saved by a measuring instrument with this software, place all the files in the same folder and open "filename**_000**.extension." All divided files are loaded as one continuous data.

Displaying Multiple Waveforms on the Same Axis

If you select and load multiple files, multiple waveforms can be displayed on the same axis.

3.4   Connecting to Instruments

The software searches for connectable devices (measuring instruments, high-speed cameras/ECU monitors (option)) on the communication line.

Procedure

Device Search Window

This is the first wizard window that appears when you select an online feature (DAQ, Remote Control, File Manager, DAQ (WT), and DAQ (IEC 2k-9kHz)) from the launcher.

*   You can also use ribbon commands to specify the various settings in the simple wizard (smart setup).

When DAQ is selected

When Remote Control, File Manager, DAQ (WT), or DAQ (IEC 2k-9kHz) is selected

1. Check the communication interface type, address (IP address or USB serial number), and the device (host) name of the connection destination.

2. Use **Auto** or **WIRE** under **Manual** to select the communication interface type.
   - **Auto**

Items	Description
WIRE	The types of communication interfaces that can be selected are as follows. You can also select both. You can also select both. • Ethernet • USB

   - **Manual**

Items	Description
WIRE	The types of communication interfaces that can be selected are as follows. Select from the drop-down list. • Ethernet • VXI11 • HiSLIP • USBTMC • VISAUSB • ModbusTCP*
Address	You can specify the IP address of the device to be connected in the combo box. • Click ⏷ to view or select the history of addresses that were entered when you manually searched for devices. • You can also press the down arrow key in the input box to display the input history. You can select from multiple input histories with the up and down arrow keys. When WIRE is set to ModbusTCP, you need to specify the IP address.
Read file	When WIRE is set to ModbusTCP, select a Modbus/TCP setup file of the device to be connected from the drop-down list. *

   * Modbus/TCP communication (MB1 option) is required. The Modbus/TCP setup file can be selected from files that you have created in advance with a dedicated tool and stored in the designated folder. For details, see the User's Manual, IM IS8000-64EN.

3. Click **Search**.

   Connectable devices on the communication line are listed. If you specify an address, the corresponding device is displayed.

4. View the information displayed in the WIRE, ADDRESS, MODEL, and NOTE columns to verify the devices to be connected.

Items	Description
WIRE	Communication interface type
ADDRESS	IP address or USB serial number
MODEL	Host name (product model name)
NOTE	In the case of the WT5000, the enabled or disabled state of the DS option is indicated. For details on the disabled indication, see page 5-24.

5. Select the check boxes on the left of the devices you want to connect to, and then click **Open** or **Next**.
   - When you click **Open**, communication will start with the instrument, and the screen of the feature you selected on the launcher will appear.
   - If you click **Next**, the Channel Setting window (next page) opens.

Note _____

When DAQ Is Selected

If the Multi-Unit Connection Feature (SY1 option), High-speed Camera Synchronization Feature (FS1 option), ECU Monitor Synchronization Feature (EM1 option), or Modbus/TCP Communication Feature (MB1 option) is installed, multiple devices can be connected as shown in the following figure.
The specifications of the IS8000 application do not apply to connection of instruments and data collection when multiple instances of the application are running on the same PC.

Y: with option, blank: without option

Option				Maximum number of connected devices	Selection of connected devices
SY1	FS1	EM1	MB1		
Y				5	In the Device Search window, you can select multiple devices.
	Y			2	• One measuring instrument and high-speed camera
		Y		2	• One measuring instrument and ECU monitor
			Y	2	• One measuring instrument and Modbus/TCP-compatible device can be selected.
Y	Y	Y	Y	5	• High-speed camera, ECU monitor, and Modbus/TCP-compatible device cannot be selected simultaneously.

Option				Number of additional connections	Addition of connections
SY1	FS1	EM1	MB1		
Y				4	After connecting the first device, clicking Add Device on the File tab opens the Device Search window. Here you can add connections for the second and subsequent devices. ► page 3-29
	Y			1	• High-speed camera
		Y		1	• ECU monitor
			Y	1	• Modbus/TCP-compatible device
Y	Y	Y	Y	4	• High-speed camera, ECU monitor, and Modbus/TCP-compatible device cannot be connected simultaneously.

Examples of Instrument Connections

When the SY1 option is installed (maximum number of connectable instruments: 5)
• DL950 × 5   • DL950 × 3 + WT5000 × 2
• WT5000 × 5   • DL950 × 1 + WT5000 × 4

When the SY1 and EM1 options are installed (maximum number of connectable instruments: 5)
• DL950 × 2 + WT5000 × 2 + ECU monitor × 1

DL950 Operation Mode and Motion Mode
• Connect the DL950 with the operation mode set to Scope.
  If you connect the DL950 through DAQ with the operation mode set to Recorder, it is automatically changed to Scope.
  For details on the operation mode, see the DL950 manuals.
• When you connect the DL950 through DAQ, the DL950 Motion Mode (page 5-21) is automatically set to FreeRun.

When Remote Control or File Manager Is Selected

You can connect only a single device in the Device Search window.

When DAQ (WT) Is Selected (WT5000 only)

When the SY1 option is installed, the maximum number of connectable instruments is five.
On the Device Search window, if you select WT5000 and click **Open**, default values will be applied to the channel selection/setting, display conditions, and recording conditions, and the data acquisition screen will appear (see page 5-2).
To change the settings, use the ribbon commands.
► channel settings (sections 5.2 and 3.5), measurement conditions (section 5.6), DAQ settings (sections 5.9 and 3.6)

When DAQ (IEC 2k-9kHz) Is Selected (WT5000 only*)

   *   This feature is available when the IEC harmonics/flicker measurement feature (/G7 option) is installed in the WT5000.

The maximum number of connected units is one.

On the Device Search window, if you select WT5000 and click **Open**, default values will be applied to the channel selection/setting, display conditions, and recording conditions, and the data acquisition screen will appear. Harmonic measurements is possible complying with IEC 61000-4-7 Annex B (2k-9kHz) (see page 5-3).

To change the settings, use the ribbon commands.

   ▶ channel settings (sections 5.2 and 3.5), measurement conditions (section 5.6), DAQ settings (sections 5.9 and 3.6)

3.5 Setting Measurement Conditions in the IS8000 Software

You can set display groups and measurement conditions for each channel to acquire channel information from the connected measuring instrument and display it on this software.

*   Measurement conditions edited on this software are not reflected on instrument.
    To change the measurement conditions on the instrument, use the channel control panel (Section 5.6) or remote control (Section 6.1). If settings are changed on the instrument, they can be reflected in this software by following the procedure in "Adding Channels (page 3-12)".

<div style="border:1px solid">Procedure</div>

Channel Setting Window

This is the second wizard window that appears when you select DAQ from the launcher. When you add channels to a display group, waveforms of measured data are displayed in the Overview panel (page 5-5).

*   You can also use ribbon commands to specify the various settings in the simple wizard (smart setup).

Example when a DL950 is connected

Add channels.

Select filter conditions.

Inverts the selected range of settings

Aligns the selected range of settings to the contents of the first row

Automatically sets the selected range of settings

Resets the selected range of settings to default

Deletes the selected line

Moves the selected line up

Moves the selected line down

Returns to the Device Search window

Applies the settings and closes the DAQ-(host name) tab window.

Moves to the DAQ Setting window

List of measurement conditions of each channel

Adding Channels

You can add channels to display groups.

1. Click **Add Channel** to open the following dialog box. The names of connected instruments and channels that can be added are displayed in a tree-style list.

DL950

Updates the channel list

Analysis items
Displayed on models with the power math option (/G05, /MT1 option)

Adds the selected channel

WT5000

Set the waveform display.

Set the numeric display.
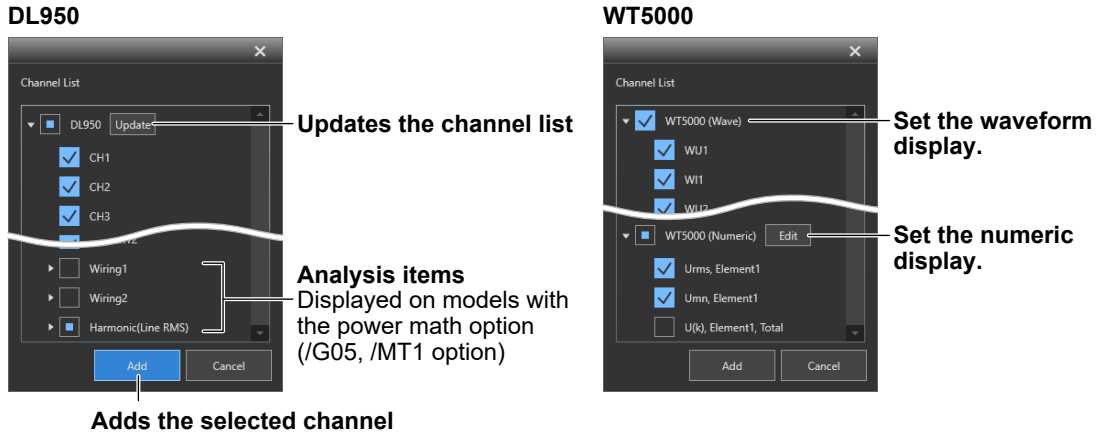
When a DL950 Is Connected

2. Click the arrow to the left of a device (instrument) name or analysis item. The list is expanded, and the channels that can be added appear.

When any of the following options is installed in the DL950, channels for analysis items of each option can be added.
- /G03 option: Real time math
- /G05 option: Power math function (including real time math function)
- /MT1 option: Motor dq analysis function (including power math function)
  When connecting a DL950 with the /MT1 option, update this software to version 23.4.1.0 or later

Analysis items vary depending on the settings. For details, see the DL950 user's manual.

Note

Updating the channel list

If you change the motor dq analysis mode, power analysis mode, or harmonic analysis mode or change the analysis item settings after connecting the DL950, click **Update**. The contents of the changed analysis items are reflected in the channel list. The changes are applied to the measurement conditions by adding the channels in steps 3 and 4.

* This updating does not affect the information of channels already added or entered in this software. Labels and other information edited with this software will not be updated to match the instrument.

Adding the Selected Channels

3. Select the check boxes of the channels you want to add.

You can select all the check boxes for the channels under a higher-level check box, located to the left of a device (instrument) name or an analysis item, by selecting the higher-level check box.

4. Click **Add** to add the channels to the list of each channel's measurement conditions.

When a WT5000 is connected

Setting the Waveform Display

2. Click the arrow to the left of **WT5000 (Wave)**. PP waveform data source channels that can be added appear.

You can add the following channels.

- WU1, WI1, WU2, WI2, WU3, WI3, WU4, WI4, WU5, WI5, WU6, WI6, WU7, WI7

If the MTR1/MTR2 option is installed on the WT, eight more channels can be added. The channels switch depending on the motor configuration setting as follows:

- WSpeed1, WTorque1, WSpeed2, WTorque2, WSpeed3, WTorque3, WSpeed4, WTorque4
- WSpeed1, WTorque1, WSpeed2, WTorque2, WAUX5, WAUX6, WAUX7, WAUX8
- WAUX1, WAUX2, WAUX3, WAUX4, WSpeed3, WTorque3, WSpeed4, WTorque4
- WAUX1, WAUX2, WAUX3, WAUX4, WAUX5, WAUX6, WAUX7, WAUX8

For details, see the WT5000 user's manual.

Proceed to step 6 under "Adding the Selected Channels" on page 3-14.

Setting the Numeric Display

2. When you click **Edit** next to **WT5000 (Numeric)**, the following window appears.
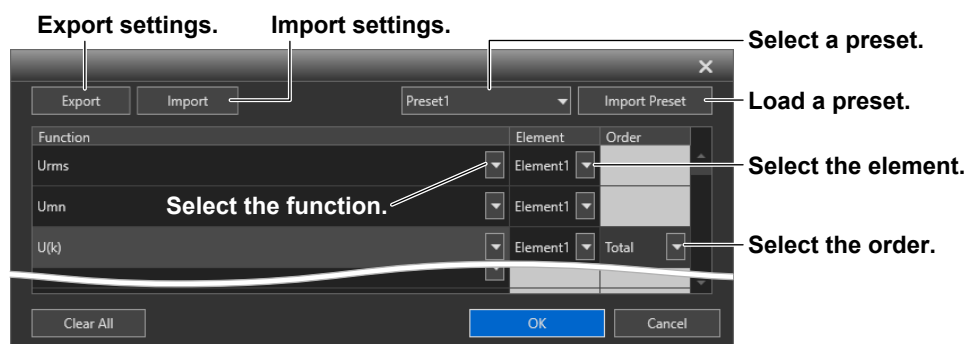
Button Name	Description
Export	Clicking this button opens a Save As dialog box. The numeric display settings can be saved to an xml file.
Import	Clicking this button opens a file open dialog box. You can load a numeric display setting file (xml file) into the PC.
Preset	From a drop-down list, you can select from Preset 1 to Preset 25. For details on each preset, see section page 3-20.
Import Preset	Clicking this button imports the contents of the preset you selected with the drop-down list.
Element	You can change the element settings.
Order	You can change the target harmonic order. Click the order display you want to change, and select the order from the drop-down list. The is blank for functions that cannot display harmonics * For details on harmonics, see the WT User's Manual.

- **Selecting and Loading a Preset**

3. From the pull-down list, select a preset from **Preset1** to **Preset25**.

For details on each preset, see section pages 3-20 to 3-23.

4. Click **Import Preset**.

5. Click **OK**. The numeric display setting window closes, and channels that can be added are displayed.

Adding the Selected Channels

6. Select the check boxes of the channels you want to add.

You can select all the check boxes for the channels under a higher-level check box, located to the left of a waveform display or numeric display or the like, by selecting the higher-level check box.

7. Click **Add** to add the channels to the list of each channel's measurement conditions.

Selecting Filter Conditions

You can select conditions to filter the list of measurement conditions of each channel.

From the drop-down list in the setup box at the upper right of the window, you can select All, Only Recording, or Group1 to Group4.

List of Measurement Conditions of Each Channel

When a channel is added, the channel information acquired from the connected instrument is listed.

Note

- Here you can set or edit the measurement conditions on the software. Measurement conditions edited here are not reflected in the connected measuring instrument.
- Measurement conditions on the instrument can be changed on the channel control panel (Section 5.6).

You can use the check boxes in the title line to collectively turn on or off the measurement conditions of the corresponding columns.

Channel number

	Record	Trace	Model	Display	Mapping	NumericMonitor	Color	Min	Max	Link	Format Type	Significant digits
	☑ 4/4			☑ 4/32	Off	☐				☑		
1	☑	CH1	DL950 10.10.123.12	☑	1 ▼	☐	🟨	-25	25	☑	Floating point ▼	5 ▼
2	☑	CH2	DL950 10.10.123.12	☑	2 ▼	☐	🟩	-25	25	☑	Floating point ▼	5 ▼

Below, the items in the table are explained in order from left-most column.

Channel number

- Click a number to select the line.
- Click ◢ in the title line of the number column to select all lines.

Recording Channel (Record)

You can select the channels to record. Select or clear the check box for each channel (trace).

Check Box	Description
ON	The channel is recorded.
OFF	The channel is not recorded.

Trace (Trace)

Label names are displayed. When you click a cell, you can edit the label name.*

* Label names edited with this software are not reflected in the connected measuring instrument.

Model (Model)

The measuring instrument name (host name, model name) of each channel is displayed.

Group1 (Group1)

You can set the channel (trace) display and mapping for each group.

Adding and Deleting Groups

You can add or delete display groups by clicking + or – in the title row.

Items	Description
+	Click this to add a display group column. Up to 4 groups can be displayed.
-	Click this to delete the group column with the largest group number.

Display (Display)

You can show or hide channels.

- You can set up to 32 channels collectively using the check box in the title row.

Check Box	Description
ON	The top 32 channels of the display group are shown.
OFF	Hides all the channels of the group

- You can select or clear the check box for each channel to show or hide it.

Mapping (Mapping)

Use the toggle switch in the title row to turn the channel mapping feature on and off.

Toggle switch	Description
ON	The display group's channel mapping is enabled. You can change the display channel assignments. You can select the channel to be assigned from each channel's drop-down list. This is available when the split style (page 4-10)) is set to Split or Tile.
OFF	The display group's channel mapping is disabled.

Numeric Monitor (Numeric Monitor)

Set whether to show or hide values on the numeric monitor.

You can select or clear the check box for each channel to show or hide it.

Waveform Color (Color)

Double-click to set the waveform color of each channel using a color palette.

Minimum (Min) and Maximum (Max)

Set the minimum and maximum values of the Y-axis of the main display. You can set them separately for each waveform.

When the Link (Link) check box (see next item) is selected, the values acquired from the connected measuring instrument are displayed. When you click a cell, you can change its value.*

> * Values changed with this software are not reflected in the connected measuring instrument. When you change a value, the Link (Link) check box is automatically unselected.

Link (Link)

You can select or clear the check box for each channel to link the minimum and maximum values of the Y-axis to those of the measuring instrument range.

If the target channel is a DL950, selecting the check box allows the DL950 target channel value to be set automatically to V/Div*10 (except logic channels).

Display Format (Format Type)

You can select the display format of the vertical-axis grid's scale values from the following options.

Display Format	Display format
Floating point	0.0, 2.5, 5.0, 7.5, 10.0
Exponent	0.0E00, 2.5E00, 5.0E00, 7.5E00, 1.0E01
Hexadecimal	0, 2, 5, 7, A

Significant digits (Significant digits)

You can set the significant digits of the following scale values from 1 to 7.

- Vertical cursor values
- Horizontal cursor values
- Waveform tooltip display (see page page 4-11).
- Computed waveform parameter values
- Cycle statistics

- History statistics
- DAQ monitor vertical cursor values
- FFT vertical cursor values
- FFT horizontal cursor values

Default value: 5

The scale value display changes depending on the display format setting as follows:

Display Format	Scale Value Display
Floating point	Number of fractional digits
Exponent	Counting the integer part as one digit, the number of significant digits is set to the digits specified by decimal place.
Hexadecimal	Displayed using the specified number of digits

Display Conditions of Logic Waveforms (Logic)

You can set the logic waveform display.

1. For logic waveform data, the bits to be displayed are shown in hexadecimal in the Logic column. When you click a value, the following window appears.

2. Set the display conditions of the logic waveform.
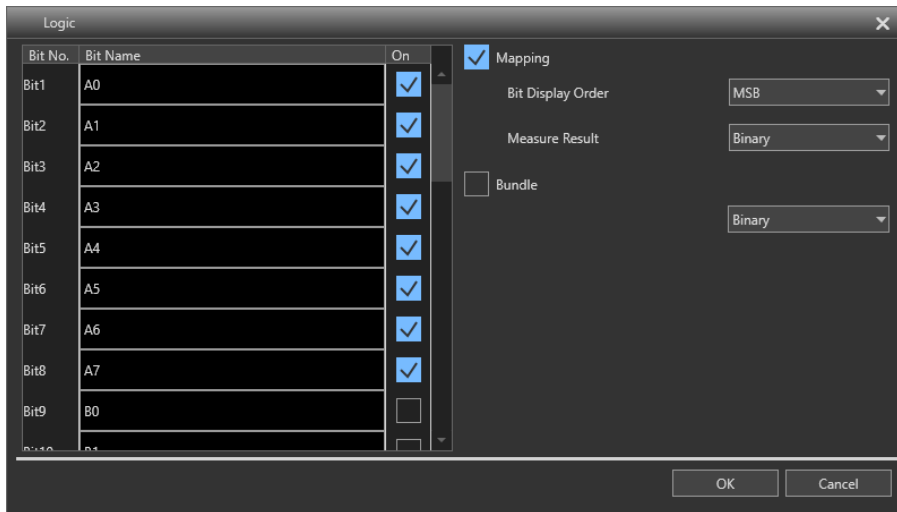
Bit Name (Bit Name)

When a bit name is assigned to the loaded logic waveform, the bit name is displayed.

On

Select the check boxes of the bit numbers you want shown. If there is no bit data in the loaded logic waveform, you will not be able to select the bit number check boxes.

Mapping

When there are bits that are hidden, select the display positions of the shown bit waveforms using the check boxes.

Check Box	Description
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).

• **Bit Order (Bit Display Order)**

You can select the bit order of logic probes.

* The order and displayed numbers vary depending on the model. For details, see the measuring instrument's user's manual.

Bit Order	Description
MSB	The most significant bit is displayed first (bit 7-> bit 0).
LSB	The least significant bit is displayed first (bit 0-> bit 7).

• **Cursor Data Display Format (Measure Result)**

Select whether to display measured values in binary or hexadecimal.

Display Format	Description
Binary	Binary format
Hex	Hexadecimal format

Bundle

You can set Bundle to ON or OFF.

Check Box	Description
ON	If there are bits that are not shown, they are shown as "–" in binary. In hexadecimal, the measured values are displayed as though they are not present. Binary: Binary format Hex: Hexadecimal format
OFF	Logic waveforms are not displayed in bundles.

Vertical Scale Unit (Unit)

You can set the vertical scale unit. Click the Unit box of the measuring channel you want to set to display the text cursor or to highlight the existing unit. Then, type the unit. Set the unit using up to four characters.

Explanation

Setting Measurement Conditions Collectively

You can set several measurement conditions of a channel collectively by dragging over the list to specify a range.

* The following buttons do not change the Trace, Model, and Link settings.

Automatically Setting the Selected Range of Settings

Affected settings: Waveform color, minimum, maximum

Click **Auto** to automatically set the selected minimum, maximum, and waveform color settings.

Inverting the Selected Range of Settings

Affected settings: Record, display, waveform color

Click **Invert** to invert the selected ON/OFF and waveform color settings.

Aligning the Selected Range of Settings to the Contents of the First Row

Affected settings: Display, minimum, maximum, display format, decimal place, unit

Click **Copy** to copy the contents of the selected range in the first row to the other rows.

Resetting the Selected Range of Settings to Default

Affected settings: Waveform color, display format

Click **Default** to reset the settings to default.

Setting the Numeric Display (when a WT5000 is connected)

Contents of Each Preset

- For details on the measurement items, see the WT5000 User's Manual.
- The element numbers (1, 2, 3, 4, 5, 6, 7, ΣA, ΣB, ΣC) indicated in the measurement items can be changed on the setting menu.

Preset 1 to Preset 8

Preset 1	Preset 2	Preset 3	Preset 4	Preset 5	Preset 6	Preset 7	Preset 8
Udc1	Udc4	Udc1	Udc4	Udc1	Udc4	Urms1	Urms2
Idc1	Idc4	Idc1	Idc4	Idc1	Idc4	Umn1	Umn2
P1	P4	P1	P4	P1	P4	Udc1	Udc2
UrmsΣA	UrmsΣA	UrmsΣA	UrmsΣA	S1	S4	Urmn1	Urmn2
IrmsΣA	IrmsΣA	UmnΣA	UmnΣA	UrmsΣA	UrmsΣA	Uac1	Uac2
PΣA	PΣA	UfndΣA	UfndΣA	UmnΣA	UmnΣA	Ufnd1	Ufnd2
Urms2	Urms1	IrmsΣA	IrmsΣA	UfndΣA	UfndΣA	Uthd1	Uthd2
Irms2	Irms1	ImnΣA	ImnΣA	IrmsΣA	IrmsΣA	Irms1	Irms2
P2	P1	IfndΣA	IfndΣA	PΣA	PΣA	Imn1	Imn2
Urms3	Urms2	PΣA	PΣA	SΣA	SΣA	Idc1	Idc2
Irms3	Irms2	λΣA	λΣA	Urms2	Urms1	Irmn1	Irmn2
P3	P2	λfndΣA	λfndΣA	Umn2	Umn1	Iac1	Iac2
Urms4	Urms3	Urms2	Urms1	Ufnd2	Ufnd1	Ithd1	Ithd2
Irms4	Irms3	Umn2	Umn1	Irms2	Irms1	P1	P2
P4	P3	Ufnd2	Ufnd1	Urms3	Urms2	S1	S2
η1	η1	Irms2	Irms1	Umn3	Umn2	Q1	Q2
FreqU2	FreqU1	Imn2	Imn1	Ufnd3	Ufnd2	λ1	λ2
		Ifnd2	Ifnd1	Irms3	Irms2	φ1	φ2
		Urms3	Urms2	Urms4	Urms3	FreqU1	FreqU2
		Umn3	Umn2	Umn4	Umn3	FreqI1	FreqI2
		Ufnd3	Ufnd2	Ufnd4	Ufnd3	U+peak1	U+peak2
		Irms3	Irms2	Irms4	Irms3	U-peak1	U-peak2
		Imn3	Imn2	η1	η1	I+peak1	I+peak2
		Ifnd3	Ifnd2	η2	η2	I-peak1	I-peak2
		Urms4	Urms3	η3	η3	CfU1	CfU2
		Umn4	Umn3	FreqU2	FreqU1	CfI1	CfI2
		Ufnd4	Ufnd3	Speed	Speed		
		Irms4	Irms3	Torque	Torque		
		Imn4	Imn3	Pm	Pm		
		Ifnd4	Ifnd3	Slip	Slip		
		η1	η1	SyncSp	SyncSp		
		η2	η2				
		FreqU2	FreqU1				

Preset 9 to Preset 16

Preset 9	Preset 10	Preset 11	Preset 12	Preset 13	Preset 14	Preset 15	Preset 16
Urms3	Urms4	Urms5	Urms6	Urms7	UrmsΣA	UrmsΣB	UrmsΣC
Umn3	Umn4	Umn5	Umn6	Umn7	UmnΣA	UmnΣB	UmnΣC
Udc3	Udc4	Udc5	Udc6	Udc7	UdcΣA	UdcΣB	UdcΣC
Urmn3	Urmn4	Urmn5	Urmn6	Urmn7	UrmnΣA	UrmnΣB	UrmnΣC
Uac3	Uac4	Uac5	Uac6	Uac7	UacΣA	UacΣB	UacΣC
Ufnd3	Ufnd4	Ufnd5	Ufnd6	Ufnd7	UfndΣA	UfndΣB	UfndΣC
Uthd3	Uthd4	Uthd5	Uthd6	Uthd7	UthdΣA	UthdΣB	UthdΣC
Irms3	Irms4	Irms5	Irms6	Irms7	IrmsΣA	IrmsΣB	IrmsΣC
Imn3	Imn4	Imn5	Imn6	Imn7	ImnΣA	ImnΣB	ImnΣC
Idc3	Idc4	Idc5	Idc6	Idc7	IdcΣA	IdcΣB	IdcΣC
Irmn3	Irmn4	Irmn5	Irmn6	Irmn7	IrmnΣA	IrmnΣB	IrmnΣC
Iac3	Iac4	Iac5	Iac6	Iac7	IacΣA	IacΣB	IacΣC
Ithd3	Ithd4	Ithd5	Ithd6	Ithd7	IthdΣA	IthdΣB	IthdΣC
P3	P4	P5	P6	P7	PΣA	PΣB	PΣC
S3	S4	S5	S6	S7	SΣA	SΣB	SΣC
Q3	Q4	Q5	Q6	Q7	QΣA	QΣB	QΣC
λ3	λ4	λ5	λ6	λ7	λΣA	λΣB	λΣC
φ3	φ4	φ5	φ6	φ7	φΣA	φΣB	φΣC
FreqU3	FreqU4	FreqU5	FreqU6	FreqU7			
FreqI3	FreqI4	FreqI5	FreqI6	FreqI7			
U+peak3	U+peak4	U+peak5	U+peak6	U+peak7			
U-peak3	U-peak4	U-peak5	U-peak6	U-peak7			
I+peak3	I+peak4	I+peak5	I+peak6	I+peak7			
I-peak3	I-peak4	I-peak5	I-peak6	I-peak7			
CfU3	CfU4	CfU5	CfU6	CfU7			
CfI3	CfI4	CfI5	CfI6	CfI7			

Preset 17 to Preset 23

Preset 17	Preset 18	Preset 19	Preset 20	Preset 21	Preset 22	Preset 23
P1	P5	P1	F1	Uthd1	Uthd2	Uthd3
WP1	WP5	P2	F2	U1(dc)	U2(dc)	U3(dc)
Irms1	Irms5	P3	F3	U1(1)	U2(1)	U3(1)
q1	q5	P4	F4	U1(2)	U2(2)	U3(2)
P2	p6	P5	F5	U1(3)	U2(3)	U3(3)
WP2	WP6	P6	F6	U1(4)	U2(4)	U3(4)
Irms2	Irms6	P7	F7	U1(5)	U2(5)	U3(5)
q2	q6	PΣA	F8	U1(6)	U2(6)	U3(6)
P3	P7	η1	F9	U1(7)	U2(7)	U3(7)
WP3	WP7	η2	F10	U1(8)	U2(8)	U3(8)
Irms3	Irms7	η3	F11	U1(9)	U2(9)	U3(9)
q3	q7	η4	F12	U1(10)	U2(10)	U3(10)
P4	PΣA		F13	U1(11)	U2(11)	U3(11)
WP4	WPΣA		F14	U1(12)	U2(12)	U3(12)
Irms4	IrmsΣA		F15	U1(13)	U2(13)	U3(13)
q4	qΣA		F16	U1(14)	U2(14)	U3(14)
				Ithd1	Ithd2	Ithd3
				I1(dc)	I2(dc)	I3(dc)
				I1(1)	I2(1)	I3(1)
				I1(2)	I2(2)	I3(2)
				I1(3)	I2(3)	I3(3)
				I1(4)	I2(4)	I3(4)
				I1(5)	I2(5)	I3(5)
				I1(6)	I2(6)	I3(6)
				I1(7)	I2(7)	I3(7)
				I1(8)	I2(8)	I3(8)
				I1(9)	I2(9)	I3(9)
				I1(10)	I2(10)	I3(10)
				I1(11)	I2(11)	I3(11)
				I1(12)	I2(12)	I3(12)
				I1(13)	I2(13)	I3(13)
				I1(14)	I2(14)	I3(14)

Preset 24, Preset 25

These are presets for harmonic measurements complying with IEC 61000-4-7 Annex B (2k-9kHz).

Preset 24	Preset 25*	
U1(Total)	U1(2100)	U1(6100)
I1(Total)	I1(2100)	I1(6100)
P1(Total)	U1(2300)	U1(6300)
S1(Total)	I1(2300)	I1(6300)
Q1(Total)	U1(2500)	U1(6500)
λ1(Total)	I1(2500)	I1(6500)
φ1(Total)	U1(2700)	U1(6700)
Uthd1	I1(2700)	I1(6700)
Ithd1	U1(2900)	U1(6900)
Pthd1	I1(2900)	I1(6900)
THC1	U1(3100)	U1(7100)
FreqPLL1(fPLL1)	I1(3100)	I1(7100)
	U1(3300)	U1(7300)
	I1(3300)	I1(7300)
	U1(3500)	U1(7500)
	I1(3500)	I1(7500)
	U1(3700)	U1(7700)
	I1(3700)	I1(7700)
	U1(3900)	U1(7900)
	I1(3900)	I1(7900)
	U1(4100)	U1(8100)
	I1(4100)	I1(8100)
	U1(4300)	U1(8300)
	I1(4300)	I1(8300)
	U1(4500)	U1(8500)
	I1(4500)	I1(8500)
	U1(4700)	U1(8700)
	I1(4700)	I1(8700)
	U1(4900)	U1(8900)
	I1(4900)	I1(8900)
	U1(5100)	FreqPLL1(fPLL1)
	I1(5100)	
	U1(5300)	
	I1(5300)	
	U1(5500)	
	I1(5500)	
	U1(5700)	
	I1(5700)	
	U1(5900)	
	I1(5900)	

* U(f): 2100 to 9900 Hz (the input range is 2000 to 10000 Hz)
   I(f): 2100 to 9900 Hz (the input range is 2000 to 10000 Hz)

3.6 Setting the Recording Conditions

When you select the data acquisition feature, set the display and recording conditions of acquisition data.

Procedure

DAQ Setting Window

This is the third wizard window that appears when you select DAQ (data acquisition feature) from the launcher.

    * You can also use ribbon commands to specify the various settings in the simple wizard (smart setup).

Returns to the Channel Setting window

Applies the settings and opens the window
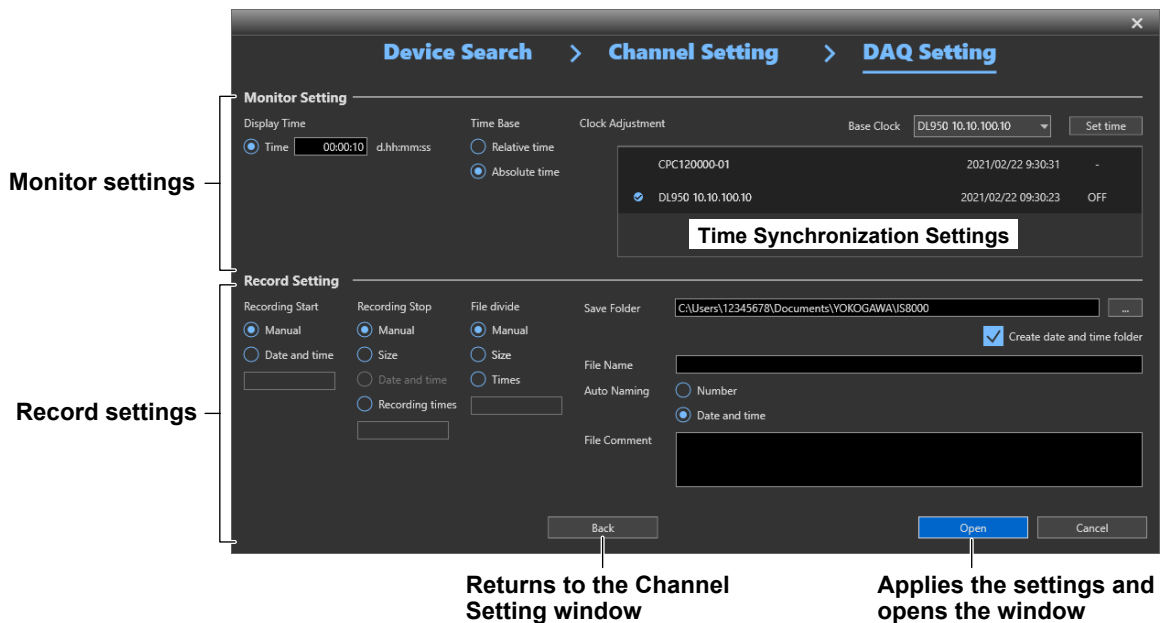
Monitor Setting

Set the display conditions.

Display Time

You can specify the display time with time.

Time: Enter the time in the d.hh:mm:ss format. The maximum time setting is 1 day.

Time Base (Time Base)

Item	Description
Relative time (Relative time)	Relative time from the start of measurement. Displays all waveforms by aligning the start position. (Select this value when multiple units are connected and the times of each measuring instrument do not match.)
Absolute time (Absolute time)	Measured time (absolute time). Waveforms are displayed using the times of each measuring instrument. Select this value when the times of measuring instruments are synchronized.

Clock Adjustment (Clock Adjustment)

Base Clock (Base Clock)

When the time base is set to **Absolute time**, select which device's clock will be used as the reference. Select the PC or any of the connected devices.

Set Time (Set time)

Specify the time of the device (check mark) that is to become the time reference on devices whose time synchronization is disabled. An error of about ±1 s will occur.

Time Synchronization Settings

The following information is displayed in the list of connected devices on the right side.

*   A check mark next to the reference device
*   Measuring instrument time
*   Time synchronization state

Display	State
OFF	No time synchronization
Unlock	Time not synchronized
Lock	Time synchronization being established
Stable	Time synchronized
Master	Master time synchronization device

Record Setting

Set the recording conditions.

Recording Start (Recording Start)

You can set the recording start conditions manually or by date.

*   **Manual**

    Recording starts when, on the feature ribbon, you select **Monitor**, the **Control** tab, and click **Record Start** in the DAQ group.

*   **Date and time**

    Enter the recording start time in the yyyy/MM/dd HH:mm format.

Recording Stop

Select the recording stop condition from the following four options.

*   **Manual**

    Recording starts when, on the feature ribbon, you select **Monitor**, the **Control** tab, and click **Record Stop** in the DAQ group or **Monitor Stop**.

*   **Size**

    You can enter the size in the following ranges.

    1 MB to 600 GB (1 G Ethernet/USB connection or 10 G Ethernet (HiSLIP) connection)

    > *   Because measurement conditions and other supplementary information are estimated in the calculation, the actual size will be smaller than the specified size.

*   **Date and time**

    Enter the recording stop time in the yyyy/MM/dd HH:mm format.

    > *   This is available only when Recording Start is set to **Date and Time**.

*   **Recording time**

    Enter the recording time in the d.hh:mm:ss format. The maximum record length is 7 days.

File Division (File Divide)

Select the file division condition from the following three options.

- **Manual**

  The recording file is divided when, on the feature ribbon, you select **Monitor**, the **Control** tab, and click **File Divide** in the DAQ group.

- **Size**

  You can enter the size in the following ranges.

  1 MB to 10 GB

  This is available when Recording Stop is set to **Manual** or **Size**.
  Specify the size so that the record file time is at least 10 s. If the record file time is less than 10 s, the file will not be divided even when the size is specified.

- **Times**

  Enter the time when the file is to be divided in the d.hh:mm:ss format.

  This is available when Recording Stop is set to **Manual** or when both Recording Start and Recording Stop are set to **Date and time**. The minimum division time is 10 s.

Save Folder

Click **[...]** to specify the folder to which data is to be recorded.

Create Date and Time Folder Check Box

Check Box	Description
ON	Date folders are created in the save folder, and recorded data is saved in those folders. The folder name is the date followed by a sequence number. Example: yyyymmdd_nnn, nnn: serial number between 000 and 999
OFF	Recorded data is saved in the save folder.

File name (File Name)

Set the file name. A serial number specified by auto naming (next section) or a timestamp is appended to the file name specified here.

Auto Naming

You can select Number or Date and time.

When Number Is Selected

A sequence number is appended to the file name that you specify.

Test_0000-00.mf4

— **Sequence number when files are divided (00 to 99)**

Sequence number (0000 to 9999)

Character string
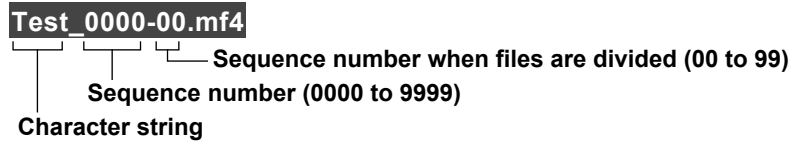
When Date and Time Is Selected

A timestamp (in ms) at the time of recording is added to the file name that you specify.

Test20210118_121530_100-00.mf4 **(2021/01/18 12:15:30.100)**

— **Sequence number when files are divided (00 to 99)**

ms

Day

Second

Month

Minute

Year

Hour

Character string
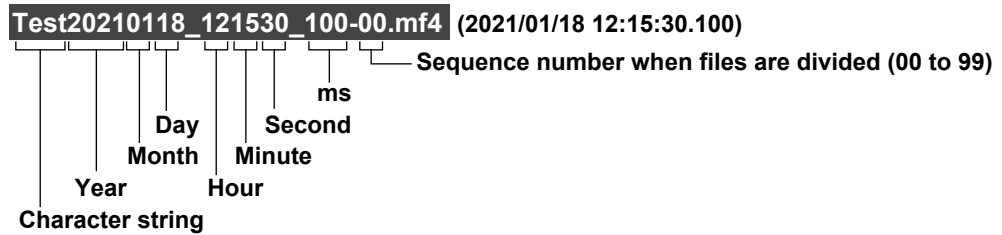
File Comment (File Comment)

Enter any necessary comments using up to 250 characters.

3.7   Window Configuration and Basic Operation

Start Window

If you configured the software to not show the launcher at startup, the following window appears when you start the software.
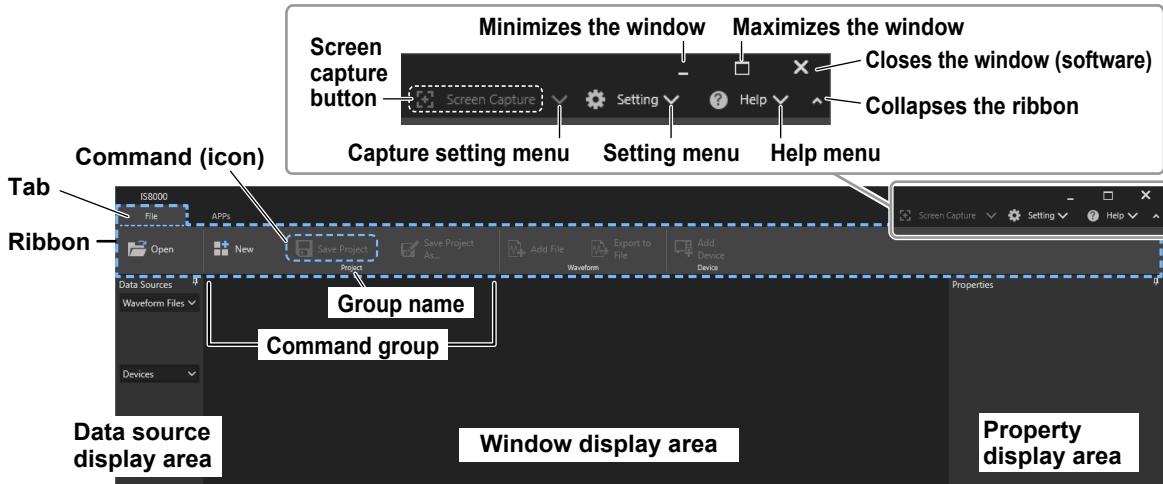
Data Source Display Area

- The names of the loaded files are displayed under **Waveform Files**.
- The names of the connected devices (hosts) are displayed under **Devices**.

Window Display Area

Tab windows and panels are displayed according to the selected feature or the contents of the loaded file.

* Feature ribbons are added in sync with tab windows. The tabs of tab windows and tabs of feature ribbons show the feature names.

Property Display Area

Information such as the settings of the selected panel is displayed.

- **Example of a Window Shown When a File Is Loaded (Waveform Analysis)**
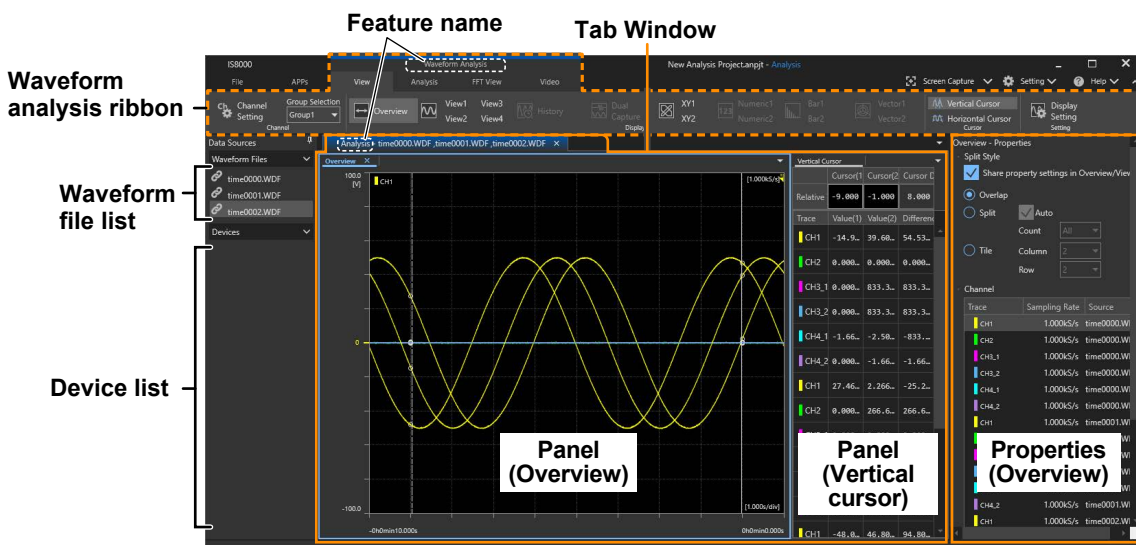
Ribbons

A ribbon consists of tabs, command groups, and commands (icons).

- Click a tab to switch the ribbon.
- A command group contains commands of a related feature.
- Commands are shown in the divided groups. Group names are shown at the bottom of the ribbon.
    - * Commands that cannot be selected appear dimmed.

File and APPs are ribbon tabs that are shown at all times. When you open a file or select a feature, the feature ribbon (page 3-30) is added.

File Tab
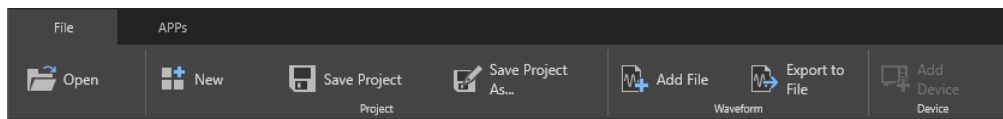
Group/Command	Description
Open	A window opens for opening the file window. ▶ section 3.3
Project	
New	A launcher appears. ▶ section 3.2 Configures a new project using a simple wizard format.
Save Project	Saves the project to a file.
Save Project As	Saves the project to a file with a different name.
Waveform	
Add File	Opens a file open dialog box. Select an additional waveform file to be displayed with an already displayed waveform file on the same axis.
Export to File	Exports the displayed waveform data to a file.
Device	
Add Device	A Device Search window opens. ▶ section 3.4 Select another measuring instrument to be displayed with the data of a measuring instrument already connected through DAQ on the same axis.

For instructions on how to use each command, see section 3.8.

APPs Tab
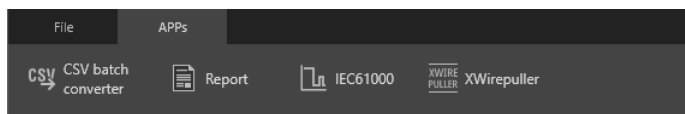
Command	Description
CSV batch converter	Starts the CSV batch converter application. ▶ section 3.9
Report	Displays a report generation window. ▶ chapter 8
IEC 61000	Displays the IEC launcher of the Harmonic/Flicker Software. ▶ User's Manual (IM IS8000-63EN)
XWirepuller	Starts the XWirepuller application. XWirepuller is a YOKOGAWA free software application that can be used to remotely control measuring instruments from a PC via Ethernet, USB, or GP-IB.

Feature Ribbons

A feature ribbon is displayed along with a tab window according to the loaded file or selected feature. The following feature ribbons are available. The feature name is displayed at the top of the ribbon tab. A blue band is displayed above the feature name when the ribbon can be used.

Waveform Analysis (Waveform Analysis)
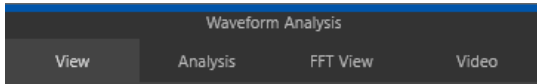
This is a ribbon for offline measurement. Click a tab to switch the ribbon.

For details on ribbon commands and how to use them, see chapter 4.

Tab	Description
View	Loads and displays measurement data files.
Analysis	Analyzes measurement data files.
FFT View	Performs FFT computation and analysis.
Video	Measured data and video data are played in sync. (High-speed Camera Synchronization Feature, option)

Monitor
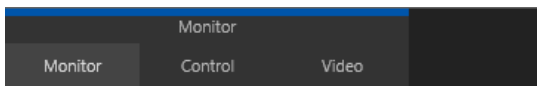
This is a ribbon for online measurement. Click a tab to switch the ribbon.

For details on ribbon commands and how to use them, see chapter 5.

Tab	Description
Monitor	Displays measured data of connected measuring instruments.
Control	Configures connected measuring instruments and executes monitoring (measurement) and recording (data acquisition).
Video	This feature synchronizes a high-speed camera and a DL950 and records waveforms. (High-speed Camera Synchronization Feature, option)

Remote Control (Remote Control)

This is a ribbon for remotely controlling measuring instruments. The following tabs are available.

For details on ribbon commands and how to use them, see chapter 6.

Tab	Description
Tool	Displays a tool for retrieving measured data as files through remote control and a tool for setting the update rate.

File Manager

This is a ribbon for file management. Files can be transferred between the PC and connected instruments. The following tabs are available.

For details on ribbon commands and how to use them, see chapter 7.

Tab	Description
File Manager	Displays tables of files for both the connected instruments and the PC. You can transfer files, create folders, rename files and folders, and so on.

Screen Capture

An image of the active panel shown in a tab window can be saved to the Clipboard or an image file.

Screen Capture

This button executes a screen capture.

Capture Setting Menu

You can select the following items from the drop-down list.

Item	Description
Capture Settings	Set the screen capture data output destination and file type.

For details, see section 3.10

Setting Menu

You can select the following items from the drop-down list.

Item	Description
Language	You can set the language. Select English, Japanese, or Chinese.
Theme	You can set the window tone. Select dark or light.
Layout	You can set the panel layout in the tab window.
• Initialization	You can initialize the panel layout in the tab window.
• Initial setting	You can apply the settings of another analysis project file (.anpjt) to display another file in the same layout.
Show the launcher at startup	You can set whether to show the launcher at start up. To not show the launcher the next time you start the software, clear the check box shown to the left of the command.
Generate cache files	Cache files can be generated and MDF files can be loaded quickly.
Confirm saving to Project file when finished	You can set whether to confirm saving to a project file when the software is closed.

For details, see section 3.11

Help Menu

You can select the following items from the drop-down list.

Item	Description
About	Displays the version of the software. ▶ section 9.4
License	Displays license information such as options and expiration date. ▶ section 9.5
Manual	You can view the PDF data of the manual for this software. ▶ section 9.3

Data Source Display Area

Displays a table of waveform files in the top row and a table of devices (connected devices) in the bottom row.

- When you drop a waveform file in the data source display area, the file is added to the list of waveform files, and you will be able to display the waveform.
- You can click the pin-on-top icon 📌 or ⊟ to minimize (automatically hide) or maximize the display area.
- If you select a file or connected device and click [**...**] shown on the right, the following drop-down list appears.

Waveform Files

A list of loaded files is displayed. Multiple sets of waveform data can be displayed on the same axis in a single tab window.
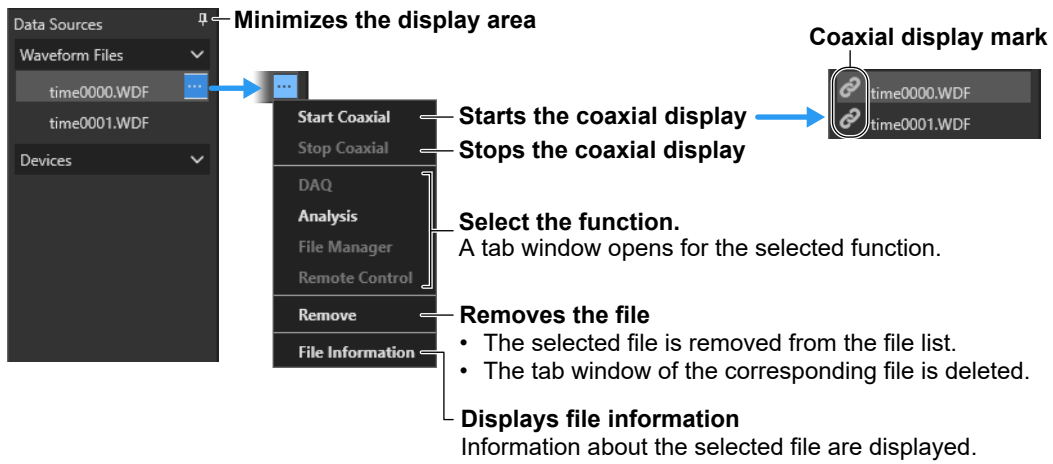
File Information

You can view the information about the file displayed in the tab window.

- **Display example**
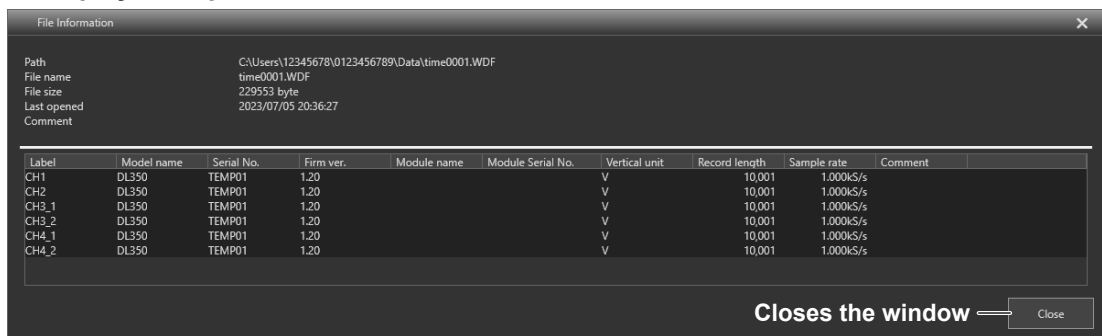
Devices

A list of connected devices (measuring instruments) is displayed. Data from multiple connected devices can be displayed synchronized in a single tab window.

Minimizes the display area

Sync mark

Starts the synchronized display

Stops the synchronized display

Select the function.
A tab window opens for the selected function.

Disconnects from the device
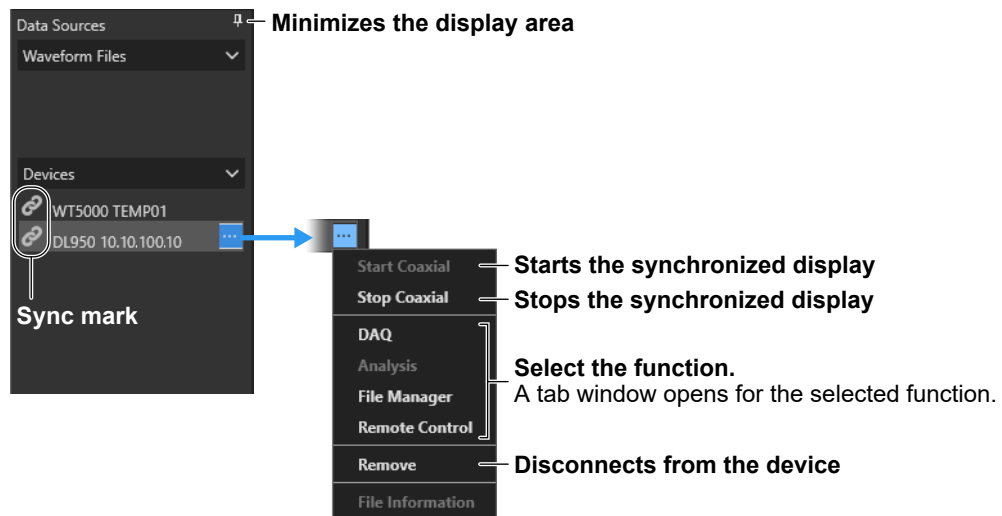
Window Display Area

When you open a file or select a feature, a tab window is displayed. A tab window consists of multiple panels.

Example displaying three files on the same axis in a single tab window
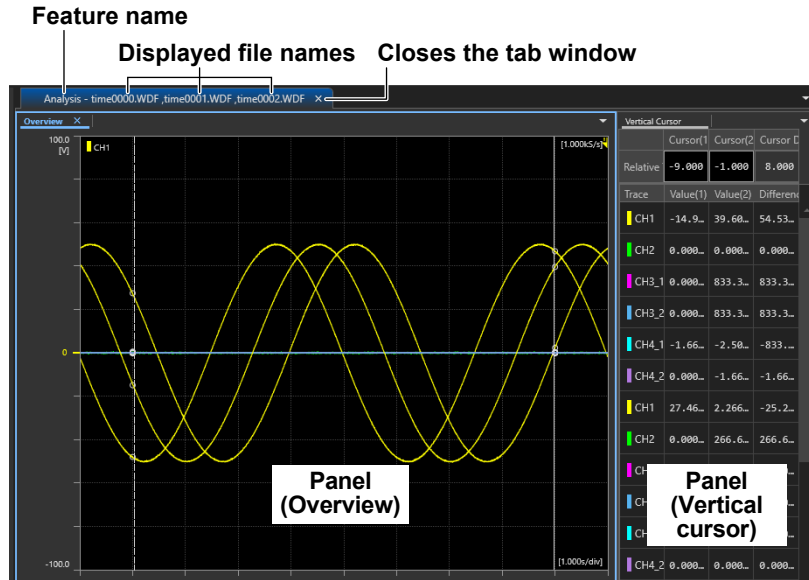
Tab Window

The following feature tab windows are displayed.

Feature Name	Description
DAQ	A tab window that appears when you select the data acquisition (DAQ) feature.
Analysis	A tab window that appears when you select the offline analysis feature.
File Manager	A tab window that appears when you select the file management feature.
Remote Control	A tab window that appears when you select the remote control feature.
DAQ (WT)	A tab window that appears when you select the easy online DAQ measurement feature for WT.
DAQ (IEC 2k-9kHz)	A tab window that appears when you select harmonic measurements complying with IEC 61000-4-7 Annex B (2k-9kHz).

Tab Window Names
Display format: (feature name) - (file name or host name)

Adding a Tab Window
Select a file or measuring instrument in the data source display area, and select a feature from the drop-down list.

Deleting a Tab Window
Click [×] next to the tab window name, or select the file or device from the waveform file or device list and select **Remove**.

Selecting (Activating) a Tab Window You Want to Use
When a tab window is activated, the background color of the tab turns blue.
When multiple tab windows are displayed overlapped in the window display area, you can click the tab of a tab window to activate the window (bring the window to the front).

Displaying a Tab Window in a New Window

If multiple tab windows are open in the window display area, you can select and display a tab window in a new window.

1. Select a tab in the tab window, and drag it to the desktop.
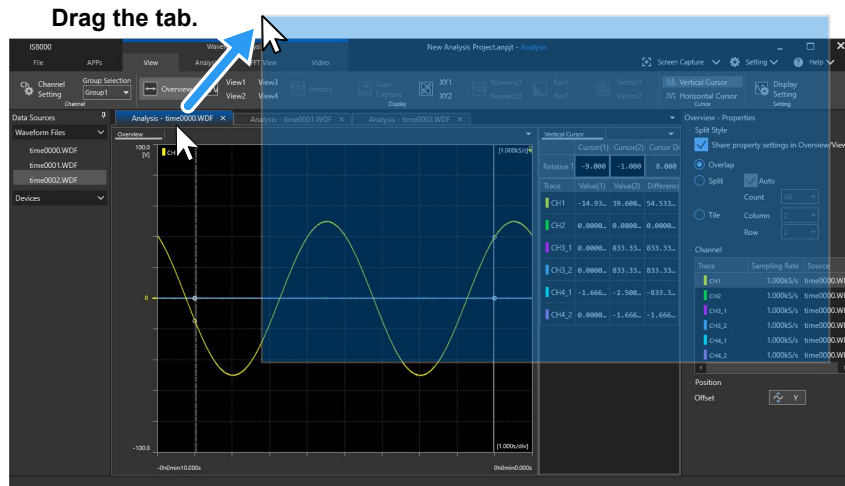
2. When a new window is displayed in light blue, and drop it. The selected tab window is displayed in a new window.
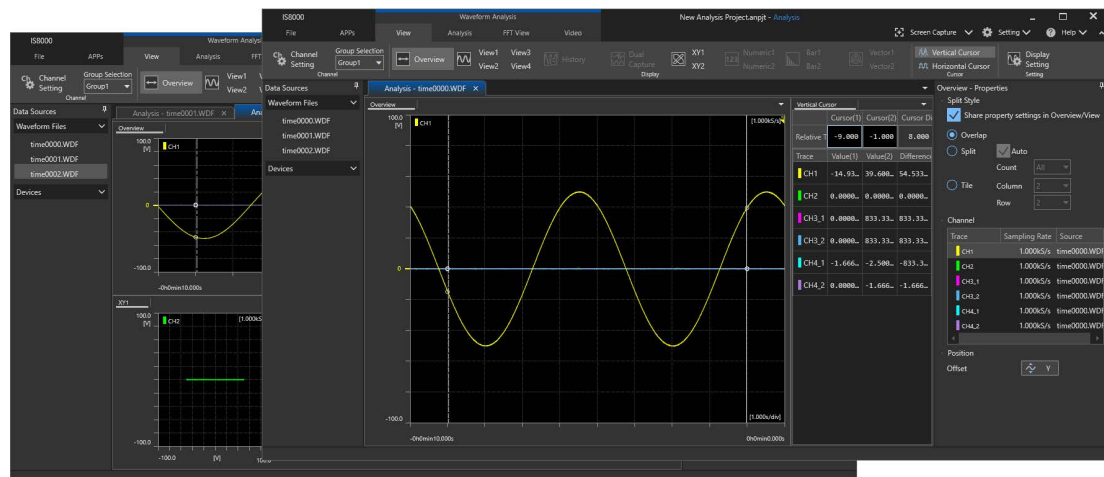
Panels

When you select a command (icon) of a ribbon, a panel for the selected item appears in the tab window.

Showing or Hiding a Panel

Click the command (icon) you want to show or hide.

Selecting (Activating) a Panel You Want to Use

When you click a panel, the panel was activated, and a blue frame is displayed.

Hiding a Panel

Click [×] next to the panel name.

Changing the Display Position of a Panel

You can change the display position of a panel within the tab window.

1. Dragging a panel name causes arrows to appear in the movable areas (top, bottom, left, right, center).

Drag the panel name display area.
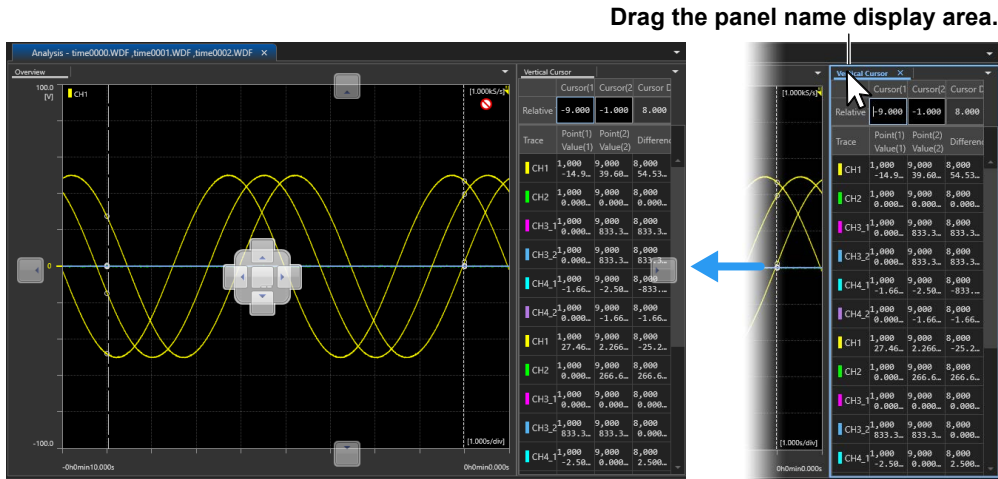
2. When you drag on top of one of these arrows, the placeable area is displayed in light blue.
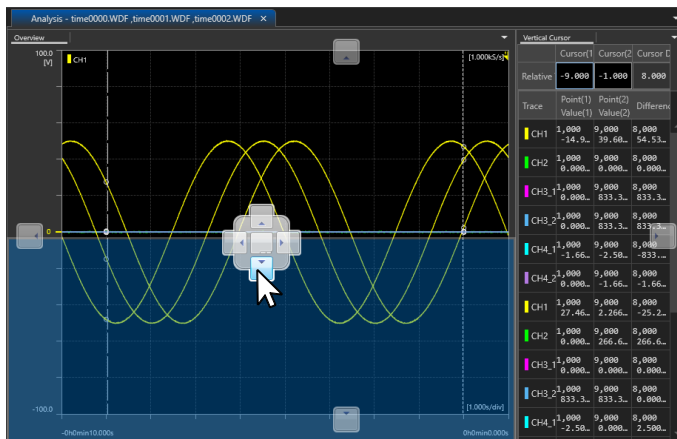
3. When you drop the panel name in such an area, the panel position changes. This causes the layout of other panels in the tab window to be adjusted.
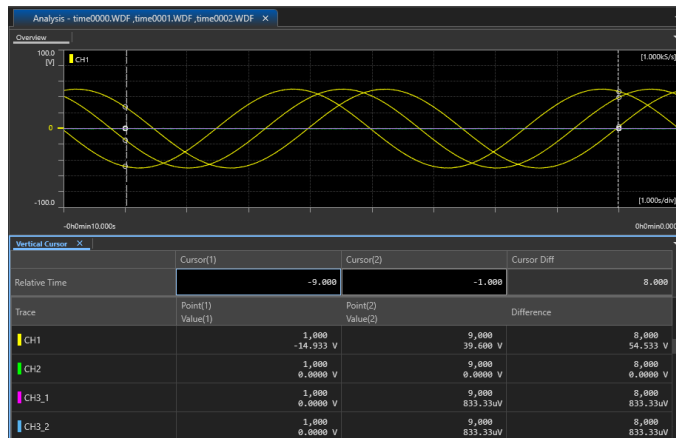
Displaying Multiple Panels on Top of Each Other

You can display multiple panels on top of each other in a tab window. You can select the panel that is displayed in front by clicking the panel name tab.

1. Drag the panel name of the panel you want to display on top of another panel to the panel name display area of the other panel. The area where the panel can be moved to is displayed in light blue.

Drag the panel name display area.
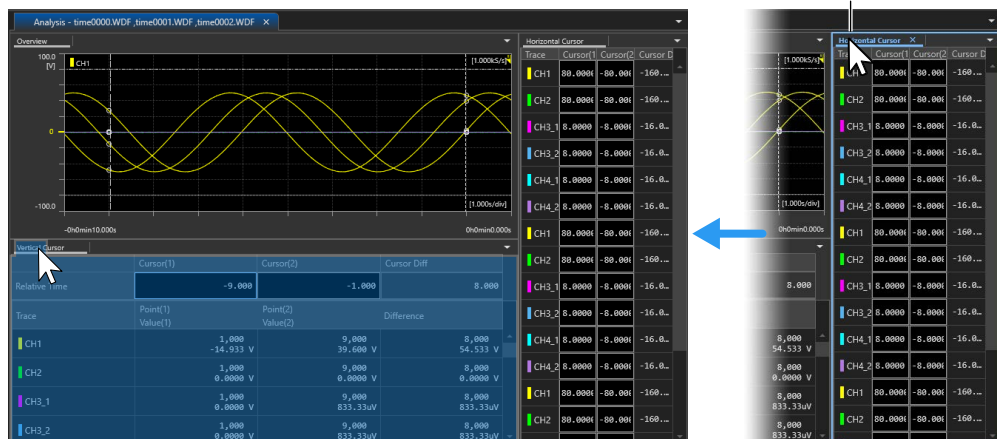
2. When you drop the panel name in such an area, the panel is displayed on top of the other panel. The panel names of the panels that are displayed on top of each other are shown in tabs. This causes the layout of other panels in the tab window to be adjusted.
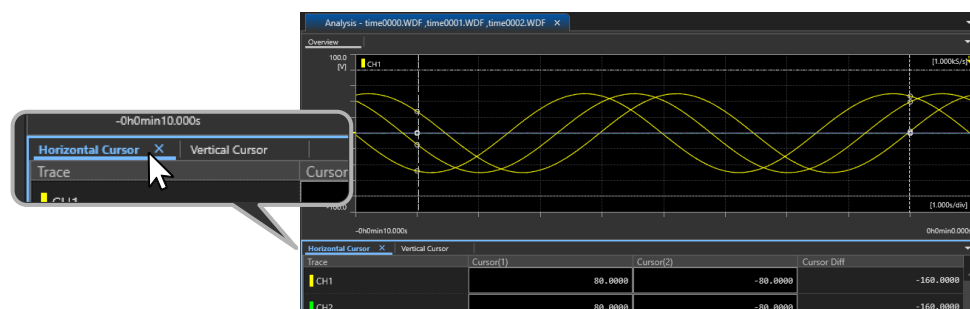
Property Display Area

- When you select a displayed panel, information (such as settings) related to the panel part displayed. The displayed information varies depending on the selected panel. For details, see chapters 4 to 7.

- You can click the pin-on-top icon or to minimize (automatically hide) or maximize the display area.

Window Display Size

You can change the size of a window as you like by dragging the window frame. The tab window and panel display area change according to the size of the entire window.

> *Note*
>
> Various waveform display information and panel positions can be saved as a project file. After you save a project file, the next time you open this file, the display conditions will be restored to what they were when the software was last closed.

3.8　File Operation

This section explains the following file operations by command groups of the File tab.
- File Open (Open)
- Project File (Project)
- Waveform File (Waveform)
- Add Device (Device)
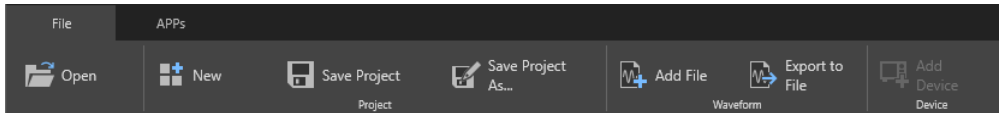
Procedure

File Open (Open)

Select a file you want to analyze offline.

1.　Click **Open**. A window opens for opening the file window.

2.　Select a file you want to display or a project file. ► section 3.3

　　An Analysis-(file name) tab window opens in the displayed window display area.

Project File (Project)

- Configures a new project using a simple wizard format.
- Saves the project to a file with a different name.
- Saves an existing project.

Creating a New Project File

1.　Select **New**. A launcher appears.

2.　Select the project content (feature). You can select the following features.

Feature	Description
File Open	Opens a file or project file in a new window.
DAQ	Select this to connect to an instrument and acquire data with the IS8000.
Remote Control	Select this to remotely control an instrument.
File Manager	Select this to transfer data between an instrument and the PC.
DAQ (WT)	Select this to connect to only the WT5000 and acquire data with the IS8000.
DAQ (IEC 2k-9kHz)	Select this to connect only to the WT5000 and acquire harmonic measurements complying with IEC 61000-4-7 Annex B (2k-9kHz) with the IS8000.

Opening the File in a New Window

3.　Select **File Open**. A window opens for opening the file window.

4.　Select a file you want to display or a project file. ► section 3.3

　　An Analysis-(file name) tab window opens in a new separate window.

Creating a New Project File

3. Refer to section 3.4, and select and connect to the target device of the project.

4. If you selected DAQ in step 2, click **Next**, set the measurement conditions (see section 3.5) and recording conditions (see section 3.6), and click **Open**.

If you selected Remote Control in step 2, FileManager, DAQ (WT),or DAQ (IEC 2k-9kHz), click **Open**.

A tab window opens for the selected project.

Saving a Project File with a Separate Name

You can assign a file name to the new project you created and save it.

5. Click **Save Project As**. A Save As dialog box appears.

6. Enter the file name and the save destination, and click **Save**. The file type and extension are as follows:

File Type	Extension
IS8000 measurement project	.mepjt
IS8000 analysis project	.anpjt

Saving a Project File

1. If you open an existing project file and want to change the conditions and save it, click **Save Project**.

* **Save Project** is valid only when an existing project file is open.

Note

Opening a File Using the Settings of Another Analysis Project File
You can open a waveform file using the settings of another analysis project file (.anpjt) saved in the past. This is useful when you want to open several files using the same settings.
For the procedure, see section 3.11.

Waveform File (Waveform)

- Loading and adding a file (coaxial display)
- Exporting a file

Loading and Adding a File (coaxial display)

1. Click **Add File**. A window opens for opening the file window. ► section 3.3

2. Select the waveform file you want to additionally display, and click **Open**. ► section 3.3

The waveform of the selected file is displayed on the same axis as the displayed waveform. The file name is also added to the tab window name.

Exporting a File

1. Click **Export to File**. The following window appears.

Example: Saving WT5000 harmonic data in waveform file (*.csv) format
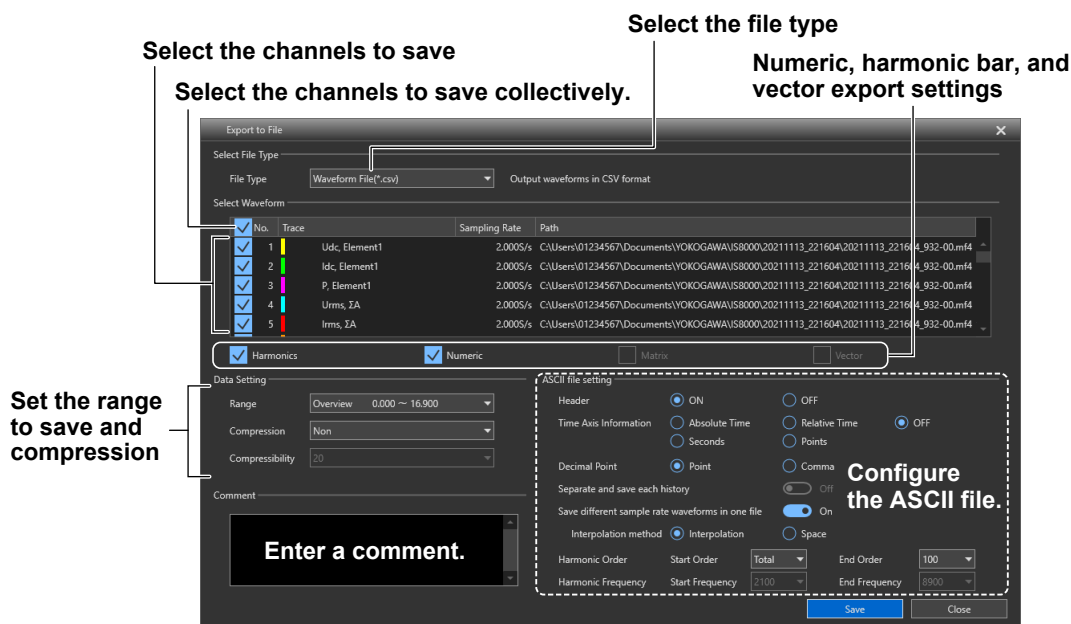
2. Specify the save file type, and enter the necessary settings. You can select decimation and the saved channels when saving data.

File Type	Description
• Waveform file (*.mf4)	The open waveform file is saved in MF4 format.
• Waveform file (*.csv) • Waveform file (*.csv) with BOM	The open waveform file is saved in CSV format.
• Waveform file (*.csz) • Waveform file (*.csz) with BOM	The open waveform file is saved in zipped CSV format.
• Measure result (*.csv) • Measure result (*.csv) with BOM	Available only when saving automated measurement values of waveform parameters (measurements shown in the measured result panel). ► section 4.7
• FFT file (*.csv) • FFT file (*.csv) with BOM	Available only when saving the analysis results of FFT waveforms. (MH1 option) ► section 4.11
• Serial bus analysis result (*.csv) • Serial bus analysis result (*.csv) with BOM	Available only when saving the results of serial bus analysis. (SB1 option) ► section 4.9

If you select the CSV or CSZ format without a BOM, data is saved without a BOM.
BOM: Byte Order Mark ► page 3-44

Storage File Formats and Settings

Setting	File Type			
	MF4	CSV/CSZ	CSV	
	Waveform file	Waveform file	Measure result	FFT file
Select the channels to save ► next page	Y	Y	—	Y
Numeric, harmonic bar, and vector export settings (WT5000 data only)	N/A	Y	—	—
Range to save and compression settings	Y	Y	—	Y
Comment	Y	Y	—	Y
ASCII file setting	—	Y	Decimal point setting only	Only the header, frequency, and decimal point settings

Details of each setting ► "Exporting to a File" on page 3-44.

- **When the Storage File Format Is Measurement Results (*.csv)**
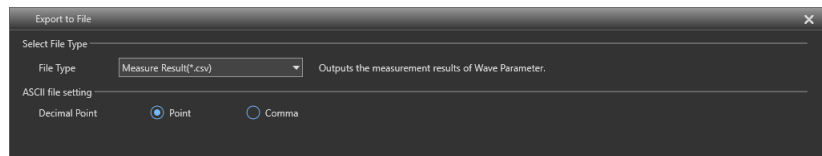
- **When the Storage File Format Is FFT File (*.csv) (MH1 option)**
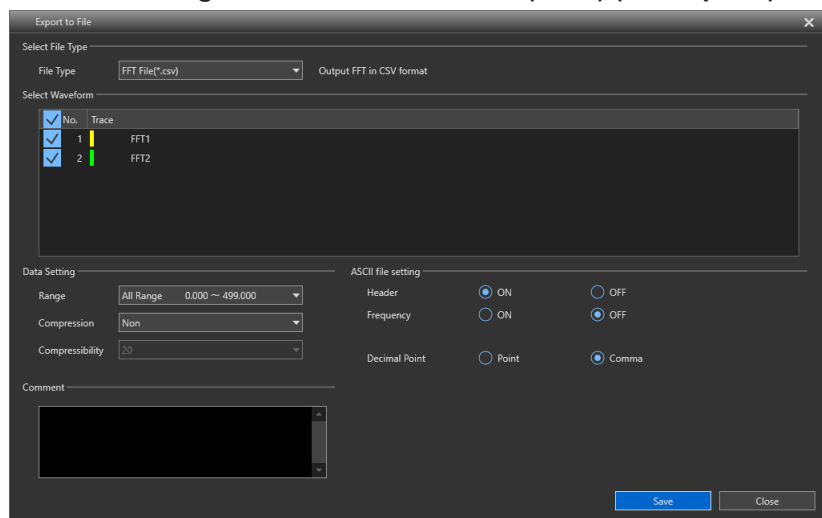
- **When the Storage File Format Is Serial Bus Analysis Results (*.csv) (SB1 option)**
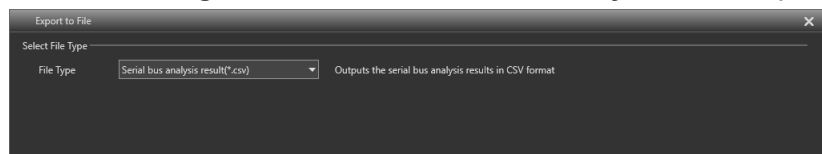
Selecting the Channels to Save

- **Select individual channels to be saved**

  You can select or clear the check box of each channel on the left side of the No. column to specify whether to save the channel.

- **Collectively saving multiple channels of a waveform file**

  Click the check box in the title row.

  When a dual capture waveform is to be saved

  Click the check box in the title row to show the selection menu in the following figure. You can collectively select only the main waveforms or only the sub waveforms.
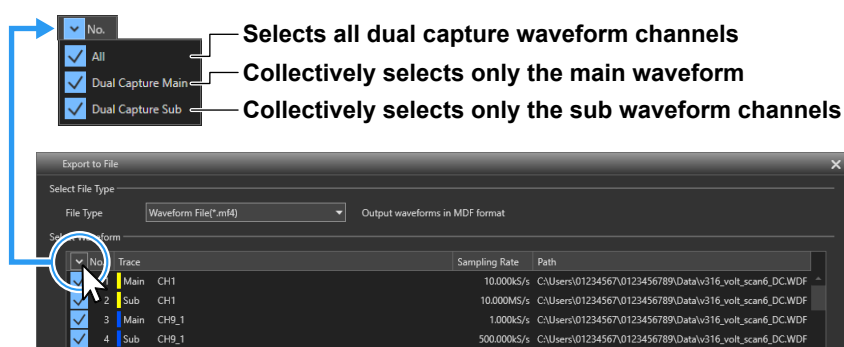
3. Click **Save**. A Save As dialog box appears.

4. Specify the save destination, and click **Save**.

  The file is exported to the specified destination.

Note

  The file format and other settings will be stored when the file is saved. The next time a file is exported, it will be exported with the same settings as the previous time.

Adding a Connected Device (on the same axis)

1. Click **Add Device**. A Device Search window opens. You can add measuring instruments to the DAQ - (host name) tab window of a measuring instrument already connected through DAQ and display them on the same axis.

  ► section 3.4

Explanation

Loadable File Formats

► page 3-6

Details of various file formats ► page 1-7

Displaying Multiple Waveforms on the Same Axis

Multiple waveforms can be displayed on the same axis. For a display example, see page 3-34.

Saving a Project File with a Separate Name

The settings of the displayed file can be saved as a project file.

Exporting to a File

• You can save waveform data in waveform file (*.mf4), waveform file (*.csv), waveform file (*.csz), measurement result (*.csv), FFT file (*.csv), and serial bus analysis result (*.csv) formats.

• The above CSV and CSZ formats can also be selected with BOMs.

BOM stands for Byte Order Mark, a short piece of data added to the beginning of Unicode-encoded text. The BOM is used as a means to determine if the text is written in Unicode, the type of encoding, endianness, and so on.

Note

Saving DL950 power math (/G05, /MT1 option) data or motor dq analysis (/MT1 option) data

When data is exported to CSV format, multiple files are created for each power or motor dq analysis and harmonic analysis result. For details, see "When DL950 Power Math or Motor dq Analysis Results Are Exported in CSV Format" on page 3-47.

Numeric, Harmonic Bar, and Vector Export Settings

These settings are available only when saving data to a waveform file (.csv or .csz) and a WT5000's numeric, harmonic bar, or vector display data is present. Saving in MF4 format is not applicable.

Item	Description

Harmonics	• Export target: Set the start order and end order.
	  The Harmonic Order settings under ASCII file setting become available.
	  ► page 3-46
	• Export target: Set the start frequency and end frequency.
	  For harmonic measurement data complying with IEC 61000-4-7 Annex B (2k-9kHz), the Harmonic Frequency setting in the ASCII file settings becomes valid.
	  ► page 3-46
	• The measured results of the Bar1 and Bar2 panels are exported to a file.

Numeric	Export target: All saved data The measured results of the Numeric1 and Numeric2 panels are exported to a file.
Matrix	The measured results of the Matrix display are exported to a file.
Vector	The measured results of the Vector display are exported to a file.

Range to Save and Compression (Data Setting)

You can set these items when the file type is set to waveform file (.mf4) or waveform file (.csv).

Item	Description
Range	• Set the range to Overview, Cursor, or select from View1 to 4. • When the storage file format is FFT file (*.csv), select from All Range, Cursor, Zoom1, and Zoom2.
Compression	Set the compression to Non, PP Comp, or Decim.
Compressibility	• This is valid when the compression is set to PP Comp. Select from 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, and 10000. • This is valid when the compression is set to Decim. Select from 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, and 10000.

Comment

You can enter up to 250 characters.

Configuring the ASCII File

You can set these items when the file type is set to waveform file (.csv or .csz).

• **Header**

Item	Description
ON	A header is included.
OFF	A header is not included.

• **Time Axis Information**

Select the time axis information type from the following.

If you are saving an external clock waveform, only Point and OFF are available.

Item	Description
Absolute time	Measurement time Example: 2021/11/16 08:30:11.848770580000
Relative time	Relative time from the start of measurement. Relative time in reference to the reference time axis (Reference time axis) in the channel settings. ► section 4.2 Example: 00:10:10.000000000000
Seconds	Relative times are added with the display unit set to seconds. Example: 610.000000000000
Point	Assuming the output start point to be zero, points incremented per line are added.
OFF	Time axis information is not included.

• **Frequency**

When the storage file format is FFT file (*.csv), you can select whether to save frequency information.

Item	Description
ON	Frequency information is saved.
OFF	Frequency information is not saved.

• **Decimal Point**

You can select the decimal point and separator (data separation).

Item	Description
Point	The decimal point is a period, and the separator is a comma.
Comma	The decimal point is a comma, and the separator is a period.

- **Separate and save each history**

  This is available only when a history waveform file is open.

Toggle switch	Description
ON	Files are divided and saved for each history. A history number is appended to each file name.
OFF	Files are not divided for each history. Data is saved in a single CSV file.

- **Save different sample rate waveforms in one file**

  This setting is unnecessary (invalid) when DL950 power or harmonic analysis (/G05, /MT1 option) data or motor dq analysis (/MT1 option) data is saved in CSV format.

Toggle switch/Item	Description
ON	Waveforms with different sampling rates are saved collectively to a single CSV file.
Interpolation method	Select the interpolation method to apply between sampling data points. • Interpolation • Space: This is available only when data compression is set to Non.
OFF	Channels with the same sampling rate are saved in separate files.

- **Harmonic Order**

  You can set the following items when **Harmonics** is selected in the numeric, harmonic bar, and vector export settings (pages 3-41, 3-44).

Item	Description
Start Order	From the drop-down list, select the harmonic order to start exporting. Total, DC, 1 to 500
End Order	From the drop-down list, select the harmonic order to stop exporting. Total, DC, 1 to 500

- **Harmonic Frequency**

  For measurement data complying with IEC 61000-4-7 Annex B (2k-9kHz), you can set the following items when you select Harmonics in the numeric, harmonic bar, and vector export settings (pages 3-41 , 3-44).

Item	Description
Start Frequency	From the drop-down list, select the harmonic frequency to start exporting. 2100 to 9900
End Frequency	From the drop-down list, select the harmonic frequency to stop exporting. 2100 to 9900

Note

If you want to load a CSV file into Excel, use the **From Text/CSV** button in the Get & Transform Data group on the **Data** tab in Excel.

If you double-click the file icon or use Open on the File tab in Excel, the default data format settings will be applied to the opened sheet, and the data may not be displayed properly.

When DL950 Power Math or Motor dq Analysis Results Are Exported in CSV Format

When the power analysis function is in use, the motor dq analysis function cannot be used.

The computed results of DL950 power or harmonic analysis (/G05 option, /MT1 option) or motor dq Analysis (/MT1 option) are saved in timestamp format. Different time information is available by wiring system.

- Regardless of whether Save different sample rate waveforms in one file (previous page) is enabled or disabled, power analysis or motor dq analysis results (RTmath13 and RTmath14) and harmonic analysis results (RTmath15 and RTmath16) are exported to separate files.
- Further, power or motor dq analysis results and harmonic analysis results are exported to separate files by wiring system (time information).
- In the vertical direction, measured values are output line by line for each timestamp.

File Names of Output Data

(Output file name)_TS000.csv. The 000 part is the index number.

Note

When MDF files containing timestamp data is saved through data acquisition (DAQ) with a version earlier than 22.2.1.0 of this software, if the data is exported in CSV format, a separate file is created for each RTmath channel. With a version 22.2.1.0 or later, MDF files are exported for each wiring system.
When MDF files are saved through data acquisition (DAQ) with a version earlier than 22.2.1.0, timestamps are saved for each DL950 RTmath channel. Since data may span over several RTmath channels depending on the wiring system, the software has been changed to save timestamps for each wiring system, not for each RTmath channel, on versions 22.2.1.0 and later.

Adding Device

Select **Add Device** to add another measuring instrument to the DAQ-host name) tab window when a measuring instrument is connected through the DAQ feature and display the waveforms on the same axis.

3.9 CSV Batch Converter

Multiple waveform files can be converted into CSV or CSZ files (see pages 1-8 and 3-41). Files can be processed collectively without having to open them.

This section explains the following operations:
- Starting the application
- Selecting the target files and converting them to CSV or CSZ files
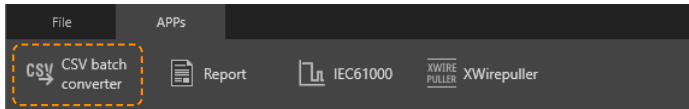
Procedure

Starting the Application

1. On the **APPs** tab, click **CSV batch converter.**

The CSV Batch Converter dialog box appears.

Selecting the Target Files and Converting Them to CSV or CSZ Files

2. Click **Add file**, and select the files you want to convert (MDF, WDF, WVF files).

The selected files appear in the file list.

- You can also select the files you want to convert and drop them on the file list.
- To select multiple files, click the files while holding down the Ctrl key.

CSV Batch Converter Dialog Box
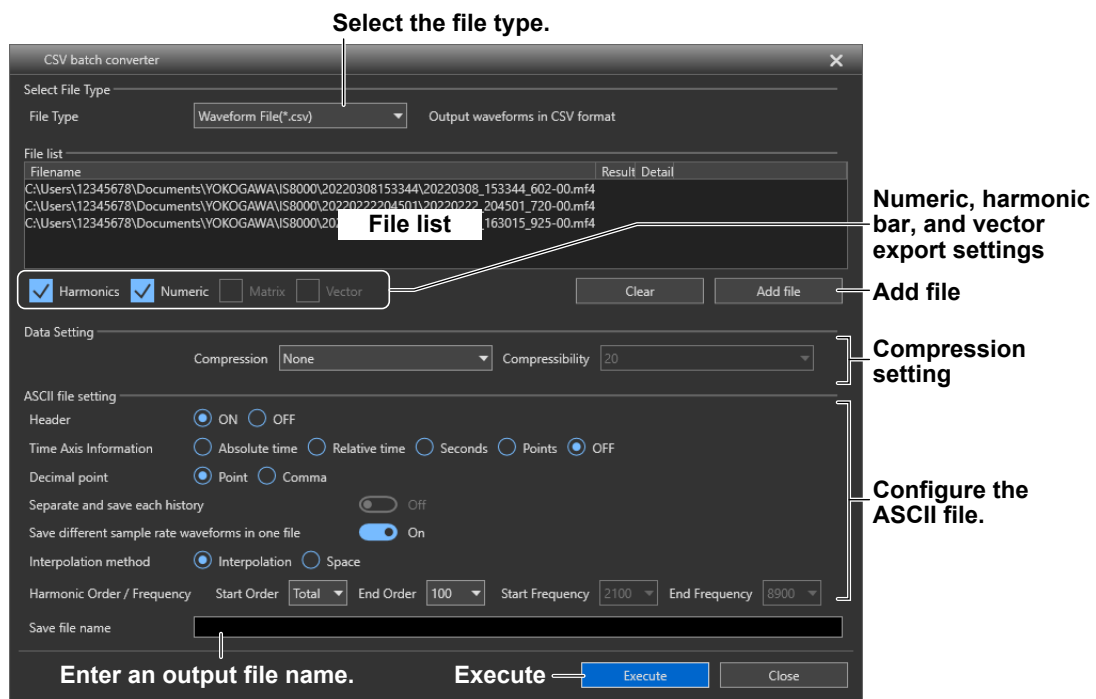
3. Select the file type.

File Type	Description
• Waveform file (*.csv) • Waveform file (*.csv) with BOM	Converts all open waveform files to CSV format at once.
• Waveform file (*.csz) • Waveform file (*.csz) with BOM	Converts all open waveform files into a compressed CSV file in Zip format.

If you select the CSV or CSZ format without a BOM, data is saved without a BOM.
BOM: Byte Order Mark ► page 3-44

4. Set the items.

The items you need to set are the same as those for "Waveform File (*.csv)" for **Export to File** (page 3-41).

However, the range to save and range of compression (Data Setting) are fixed to the entire range, and the channels to save is fixed to all channels.

• **Numeric, harmonic bar, and vector export settings and compression settings** ► page 3-44
• **ASCII file settings** ► page 3-45

5. Enter the output file name, and click **Execute**.

A progress bar is displayed while the conversion is in progress.

If you cancel the operation during the conversion process, the conversion is aborted after completing the conversion of the file being converted.

The converted CSV files are saved in the same folder as the files you selected to be converted.

If DL950 power math (/G05, /MT1 option) data or motor dq analysis (/MT1 option) data is converted collectively to CSV files, power analysis results, motor dq analysis results, and harmonic analysis results are saved to separate files for each specified file. For details, see "When DL950 Power Math or Motor dq Analysis Results Are Exported in CSV Format" on page 3-47.

Explanation

File Formats That Can Be Batch Converted to CSV or CSZ Files

You can select multiple file formats.

• MDF
• WDF
• WVF

File Names of Output Data

The names of the files after the conversion are the same as those of the files being converted. The extension becomes .csv or .csz.

When Waveforms with Different Sample Rates Are Saved to a Single File

(User-assigned file name)(name of the file to be converted).csv

When Waveforms Are Saved Separately by Sample Rates

(User-assigned file name)(name of the file to be converted)_(sample rate).csv

Note

If you want to load a CSV file into Excel, use the **From Text/CSV** button in the Get & Transform Data group on the **Data** tab in Excel.

If you double-click the file icon or use Open on the File tab in Excel, the default data format settings will be applied to the opened sheet, and the data may not be displayed properly.

3.10 Screen Capture

An image of panel shown in a tab window can be saved to the Clipboard or as screen capture data in the folder you specify.

The screen capture feature becomes available in the following cases:

Offline analysis	
When a Overview, View, XY, History, or Dual Capture panel is displayed	► section 4.3
When a FFT View, Zoom, or [FFT] History panel is displayed	► section 4.11
When a Video panel is displayed ► For details, see chapters 3 and 4 of the *IS8000 Integrated Software High-speed Camera Synchronization Feature (FS1 option) User's Manual*, IM IS8000-61EN.	
Remote control	
When a remote control window is displayed	► section 6.1

Capture Settings menu

Execute a screen capture —
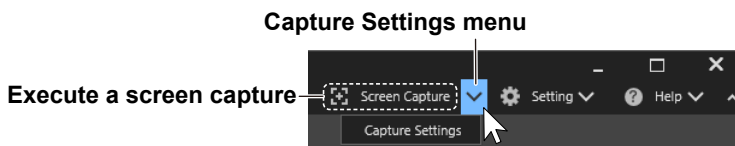
This section explains the following operations:
• Selecting the panel to save
• Selecting the output destination and output format
• Executing a screen capture

Procedure

Selecting the Panel to Save

1. Click the panel you want to save.

The selected panel is activated, and the panel frame is displayed in light blue.

Selecting the Output Destination and Output Format

2. Click ☑ next to **Screen Capture**, and select **Capture Settings** from the drop-down list.

A screen capture setting window appears.

Select the output destination.

Appears only when the output destination is Folder.

Select the file type.

Select the output destination folder.

The output destination folder

3. Select the output destination (Folder or Clipboard).

If you set the output destination to Clipboard, proceed to step 5.

4. If you set the output destination to Folder, select the file type and output destination folder.

5. Click **OK**.

The settings are applied, and the screen capture setting window closes.

Executing a Screen Capture

6. Click **Screen Capture**.

The panel selected in step 1 is saved as screen capture data in the specified output destination.

Example of Saved Screen Capture Data
(When the Overview panel is saved)
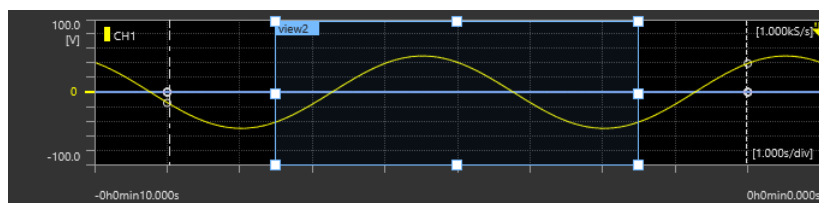
Explanation

File Settings

Output Destination (Output)

Output	Description
Clipboard	The screen capture data is saved to the Clipboard.
Folder	The image file is saved to the specified folder.

File Type

You can select from the following file types. This setting is valid when the output destination is set to Folder.
*   PNG
*   JPEG
*   GIF

File Names of Screen Capture Data

When the output destination is set to Folder, the name of the file will be in the following format.

Saved panel (name of the panel to be saved)_date (yyyymmdd)_time (hhmmss)

Example: Overview_20220131_110745

Panels to Be Saved

*   Overview
*   View1 to 4
*   XY1 or XY2
*   History
*   Dual Capture
*   FFT View
*   Zoom1 or Zoom2
*   [FFT] History
*   Video1 or Video2
*   Remote Control

3.11 Setting Menu

This section explains the following setting operations.

- Language
- Window Theme
- Layout
- Showing or Hiding the Launcher
- Generate Cache Files
- Confirm saving to Project file when finished
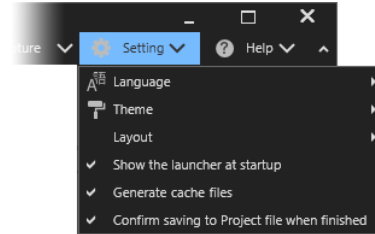
Procedure

Language

On the **Setting** menu, click **Language** to select the language of the software.

You can select from the following languages.

- Japanese
- English
- Chinese
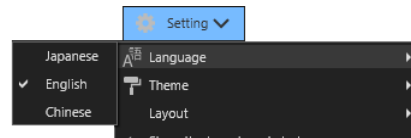
Window Theme

On the **Setting** menu, click **Theme** to change the window theme of the software.

You can select from the following tones.

- Light
- Dark
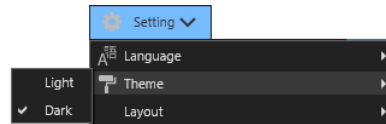
Layout

On the **Setting** menu, click **Layout** to initialize the panel layout in the tab window or change the default layout settings that are applied at startup.

You can select the following items.

- Initialization
- Initial setting
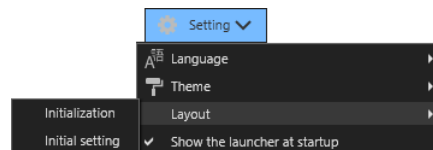
Initialization

1. Click the tab of the tab window you want to control.

The selected tab window is activated, and the background color of the tab turns blue.

2. On the **Setting** menu, click **Layout** and then **Initialization**.

The panel layout will be initialized.

Initial setting

You can use the settings of another analysis project file (.anpjt) to display another waveform file in the same panel layout.

However, analysis project files containing the following settings cannot be used.
- Save multiple files
- Display multiple tab windows

1. On the **Setting** menu, click **Layout** and then **Initial setting**.

The following window appears.

Turns default layout settings on and off

Specify an anpjt file.

Browse anpjt files.

Saves and applies the current layout as default

Item	Description
Toggle switch	ON: The default layout settings are enabled. OFF: The default layout settings are disabled.
Default window layout settings (*.anpjt)	You can specify an analysis project file (.anpjt) saved in the past to use its layout settings. If the specified analysis project file is not applicable, an error is displayed, and the file cannot be applied. **File conditions that can be specified** You can specify only project files that contain a single tab, displayed from a single file. You cannot specify multiple files, a file containing devices, or a file containing multiple tabs.
Save & apply current layout as default	The current layout is saved in an analysis project file. The saved file is automatically applied to the **Default window layout settings** file. If the current layout is inapplicable, an error is displayed, and the file cannot be applied. **Layout conditions that can be saved and applied** Layout conditions can be specified only when the following conditions are met. • Layout of the current (active) tab only • This active tab is displaying the information of a single file. An error will occur if multiple files (coaxial) are displayed or when the online tab is activated. Also, the layout (project file) saved here will only contain information for the current tab.

2. Turn on the default layout settings toggle switch.

Using the settings of an analysis project file saved in the past

3. Click **[...]**. An Open dialog box appears.

4. Specify a default window layout settings file (*.anpjt).

Saving the settings of the opened waveform file to an anpjt file and applying the settings

3. Click **Save & apply current layout as default**.

A Save As dialog box appears.

4. Enter a file name, and click **OK**.

The current layout is saved in an analysis project file. The saved file is automatically applied to the default layout settings file.

5. Click **OK**.

The layout settings are applied to the currently opened waveform file. They will also be applied to files that will be opened in the future.
If the currently opened tab window is inapplicable, the following error will appear.
"Settings cannot be applied when a view includes multiple files or when multiple windows are displayed."

Clicking **Cancel** cancels the changes to the settings and closes the setting window.

Note

- Once set, the settings are automatically applied the next time you start the software. To stop using them, turn off the toggle switch.
- Settings are skipped (ignored) when their conditions do not match.
  Example: When the target channel is a voltage channel but the channel in the anpjt file you want to apply is a logic channel.

Showing or Hiding the Launcher

On the **Setting** menu, click **Show the launcher at startup** to select whether to show the launcher at startup.

Click the menu item to place or remove the check mark.

Check mark	Description
Yes	The launcher is shown at startup.
No	The launcher is not shown as start, and the start window is shown instead.

Generate Cache Files

MDF files can be loaded quickly when you generate cache files.

From the **Setting** menu, click **Generate cache files** to enable or disable this feature.

Click the menu item to place or remove the check mark.

Check mark	Description
Yes	• When the menu item has a check mark and you open an MDF (.mf4 extension) file, a cache folder is created in the same path as the waveform file for the first time, and the cache file is saved. The next time the same file is opened, it will load quickly. • cache folder The generated cache folder can be deleted. If it is not available the next time it is opened, it will be generated automatically.
No	Cache files are not generated.

Confirm saving to Project file when finished

From the **Setting** menu, click **Confirm saving to Project file** when finished to enable or disable this feature.

Operation at closing ▶ section 3.1

Click the menu item to place or remove the check mark.

Check mark	Description
Yes	A confirmation is made to save a project file when finished. A Save As dialog box appears, and you can save the settings of the window being closed to a project file.
No	A confirmation is not made to save a project file when finished. The window simply closes.

Analyzing Measured Data (Offline Analysis)

This chapter explains how to analyze measured data on an offline PC.

4.1 Opening Files

1. Use any of the following methods to open a file or project file.

- On the launcher, click **File Open** and select a file.
- On the start window, click the **File** tab and then **Open**, or click **Add File**, and select a file.

A window opens for opening the file window. ► section 3.3

2. Select a file or specify the file name in the text box, and click **Open**.

An Analysis-(file name) tab window opens, and the waveforms of measured data are displayed in the Overview panel. The Waveform Analysis ribbon will appear.
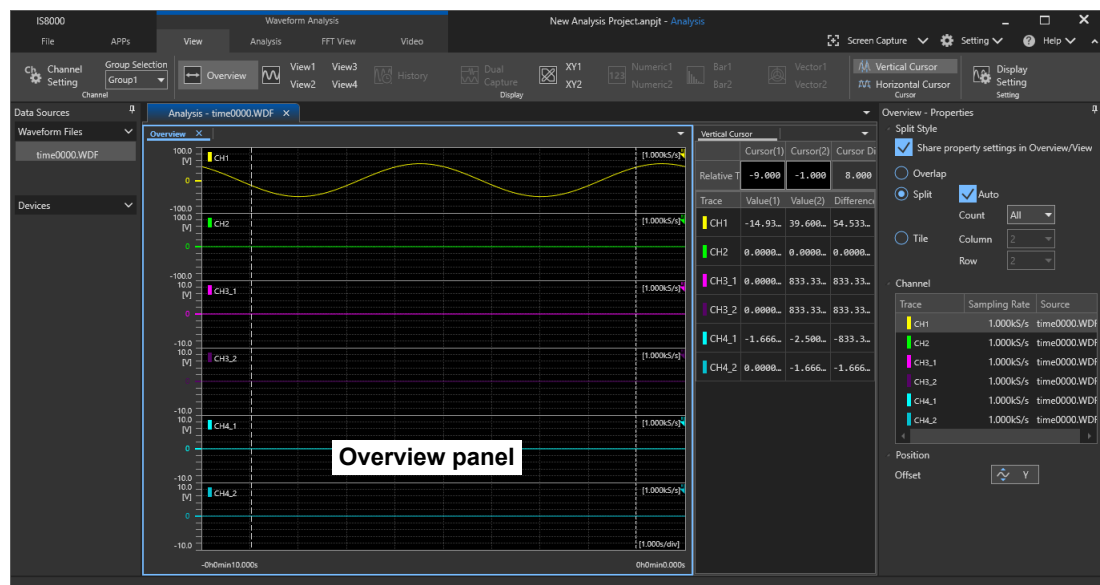
Waveform Analysis (Waveform Analysis) Ribbon
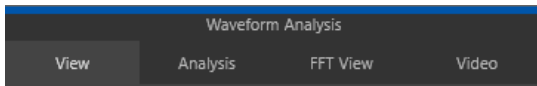
This is a ribbon for offline measurement. Click a tab to switch the ribbon.

Tab	Description	Refer To
View	Loads and displays measurement data files.	Section 4.2 to section 4.6
Analysis	Analyzes measurement data files.	Section 4.7 to section 4.10
FFT View	Performs FFT computation and analysis.	Section 4.11
Video	This is the high-speed camera synchronization feature (option).	Section 4.12

Explanation

Opening a Project File

To open an IS8000 project file (.anpjt), on the **File** tab, click **Open**. You cannot load a project file if you click **Add File**.

Opening by Dropping Files

Files with the following extensions can be loaded by dragging the files from the load source window to the data source display area, which is on the left side of the window.

Extension	Description
.mf4	Measurement data saved in MF4 (MDF4.1) format MDF files can be loaded quickly by enabling Generate cache files in the Setting menu. See page 3-55.
.wdf	YOKOGAWA's standard format waveform data files
.wlk	Shortcut to consecutive files created when a file is split and saved
.csv	Data saved with this software, Xviewer, DL950, DL850 series, DL350, DLM5000 series, DLM4000 series, DLM3000 series, DLM2000 series, WT5000, WT3000 series, or WT1800 series
.csz	CSV files zipped and saved with this software
.wvf	YOKOGAWA's old file format

Opening by Double-Clicking

The files with the following extensions can be opened by double-clicking.

Extension	Description
.mepjt	IS8000 measurement project file
.anpjt	IS8000 analysis project file
.mf4	Measurement data saved in MF4 (MDF4.1) format
.wdf	YOKOGAWA's standard format waveform data files

Opening Multiple Files

You can use any of the following methods to open multiple files at once.

- In the Open dialog box, select multiple files.
- Drag multiple files to the data source display area.
- On the **File** tab, click **Add File** to select files.
- Under Waveform Files in the data source display area, select a file. Click **[...]** and select **Start Coaxial**.

Note

Loading files divided and saved by a measuring instrument

When a file is divided and saved with a measuring instrument such as the DL950, an underscore "_" and a 3-digit serial number (000 to 999) are added to the end of the file name.

To load files that have been divided and saved by a measuring instrument with this software, place all the files in the same folder and open "filename_**000**.extension." All divided files are loaded as one continuous data.

4.2　Waveform/Power Display Window

This section explains how to configure the display channels for loaded measurement data (waveforms, power values).

- The settings are mostly the same as those in the Channel Setting window of Smart Setup. ▶ section 3.5
- This section explains only the settings that are different from those in the Channel Setting window of Smart Setup.
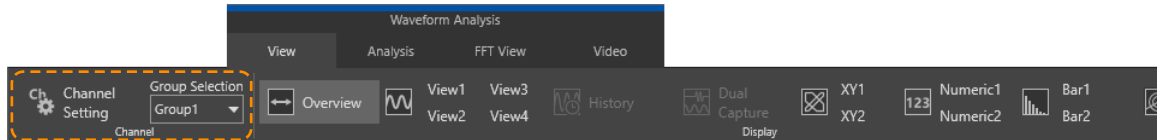
Procedure

Channel Setting Window

1. On the **View** tab, click **Channel Setting**. A Channel Setting window opens.

2. For each channel, set the waveform display conditions, groups, and so on.
   - Set display groups.
   - Channel number
   - Enter the group name.
   - Channels (trace names) registered in the group

Adding Channels (Add Channel)

When you click **Add Channel**, the channels that can be added are displayed in a tree-style list. You can add the selected channels. ▶ page 3-14

Reference Time Axis

Set the synchronized display method. You can select the following items from the drop-down list.

Item	Description
Trigger Position	Displays waveforms by aligning their trigger positions. The trigger position is set to 0 s.
Absolute Time	Displays waveforms using absolute times.
First	Displays waveforms by aligning the beginning of each waveform. The beginning is set to 0 s.
Last	Displays waveforms by aligning the end of each waveform. The trigger position is set to 0 s.

Selecting Filter Conditions

List of Measurement Conditions of Each Channel

For each channel number, you can set (1) the display format and the number of displayed digits of the values on the Analysis 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.

- You can use the check boxes in the title line to collectively turn on or off the display conditions of the corresponding columns.
- You can set multiple items collectively. Select a range, and then click **Auto**, **Invert**, **Copy**, or **Default** below the list.

Channel number

	Trace	Model	Group1 +		Measure Target	Color	Min	Max	First Source	Offset Time [s]
			Display ✓ 18/32	Mapping ◯ Off	✓ 18/32					
1	CH1	DL950 10.10.123.12	✓	1 ▼	✓	(yellow)	-25	25	1 : CH1 ▼	0
2	CH2	DL950 10.10.123.12	✓	2 ▼	✓	(green)	-25	25	2 : CH2 ▼	0

et Time [s]	Format Type	Significant digits	Logic	Unit	Mode	Distal	Mesial	Proximal	High/Low
0	Floating point ▼	5 ▼		V	% ▼	90.0	50.0	10.0	Auto ▼
0	Floating point ▼	5 ▼		V	% ▼	90.0	50.0	10.0	Auto ▼

The items in the table are explained in order from left-most column.

Channel number

Trace

Model

Group1 (Group1)

- **Adding and Deleting Groups**
- **Display (Display)**
    - ► page 3-16
- **Mapping (Mapping)**
    - ► page 3-16

Measure Target (Measure Target)

You can select or clear the check box for each channel to select the channels to be measured.

* Logic waveforms, high-speed sampling waveforms (sub waveforms) of dual capture, WT5000 PP waveforms, external clock data, timestamp data (DL950 power math data or motor dq analysis data and Modbus/TCP (MB1 option) data) are excluded. Check boxes are not displayed for these.

Waveform Color (Color)

► page 3-16

Minimum (Min) and Maximum (Max)

► page 3-16

First Source

The beginning of the waveform of each channel can be displayed according to the position of the beginning of the channel selected here.

> Example   **When data is acquired by connecting a DL950, WT5000, and ECU monitor, synchronizing the DL950 and WT5000, and aligning the beginning of the waveform on the DL950 and ECU monitor**
>
> The positions of the waveforms can be aligned and displayed by setting the reference time axis to absolute time and aligning the first source of the waveform on the ECU monitor with the DL950 channel.

Offset Time

You can offset the waveform display positions by the specified time.

Display Format (Format Type)

► page 3-17

Significant digits (Significant digits)

► page 3-17

Display Conditions of Logic Waveforms (Logic)

► page 3-18

Vertical Scale Unit (Unit)

► page 3-19

Mode

Set the unit for distal, mesial, and proximal values. Select either of the following:

Item	Description
%	You can set the distal, mesial, and proximal values as percentages of the specified trace. The high value of the specified trace is equal to 100.0%, and the low value is equal to 0.0%.
Unit	You can set the distal, mesial, and proximal values of the specified trace by specifying physical values, such as voltages or temperatures.

For details, see the measuring instrument's user's manual.

Distal Line, Mesial Line, and Proximal Line Values

You can set the distal, mesial, and proximal levels.

*   Range when the mode is set to %

    0.0 to 100.0% (in steps of 0.1%)

*   Range when the mode is set to Unit

    Range defined by Min and Max specified in the channel settings

For details, see the measuring instrument's user's manual.

Setting the High and Low Levels

The high and low levels are the 100 % and 0 % levels used to measure various parameter values, such as the rise and fall times.

You can choose one of the following methods for setting the high and low levels.

*   AUTO
*   MAX-MIN

For details, see the measuring instrument's user's manual.

Selecting Display Groups

1. On the **View** tab, click **Group Selection**. You can select the channel groups to show in the Overview panel from the drop-down list.

Explanation

Groups and Channels (Traces) That Can Be Registered

Channels (trace names) can be divided into up to 4 groups. Up to 32 channels can be registered in a group.

Displaying External Clock Waveforms

- The sample rate for an external clock waveform is displayed at 1 S/s. For an external clock waveform saved on the DL series, the pulse/rotate value is used as the sample rate.
- The horizontal scale is points. However, for the DL series, the horizontal scale is the value that results by dividing the number of points by the pulse/rotate value.
- Coaxial display is not possible for an external clock waveform loaded from a file.
- External clock waveforms are cannot be used with Measure, Math, or FFT.

Displaying Timestamps

- Data containing timestamps and measured results under irregular sample interval conditions are displayed.
- Timestamped waveforms are cannot be used with Measure, Math, or FFT.

Viewing the DL950 Power Math Results

Power Analysis and Harmonic Analysis (/G05 option, /MT1 option)

In power analysis and harmonic analysis, the analysis period* is from a zero crossing point to the next zero crossing point.* Calculations are performed on the data in this section, and the zero crossing time at the calculation start point and the calculation result are recorded (timestamp format). Since the calculation result is displayed based on the time of the calculation start point, it is possible to display the analysis result, the waveform data that is the basis of the calculation, and the calculation result without phase shift.

* In power analysis, the analysis period differs depending on the type of calculation period (calc period). If the type is edge (Edge), the analysis period is from the zero crossing point of the edge source to the zero crossing point (for power analysis, the analysis period can be specified even for the encoder's rotation angle (with a threshold setting)). If the type is Timer, the analysis period is the specified update time (Auto Timer). If the type is transient (Transient), the analysis period switches when the edge and Timer switch.

- The timestamp data value at the cursor position (the previous value if it is not available) is displayed.
- The sample rate is indicated as "---."
- DL950 power math data saved in MDF format on the IS8000 Software cannot be used with Measure, Math, or FFT. (Files saved in WDF format on the DL950 are resampled and displayed as fixed-period data and can be used with Measure, Math, and FFT.)

4.3 Using the Window

This section explains the following operations:

- Displaying Overview Waveforms
- Displaying View Waveforms
- Displaying History Waveforms
- Displaying Dual Capture Waveforms
- Displaying XY Waveforms

- Numeric Display (WT5000)
- Displaying Harmonic Bar Graphs (WT5000)
- Displaying Vector (WT5000)
- Moving and Zooming Waveforms
- Splitting and Displaying Windows
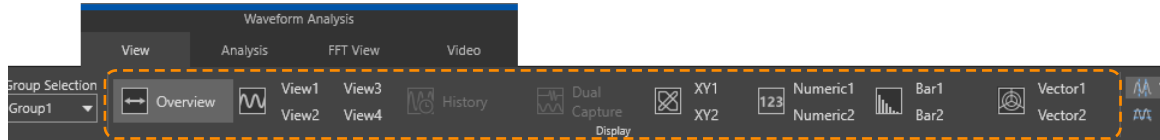
Procedure

Displaying Overview Waveforms

1. When you open a waveform data file, overview waveforms and vertical cursor measurement results are displayed. On the **View** tab, click **Overview** to show or hide the Overview panel.
Cursor measurement ► section 4.4

Overview panel

The entire waveform data is displayed in the Overview panel.

Example Displaying Overview Waveforms (Overlap Display) and Properties
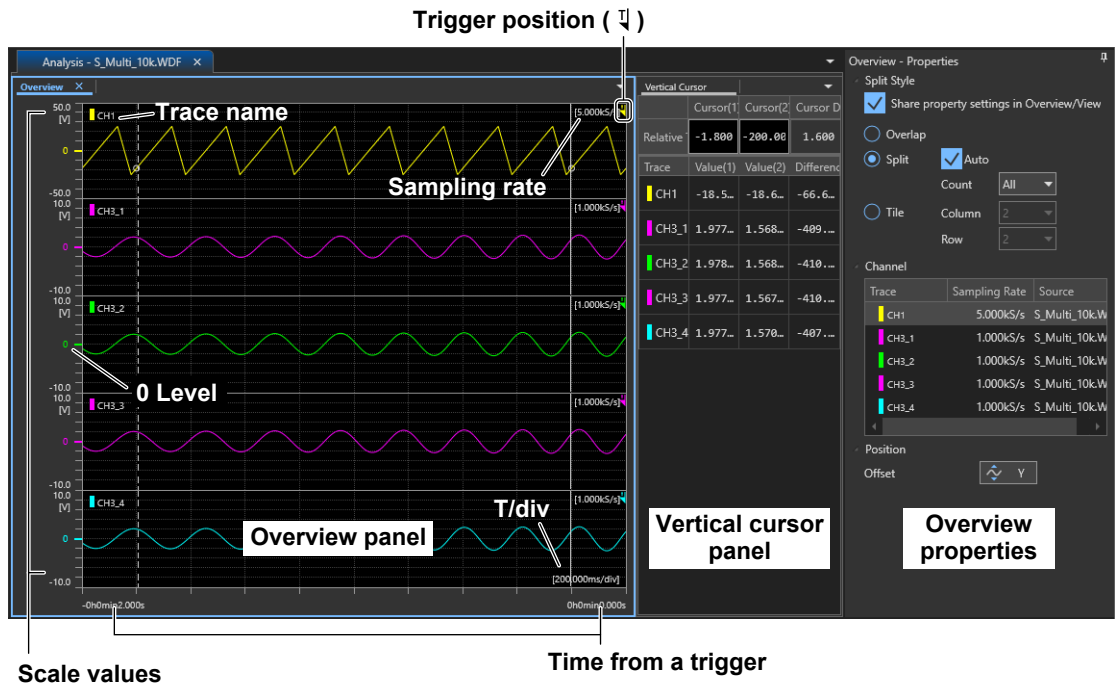
When waveforms are overlapped, clicking the top waveform causes the waveform under it to become active.

Overview Properties

The following items are displayed in the property display area. Click ◢ in front of each item to expand or collapse the display.

Split Style

Overview waveforms can be displayed separately by trace names.

- **Share property setting in Overview/View**

Check Box	Description
ON	The split style setting is shared among overview waveforms and view 1 to 4 waveforms. • Cursor measurement values use the settings of the Overview panel. • When the display style is **Split,** detailed settings such as Auto, Count, and Tile Column and Row are not shared. Set these separately for the overview and view waveforms.
OFF	The split style setting is not shared among overview waveforms and view 1 to 4 waveforms. Set these separately for the overview and view waveforms.

- **Overlap, Split, and Tile**

  You can select the waveform display style.

Display Style		Description
Overlap		Waveforms are displayed overlapped in a single window. The trace you select in the list of channels in the properties is shown in front.
Split		The window is split horizontally. The waveforms are mapped to the split areas in ascending order by channel number.
	Auto	ON: The waveforms are displayed at regular intervals based on the specified number of divisions. Count: You can set the number of splits (Count) to All or a value between 1 and 10.
		OFF: You can change the height of each trace display by dragging the boundaries of the split trace displays. Right-click the area to the left of each trace to display the menu shown in the following figure.

Align to this height
Aligns the height of all traces with the height of the clicked trace.

Align height in number of row
Divides the window by the specified number of rows. From the drop-down list, select the number of rows.
(Auto, 1 to 32)

Cancel
Closes the menu
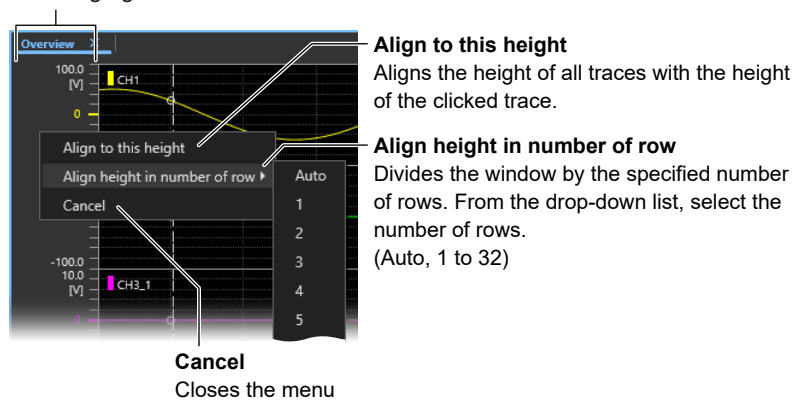
Tile		The waveforms are tiled at the trace name level. Set the number of columns and the number of rows.

For display examples of split styles ► page 4-30

Channel (Channel)

The trace names, sample rates, source file names of the channels displayed on the Overview panel are shown in a table.

The active waveform channel is highlighted in light gray.
If the display style is Overlap, when you click a trace on the list of channels, that channel is shown in front.

Position

- **Offset**

  When you click the following item, the vertical movement mode can be turned on or off for the displayed waveform.

Item		Description
⩗	Y	You can turn on or off the waveform vertical movement mode.
		ON: The button's background color changes to light blue. On the Overview panel, the pointer icon changes to the shape shown in the following figure. Click the waveform you want to control to select it, and then drag it vertically.
		The maximum and minimum values of the range that results by moving the waveform vertically are applied to the maximum and minimum values of the channel setting.
		OFF: The waveform cannot be moved vertically.

Explanation

Tooltip Display

If you select a waveform with the pointer and keep the mouse button held down, the information about that point is displayed. Information is displayed for overview and view waveforms.

Example of a time vs. voltage waveform
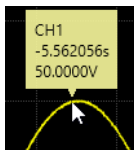
The time and voltage are displayed.

Displaying View Waveforms

1. On the **View** tab, click **View 1** to **View 4** to show or hide View 1 to 4 panels.

View 1 to 4 Panels

The display areas of the View 1 to 4 panels are indicated with frames on the overview waveform.

Example Displaying View Waveforms (Overlap Display) and Properties
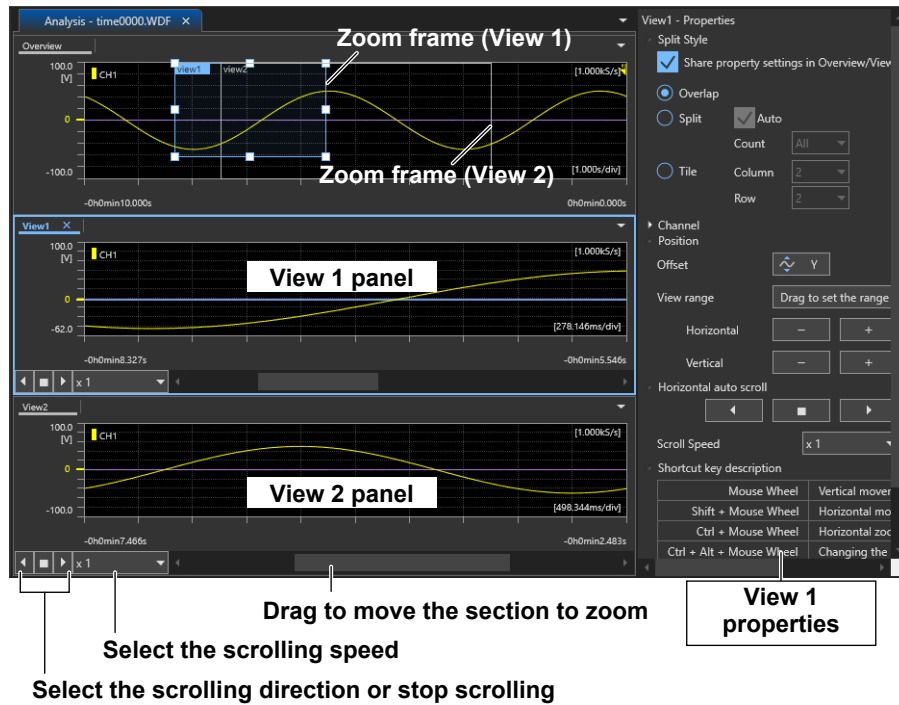
View 1 to 4 Properties

The following items are displayed in the property display area. Click ◢ in front of each item to expand or collapse the display.

Split Style

View waveforms can be displayed separately by trace names.

• **Share Property Setting in Overview/View**
   The split style setting can be shared among overview waveforms and view 1 to 4 waveforms. ► page 4-10

• **Overlap, Split, and Tile**
   ► page 4-10

Channel (Channel)

The trace names, sample rates, source file names of the channels displayed in the View 1 to 4 panels are shown in a table.

Position

*   **Offset**

    When you click the $\hat{\updownarrow}$ **Y** button, the vertical movement mode can be turned on or off for the view waveform.

    ► page 4-11

*   **View range**

    When you click the following items, you can set the zoom area to any position and zoom in or out of the target view waveform.

Item		Description
Drag to set the range		When you click this button and drag the overview waveform to any position, the zoom area is set to the area that results from dragging.
Horizontal	–/+	Each time you click [-] or [+], the waveform is expanded or reduced horizontally.
Vertical	–/+	Each time you click [-] or [+], the waveform is expanded or reduced vertically.

Horizontal auto scroll

The target view waveform can be scrolled horizontally automatically.

Item	Description
◄	Scrolling starts to the left.
■	Scrolling stops.
►	Scrolling starts to the right.
Scroll Speed	You can select the auto scroll speed. From the drop-down list, you can select **x1** (normal speed) or **x2** (double speed).

Shortcut key description

Shortcut Key	Description
Mouse wheel	Vertical movement of the scroll box
Shift + mouse wheel	• Horizontal movement of the scroll box • Horizontal movement of the zoom position when a zoom waveform is selected
Ctrl + mouse wheel	Horizontal zoom
Ctrl + Alt + mouse wheel	Changing the range (the channel settings' maximum and minimum values)
Space + dragging	Move the zoom position in any direction
Space + Shift + dragging	Move the zoom position horizontally

Moving the Zoom Position

You can move the zoom position using any of the following methods.

*   Dragging
*   Scroll Bar
*   Auto Scroll
*   Using shortcut keys ► See the previous section

Dragging

The following two methods are available.

*   Moving the Zoom Frames on the Overview Panel
*   Moving the Zoom Area on the View Panel

Moving the Zoom Frames on the Overview Panel

1. When you click the white frame (zoom frame: view1 to 4) indicating the zoom area of the overview waveform, the frame color changes to light blue, and white squares (anchor points) are displayed on the frame.

2. If you drag a point within the zoom frame when the anchor points are shown, you can move the entire zoom area.

Moving the Zoom Area on the View Panel

1. Click the view panel to select it. The view panel frame color changes to light blue.

2. Place the mouse pointer on the view panel, and press the **space** key. The mouse pointer changes to 🖐 (a palm shape).

3. Then click. The mouse pointer changes to ✊ (a grabbing hand shape). Then drag to move the zoom area.

The direction in which it can be moved depends on the split style of the view waveform.

Split Style	Description
Overlap and Tile	Can be moved in any direction.
Split	Can be moved horizontally.

Example of overlapped view waveform display
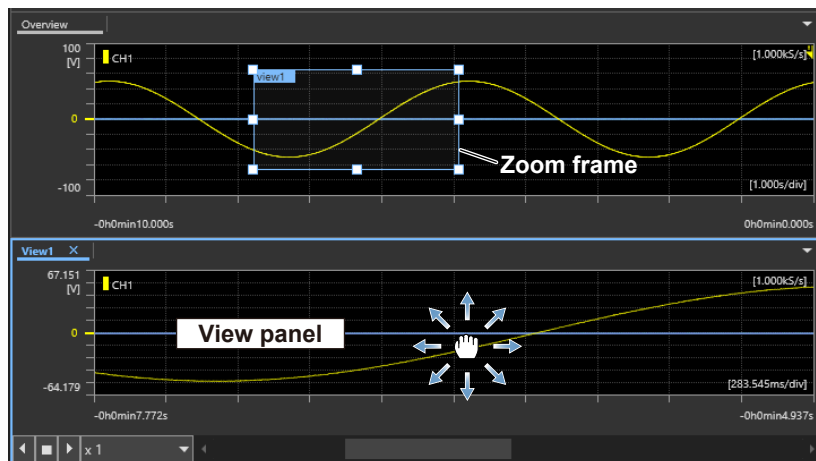
4. If you drag while holding down the **Shift** key, you can limit the movement of the zoom range to the horizontal direction.

Scroll Bar

• You can drag the scroll box at the bottom of a View panel (View 1 to 4) to move the zoom position horizontally.

• Click ◀ or ▶ at the ends of the scroll bar to move the zoom position left or right.

• Click left or right of the scroll box to move the zoom position by one zoom window.

Note ─────────────────────────────────────

You can also move the zoom position with a shortcut key. After selecting the target View panel, use the following shortcut key.

Shift+mouse wheel: The scroll box is moved horizontally.

Auto Scroll

You can perform the following operations in the bottom area of a View panel (View 1 to 4) or the property display area.

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

2. Click ■ to stop scrolling.

3. Click ◀ or ▶ to resume scrolling.

Auto Scroll Speed

From the drop-down list, you can select **x1** (normal speed) or **x2** (double speed).

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

Changing the Zoom Area

You can change the zoom area in the following ways.
• Dragging the zoom frame
• Using shortcut keys ▶page 4-13

Dragging the Zoom Frame

1. When you click the zoom frame (view 1 to 4) of the overview waveform, the frame color changes to light blue, and anchor points are displayed on the frame.

2. Dragging these anchor points changes the zoom area.

The anchor point display changes depending on the split style of the overview waveform.

Split Style	Description
Overlap and Tile	Anchor points are shown in the four corners of the zoom frame.
Split	Anchor points are shown at the left and right of the zoom frame.

When the waveform display area is narrow, some of the anchor points may not be shown.

Note
You can also change the zoom area with a shortcut key. After selecting the target View panel, use the following shortcut key.

Ctrl+mouse wheel: The zoom area is expanded or reduced horizontally.

Explanation

Tooltip Display

If you select a waveform with the pointer and keep the mouse button held down, the information about that point is displayed. Information is displayed for overview and view waveforms.
▶ page 4-11

Zoom Factor

The maximum zoom factor varies depending on the displayed data.

Procedure

Displaying History Waveforms

1. On the **View** tab, click **History** to show or hide the History panel.

History Panel

- When a history waveform file is open, you can display the History panel.
- The display group settings (waveform color, channel registration, show/hide, and Y-axis minimum and maximum) are applied to waveforms displayed in the history panel.

Thumbnail Display

The top area of the History panel displays history waveforms.

- **Selecting the Active Waveform**

  When you click a thumbnail display to activate it, that waveform is displayed in the history waveform chart in the bottom area of the History panel.

- **Selecting an Inactive Waveform**

  When you select the check box below a thumbnail display, the selected waveform is displayed overlapped on the history waveform chart. An inactive waveform appears darker than the active waveform.

Example Displaying History Waveforms and Properties
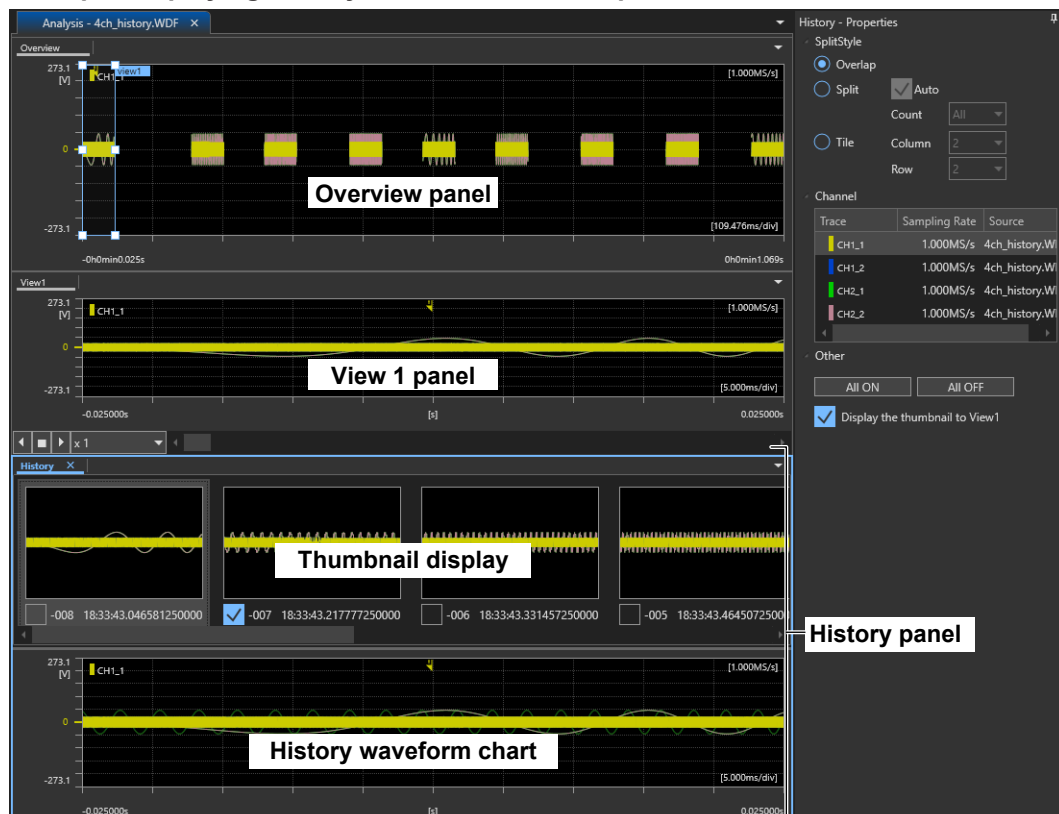
History Properties

The following items are displayed in the property display area. Click ◢ in front of each item to expand or collapse the display.

Split Style

The waveforms displayed on the history waveform chart can be split by trace name and displayed.

*   **Overlap, Split, and Tile**
    ► page 4-10

Channel (Channel)

The history waveform chart's trace names, sample rates, source file names of the displayed channels are shown in a table.

Other Settings (Other)

*   **ALL Display**

Item	Description
All ON	Click this to display all history waveforms on the history waveform chart.
All OFF	Click this to display only the active waveform on the history waveform chart.

*   **Displaying the Thumbnail Range in the View1 Panel**

    You can specify the following setting using the **Display the thumbnail to View1** check box.

Check Box	Description
ON	When the View1 panel is displayed, clicking a history waveform thumbnail causes the thumbnail range to be displayed in the View1 panel. You can analyze the history waveform range displayed in the View1 panel.
OFF	Clicking a history waveform thumbnail does not cause the thumbnail range to be displayed in the View1 panel.

Explanation

Data That Can Be Displayed in the History Panel

The waveforms of multiple records saved using the YOKOGAWA DL series' sequential store, single (N) trigger mode, and history features can displayed in a table.

Procedure

Displaying Dual Capture Waveforms

1. On the **View** tab, click **Dual Capture** to show or hide the dual capture panel.

Dual Capture Panel

- When a dual capture waveform file is open, you can display the Dual Capture panel.
- The display group settings (waveform color, channel registration, show/hide, and Y-axis minimum and maximum) are applied to waveforms displayed in the Dual Capture panel.

Thumbnail Display

The top area of the Dual Capture panel displays captured waveforms.

- **Selecting the Active Waveform**
  When you click a thumbnail display to activate it, that waveform is displayed in the dual capture waveform chart in the bottom area of the Dual Capture panel.

- **Selecting an Inactive Waveform**
  When you select the check box below a thumbnail display, the selected waveform is displayed on the dual capture waveform chart.
  An inactive waveform appears darker than the active waveform.

Example Displaying Dual Capture Waveforms and Properties

Overview and Dual Capture Properties

The following items are displayed in the property display area. Click ◢ in front of each item to expand or collapse the display.

Split Style

The waveforms displayed on the overview waveform or dual capture waveform chart can be split by trace name and displayed.

- **Overlap, Split, and Tile**
► page 4-10

Channel (Channel)

The overview waveform or dual capture waveform chart's trace names, sample rates, source file names of the displayed channels are shown in a table.

The mark **m** in the trace name represents the low-speed sampling waveform (main waveform) of dual capture and mark **S** the high-speed sampling waveform (sub waveform).

Display example

Low-speed sampling waveform (main waveform)

High-speed sampling waveform (sub waveform)

Overview properties

Channel		
Trace	Sampling Rate	Source
m CH1	10.000kS/s	Trig-DualCapture-1M-
S CH1	100.000kS/s	Trig-DualCapture-1M-
m CH2	10.000kS/s	Trig-DualCapture-1M-
S CH2	100.000kS/s	Trig-DualCapture-1M-
m CH3	10.000kS/s	Trig-DualCapture-1M-
S CH3	100.000kS/s	Trig-DualCapture-1M-

Dual Capture properties

Channel		
Trace	Sampling Rate	Source
S CH1	100.000kS/s	Trig-DualCapture-1M-
S CH2	100.000kS/s	Trig-DualCapture-1M-
S CH3	100.000kS/s	Trig-DualCapture-1M-

Other

[All ON] [All OFF]

☑ Display the thumbnail to View1

Dual Capture Properties

Other Settings (Other)

- **ALL Display**

Item	Description
All ON	Click this to display all captured waveforms on the dual capture waveform chart.
All OFF	Click this to display only the active waveform on the dual capture waveform chart.

- **Displaying the Thumbnail Range in the View1 Panel**

You can specify the following setting using the **Display the thumbnail to View1** check box.

Check Box	Setting
ON	When the View1 panel is displayed, clicking a captured waveform thumbnail causes the thumbnail range to be displayed in the View1 panel. You can analyze the captured waveform range displayed in the View1 panel.
OFF	Clicking a captured waveform thumbnail does not cause the thumbnail range to be displayed in the View1 panel.

Explanation

Data That Can Be Displayed in the Dual Capture Panel

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

Procedure

Displaying XY Waveforms

1. On the **View** tab, click **XY1, XY2** to show or hide the XY panel.

XY1 and 2 Panels

- The channel name selected with **Y Trace** in the property display area (XY Setting) in the unit are displayed.
- The minimum and maximum values in the channel settings are applied to the Y-axis and X-axis scales. The waveform color in the channel settings is applied to the text color.
- The trace name of the channel assigned to **X Trace** of the active waveform (forming a pair with Y Trace) and the unit are displayed. The waveform color in the channel settings is applied to the trace name and unit.

Example Displaying XY Waveforms and Properties
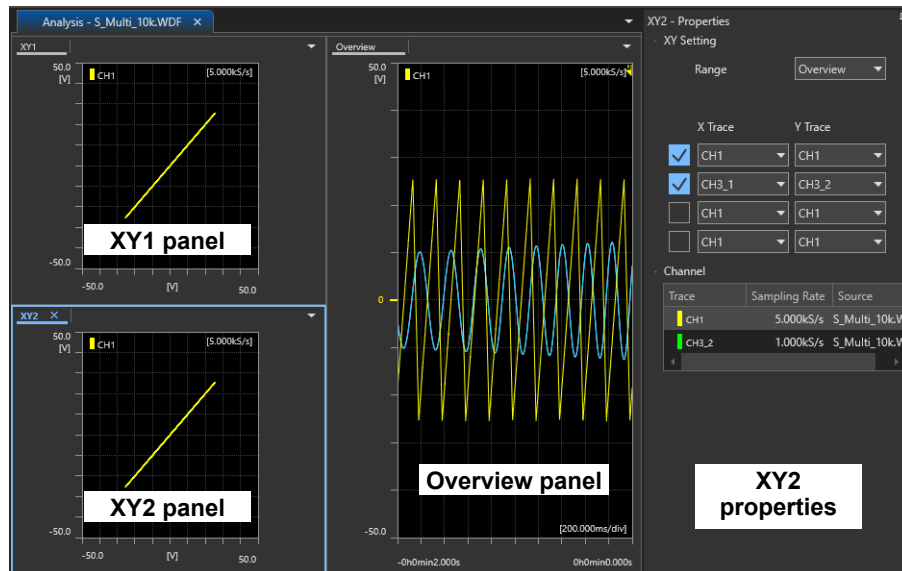
XY1 and 2 Properties

The following items are displayed in the property display area. Click ◢ in front of each item to expand or collapse the display.

XY Setting

- **Selecting the Source Waveforms (Range)**
  Select the source waveform type from the **Range** drop-down list in the property display area.

Source Waveform	Description
Overview	XY waveforms are displayed for all waveforms displayed in the Overview panel.
View1 to 4	XY waveforms are displayed for the waveforms displayed in the View 1 to 4 panels (the data in the areas enclosed by the zoom frames).

X Trace and Y Trace

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

Specify waveforms with the same sample rate for X and Y. The same sample waveform list selected with the X trace is displayed in the Y trace list.

Channel (Channel)

The trace names, sample rates, source file names of the displayed channels on the XY1 and 2 panels are shown in a table.

Overlaying on the X-Y waveform

The active waveform in the history panel can be displayed overlapped on the XY panel.

*   If Range is set to Overview, the waveform in the Overview panel is overlapped.
*   If Range is set to View1 to 4, the waveform in the View1 to 4 panels is overlapped.

Note

XY display is not possible on logic waveforms or WT5000's PP waveforms.

Numeric Display (WT5000)

1. On the **View** tab, click **Numeric1** or **Numeric2** to show or hide the Numeric 1 or 2 panel.

Numeric 1 and 2 Panels

The measurement data values at the vertical cursor 1 position are displayed numerically.

Cursor operation ▶ section 4.4

Example Displaying the Numeric 1 Panel (4-value display) and Properties
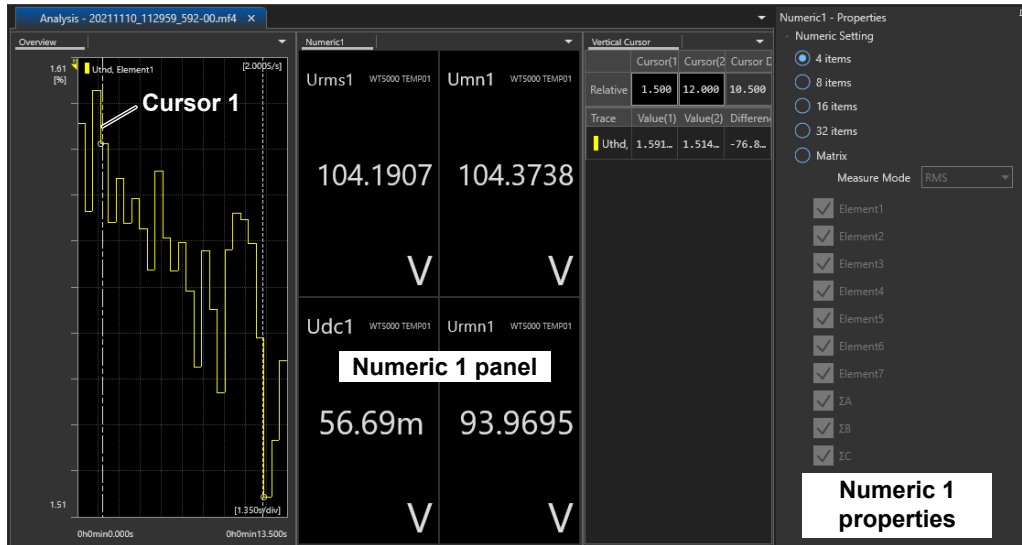
Numeric 1 and 2 Properties

You can set the numeric display format in the property display area of each panel.

Numeric Data Display

Display Format	Description
4 items	4-value display. Four numeric data values are displayed in two columns.
8 items	8-value display. Eight numeric data values are displayed in two columns.
16 items	16-value display. 16 numeric data values are displayed in four columns.
32 items	32-value display. 32 numeric data values are displayed in four columns.
Matrix	Matrix display. A table of numeric data is displayed with measurement functions listed vertically and symbols indicating elements and wiring units listed horizontally. Data can be displayed for all connected units and for all measurement modes (850 channels max.).* * For 17 functions × (7 elements + 3 wiring units) × 5 units max.
Measure Mode	Select the measurement mode of the function you want to display from the following: RMS, MEAN, DC, RMEAN, AC
Select element to display	Show or hide the following elements and wiring units by selecting or unselecting the check boxes. Element 1 to 7, ΣA , ΣB , ΣC

- **Display Example**

4 items (4-value display)

Urms1 WT5000 No.07(W	Umn1 WT5000 No.07(W
1.022	1.027
V	V
Udc1 WT5000 No.07(W	Urmn1 WT5000 No.07(W
- 0.012	0.925
V	V

8 items (8-value display)

Urms1 WT5000 No.07(W	Umn1 WT5000 No.07(W
1.022	1.027
V	V
Udc1 WT5000 No.07(W	Urmn1 WT5000 No.07(W
- 0.012	0.925
V	V
Uac1 WT5000 No.07(W	Irms1 WT5000 No.07(W
1.022	0.123
V	A
Imn1 WT5000 No.07(W	Idc1 WT5000 No.07(W
0.123	0.001
A	A

16 items (16-value display)

Urms1	Umn1	Udc1	Urmn1
1.022	1.027	- 0.012	0.925
V	V	V	V
Uac1	Irms1	Imn1	Idc1
1.022	0.123	0.123	0.001
V	A	A	A
Irmn1	Iac1	P1	S1
0.110	0.123	- 0.000	0.126
A	A	W	VA
Q1	λ1	φ1	FreqU(fU)1
- 0.126	- 0.002	- 90.108	98.563
var		°	Hz

32 items (32-value display)

Urms1	Umn1	Udc1	Urmn1
1.022	1.027 -	0.012	0.925
V	V	V	V
Uac1	Irms1	Imn1	Idc1
1.022	0.123	0.123	0.001
V	A	A	A
Irmn1	Iac1	P1	S1
0.110	0.123 -	0.000	0.126
A	A	W	VA
Q1	λ1	φ1	FreqU(fU)1
- 0.126 -	0.002 -	90.108	98.563
var		°	Hz
FreqI(fI)1	U+peak(U+pk)1	U-peak(U-pk)1	I+peak(I+pk)1
0.000	1.432 -	1.459	0.250
Hz	V	V	A
I-peak(I-pk)1	CfU1	CfI1	Pc1
- 0.232	1.427	2.035 -	0.000
A			W
P+peak(P+pk)1	P-peak(P-pk)1	Freq2U(f2U)1	Freq2I(f2I)1
0.319 -	0.328	98.562	2391.385
W	W	Hz	Hz
Ufnd1	Ifnd1	Pfnd1	Sfnd1
1.016	0.005	0.001	0.005
V	A	W	VA

Matrix (Matrix display)
When Element1 to 5 are displayed

Urms1	Urms2	Urms3	Urms4	Urms5
1.022	1.034	1.040	1.034	0.000
V	V	V	V	V
Irms1	Irms2	Irms3	Irms4	Irms5
0.123	0.000	0.000	0.000	0.000
A	A	A	A	A
P1	P2	P3	P4	P5
- 0.000 -	0.000 -	0.001	0.000 -	0.000
W	W	W	W	W
S1	S2	S3	S4	S5
0.126	0.000	0.000	0.000	0.000
VA	VA	VA	VA	VA
Q1	Q2	Q3	Q4	Q5
- 0.126	0.000	0.000	0.000	0.000
var	var	var	var	var
λ1	λ2	λ3	λ4	λ5
- 0.002	- - -	- - -	- - -	- - -
φ1	φ2	φ3	φ4	φ5
- 90.108	- - -	- - -	- - -	- - -
°	°	°	°	°
FreqU(fU)1	FreqU(fU)2	FreqU(fU)3	FreqU(fU)4	FreqU(fU)5
98.563	0.000	0.000	0.000	0.000
Hz	Hz	Hz	Hz	Hz
FreqI(fI)1	FreqI(fI)2	FreqI(fI)3	FreqI(fI)4	FreqI(fI)5
0.000	0.000	0.000	0.000	0.000
Hz	Hz	Hz	Hz	Hz

Procedure

Displaying Harmonic Bar Graphs (WT5000)

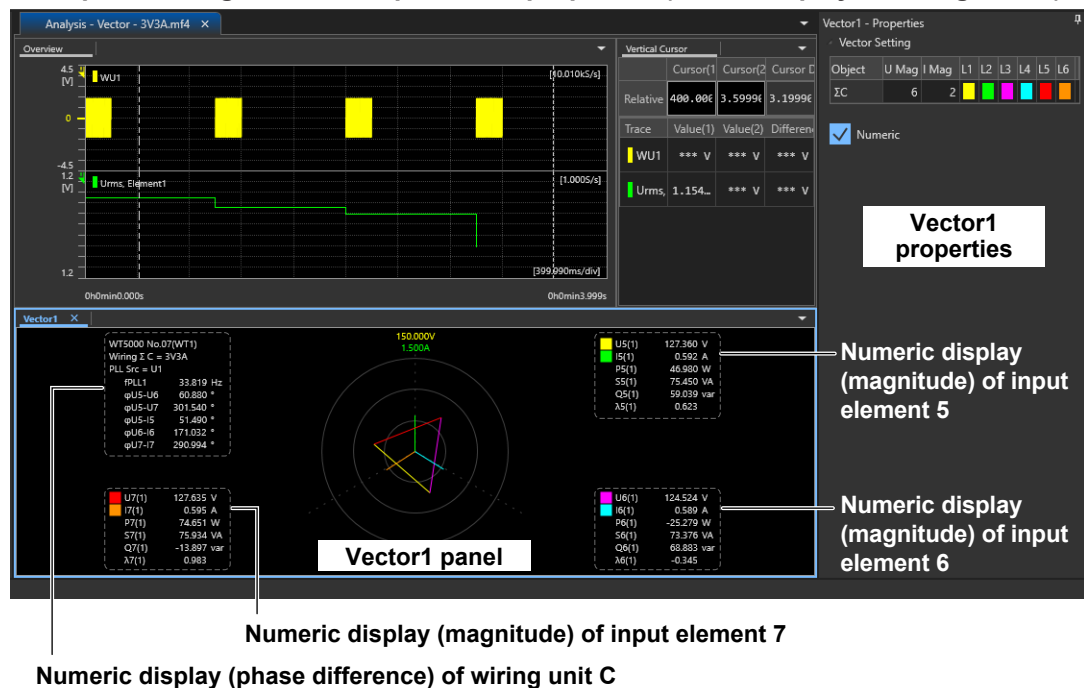*1.* On the **View** tab, click **Bar1**, **Bar2** to show or hide the bar panel.

Bar 1 and 2 Panels

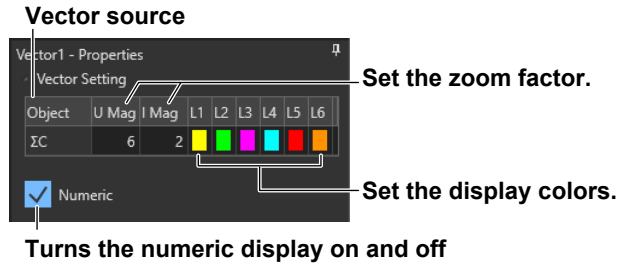Harmonic measurement data values at the vertical cursor 1 position are displayed in a bar graph and numeric list for each harmonic or frequency.*

Cursor operation ► section 4.4

Example Displaying Harmonic Bar Graphs and Properties

Harmonic bar graphs   Numeric list
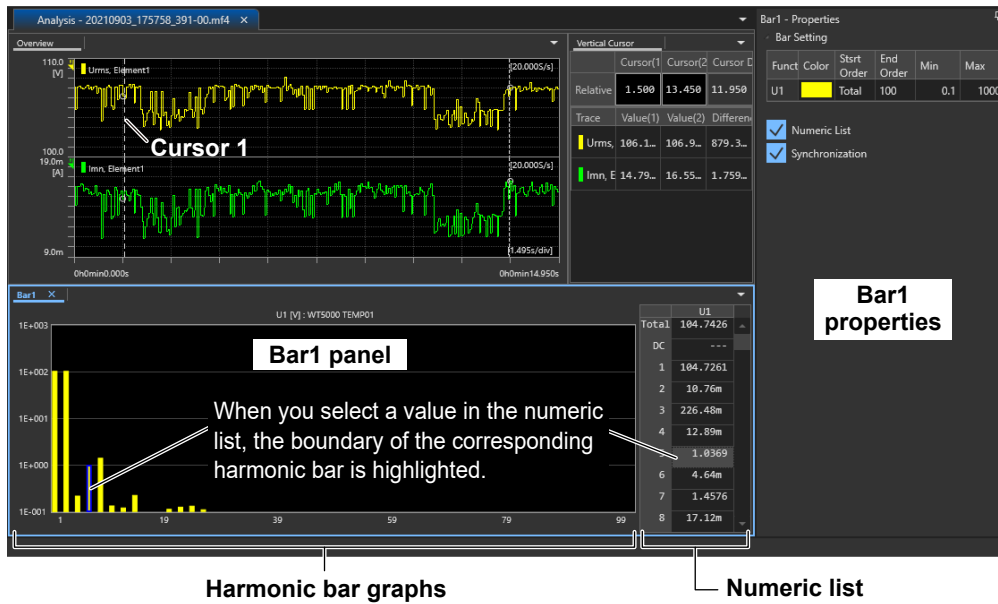
* For measurement data recorded with the launcher's **DAQ (IEC 2k-9kHz)** feature, the numeric list is displayed by frequency.
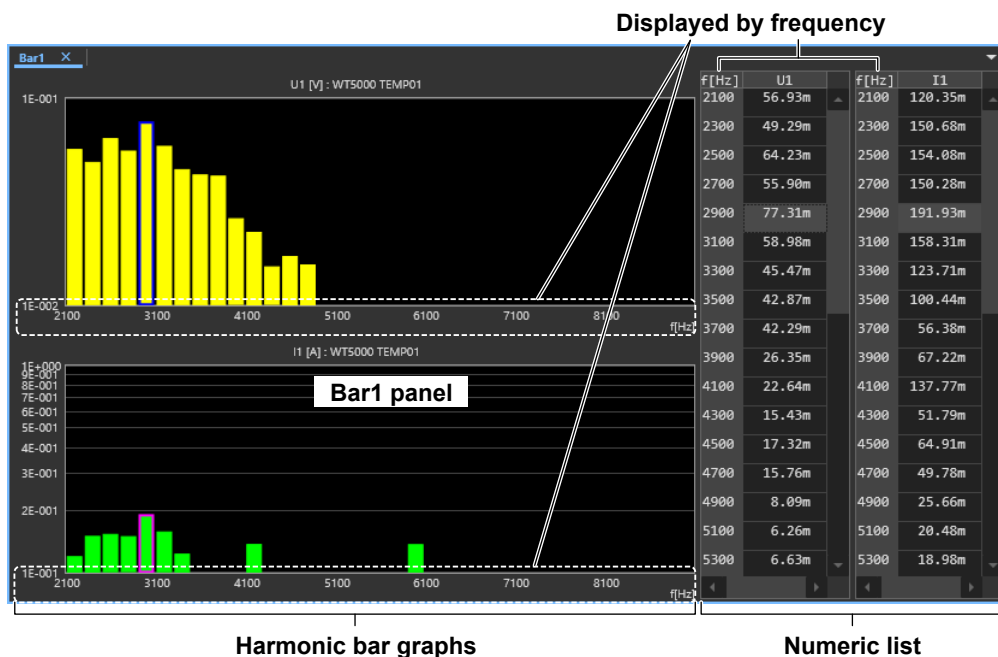
Harmonic bar graphs   Numeric list

On the Bar 1 and 2 panels, you can display harmonic bar graphs and numeric lists. Up to three of these elements can be displayed.

Bar 1 and 2 Properties

Bar1 properties

Shows or hides numeric lists
Synchronizes or unsynchronizes numeric lists

Bar2 properties

The following items are displayed in the property display area.

Bar Setting

- **Function**

  Bar graph functions are displayed.

- **Color**

  Bar graph colors are displayed. Double-click to select the bar graph color to display.

- **Start Order and End Order**

  Double-click to select from a drop-down list the harmonic orders or frequencies* of the numeric data to display.

  If the start order is greater than the end order, only the start order is displayed.

  * For IEC 61000-4-7 Annex B (2k-9kHz) harmonic measurement data, frequencies are displayed. You can select the start and end frequencies.

- **Minimum (Min) and Maximum (Max)**

  Set the maximum and minimum values for displaying harmonic bar graphs.

- **Numeric Display (Numeric List)**

  Show or hide the harmonic numeric list with the check box. The default setting is ON.

Check Box	Setting
ON	A numeric list is displayed to the right of the bar graph.
OFF	A numeric list is not displayed.

- **Synchronization (Synchronization)**

  Set whether to synchronize the scrolling of multiple numeric lists with the check box.

Check Box	Setting
ON	The vertical scrolling of the numeric lists is synchronized. When you control any of the scroll bars or turn the mouse wheel on any of the numeric lists, all the numeric lists on the same panel scrolls in sync.
OFF	The vertical scrolling of the numeric lists is not synchronized. You can scroll each numeric list separately.

<div style="background:#003399;color:white;padding:4px;display:inline-block">

Procedure

</div>

Displaying Vector (WT5000)

1. On the **View** tab, click **Vector1**, **Vector2** to show or hide the vector panel.

Vector 1 and 2 Panels

The measurement data values at the vertical cursor 1 position are displayed in a vector graph and numerically.

Cursor operation ► section 4.4

The relationship of the phase difference and magnitude (rms value) between the fundamental waves U(1) and I(1) of each element assigned to the selected wiring unit is displayed using vectors. The positive vertical axis is set to zero (angle zero), and the vector of each input signal is displayed.

Example showing the Vector1 panel and properties (vector display of wiring unit C)

Vector1 properties

Numeric display (magnitude) of input element 5

Numeric display (magnitude) of input element 6

Vector1 panel

Numeric display (magnitude) of input element 7

Numeric display (phase difference) of wiring unit C

Vector 1 and 2 Properties

Vector source

Set the zoom factor.

Set the display colors.

Turns the numeric display on and off

The following items are displayed in the property display area.

Vector Setting

- **Vector Source (Object)**

   The vector display source, an element or wiring unit, is displayed.

- **Voltage Zoom Factor (U Mag), Current Zoom Factor (I Mag)**

   Set the zoom factors (0.100 to 100.000) of the fundamental waves U(1) and I(1).
   The value that indicates the size of the vector display's peripheral circle changes according to the zoom factor, and the size of the vectors that indicate U (1) and I (1) change accordingly as well.

- **Display Colors (L1 to L6)**

   Line colors of the vector graph are shown. Double-click to select the color of each line.

- **Numeric Display (Numeric)**

   The numeric display can be shown or hidden with the check box.

Check Box	Description
ON	The phase difference and magnitude (rms value) between the fundamental waves U(1) and I(1) of each element assigned to the selected wiring unit are displayed numerically. Example of numeric display ► page 4-27
OFF	Numeric values are not displayed.

Procedure

Moving and Zooming Waveforms

You can perform these operations in the Overview and View panels.

- Displaying the overview waveform ► page 4-9
- Displaying view waveforms ► page 4-12

1. Select the overview or view waveform panel you want to control.

Moving a Waveform Vertically

2. Under **Position** > **Offset** in properties, click ↕ **Y**.

The waveform vertical movement mode is turned on. ► page 4-11

3. Drag the overview or view waveform you want to move.

The waveform is moved vertically.

Zooming In or Out of a Specified Point

You can use shortcut keys to change a range (the maximum and minimum values of a channel) without opening the channel setting window.

2. On the waveform, point to the center position you want to zoom in or out of.

3. While holding down the Ctrl and Alt keys, turn the mouse wheel.

The pointer icon in the waveform window changes in shape as shown in the following figure, and the waveform is expanded or reduced around the pointer.
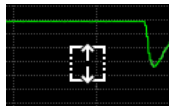
Zooming In on or Out of a Waveform

Zooming Vertically

2. Under **Position** > **View range** in the view properties, click **[-]** or **[+]** next to **Vertical**.

Vertical	Description
–	The zoom target waveform is reduced vertically each time you click the button.
+	The zoom target waveform is expanded vertically each time you click the button.

Zooming Horizontally

2. Under **Position** > **View range** in the view properties, click **[-]** or **[+]** next to **Horizontal**.

Horizontal	Description
–	The zoom target waveform is reduced horizontally each time you click the button.
+	The zoom target waveform is expanded horizontally each time you click the button.

Explanation

Shortcut Keys for Moving and Zooming Waveforms

► "Shortcut key description" on page 4-13

Procedure

Splitting and Displaying Windows

Split Waveform Display

If the waveforms are difficult to view because they are overlapped, you can select a split style in the properties to split the waveforms displayed in the Overview and View panels at the trace name level.

► "Split Style" on page 4-10

Setting the Split Display

The default number of splits is automatically detected and set to the number of displayed source waveforms. This number is shared between the Overview and View panels. The default value can be changed in the properties of the overview and view. You can set separate number of splits for the Overview and View panels or set it to any value like.

► "Share property setting in Overview/View" on page 4-10

Example of Split Display Style Set to Split

Select Split, and set Auto and Count.

Example of Split Display Style Set to Tile

Select Tile, and set Column and Row.
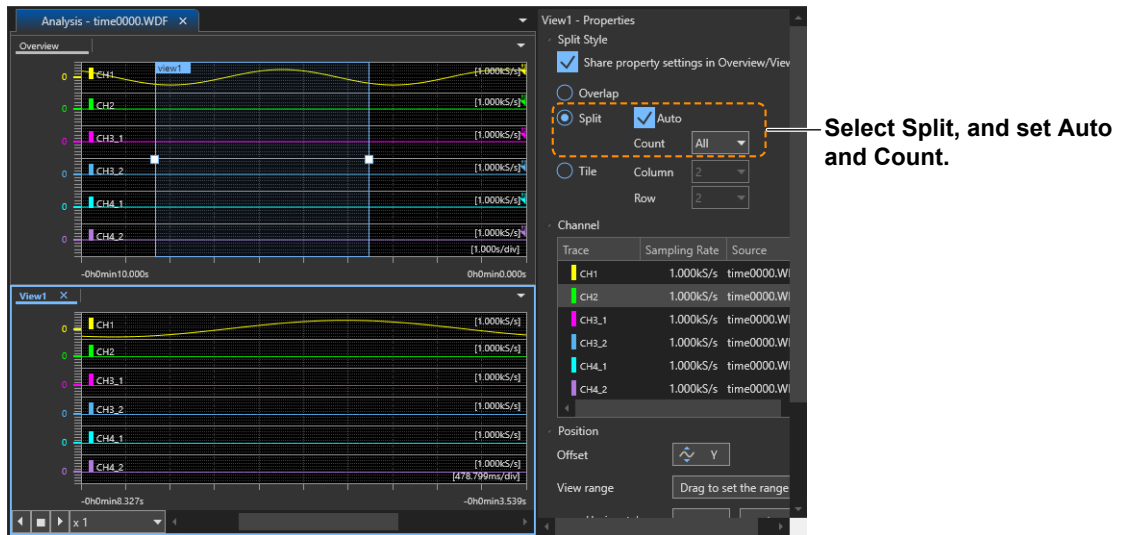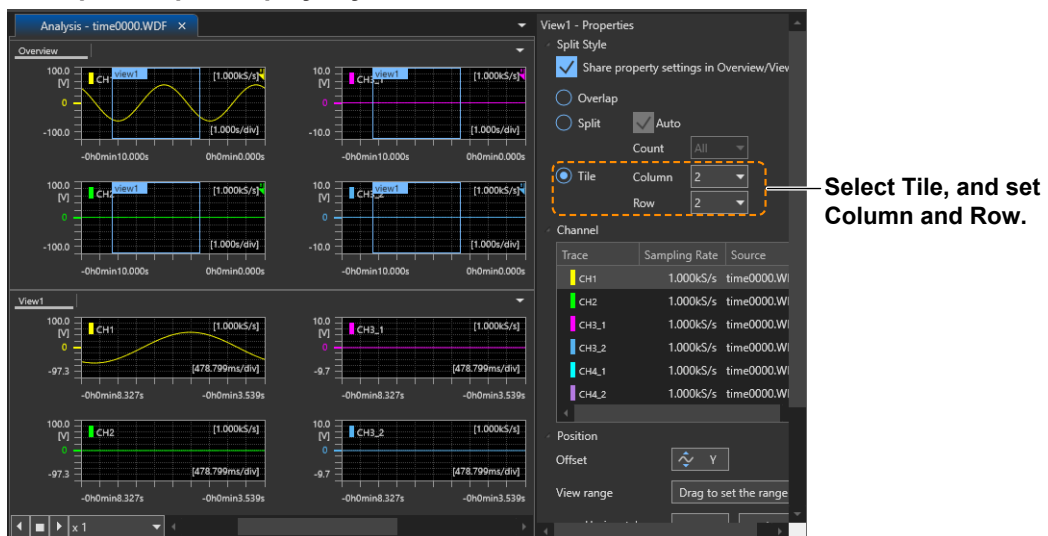
4.4 Measuring with Cursors

This section explains the following operations:
- Measuring with vertical cursors
- Measuring with horizontal cursors
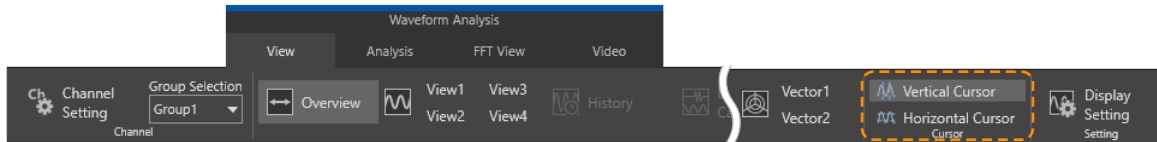
Procedure

Measuring with Vertical Cursors

1. On the **View** tab, click **Vertical Cursor** to display two vertical cursors in the Overview and View panels.

Vertical Cursor Panel

The Vertical Cursor panel displays the measured value at each cursor position (time), the differences in times and measured values between the two cursors, and so on.

Example Displaying Vertical Cursors and Properties (When Point Display is ON)

* When the horizontal scale display format is Absolute time, the panel is displayed as follows. Values can be entered in time format. Setting the horizontal scale display format ► section 4.5

Moving the Vertical Cursors

- You can drag each cursor.
- You can click the cursor value in the Vertical Cursor panel and enter the value of the position you want to move the cursor to. The cursor will move to the specified position.
- If you select **Vertical Cursor > Move Cursor (1)/(2) Here** from the shortcut menu that appears by selecting the vertical cursor command (icon) and right-clicking in the Overview and View panel, you can move the cursor to the position you click.

Cursor positions

Vertical Cursor ✕	Cursor(1)	Cursor(2)	Cursor Diff	
Relative Time	-7.939	-3.017	4.922	**Time difference between cursors 1 and 2**
Trace	Value(1)	Value(2)	Difference	
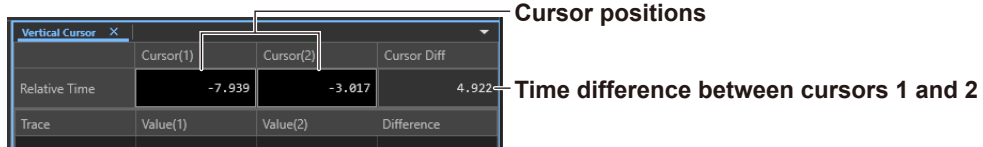
* For logic waveforms, the values will be blank.

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.

Measuring with Horizontal Cursors

1. On the **View** menu, click **Horizontal Cursor** to display two horizontal cursors in the Overview and View panels.

Note

When the waveforms shown in the Overview and View panels are different (when "Share property setting in Overview/View" is set to off), horizontal cursors are not displayed in the View panel.

Horizontal Cursor Panel

The Horizontal Cursor panel displays the measured value at each cursor.

Cursor 1 (can be moved by dragging)
Cursor 2 (can be moved by dragging)

Measured value difference of cursors 1 and 2
Measured value of cursor 2 (intersection of cursor 2 and waveforms)
Measured value of cursor 1 (intersection of cursor 1 and waveforms)
Horizontal Cursor Panel

Cursor 1   **Cursor 2**
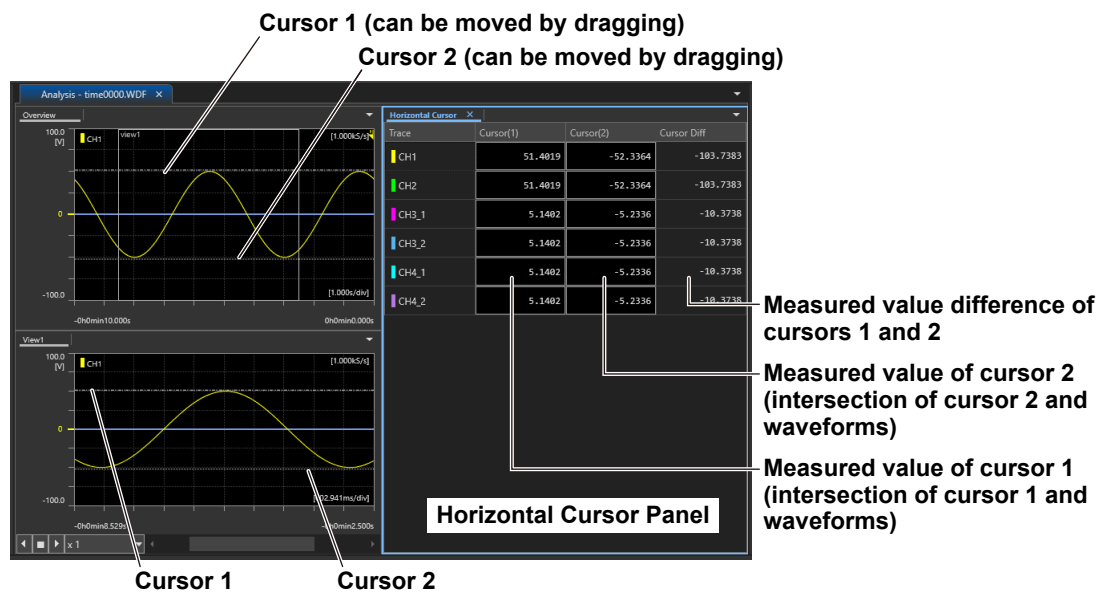
* For logic waveforms, "***" is displayed.

Moving the Horizontal Cursors

- You can drag each cursor.
- You can click the cursor value in the Horizontal Cursor panel and enter the value of the position you want to move the cursor to. The cursor will move to the specified position.
- If you select **Horizontal Cursor > Move Cursor (1)/(2) Here** from the shortcut menu that appears by selecting the horizontal cursor command (icon) and right-clicking in the Overview and View panel, you can move the cursor to the position you click.

Explanation

Cursor Position Display

Time Display

The time is displayed in absolute or relative time. You can select the display type with the horizontal axis display format.

- Absolute time: The cursor positions are displayed using absolute times.
- Relative time: The cursor positions are displayed using relative times from the trigger position.

Setting the horizontal scale display format ► section 4.5

Point Display

Measurements at the vertical cursors can be displayed in terms of the number of points. Set whether to show or hide the number of points using **Display Settings > Point Display** in the vertical cursor properties.

Check Box	Description
ON	The number of points is displayed above the cursor measurement value (time display) in the vertical cursor panel. The number of points is counted with the beginning of each trace assumed to be zero. Even when two traces have the same sample rate, if the start positions are different, the number of points at each cursor position will be different.
OFF	Only the cursor measurement value (time display) is shown. The number of points is not shown.

Note

When DL950 power math waveform data (timestamp format) is displayed

The timestamp data value at the cursor position is displayed. If the data is not available, the previous data value is displayed.

4.5   Configuring the Window Display Settings

This section explains the following display settings.

- Grid
- Horizontal axis
- Color
- Waveform and grid line weight
- Waveform display panel's scale information
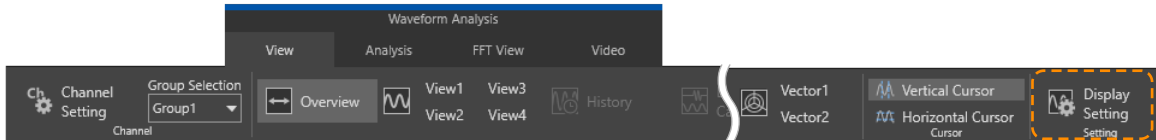
Procedure

Display Setting

1. On the **View** tab, click **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.

Grid

When you click the **Graticule** tab, the following item appears. You can set the number of vertical divisions.
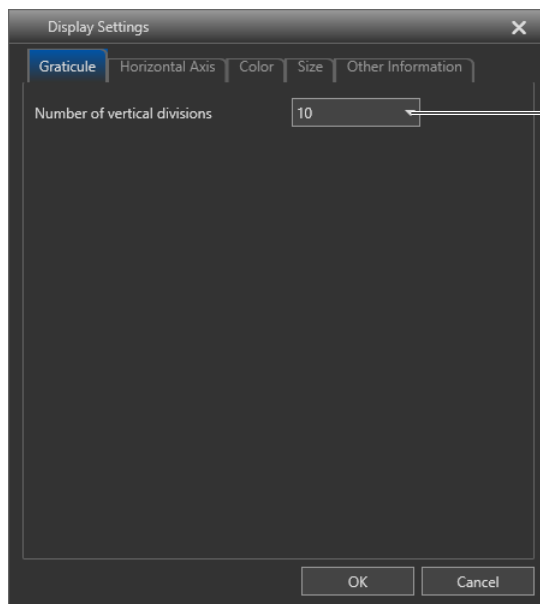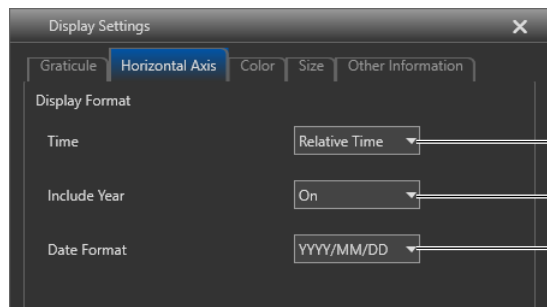
Select the number of vertical scale divisions.

Horizontal Axis Display Format

When you click the **Horizontal Axis** tab, the following items appear. You can set the horizontal axis display format.

Select the type of time to display on the horizontal scale.

Turns the detailed time display on or off

Select the time display format.

Time

You can set the type of time to display on the horizontal scale.
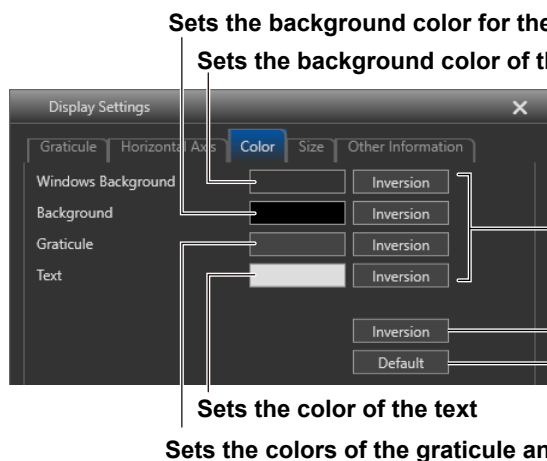
Type	Description
Relative Time	Relative time from the trigger time. Relative time in reference to the reference time axis (Reference time axis) in the channel settings. ► section 4.2
Absolute Time	Measured time (absolute time)

Include Year

Setting	Description
On	The Gregorian year is displayed when absolute time is displayed.
Off	The Gregorian year is omitted when absolute time is displayed.

Color

When you click the **Color** tab, the following items appear. Using the color palette, you can set the window background, grid, and text colors.

Sets the background color for the waveforms
Sets the background color of the windows

Inverts the color tones.

Inverts the color tones of all items
Resets settings to their defaults

Sets the color of the text

Sets the colors of the graticule and the divisions

Waveform and Grid Line Weight

When you click the **Size** tab, the following items appear. You can set the waveform and grid line weight.
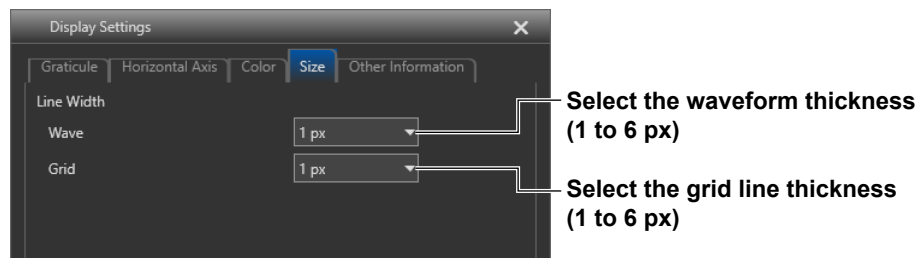
Select the waveform thickness (1 to 6 px)

Select the grid line thickness (1 to 6 px)

Other

When you click the **Other Information** tab, the following items appear. You can set the waveform interpolation and the bit label display on/off state.

Waveform interpolation

Turns bit label display on or off
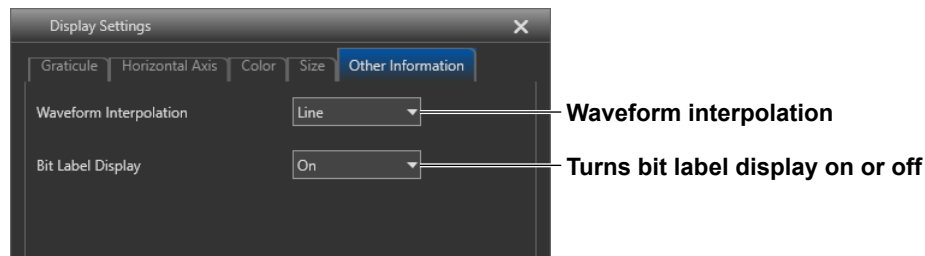
Waveform Interpolation

You can change the setting to display the waveforms as follows:

Setting	Description
Off	Waveforms are displayed without connecting between measurement points with lines.
Line	Waveforms are displayed by connecting between measurement points with lines.

Bit Label Display

The bit names of logic waveforms can be displayed in the Overview panel.

Setting	Description
Off	Bit names are not displayed.
On	Bit names are displayed.
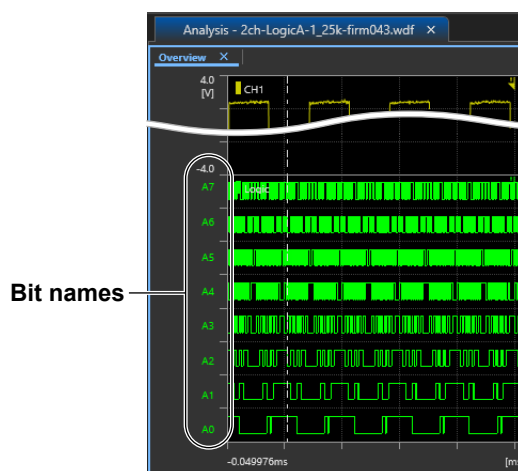
Bit names

Note

Bit labels are not displayed if the display area of the Overview panel is narrow. To display bit labels, do the following:
- Drag the Overview panel vertically to expand it.
- Reduce the number of split windows.

Explanation

Display Color Settings

You cannot change the colors of the displayed waveforms in the display setting dialog box. You can change the waveform color settings in the Channel Setting window. ► sections 3.5, 4.2

Tone Inversion

Click **Inversion** to invert the tone. Clicking the button again sets the colors back to the original settings.

Initialization

Click **Default** to reset the color settings to their defaults.

4.6   Coaxial Data Display

Multiple waveforms can be displayed on a single time axis.

• When multiple files are selected and opened, the waveforms are displayed on a single time axis.

• If you add waveforms of another file to waveforms that are displayed, you can set the coaxial display in the following manner.

- From the list of waveform files, select the files you want to load, right-click to open the shortcut menu, and set **Start Coaxial**.

- From the list of waveform files, drag and drop the files you want to load onto the displayed waveforms.

► "Waveform Files" on page 3-32

4.7 Automatically Measuring Waveform Parameters

This section explains the following operations:

- Automatically Measuring Waveform Parameters
- Automated Measurement of History Statistics
- Automated Measurement of Cycle Statistics
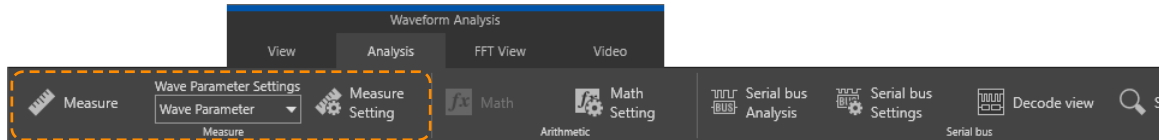
Procedure

Automatically Measuring Waveform Parameters

Setting the measurement items

1. From the **Wave Parameter Settings** drop-down list on the **Analysis** tab, select **Wave Parameter**.

   * If **Waveform Parameter** is already selected, click **Measure Setting**.

   A Waveform Parameter Setting dialog box appears.

2. Set the measurement items and the display conditions of measurement results, and click **OK**.
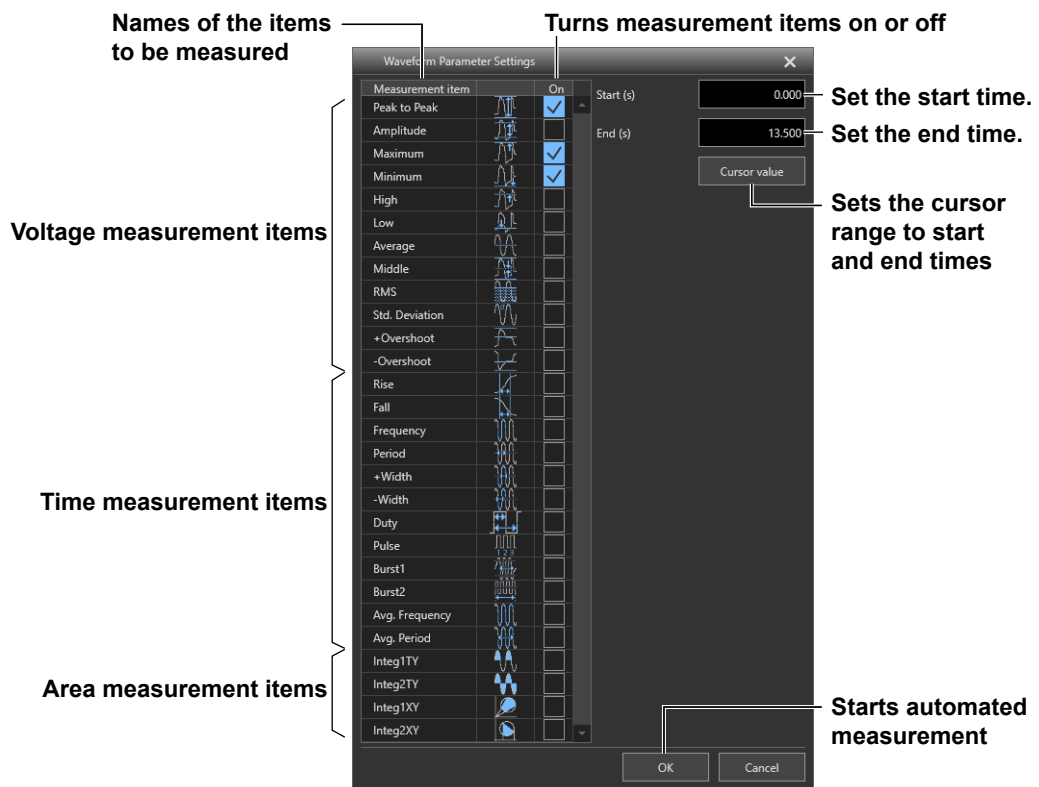
The dialog box closes, and automated measurement starts.

When the measurement is completed, a measurement result panel appears. A measurement range (Measure) bar appears at the top of the Overview panel and View panel.

Displaying Measured Results

1. On the **Analysis** tab, click **Measure** to display the Measure Result panel.

Drag the left edge of the Measure bar to change the math start position and computation time.

Drag the right edge of the Measure bar to change the computation time.

Swaps the rows and columns of the measurement result display

Measurement result panel

Rows: measured items, columns: channel

Rows: channel, columns: measured items

Measured results

Measurement items to measure automatically
(Set in the waveform parameter setting dialog box)

Measurement time period

Measurement start point cursor   Measurement end point cursor

If you change the measurement range, the wave parameters are automatically remeasured.

Explanation

Items That Can Be Measured

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

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
- If there are two or more cycles of a waveform in the measurement scope, time parameters are measured for the first cycle.
- Logic waveforms, high-speed sampling waveforms (sub waveforms) of dual capture, WT5000 PP waveforms, external clock data, timestamp data (DL950 power math data or motor dq analysis data and Modbus/TCP (MB1 option) data) cannot be measured automatically.

Details of the Measurement Result Display

Automatically measured values using waveform parameter are displayed.

The displayed items and measured values vary depending on the content of the measurement and waveform.

- The item names in the result display are abbreviated.
- If the display format is percentage, the values are displayed to two decimal places.
- If the display format is floating, five digits are displayed.
- If the measurement result is invalid or impossible, "***" is displayed as the measured value. Waveforms with small amplitudes may fail to produce correct readings.

The display is updated at the following times.

- When the Measure bar is moved or the size is changed
- When the settings in the Channel Setting window are changed
- When OK is clicked in the waveform parameter setting dialog box
- When a display group is changed

Note

When the measurement result panel is not displayed and you execute cursor measurement or automated measurement of waveform parameters, the measurement result panel will automatically appear.

Table of Items

Group	Item	Display Format	Unit Prefix	Unit
Voltage axis items	Peak to Peak	Decimal	Y	VUnit
	Amplitude	Decimal	Y	VUnit
	Maximum	Decimal	Y	VUnit
	Minimum	Decimal	Y	VUnit
	High	Decimal	Y	VUnit
	Low	Decimal	Y	VUnit
	Average	Decimal	Y	VUnit
	Middle	Decimal	Y	VUnit
	RMS	Decimal	Y	VUnit
	Std. Deviation	Decimal	Y	VUnit
	+Overshoot	%	—	Fixed to %
	-Overshoot	%	—	Fixed to %
Time axis items	Rise	Decimal	Y	HUnit
	Fall	Decimal	Y	HUnit
	Frequency	Decimal	Y	Fixed to Hz
	Period	Decimal	Y	HUnit
	+Width	Decimal	Y	HUnit
	-Width	Decimal	Y	HUnit
	Duty	%	—	Fixed to %
	Pulse	Integer	—	None
	Burst1	Decimal	Y	HUnit
	Burst2	Decimal	Y	HUnit
	Avg. Frequency	Decimal	Y	Fixed to Hz
	Avg. Period	Decimal	Y	HUnit
Area items	Integ1TY	Decimal	Y	None
	Integ2TY	Decimal	Y	None
	Integ1XY	Decimal	Y	None
	Integ2XY	Decimal	Y	None

For details on each measurement item, see the user's manual for the instrument.

Data Obtained through Automatic Measurements with Waveform Parameters

You can save the automatically measured values that are shown in the measurement result panel to a file.

There are two methods to save automatically measured data.

Exporting the Measured Results to a File

On the **File** tab, click **Export** File.

► "Exporting a File" on page 3-41

Saving the Measured Results Using the Export Menu

Right-click on the measurement result panel to display the following menu.
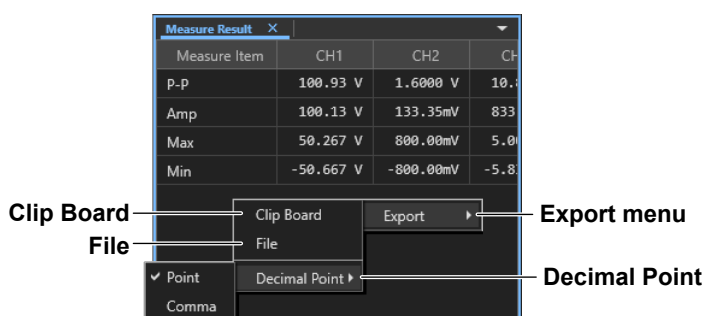
Export menu

Item		Description
Clipboard		All the contents displayed in measurement result panel are copied to the clipboard.
File		A Save to Measure Result dialog box will open. You can save the contents of the measurement result panel to a CSV file in the specified destination.
Decimal Point		You can select the decimal point and separator (data separation). Select either of the following:
	Point	The decimal point is a period, and the separator is a comma.
	Comma	The decimal point is a comma, and the separator is a period.

Procedure

Automated Measurement of History Statistics

You can perform the following operations when a history waveform file is open.

Setting the measurement items

1. From the **Wave Parameter Settings** drop-down list on the **Analysis** tab, select **History Statistics**.

   * If **History Statistics** is already selected, click **Measure Setting**.

   The History Statistics Settings dialog box appears.

2. Set the measurement items and the display conditions of measurement results, and click **OK**.
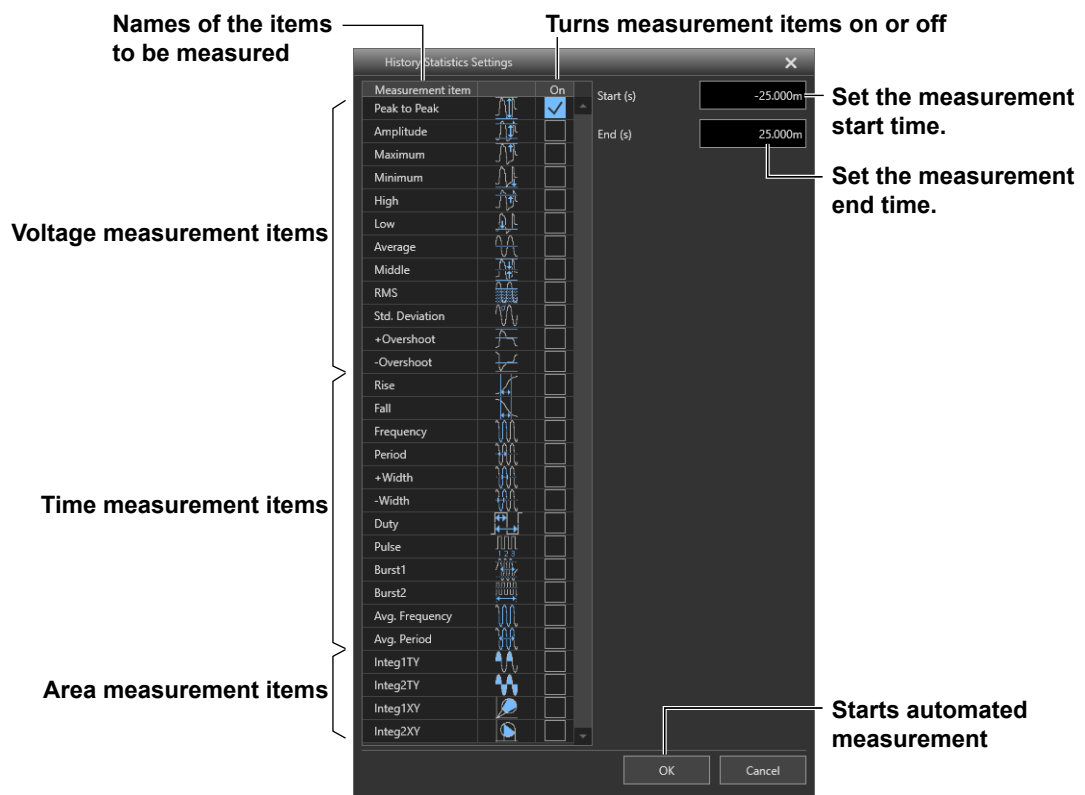
The dialog box closes, and automated measurement starts.

When the measurement is completed, a measurement result panel appears. Two vertical cursors and a measurement range (Measure) bar are displayed on the history waveform chart of the History panel.

Displaying History Statistic Results

1.   On the **Analysis** tab, click **Measure** to show or hide the Measure Result panel.

Drag the left edge of the Measure bar to change the measurement start position and computation time.

Drag the right edge of the Measure bar to change the measurement time.

Histogram of Statistic Results

Measurement result panel

History Statistics Values

Measurement items and channels

Statistic results for each history entry
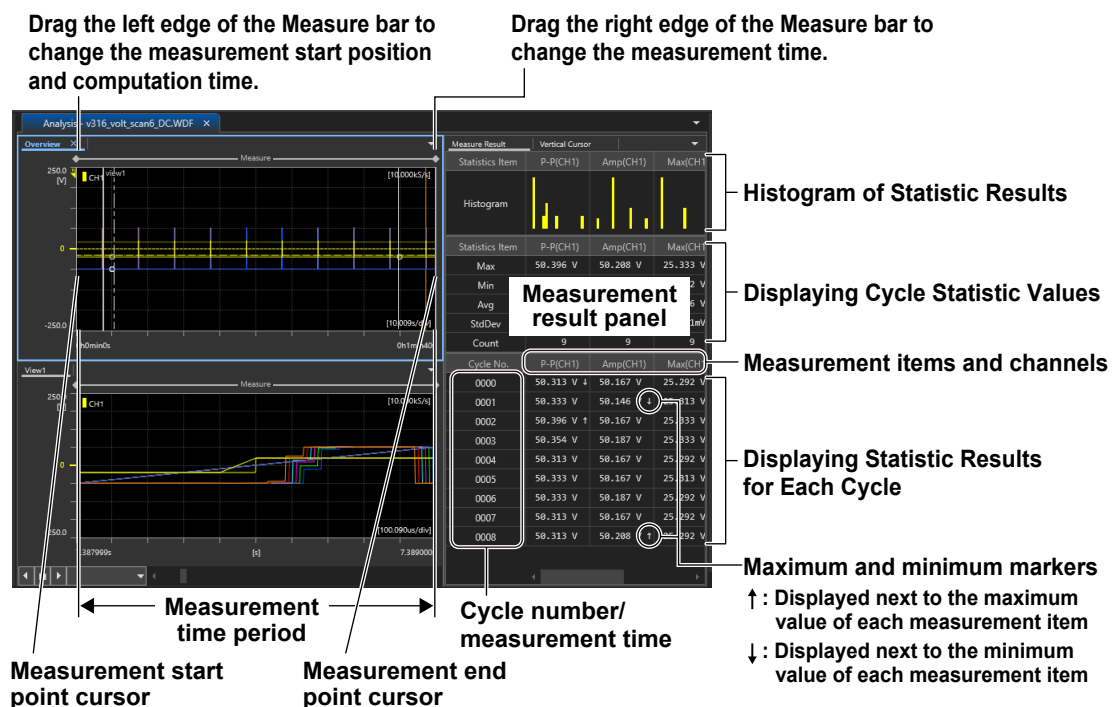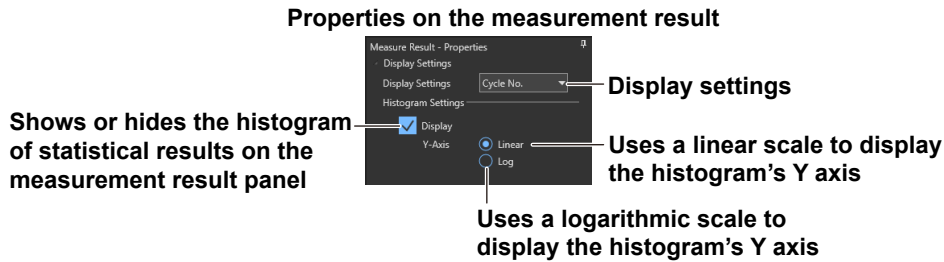
Maximum and minimum markers
↑ : Displayed next to the maximum value of each measurement item
↓ : Displayed next to the minimum value of each measurement item

History numbers

Measurement time period

Measurement end point cursor

Measurement start point cursor

Properties on the measurement result

Shows or hides the histogram of statistical results on the measurement result panel

Uses a linear scale to display the histogram's Y axis

Uses a logarithmic scale to display the histogram's Y axis

If you change the measurement range, the history statistics are automatically remeasured.

Histogram of Statistic Results

• Using a property on the Measure Result panel, you can show or hide the histogram display.
• When the histogram display is on, you can select Linear or Log for displaying the Y axis.

History Statistics Values

For each of the following statistics items, the statistical results of the selected measurement item and target channel are displayed.

Max (maximum), Min (minimum), Avg (average), StdDev (standard deviation), Count (cycle count)

Displaying Statistic Results for Each History Entry

• For each history entry, the measurement results of the selected measurement item and target channel are displayed.
• When the View1 panel is displayed, clicking a history number causes the corresponding history waveform to be displayed in the View1 panel.

Explanation

Items That Can Be Measured with History Statistics

On history waveforms, you can set and measure voltage parameters, time parameters, and area parameters. Parameters that can be measured are the same as those of the automated measurement of waveform parameters. ► page 4-41

Displayed Content of History Statistic Result

Automatically measured history statistics are displayed.

The displayed items and measured values vary depending on the content of the measurement and waveform.

- The item names in the result display are abbreviated.
- If the display format is percentage, the values are displayed to two decimal places.
- If the display format is floating, five digits are displayed.
- If the measurement result is invalid or impossible, "***" is displayed as the measured value. Waveforms with small amplitudes may fail to produce correct readings.

The display is updated at the following times.

- When the Measure bar is moved or the size is changed
- When the settings in the Channel Setting window are changed
- When OK is clicked in the History Statistics Settings dialog box
- When a display group is changed

Note

- When the measurement result panel is not displayed and you execute automated measurement of history statistics, the measurement result panel will automatically appear.
- 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 results cannot be displayed. If a message appears, change the number of displayed channels and measurement items so that 100000 is not exceeded.

Saving History Statistics' Automated Measurement Data

You can save the contents displayed in the measurement result panel to a file.

The save procedure is the same as for automated measurement of waveform parameters.

► page 4-43

Procedure

Automated Measurement of Cycle Statistics

Setting the measurement items

1. From the **Wave Parameter Settings** drop-down list on the **Analysis** tab, select **Cycle Statistics**.

   *   If **Cycle Statistics** is already selected, click **Measure Setting**.

   The Cycle Statistics Settings dialog box appears.

2. Set the names of the traces to be measured, measurement items and the display conditions of measurement results, and click **OK**.
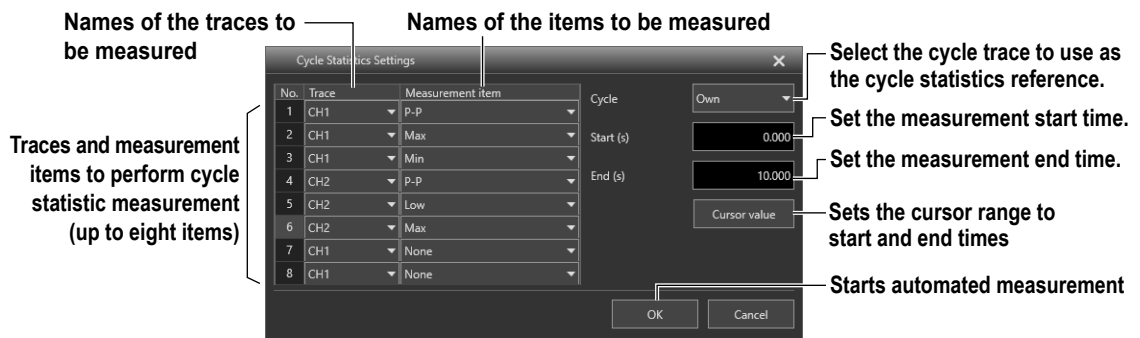
Names of the traces to be measured

Names of the items to be measured

Select the cycle trace to use as the cycle statistics reference.

Set the measurement start time.

Set the measurement end time.

Traces and measurement items to perform cycle statistic measurement (up to eight items)

Sets the cursor range to start and end times

Starts automated measurement

The dialog box closes, and automated measurement starts.

When the measurement is completed, a measurement result panel appears. A measurement range (Measure) bar appears at the top of the Overview panel and View panel.

Displaying Cycle Statistic Results

1. On the **Analysis** tab, click **Measure** to show or hide the Measure Result panel.

Drag the left edge of the Measure bar to change the measurement start position and computation time.

Drag the right edge of the Measure bar to change the measurement time.

Histogram of Statistic Results

Displaying Cycle Statistic Values

Measurement result panel

Measurement items and channels

Displaying Statistic Results for Each Cycle

Maximum and minimum markers

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

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

Measurement time period

Cycle number/ measurement time

Measurement start point cursor

Measurement end point cursor

Properties on the measurement result

Shows or hides the histogram of statistical results on the measurement result panel

Display settings

Uses a linear scale to display the histogram's Y axis

Uses a logarithmic scale to display the histogram's Y axis

If you change the measurement range, the cycle statistics are automatically remeasured.

Histogram of Statistic Results

This is the same as displaying history statistic results. ► page 4-45

Displaying Cycle Statistic Values

This is the same as displaying history statistic results. ► page 4-45

Displaying Statistic Results for Each Cycle

For each cycle, the measurement results of the selected measurement item and target channel are displayed.

• **When the Cycle Trace Is a Trace**

- You can select the content to be displayed in the Cycle No. column using the **Display Settings** property on the Measure Result panel.

Display Settings	Content to be displayed in the Cycle No. column
Cycle No.	Displays the cycle number.
Relative	The start times of cycle divisions are displayed with relative times.
Absolute	The start times of cycle divisions are displayed with absolute times.

- If you click a cycle number/time in the Cycle No. column when the View1 panel is displayed causes the target cycle to be displayed in the View1 panel.

• **When the Cycle Trace Is Own**

The cycle statistics results of each trace is displayed according to the minimum number of cycles in the target traces.

Example

If the numbers of cycles are three for trace 1, two for trace 2, and five for trace 3, the results of all traces are displayed for two cycles (which is the least number of cycles).

Explanation

Items That Can Be Measured with Cycle Statistics

On each cycle of the waveforms, you can set and measure voltage, time, and area items. Items that can be measured are the same as those of the automated measurement of waveform parameters. ► page 4-41

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. The measurement result panel will show the measured results over the time period for the least number of cycles.

When Cycle Trace Is Set to Own

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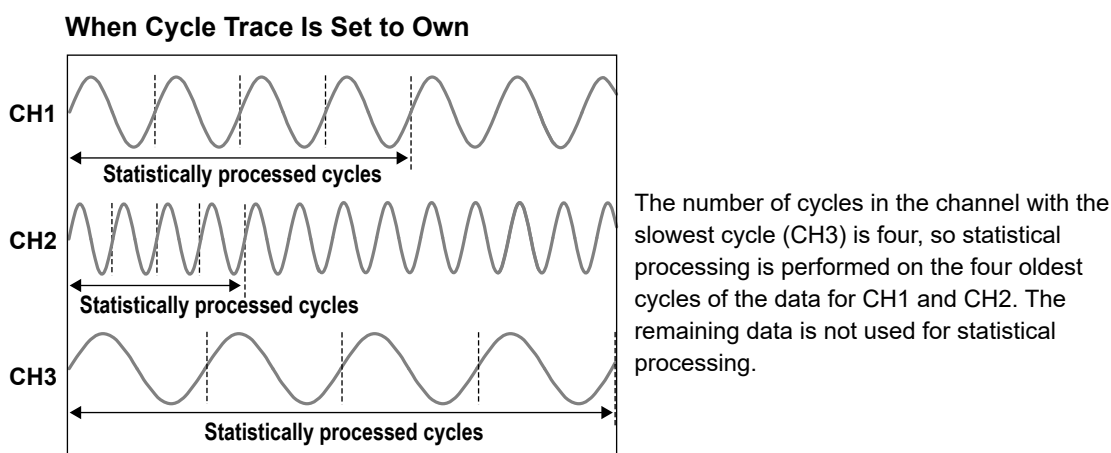
Note

If the measurement cycle of the measurement source waveform is different from that of the waveform assigned to be the cycle trace, "***" is displayed in the measurement results.

Displayed Content of Cycle Statistic Results

Automatically measured cycle statistics are displayed.

The displayed items and measured values vary depending on the content of the measurement and waveform.

- The item names in the result display are abbreviated.
- If the display format is percentage, the values are displayed to two decimal places.
- If the display format is floating, five digits are displayed.
- If the measurement result is invalid or impossible, "***" is displayed as the measured value. Waveforms with small amplitudes may fail to produce correct readings.

The display is updated at the following times.

- When the Measure bar is moved or the size is changed
- When the settings in the Channel Setting window are changed
- When OK is clicked in the Cycle Statistics Settings dialog box
- When a display group is changed

Note

- When the measurement result panel is not displayed and you execute automated measurement of cycle statistics, the measurement result panel will automatically appear.
- If the total number of items that is determined by the number of cycles and the number of measurement items exceeds 100000, computation results cannot be displayed. If a message appears, change the measurement range and the number of measurement items so that 100000 is not exceeded.

Saving Cycle Statistics' Automated Measurement Data

You can save the contents displayed in the measurement result panel to a file.

The save procedure is the same as for automated measurement of waveform parameters.

4.8   Measuring with the Math Feature (MH1 option)

This section explains the following operations:
• Setting expressions
• Displaying math waveforms and math ranges
• Setting the math start time, math time, and math start history
• Setting filters
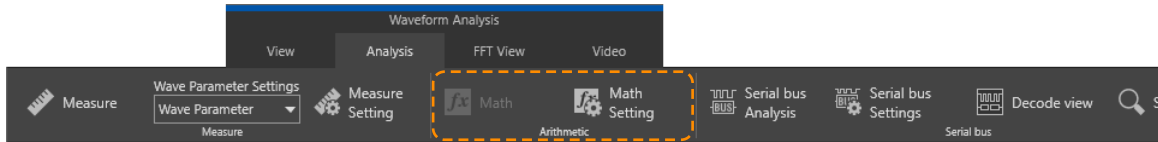
Procedure

Setting expressions

1.   On the **Analysis** tab, click **Math Setting** to display of a Arithmetic Setting dialog box.
Set expressions, filters, FFTs, and other math operations to display math waveforms.

2.   In the Arithmetic Setting dialog box, select the **Math Setting** tab.

3.   Click the **Expression** column to display of a user-defined expression input dialog box.

4. Input an expression using variables and operators.

Set the label name (up to 31 characters).

Set the unit (up to 15 characters).

Set the expression (up to 63 characters).

Set numerals and variables.

Trace names corresponding to the variables

Other math waveform information

Select the operator.

- **Trace names corresponding to the variables**
  Use the Cx (where x is a number) or Mx variables to specify channels in an expression.
  Assign Cx and trace names here.

- **Other math waveform information**
  Registered expressions are automatically assigned to Mx variables.

5. Click **Register** to close the expression input dialog box. The specified expression is displayed in the Expression column of the Arithmetic Setting dialog box.

6. Click **Register**. The specified expression is registered.

Displaying Math Waveforms and Math Range

When an expression is registered, a Math bar is displayed representing the math waveform and math range in the Overview panel. Further, **Math** on the **Analysis** tab become selectable. Click **Math** to show or hide the math waveform and Math bar.

Setting the Math Start Time and Math End Time

You can set the math range by specifying the math start time and math end time.
Click **Cursor value** to set the cursor values to the math start and end times.
You can also change the math range by using the Math bar on the Overview panel.

Note

- An error message appears when the math time exceeds the math range (12 Mpoint).
- MATLAB Runtime can be used to extend the computation range up to 100 Mpoints.
  Install MATLAB Runtime version 9.11, and make sure it is located in the following path.
    C:\Program Files\MATLAB\MATLAB Runtime\v9.11
- Logic waveforms, high-speed sampling waveforms (sub waveforms) of dual capture, WT5000 PP waveforms, external clock data, timestamp data (DL950 power math data and Modbus/TCP (MB1 option) data) cannot be computed.

Setting Filters

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

- Type: Set the type.
- Band: Set the band.
- CutOff1, CutOff2: Set the cutoff frequencies.

Explanation

Operator Menu

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

Function Display	Allowed Operators
Basic	SHIFT, ABS, SQRT, LOG, EXP, RMS, NEG, P2, P3, F1, F2
Trigonometric	SIN, COS, TAN, ATAN, PH
Pulse Width	PWHH, PWHL, PWLH, PWLL, PWXX, FV, DUTYH, DUTYL
DIF & INTG	DIF, DDIF, INTG, IINTG
Filter	FILT1, FILT2, HLBT, MEAN, BIN

Limitations on Expressions

When $m \leq n$, an expression for Mathm cannot include the variable Mn (operations for Mathn).

Example of an expression that is not allowed: Math5 = M6 + M3

Filter Settings

Type/Band

- Gauss (Gauss):   Low Pass
- Sharp (Sharp):   Low Pass/High Pass/Band Pass
- IIR (Butterworth): Low Pass/High Pass/Band Pass

CutOff1/CutOff2

Set either or both cutoff frequencies as a ratio to the sampling frequency. The allowable range is 2.0 % to 30.0 % (0.2 % steps). If you set Band to Bandpass, specify both the CutOff1 and CutOff2 orders. The higher the filter order, the longer the computation.

Math Start Time and Math Time

When you perform a math operation, a Math bar appears on the Overview panel.

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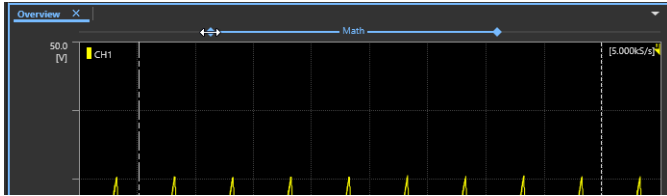
• When you click the right edge of the Math bar, a horizontal arrow cursor appears. In this situation, you can only change the math time.

• When you drag the middle of the Math bar, the math range is displayed in light blue, and you can change the math start time with the math time fixed.

Drag the middle of the Math bar to move the math start time. (The math time is fixed.)
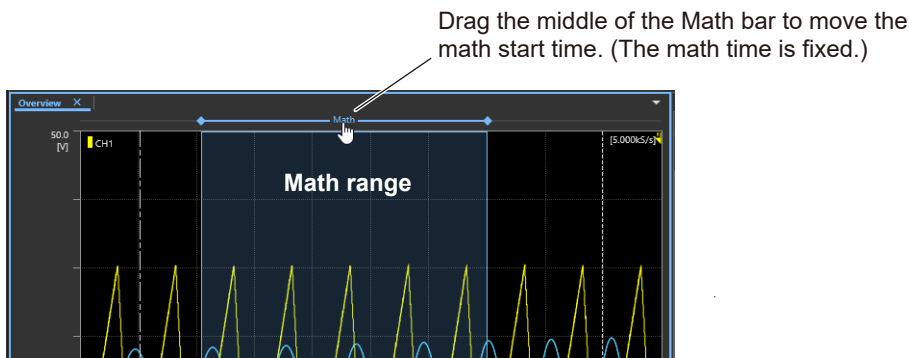
Variables and Operators

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

Variable

Variable	Example	Description
Cx	C1+C2	Measured value of the channel assigned with a trace name corresponding to variable C
My	ABS(M1)	Computed (Math) value
A	BIN(C1,A,B)	Upper threshold level
B	BIN(C1,A,B)	Lower threshold level
N	SHIFT(C1,N)	Integrated data value over time
T	RMS(C1,T)	Math time (ms)

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

y: Number

Operators

Operator	Example	Description
+, −, *, /	C1+C2	Basic arithmetic on the two specified waveforms
SHIFT	SHIFT(C1,N)	Phase shift
ABS	ABS(M1)	Absolute value of the specified waveform
SQRT	SQRT(C2)	Square root of the specified waveform
LOG	LOG(C1)	Natural logarithm of the specified waveform
EXP	EXP(C1)	Euler's number power (Napier's constant power) of the specified waveform
RMS	RMS(C1,T)	Rms value of the specified waveform (for internal clock). The unit is milliseconds.
	RMS(C1,N)	Rms value of the specified waveform (for external clock).
NEG	NEG(C1)	Negation
SIN	SIN(C1)	Sine of the specified waveform
COS	COS(C1)	Cosine of the specified waveform
TAN	TAN(C1)	Tangent of the specified waveform
ATAN	ATAN(C1)	Displays the arc tangent of the specified waveform (a value within $\pm \pi$)
P2	P2(C1)	Square of the specified waveform
P3	P3(C1)	Cube of the specified waveform
F1	F1(C1,C2)	$\sqrt{|C1^2 + C2^2|}$ of the specified waveform
F2	F2(C1,C2)	$\sqrt{|C1^2 - C2^2|}$ of the specified waveform
K1 to 10	C1+K1	Constant (set a specific value)
BIN	BIN(C1,A,B)	Binarization of the 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 from a rising edge to the next rising edge or from a falling edge and the next falling edge
FV	FV(C1,A,B)	Inverse of PWHH
DUTYH	DUTYH(C1,A,B)	Percentage of the interval from a rising edge to the next falling edge within the interval from a rising edge to the next rising edge
DUTYL	DUTYL(C1,A,B)	Percentage of the interval from a falling edge to the next rising edge within the interval from a rising edge to the next rising edge
MEAN	MEAN(C1)	10th order moving average of the specified waveform
DIF	DIF(C1)	Derivative of the specified waveform
DDIF	DDIF(C1)	Second-order derivative of the specified waveform
INTG	INTG(C1)	Integral of the specified waveform
IINTG	IINTG(C1)	Second-order integral of the specified waveform
PH	PH(C1,C2)	Unwrapping phase between the two specified waveforms
HLBT	HLBT(C1)	Hilbert function of the specified waveform
FILT1	FILT1(C1)	Filtering of the specified waveform
FILT2	FILT2(C1)	Filtering of the specified waveform

For details on each operator, see the user's manual for the instrument.

Display during Math Measurement

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

Note

Canceling Math Operations

While a math operation is in progress, a progress bar and a Cancel button are displayed. Click the Cancel button to cancel the math operation.
If you cancel a math operation, nothing will be displayed in the waveform display panel or measurement result panel.

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.

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	Low Pass
Sharp	Low Pass/High Pass/Band Pass
IIR (Butterworth)	Low Pass/High Pass/Band Pass

Filter Orders

See the following table for the filter orders.

Cutoff frequency/sampling frequency × 100		2 %	5 %	10 %	20 %	30 %
Gauss	Low Pass	49	21	9	5	5
Sharp	Low Pass	88	36	18	9	8
	High Pass	159	65	33	17	13
IIR	Low Pass	4	4	4	3	2
	High Pass	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 (Low Pass), -40 dB at -1 oct (High Pass)	-40 dB	Linear
IIR	0 dB	-5 dB at 1/6 oct (Low Pass), -20 dB at -1 oct (High Pass)	-	Non-linear

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

Examples of Frequency Characteristics for Various Filters

Gauss
Cutoff: 10 %
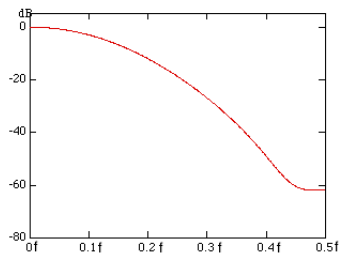
Sharp
Low Pass, cutoff: 10 %
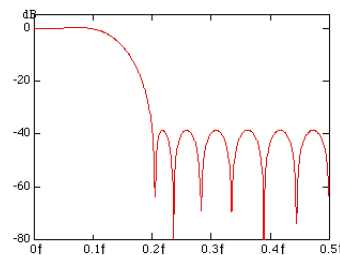
IIR
Low Pass, cutoff: 10 %
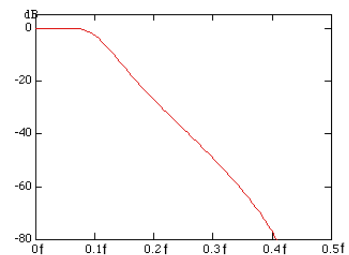
f : Sampling Frequency [Hz]

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): SQRT(C1*C1+HLBT(C1)*HLBT(C1))

Demodulation of a FM signal: DIF(PH(C1,HLBT(C1)))

Phase Function (PH)

Phase function 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.

θ2 = θ1 + Δθ2

θ2 = θ1 - Δθ2
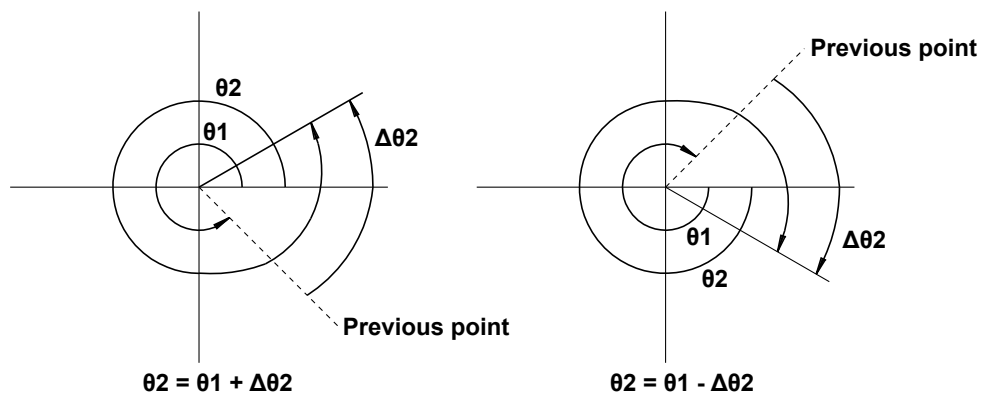
Binary Conversion (BIN)

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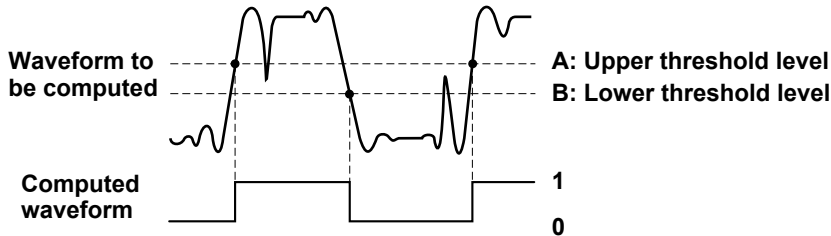
Pulse Width Computation (PWHH/PWHL/PWLH/PWLL/PWXX)

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 a rising edge to the next rising edge or from a falling edge and the next falling edge.

The threshold level is specified as follows:

Expression: PWHH(C1,A,B)

A: Upper threshold level
B: Lower threshold level
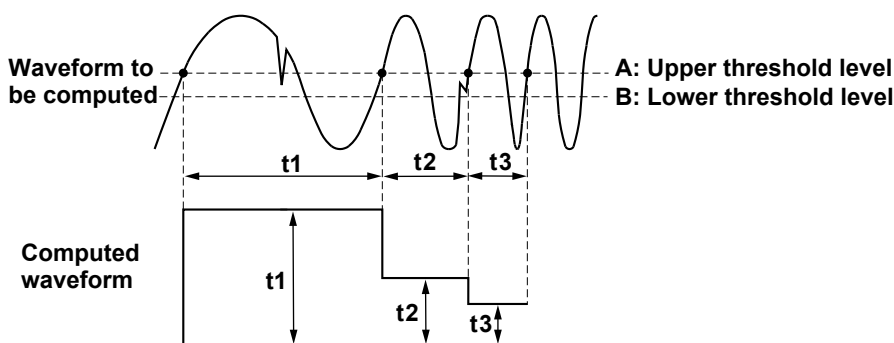
4.9 Analyzing and Searching CAN Bus Signals (SB1 option)

This section explains the following operations:

- Analyzing CAN Bus Signals
- Decoded View
- Search Settings (search type and search execution)
- Setting the Source Waveforms and Analysis Range

- List Display
- Displaying the Analysis/Search Results (zoom view)
- Saving the Results of CAN Bus Signal Analysi (zoom view)
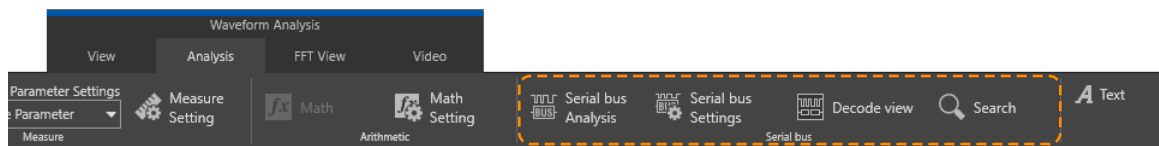
Procedure

Analyzing CAN Bus Signals

1. When you open a waveform data file (see section 4.1), overview waveforms and vertical cursor measurement results are displayed.

Cursor measurement ► section 4.4

2. On the **Analysis** tab, click **Serial bus Analysis** to show or hide the serial bus panel.

When you show the serial bus panel:
- A serial bus bar appears indicating the analysis range at the top of the overview panel.
- If you load waveform data and then show the serial bus panel for the first time, the decoded results are also displayed below the overview waveforms.
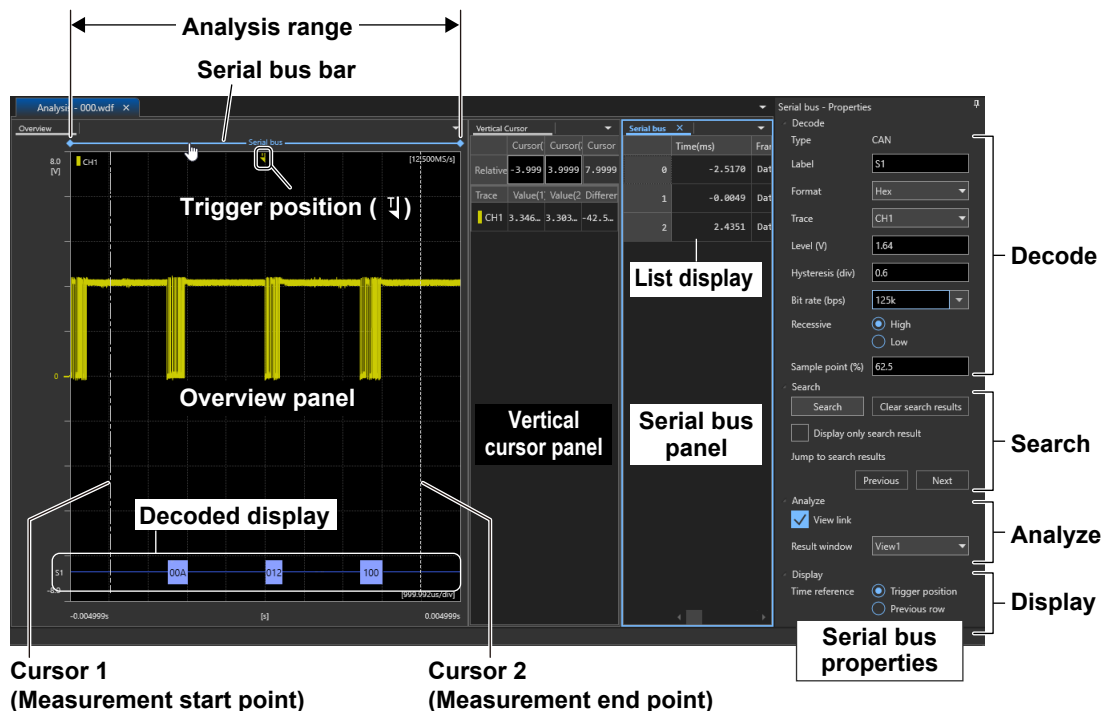
Setting the Source Waveforms and Analysis Range

3. On the **Analysis** tab, click **Serial bus Setting** to display a serial bus settings dialog box.

Set the analysis/search source waveforms and the analysis range.
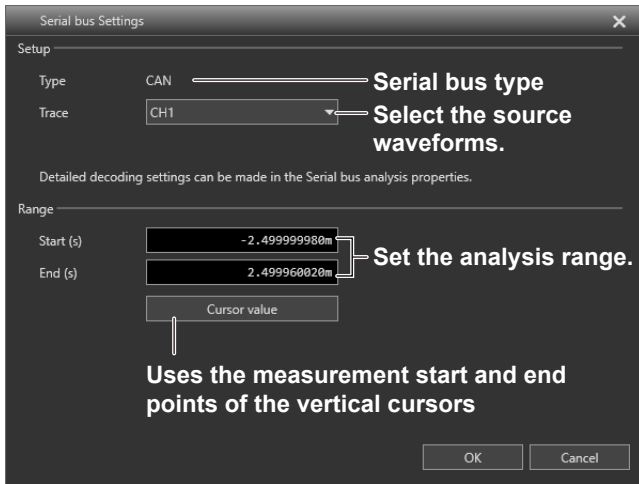
Selecting the Source Waveforms

From the loaded waveforms, waveforms that can be used for CAN bus signal analysis are displayed in the drop-down list.

Setting the Analysis Range

The analysis range setting is reflected in the serial bus bar.

You can also drag the serial bus bar to change the analysis range.

- When you click the left edge of the serial bus bar, a horizontal arrow cursor appears. You can drag the edge to change the analysis start time and analysis time.
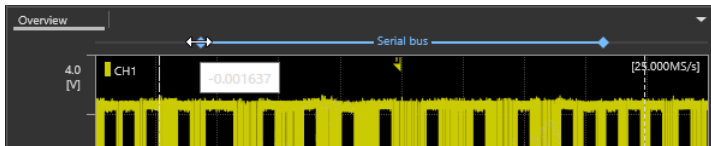
- When you click the right edge of the serial bus bar, a horizontal arrow cursor appears. In this situation, you can only change the analysis time.
- When you drag the middle of the serial bus bar, the analysis range is displayed in light blue, and you can change the analysis start time with the analysis time fixed.

Drag the middle of the serial bus bar to move the analysis start time. (The analysis time is fixed.)
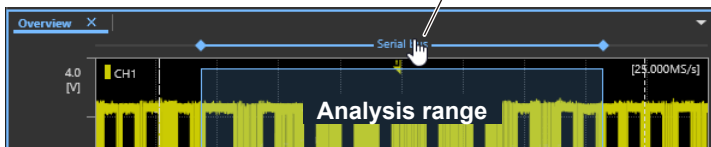
Decoded View

4. On the **Analysis** tab, click **Decode view** to show or hide the decoded results.

Details of the decode view ► section page 4-62

5. Select the serial bus panel. Under Decode of serial bus properties, set the parameters needed for analysis.

Parameter	Description
Type	The type of serial bus signal is displayed.
Label	You can assign labels using up to 8 characters to be displayed.
Format	You can select from the following decode formats. • Hex: Always displayed in hexadecimal format. • Hex (Auto Bin): Usually displayed in hexadecimal format. When zoom display is in use, the format automatically switches to binary when the zoom range is adjusted with the zoom frame. ▶see page 4-70
Trace	Select the analysis/search source waveform.
Level (V)	Enter the level used to detect the analysis/search source waveform. Selectable range: 8 divisions within the window Resolution: 0.01 divisions (for example: 0.02 mV when the time scale is set to 2 mV/division)
Hysteresis (div)	You can apply a hysteresis to the detection level so that level changes within the range will not be detected as edges. Range: 0.3 div to 8.0 div Resolution: 0.1 div
Bit rate (bps)	Set the CAN bus signal transfer rate. • You can select the following values from the drop-down list. 33.3 k, 83.3 k, 125 k, 250 k, 500 k, 1 M • You can also manually enter the value in the range of 10.0 kbps to 1000.0 kbps (1 Mbps). Resolution: 0.1 kbps
Recessive	Select the recessive level from one of the settings below. In either setting, the logical value of the recessive level is 1, and the logical value of the dominant level is 0. • High: The recessive level is greater than the dominant level. • Low: The recessive level is less than the dominant level.
Sample point (%)	You can set the point that will be used to determine the bus level (recessive or dominant) in the range of 18.8 to 90.6%. Resolution: 0.1 %
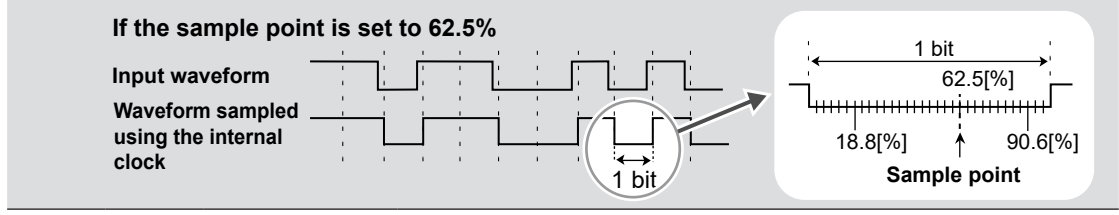
Changes you make are reflected in the serial bus panel's list display and the decoded view on the overview panel.

Decoded Display

The instrument decodes each field value and displays the decoded result using different colors for each field at the bottom of the screen.

Decoded display format: Hex, Bin

Display Example
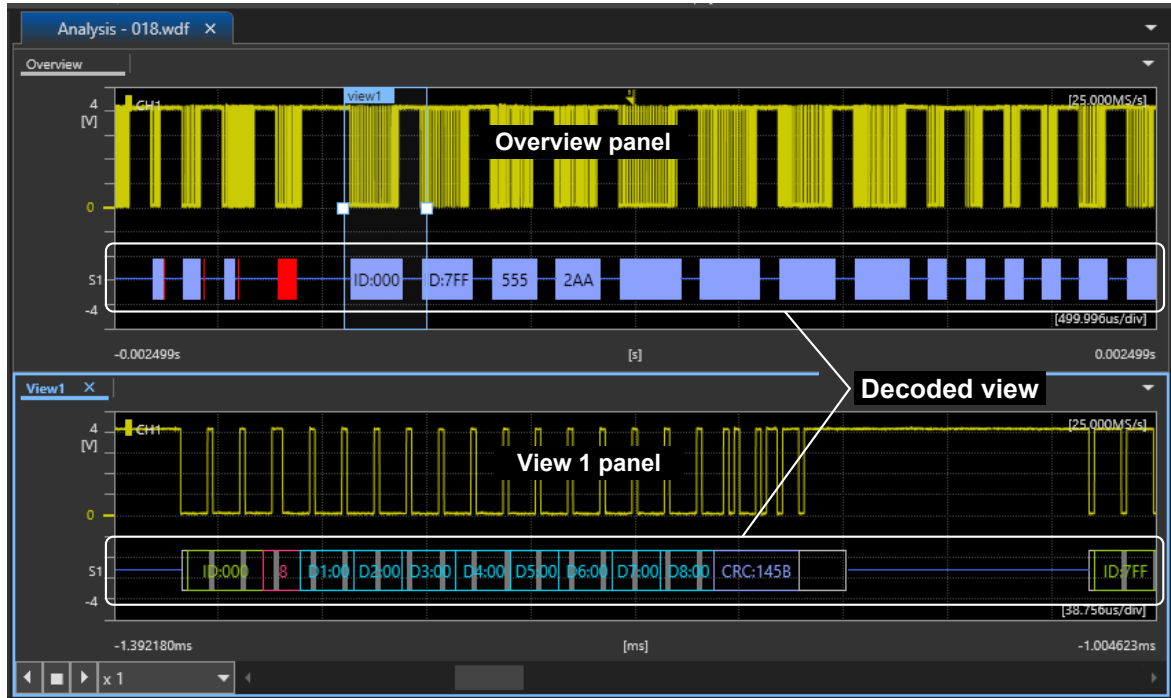
The colors that are used for the fields in the decoded display are as follows:

Field	Display Color
Arbitration	Light green (Light Green)
Control	Pink (Pink)
Data	Cyan (Cyan)
CRC	Light blue (Light Blue)
Error bit, field in which the error occurred, frame, error frame	Red (Red)
Overload frame	Green (Green)
Frame background	Gray (Gray)
Stuff bits	Gray (Gray) fill

List Display

Analysis number (0 up to 99999)

Shows a list of decoded results. The list displays the following items from the left.

Parameter	Description
Analysis number	From the analysis start position of the overview waveform, numbers are assigned as 0, 1, ..., (number of analysis - 1). Analysis results can be displayed for up to 100000 frames in the range of 0 to 99999.
Time(ms)	The time is displayed in ms relative to the trigger point or relative to the time difference between frames. Setting the time display method ►see page 4-69
Frame	Displays the frame type. The following four frame types can be analyzed: data frame (Data), remote frame (Remote), error frame (Error), and overload frame (Over load).
ID	• Frame format: Standard, frame type: Data/Remote 　11 bits of the ID value in 3 hexadecimal digits • Frame format: Extend, frame type: Data/Remote 　29 bits of the ID value in 8 hexadecimal digits
DLC	Displays the data length of the data field. Displays the number of significant bytes in decimal notation.
Data	Displays the data in hexadecimal notation when the frame type is data frame.
CRC	Displays the sequence in hexadecimal notation. This is displayed when the frame type is data frame or remote frame.
ACK	Displays "ACK" when an ACK bit is detected and "NON ACK" otherwise.
Information	Displays the following error information. If multiple errors are detected in one piece of data, the instrument displays a single error in the following order of precedence. Stuff Error, CRC Error

Search Settings

6. On the **Analysis** tab, click **Search** to display a CAN search settings dialog box.

You can also display the same dialog box with the Search button under serial bus properties.
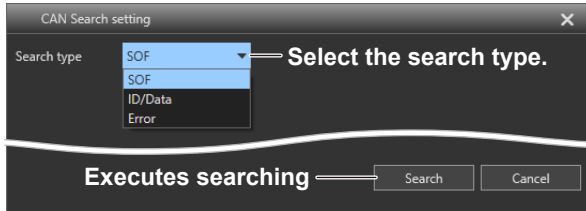
7. Select the search type.

Search Type	Description
SOF	Searches for the start-of-frame position
ID/Data	Searches for the position where the search conditions specified by ID bit pattern are met. (Search by data pattern is not available in this version. This is planned to be supported in the future.)
Error	Searches for error frames (when the error flag is active) or various errors.

8. If you select ID/Data or Error, set the search conditions.

ID/Data search conditions

The instrument searches on the AND of the SOF, ID, frame type (Remote or Data), Data, and ACK Mode conditions.

Items whose check boxes are selected are used as search conditions.

1. Select **Standard** or **Extend** frame format.

► "Frame Format and Detected Point" on page 4-72

When the Comparison Condition Is True or False

(Example when the frame format is Standard)

When the data frame condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data

(Example when the frame format is Extend)

SOF
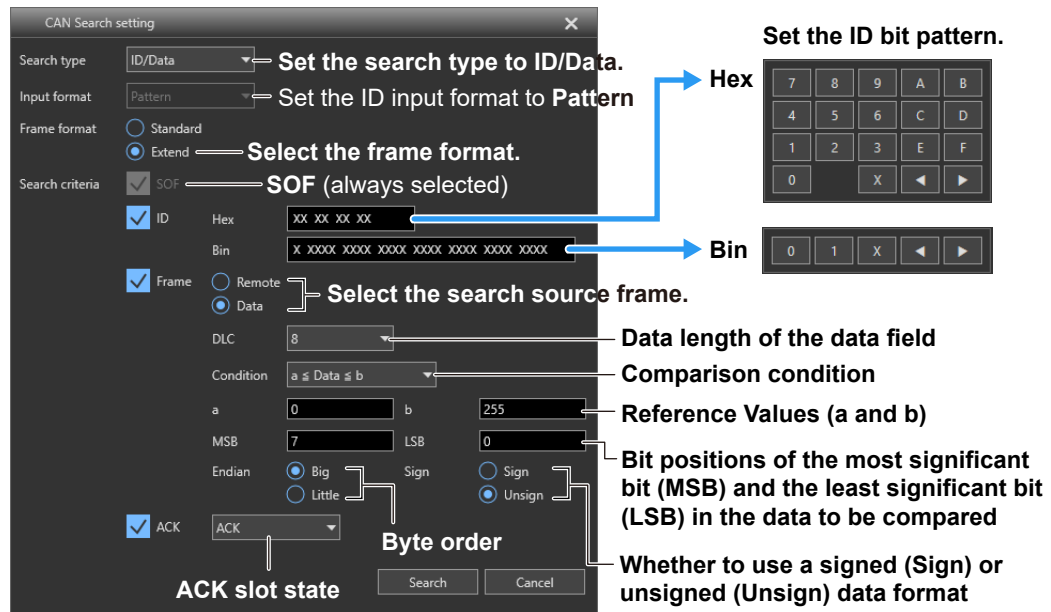
Searches for the start-of-frame position of the CAN bus signal when the search condition is SOF only. SOF of ID/Data is always selected as a search condition.

ID

If you select ID, enter the ID bit pattern.

Hex/Bin (Bit Pattern)

- Set the 11-bit standard format ID bit pattern or the 29-bit extended format ID bit pattern in hexadecimal (Hex) or binary (Bin) notation. The ID search condition is met when the input signal ID bit pattern matches the specified bit pattern.
- HWhen you click the Hex or Bin input box, a soft keyboard (see the figure above) appears. Use the ◄ and ► keys to move the cursor and enter the value.

Note

- If you specify X in the ID bit pattern, the condition is assumed to be met regardless of the corresponding bit status.
- In a bit pattern setting, if a binary pattern contains any Xs, the corresponding hexadecimal display will be "$."

Frame

If you select Frame, select the frame to search from Remote or Data.

Frame Type	Description
Remote	A search is performed on the Remote Frame.
Data	A search is performed on the Data Frame. You can set a search condition based on the data field value. DLC, Condition, and data pattern can be set only when Data is selected.

DLC (Data Length Code)

Set the data length of the data field. The DLC search condition is met when the specified value matches the input signal DLC value.

Selectable range: 0 to 8 bytes

Comparison Condition (Condition)

The data search condition is met when the result of comparing the data pattern or reference value to the input signal's data field meets the specified comparison condition.

True	When the value matches the data pattern
False	When the value does not match the data pattern
Data=a[1]	When the value is equal to the reference value
Data≠a[1]	When the value is not equal to the reference value
a≤Data[1]	When the value is greater than or equal to the reference value
Data≤b[1]	When the value is less than or equal to the reference value
a≤Data≤b[2]	When the value is within the reference range (including the reference values)
Data<a, b<Data[2]	When the value is outside the reference range (excluding the reference values)

1 Set one reference value
2 Set two reference values

- **When the Comparison Condition Is True or False**

  Data Pattern (Hex/Bin)

  If the comparison condition is set to True or False, set the data pattern for the data whose length was set with DLC in hexadecimal (Hex) or binary (Bin) notation.

- **When the data frame condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**

  Reference Values (a and b)

  If the comparison condition is set to Data = A, Data ≠ a, a ≤ Data, Data ≤ b, a ≤ Data ≤ b, or "Data < a or b < Data," set the reference values in decimal notation. You must set the byte order (Endian), sign (Sign), and comparison range (MSB or LSB). The selectable ranges are as follows:

Unsigned (Unsign)	0 to 1.84467440737096e+019
	This is the range when 18446744073709551615 ((2^64)-1) is rounded to 15-digit exponential notation. The selectable maximum value is limited by the data length and bit position, which are determined by the DLC and MSB/LSB settings, respectively.
Signed (Sign)	-9.22337203685478E+18 to 9.22337203685478E+18
	This is –9223372036854775808 to 9223372036854775807 rounded to exponential representation. The selectable minimum and maximum values are limited by the data length and bit position, which are determined by the DLC and MSB/LSB settings, respectively.

Values are displayed as integers up to 15 digits, and exponents for 16 or more digits.

Display example:

1.84467440737096e+019 (when 18446744073709551615 is entered)

Byte Order (Endian)

Set the byte order of the data stream to Big Endian (Big) or Little Endian (Little). The following figure illustrates a 4-byte data stream on the bus. The data field value is 12345678 in hexadecimal notation.
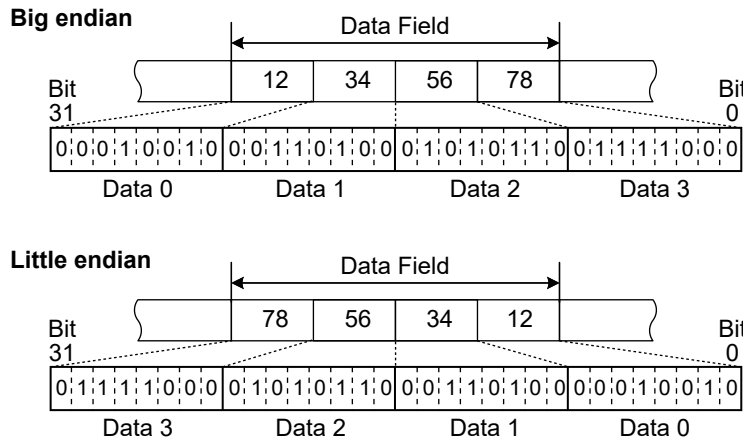
Sign (Sign)

Set whether to use a signed (Sign) or unsigned (Unsign) data format.

The selectable range of data reference values varies depending on whether the data is signed or unsigned.

Comparison Range (MSB/LSB)

Set the MSB (MSB) or LSB (LSB) bit positions for the data that you will compare. For example, if you want to compare bits 5 through 20 of a 4-byte data value (12345678: hexadecimal), set the MSB to 20 and the LSB to 5. In this case, the bits that are compared are those that are shaded in the following figure.

Selectable range: 0 to (the number of bytes of data No 8 − 1). The maximum value is 63.
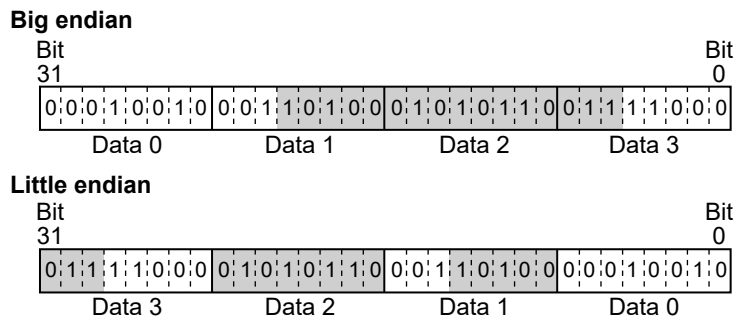
ACK

You can set a search condition based on the ACK slot state. The ACK search condition is met when the specified state matches the input signal ACK slot state.

NON ACK	When the status is recessive
ACK	When the status is dominant
NON ACK or ACK	When the status is recessive or dominant

Error search conditions

1. Select the Error type.
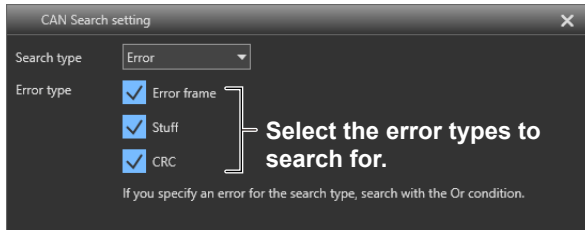
Error Type	Description
Error frame	Searches for active error flags (six consecutive dominant bits)
Stuff	Searches for instances where stuff bits are not inserted correctly
CRC	Searches for CRC errors

9. In the search settings dialog box, click **Search** to execute a search.

- **Overview**

Detected points (∇)
Detected points are displayed above the overview waveform.

- **List display**

If the search conditions are matched, the background color of the analysis number is highlighted in yellow.

Displaying the Analysis/Search Results

Select the serial bus panel, and use Search, Analysis, and Display settings under serial bus properties to change or control the analysis/search results.

- Opens a CAN search settings dialog box
- Clears the search results
- Shows only the search results
- Moves the zoom position to the next detected point
- Moves the zoom position to the previous detected point
- Turns zoom view linking on or off
- Select a view panel (view1 to 4) to zoom in on the detected point.
- Select the time display format.
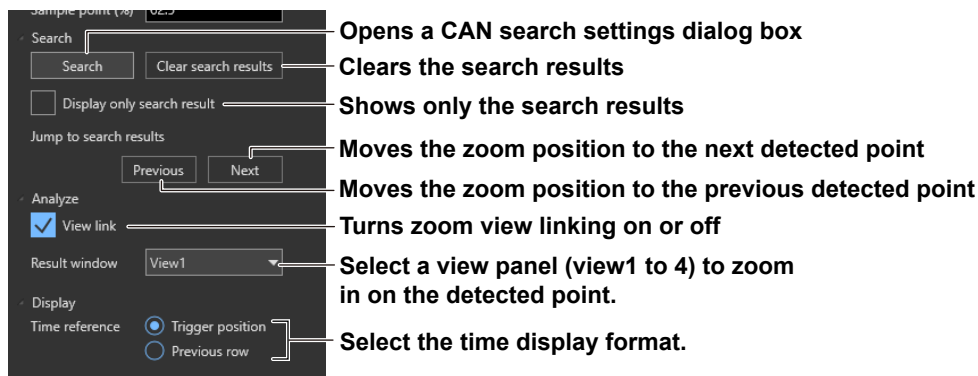
Search

- Click **Search** to display a CAN search settings dialog box.
  - ► page 4-64
- Clicking **Clear search results** will clear the detected points (∇) shown at the top of the overview waveform and the search results in the list display.
- You can use the **Display only search result** check box to set what to show in the list display.

Check Box	Description
ON	Only the analysis results that match the search conditions are listed.
OFF	All analysis results are listed.

Analysis

- Use the **View link** check box to set whether to link the detected point selection and zoom display.

Check Box	Description
ON	When you select a detected point, it is enlarged in the specified view panel. Result window: Select the panel to show the enlarged view from View1 to 4.
OFF	The view panel display is not linked even when you select a detected point.

Display

- **Time reference**

  You can select how to display the time in the analysis result list.

Parameter	Description
Trigger position	Displayed in time relative to the trigger point.
Previous row	Displayed in time relative to the previous row.

Linking the Search Result (Detected Point) Selection and Zoom Display

1. Select the **View link** check box, and select the view panel you want to link (**View1 to 4)**.

2. Select the analysis result (detected point) you want to zoom in on. You can use either of the following methods.
   - Click on the list in the serial bus panel.
   - Under serial bus properties, click Search > Jump to search result **Previous** or **Next**.

If the view panel is hidden, the view panel selected in step 1 is automatically shown.

The area enclosed by the zoom frame (view1 to 4) of the overview waveform is displayed zoomed in the view panel.

* The area of the zoom frame centered on the search point is enlarged. You can also drag the zoom frame to change the area displayed in the view panel.
   Moving the zoom position ► see page 4-13
   Changing the zoom area ► see page 4-15
   Moving the waveform, zoom display ► see page 4-29

Display Example

• **When the decode display format is Hex**

Select the decode display format.

Selected detected point (▼)

Zoom frame (view1)   Select the search result.

Serial bus panel   Serial bus properties

Overview panel

View 1 panel

Zoom view

Select the detected points with buttons.

Select the View link check box.   Select View1.

• **When the decode display format is Hex (Auto Bin)**

View 1 panel

When the display area of each field is narrow, the data is displayed in hexadecimal format. When the zoom frame is adjusted and the zoom range is increased, the format switches to binary.

Saving the Results of CAN Bus Signal Analysi

Analysis results (list data of decoded results) shown in the serial bus panel can be saved in CSV format.

There are two ways to save analysis results.

Exporting Analysis Results to a File

On the **File** tab, click **Export** to File.

► "Exporting a File" on page 3-41

Saving the Analysis Results Using the Export Menu

Right-click on the serial bus panel to display the following menu.
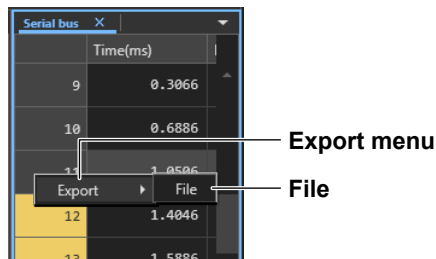
Export menu

Item	Description
File (File)	A Save Serial bus analysis result As screen appears. You can save the analysis results to a CSV file in the specified destination. Save file format: You can select CSV with or without a BOM.

Explanation

Number of Analyzable and Searchable Frames or Data Bytes

The following frames can be analyzed for up to 100000 frames.

Remote, data, error, and overload frames

Analysis/search source waveform

• From the loaded waveforms, waveforms that can be used for CAN bus signal analysis are displayed in the drop-down list.

• The following waveforms cannot be analyzed.

Logic waveforms, Math, high-speed sampling waveforms (sub waveforms) of dual capture, external clock data, timestamp data (DL950 power math data or motor dq analysis data, and Modbus/TCP (MB1 option) data)

Frame Format and Detected Point

The following figures illustrate the formats and detected points of the various frames.

Data Frame (Data Frame)

- **Standard format**

CAN Data Frame

Arbitration Field | Control Field | Data Field | CRC Field | ACK

Recessive

SOF | ID 10-0 | RTR | IDE | r0 | DLC 3-0 | Data | CRC Sequence | CRC Delimiter | ACK Slot | ACK Delimiter | EOF

Dominant

1 11 1 1 1 4 8N (0≤N≤8) 15 1 1 1 7

(1)   (2) (3)   (4)   (5) (6)

- **Extended format**

CAN Data Frame

Arbitration Field | Control Field | Data Field | CRC Field | ACK

SOF | ID 28-18 | SRR | IDE | ID 17-0 | RTR | r1 | r0 | DLC 3-0 | Data | CRC Sequence | CRC Delimiter | ACK Slot | ACK Delimiter | EOF

1 11 1 1 18 1 1 1 4 8N (0≤N≤8) 15 1 1 1 7

(1)   (2) (3)   (4)   (5) (6)

Positions (1) to (6) above are detected points for the following conditions.

(1) SOF
(2) ID
(3) Data Frame (when DLC = 0)
(4) Data Frame (when DLC ≠ 0)
(5) CRC Error
(6) ACK

Remote Frame (Remote Frame)

- **Standard format**

Remote Frame

Arbitration Field | Control Field | CRC Field | ACK

Recessive

SOF | ID 10-0 | RTR | IDE | r0 | DLC 3-0 | CRC Sequence | CRC Delimiter | ACK Slot | ACK Delimiter | EOF

Dominant

1 11 1 1 1 4 15 1 1 1 7

(1)'   (2)' (3)'   (4)' (5)'

- **Extended format**

Remote Frame

Arbitration Field | Control Field | CRC Field | ACK

SOF | ID 28-18 | SRR | IDE | ID 17-0 | RTR | r1 | r0 | DLC 3-0 | CRC Sequence | CRC Delimiter | ACK Slot | ACK Delimiter | EOF

1 11 1 1 18 1 1 1 4 15 1 1 1 7

(1)'   (2)' (3)'   (4)' (5)'
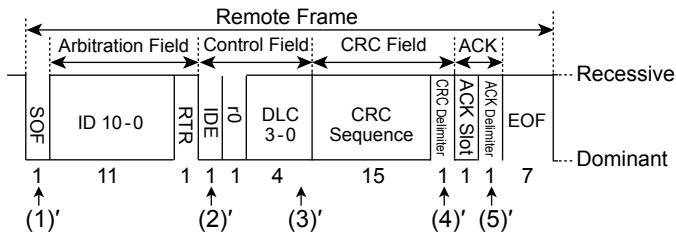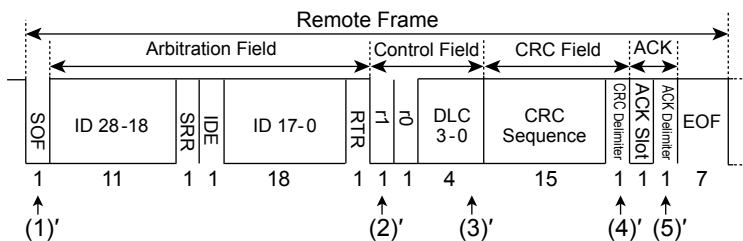
Positions (1)' to (5)' above are detected points for the following conditions.

(1)' SOF
(2)' ID
(3)' Remote Frame (when DLC = 0)
(4)' CRC Error
(5)' ACK

Error Frame (Error Frame)

If the mode is set to Error Frame, the
detected point is the 6th error flag bit.
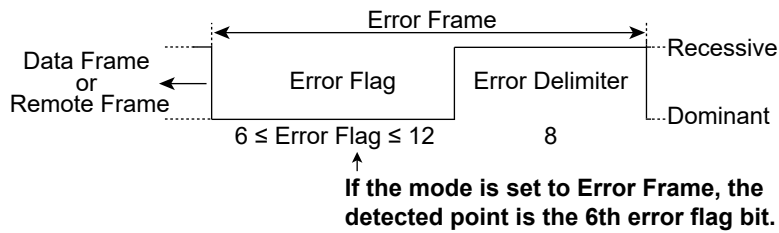
Stuff Error (Stuff Error)

The detected point is the sample point of the bit that violates the bit stuffing rule.

CRC Error (CRC Error)

CRC errors are indicated in the data-frame and remote-frame figures.

Note

If multiple field types and frame types are combined, the detected point is the point where the last type appears on the time axis.

High speed CAN (ISO11898) and Low speed CAN (ISO11519-2)

The primary standards for the CAN physical layer are High-speed CAN (ISO11898) and Low-speed CAN (ISO11519-2).

As shown in the following figure, the bus level is determined by the potential difference between two buses, CAN_High and CAN_Low, in either standard.
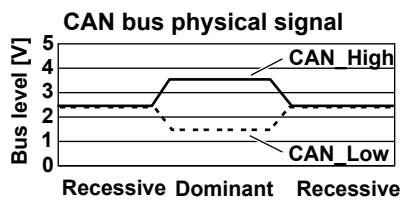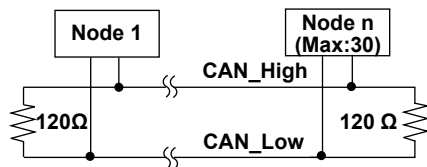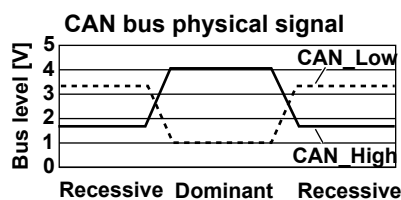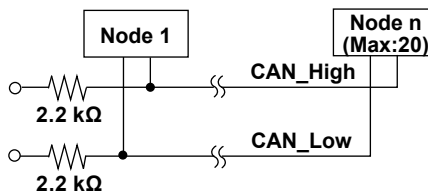
4.10 Inserting Annotations in the Waveform View

This section explains the following operations:
- Selecting the annotation type
- Inserting annotations

Procedure

Selecting the Annotation Type

Follow the procedure below to enter annotation mode.

1. On the **Analysis** tab, in the **Annotation** group, click an annotation type command.

    The five available annotation types are text, ΔT, ΔV, marker, and Δ marker. Depending on the annotation that you select, the pointer displayed in the waveform view will vary.
    For details, see the explanations on the following pages.

2. Depending on the annotation that you selected, perform the appropriate operations to insert the annotation.
    For details, see the explanations on the following pages.

Set the annotation font and color in the dialog box that is displayed.

Inserted annotation
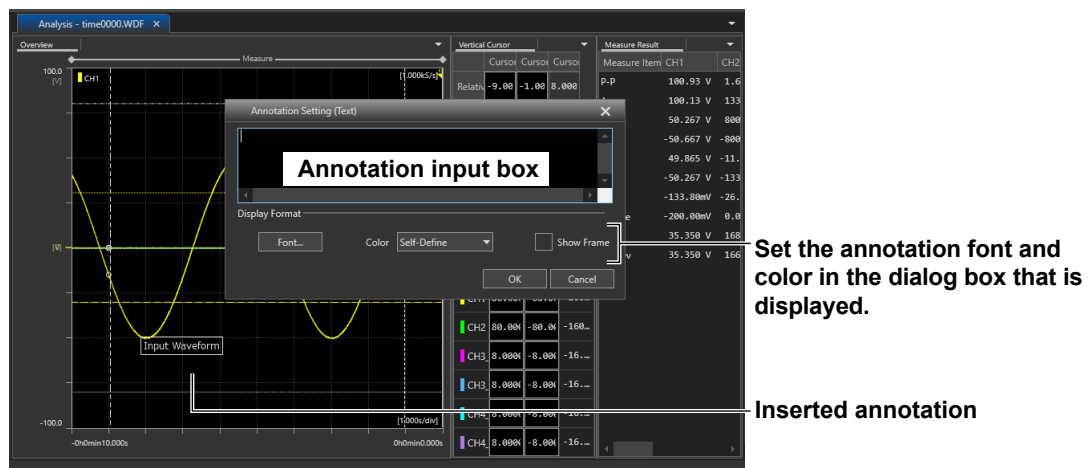
Inserting Annotations

3. When an annotation command is selected, right-click the panel displaying the waveforms or a waveform to display a shortcut menu.

Creating a New Annotation

Select **Annotation** and then **New**. Select an annotation type to insert the annotation in the view.
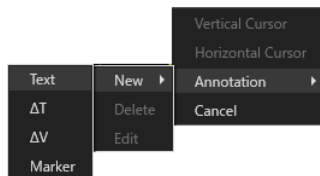
Set the annotation type to text, ΔT, ΔV, or marker.

The Δ marker can be selected from the ribbon commands. It cannot be selected from the pop-up menu.

Editing or Deleting an Annotation

1. Click the annotation you want to edit to select it. The selected annotation appears red.

2. Right-click to display the same shortcut menu as shown in the figure above.

Editing an Annotation

3. Select **Annotation** and then **Edit**. The corresponding annotation dialog box appears.

4. Make the edit, and click **OK**.

Deleting an Annotation

3. Select **Annotation** and then **Delete**. The annotation is deleted.

Note
- When you select an annotation command is selected and right-click the panel displaying the waveforms, an annotation format setting dialog box appears.
- When you double-click an already inserted annotation, a format setting dialog box is displayed for that annotation.

Explanation

Annotation Types

The five available annotation types are text, ΔT, ΔV, marker, and Δ marker.

Linked Annotations

- ΔT, ΔV, marker, and Δ marker are annotations that are linked to waveforms.
- When a text annotation is linked to a waveform, the text is connected to the waveform with a link line.
- You can insert a linked annotation for each waveform. Even if you change the displayed group, these annotations remain linked to their corresponding waveforms.

Unlinked Annotations

Text annotations that are not connected by link lines are unlinked annotations. Their positions change depending on the window size.

Text annotation example

Unlinked annotation

Input Waveform

Linked annotation

Voltage

Link line
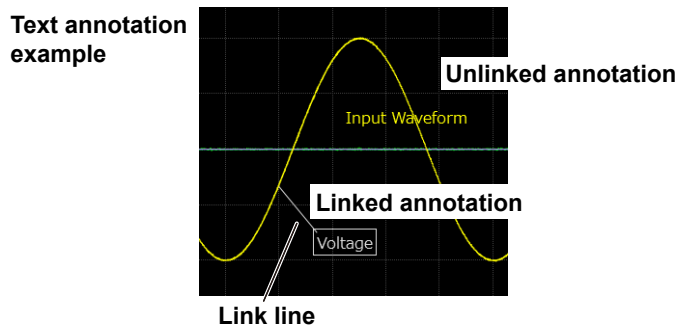
Display Panels That Annotations Can Be Inserted Into
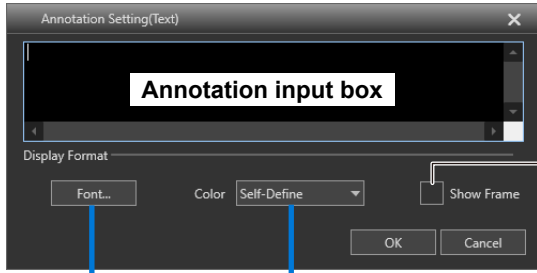
Y: Insertable, N: Uninsertable

Annotation Types	Display Panel		
	Overview	View	XY
Text, ΔT, ΔV	Y	Y	Y
Marker, Δ marker	Y	Y	N

* Only text annotations can be inserted for logic waveforms.

Text Annotation Pointer icon: 🄰

If you select text annotation and double-click in the waveform view or a waveform, the following setting dialog box appears. You can set the display format of the annotation, such as the font type and color.
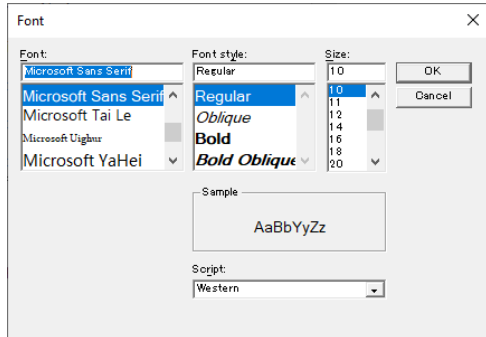
Select this check box to show a frame around annotations.

A pop-up menu appears for setting the color.

You can set any color.

You can set the font type and size.

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

Display Example

Moving an annotation

Link line
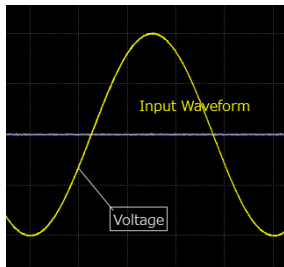
Annotation with a frame
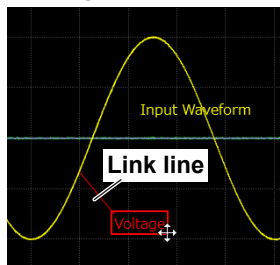
Select the annotation. When it turns red, drag it.

Note

Inserting a Text Annotation Linked to a Waveform

If you double-click a waveform to set an annotation, you can insert an annotation linked to the waveform.

ΔT Annotation   Pointer icon:

When you select ΔT annotation and perform either of the procedures below in the waveform view, the X value is displayed.

Drag horizontally
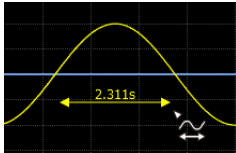
Double-click

The following setting dialog box appears. You can set the trace (waveform) that the annotation is linked to, the display format, the arrow style, and other items.

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

Preview of the displayed value (cannot be entered)

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

Set the font type, color, and frame.
(See the text annotations section.)

Select the number of decimal places (1 to 5).

Select the display format (floating point).
► section 3.5.

Select the arrow weight.

Select the weight of the auxiliary lines that pass through the arrow tips.

Shows additional lines

Displays a ΔT annotation between vertical cursors

Hides values

Display Example

**ΔT annotation with auxiliary lines**
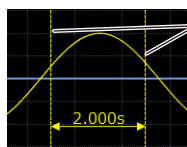
Auxiliary lines

**ΔT annotation between vertical cursors**
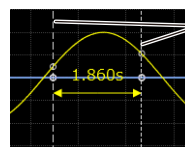
Vertical cursor

Moving a ΔT annotation
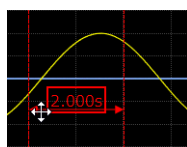
Select an arrow and drag. To only move the value, you can move it in the same manner as with a text annotation.
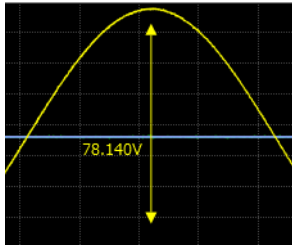
Moving arrows
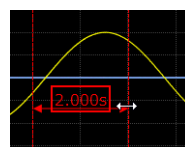
Select an arrow tip and drag. The value is updated according to the length of the arrow line.

Changing the text size

Same procedure as for text annotations.

ΔV Annotation **Pointer icon:**

When you select ΔV annotation and perform either of the procedures below in the waveform view, the Y value is displayed.

Drag vertically
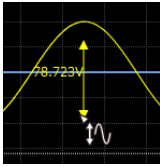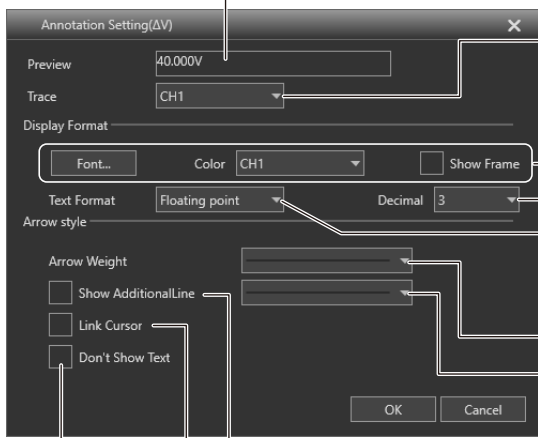
Double-click

The following setting dialog box appears. You can set the trace (waveform) that the annotation is linked to, the display format, the arrow style, and other items.

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

Preview of the displayed value (cannot be entered)

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

Set the font type, color, and frame.
(See the text annotations section.)

Select the number of decimal places (0 to 9).

Select the display format (floating point, exponential).
► section 3.5.

Select the arrow weight.

Select the weight of the auxiliary lines that pass through the arrow tips.

Shows additional lines

Displays a ΔV annotation between horizontal cursors

Hides values

Display Example

ΔV annotation with auxiliary lines
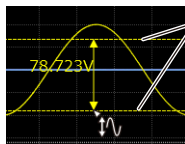
Auxiliary lines
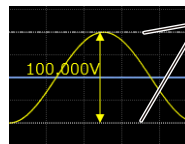
ΔV annotation between horizontal cursors

Horizontal cursor

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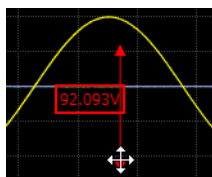
Select an arrow and drag. To only move the value, you can move it in the same manner as with a text annotation.

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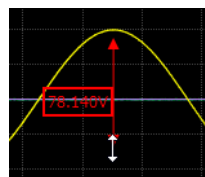
Select an arrow tip and drag. The value is updated according to the length of the arrow line.

When the waveform is zoomed vertically

The length of the arrow and the value are updated according to the zoom factor.

78.140V

Changing the text size

Same procedure as for text annotations.

Marker Annotation   Pointer icon:

A marker annotation displays the trace, X value, and Y value at the double-clicked point.

If you select Marker annotation and double-click a waveform, the following setting dialog box appears.
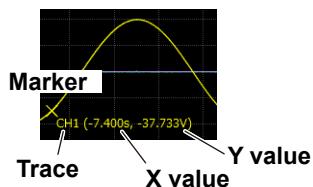
- You can set the trace (waveform) that the annotation is linked to, the format, the marker shape, and other items.
- There are four marker shapes (✕, ✛, ◆, ▲). Each time a marker annotation is inserted, a shape different from the previous one is used.

Annotation Setting(Marker)

Preview	CH1 (- 5.520s, 50.133V)
Trace	CH1
Format	ChannelName + Y-Value + X-Value

Marker
| Style | ✕ | Size | Small |

Display Format
| Font... | Color | CH1 | Show Frame |

Y-Axis
| Text Format | Floating point | Decimal | 3 |

X-Axis
| Text Format | Floating point | Decimal | 3 |

OK   Cancel

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

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

Select the items to display.

Select the marker shape and size.

Set the font type and frame.
(See the text annotations section.)

Select the Y (vertical) scale display format*
and the number of decimal places (0 to 9).
(* floating point, exponential ► section 3.5.)

Select the X (horizontal) scale display format*
and the number of decimal places (1 to 5).
(* floating point ► section 3.5.)

Display Example

Marker

CH1 (-7.400s, -37.733V)

Trace   X value   Y value

Moving a marker

CH1 (-7.437s, -39.333V)

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

Moving an annotation

CH1 (-7.437s, -39.333V)
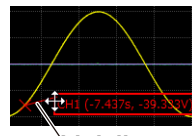
Link line

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

Changing the text size

Same procedure as for text annotations.
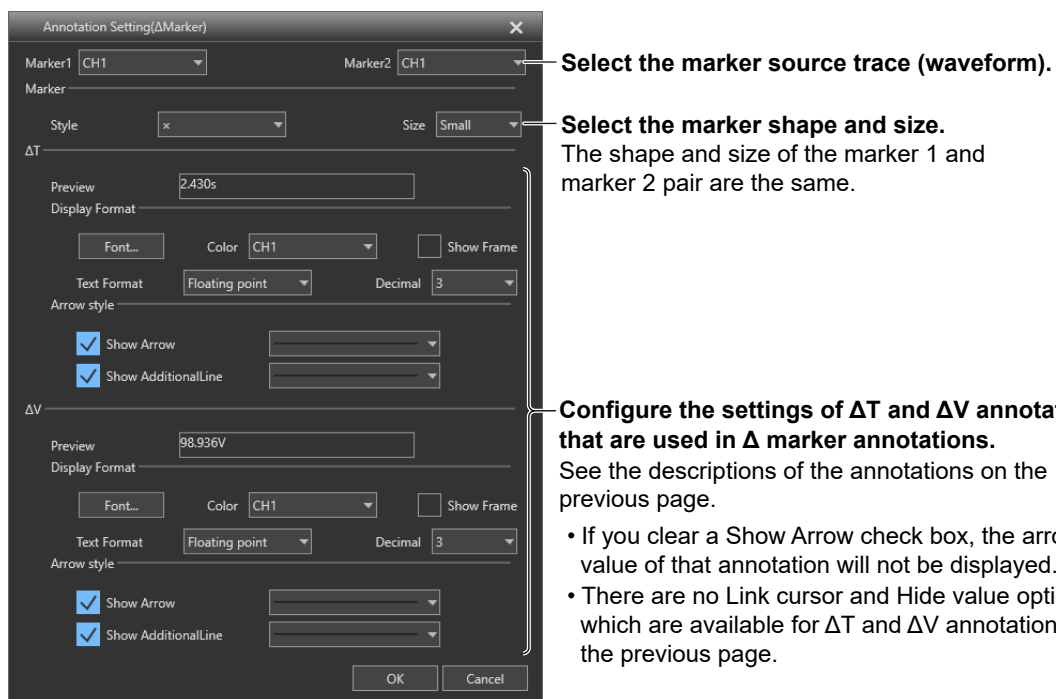
Δ Marker Annotation   Pointer icon:

A Δ marker annotation displays the ΔT (X value) and ΔV (Y value) between two markers.

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

Click on the waveform.　**Drag**　　　　　　　　**Drop on the waveform.**
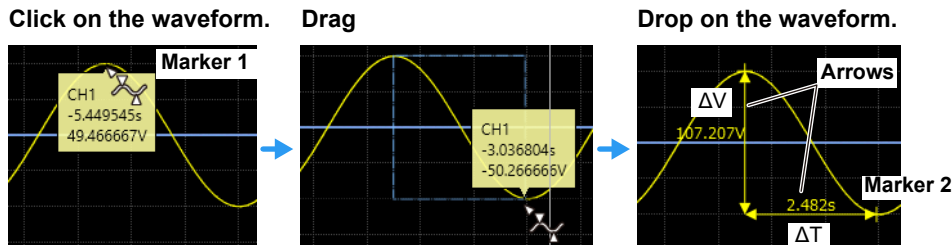
Double-clicking an annotation displays the following setting dialog box.

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

Select the marker source trace (waveform).

Select the marker shape and size.
The shape and size of the marker 1 and marker 2 pair are the same.

Configure the settings of ΔT and ΔV annotations that are used in Δ marker annotations.
See the descriptions of the annotations on the previous page.

- If you clear a Show Arrow check box, the arrow and value of that annotation will not be displayed.
- There are no Link cursor and Hide value options, which are available for ΔT and ΔV annotations on the previous page.

Display Example

Δ Marker annotation with auxiliary lines

Marker 1

99.600V

2.400s Marker 2

Auxiliary lines

Moving a marker

99.600V

2.400s
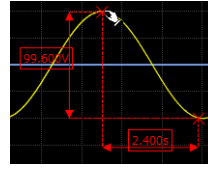
Select a marker and drag. The length of the arrow line, values, and auxiliary lines are updated according to where the marker is moved to.

Moving a ΔT annotation

99.600V

2.400s
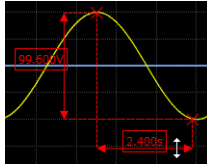
Select the arrow of the ΔT annotation and drag. To only move the value, you can move it in the same manner as with a text annotation.

Moving a ΔV annotation

99.600V

2.400s
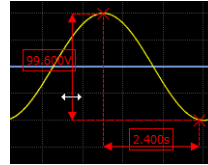
Select the arrow of the ΔV annotation and drag. To only move the value, you can move it in the same manner as with a text annotation.

Changing the text size

Same procedure as for text annotations.

4.11 FFT Waveform Analysis (MH1 option)

This section explains the following operations:

- Configuring Channels
- Setting Expressions
- Displaying FFT Waveforms and Math Range
- Setting the FFT Start Time and the Number of FFT Points
- Displaying Zoom Waveforms
- Displaying History Waveforms
- Measuring with Vertical Cursors
- Measuring with Horizontal Cursors
- Saving the Analysis Results of FFT Waveforms
- Configuring the FFT Waveform Display
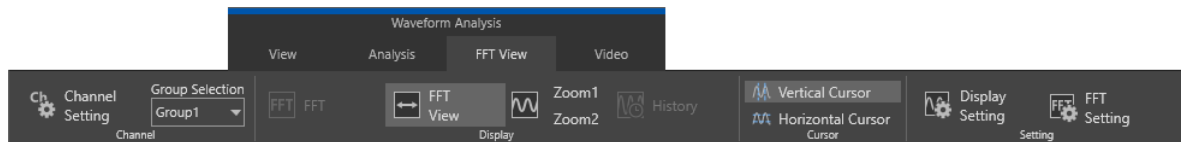
Procedure

Configuring Channels

1. On the **FFT View** tab, click **Channel Setting**. A Channel Setting window opens.

Adding Channels (Add Channel)

2. Click **Add Channel** to open the following dialog box. Channels that can be added (FFT numbers) are displayed.
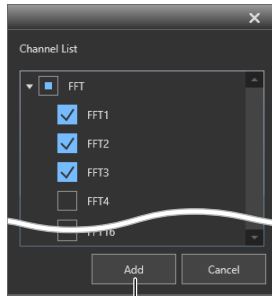
Adds the selected channels

Selecting Filter Conditions

► section 3.5

List of Measurement Conditions of Each Channel

For each channel number, set the numeric display format and the number of displayed digits of the FFT waveforms as well as the display conditions and the unit of logic waveforms.

- You can use the check boxes in the title line to collectively turn on or off the display conditions of the corresponding columns.
- You can set multiple items collectively. Select a range, and then click **Auto**, **Invert**, **Copy**, or **Default** below the list. ► page 3-19

The items in the table are explained in order from left-most column.

Channel number
► page 3-15

Trace
► page 3-15

Model
► page 3-15

Group1 (Group1)
- **Adding and Deleting Groups**
- **Display (Display)**
  ► page 3-16
- **Mapping (Mapping)**
  ► page 3-16

Waveform Color (Color)

► page 3-16

Log

Select this check box to use the Log scale.

   * FFTs that involve LOG calculations (e.g., PS-LOGMAG(C1)) will not be displayed properly.

Minimum (Min) and Maximum (Max)

► page 3-16

Display Format (Format Type)

► page 3-17

Significant digits (Significant digits)

► page 3-17

Display Conditions of Logic Waveforms (Logic)

► page 3-18

**Vertical Scale Unit (Unit)**

► page 3-19

Selecting Display Groups

3.   On the **FFT View** tab, click **Group Selection**. You can select the groups (1 to 4) to show in the FFT View panel from a drop-down list.

Procedure

Setting Expressions

1.   On the **FFT View** tab, click **FFT Setting** to display of a Arithmetic Setting dialog box.

Set expressions, FFTs, and other math operations to display FFT waveforms.

2.   In the Arithmetic Setting dialog box, select the **FFT Setting** tab.

3.   Click the **Expression** column in the Arithmetic Setting dialog box to display of a user-defined expression input dialog box.
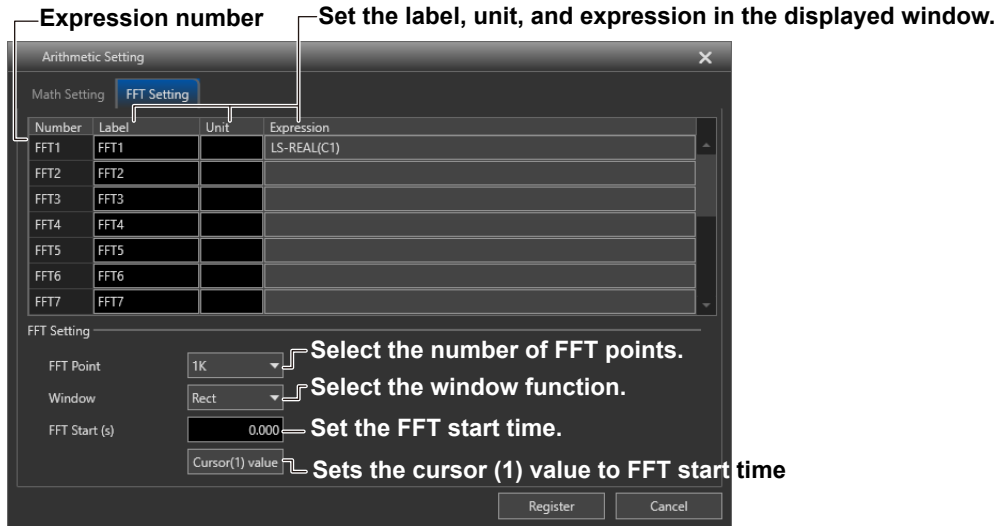
FFT Points

Select the number of FFT points from the following:

1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M, 5M,* 10M,* 20M,* 50M,* 100M*

  *   5M, 10M, 20M, 50M, and 100M become available when MATLAB Runtime is installed.

Note

To analyze data points exceeding 2 Mpoints using FFT, you need to install MATLAB Runtime version 9.11, and make sure it is located in the following path.

C:\Program Files\MATLAB\MATLAB Runtime\v9.11

Windows

► page 4-93

FFT Start (s)

You can specify the FFT start time. You can also change the FFT start time by using the FFT bar on the Overview panel.
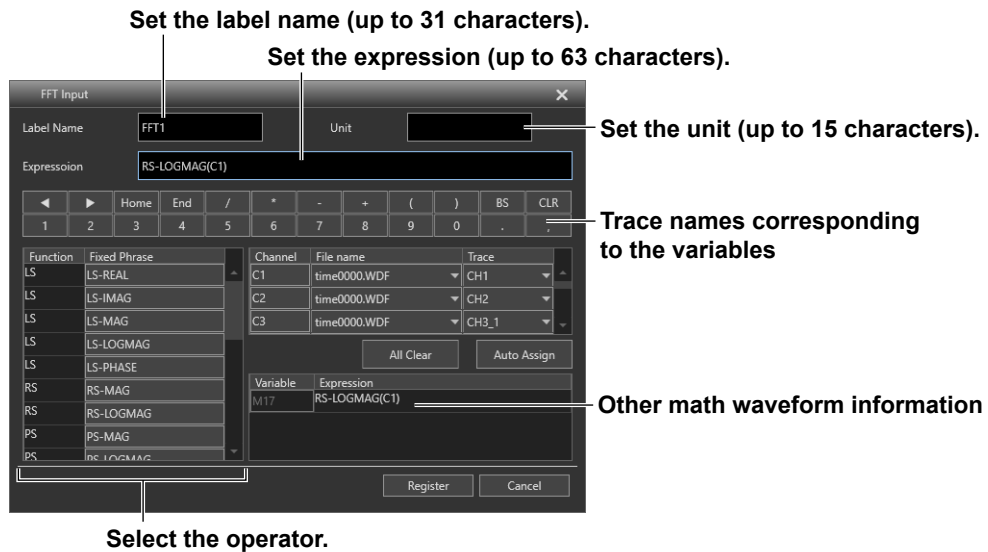
For history waveforms, enter the elapsed time from the start point of the history waveform as the FFT start time.

The elapsed time from the start point can be determined with the vertical cursor.

► page 4-95

Label, Unit, and Expression

4. Create an expression using variables and operators.

Set the label name (up to 31 characters).

Set the expression (up to 63 characters).

Set the unit (up to 15 characters).

Trace names corresponding to the variables

Other math waveform information

Select the operator.

5. Click **Register** to close the expression input dialog box. The specified expression is displayed in the Expression column of the Arithmetic Setting dialog box.

6. Click **Register**. The specified expression is registered.

FFT waveforms are displayed on the FFT View panel.

In addition, FFT becomes available (active) on the FFT View tab.

Explanation

Operator Menu

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

Function Display	Allowed Operators
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

Limitations on Expressions

- Only one source waveform can be specified in an FFT.

  Example of an expression that is not allowed: PS-MAG(C1+C2)

- A computation cannot be performed on the result of an FFT.

  Example of an expression that is not allowed: PS-MAG(C1)+C2

Note ───

FFT operation is possible on math results. In the example above, define Math1=C1+C2 in advance, and then perform P-MAG(M1).

───

Notes on Computation

An FFT is not possible when there is no waveform in the math range if the display record length of the waveform is less than number of math points.

Operators

Operator	Example	Description
LS-REAL	LS-REAL(C1)	Real part of the linear spectrum of the specified waveform
LS-IMAG	LS-IMAG(C1)	Imaginary part of the linear spectrum of the specified waveform
LS-MAG	LS-MAG(C1)	Magnitude of the linear spectrum of the specified waveform
LS-LOGMAG	LS-LOGMAG(C1)	Logarithmic magnitude of the linear spectrum of the specified waveform
LS-PHASE	LS-PHASE(C1)	Phase of the linear spectrum of the specified waveform
RS-MAG	RS-MAG(C1)	Magnitude of the specified waveform's RMS spectrum
RS-LOGMAG	RS-LOGMAG(C1)	Logarithmic magnitude of the specified waveform's RMS spectrum
PS-MAG	PS-MAG(C1)	Magnitude of the power spectrum of the specified waveform
PS-LOGMAG	PS-LOGMAG(C1)	Logarithmic magnitude of the power spectrum of the specified waveform
PSD-MAG	PSD-MAG(C1)	Magnitude of the power spectrum density of the specified waveform
PSD-LOGMAG	PSD-LOGMAG(C1)	Logarithmic magnitude of the power spectrum density of the specified waveform
CS-REAL	CS-REAL(C1,C2)	Real part of the cross spectrum of the two specified waveforms
CS-IMAG	CS-IMAG(C1,C2)	Imaginary part of the cross spectrum of the two specified waveforms
CS-MAG	CS-MAG(C1,C2)	Magnitude of the cross spectrum of the specified two waveforms
CS-LOGMAG	CS-LOGMAG(C1,C2)	Logarithmic amplitude of the cross spectrum of the two specified waveforms
CS-PHASE	CS-PHASE(C1,C2)	Phase of the cross spectrum of the two specified waveforms
TF-REAL	TF-REAL(C1,C2)	Real part of the transfer function of the two specified waveforms
TF-IMAG	TF-IMAG(C1,C2)	Imaginary part of the transfer function of the two specified waveforms
TF-MAG	TF-MAG(C1,C2)	Amplitude of the transfer function of the two specified waveforms
TF-LOGMAG	TF-LOGMAG(C1,C2)	Logarithmic amplitude of the transfer function of the two specified waveforms
TF-PHASE	TF-PHASE(C1,C2)	Phase of the transfer function of the two specified waveforms
CH-MAG	CH-MAG(C1,C2)	Magnitude of the coherence function of the two specified waveforms

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 Vpeak

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 Vrms

Power Spectrum (PS-MAG/PS-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	$R^2 + I^2$
		AC component	$(R^2 + II^2)/2$
Log magnitude	PS-LOGMAG	DC component	$10 \times \log(R^2 + II^2)$
		AC component	$10 \times \log\{(R^2 + II^2)/2\}$

Log magnitude reference (0 dB): 1 Vrms^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 × NENBW)
Log magnitude	PSD-LOGMAG	10 × log(PS-MAG/(Δf × NENBW))

Log magnitude reference (0 dB): 1 Vrms^2

NENBW (Normalized Equivalent Noise BandWidth)

NENBW varies as indicated below depending on the selected time window.

Time Window Type	NENBW
Rect (Rectangular window)	1
Hanning (Hanning window)	1.5
FlatTop (Flattop window)	3.19693
Hamming (Hamming window)	1.3628

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 (Gx) and the complex conjugate (Gx*) of the linear spectrum of the other signal (Gy).

If the linear spectra of the 2 signals are represented by

$\quad$ Gx = Rx + jIx

$\quad$ Gy = Ry + jIy

then the cross spectrum Gyx is

$\quad$ Gyx $\quad$ = Gy×Gx*

$\qquad\qquad$ = (Ry + jIy)(Rx - jIx) = Ryx + jIyx

where Ryx = RyRx + IyIx

$\quad$ Iyx = RxIy - RyIx

The following spectra can be determined:

Item	Expression	Computation	
Real part	CS-REAL	DC component	Ryx
		AC component	Ryx/2
Imaginary part	CS-IMAG	DC component	Iyx
		AC component	Iyx/2
Amplitude	CS-MAG	DC component	$\sqrt{(Ryx^2 + Iyx^2)}$
		AC component	$\sqrt{(Ryx^2 + Iyx^2)}/2$
Log magnitude	CS-LOGMAG	DC component	$10 \times \log\sqrt{(Ryx^2 + Iyx^2)}$
		AC component	$10 \times \log(\sqrt{(Ryx^2 + Iyx^2)})/2$
Phase	CS-PHASE		$\tan^{-1}(Iyx/Ryx)$

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 (Gy) to the spectrum of the input (Gx) 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 (Gyx) and the input power spectrum (Gxx).

$\quad$ Transfer Function = Gy/Gx = (Gy×Gx*)/(Gx×Gx*) = Gyx/Gxx = $(Ryx + jIyx)/(Rx^2 + Ix^2)$

The following items can be determined:

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

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.

Coherence function = Gyx×Gyx*/(Gxx×Gyy)

Item	Expression	Computation
Magnitude	CH-MAG	$(Ryx^2 + Iyx^2)/(Gxx \times Gyy)$

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.

Time Windows

You can select rectangular, Hanning, flattop, or Hamming 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 Hanning window provides a relatively higher frequency resolution compared to the flattop window. However, the flattop window has a higher level of accuracy. The Hamming window is a corrected Hanning window. The frequency resolution of its main beam is greater than that of the Hanning window. The Hamming window is suited for dividing close signals. When the waveform being analyzed is a continuous signal, consider the above characteristics in selecting the proper window to be applied.
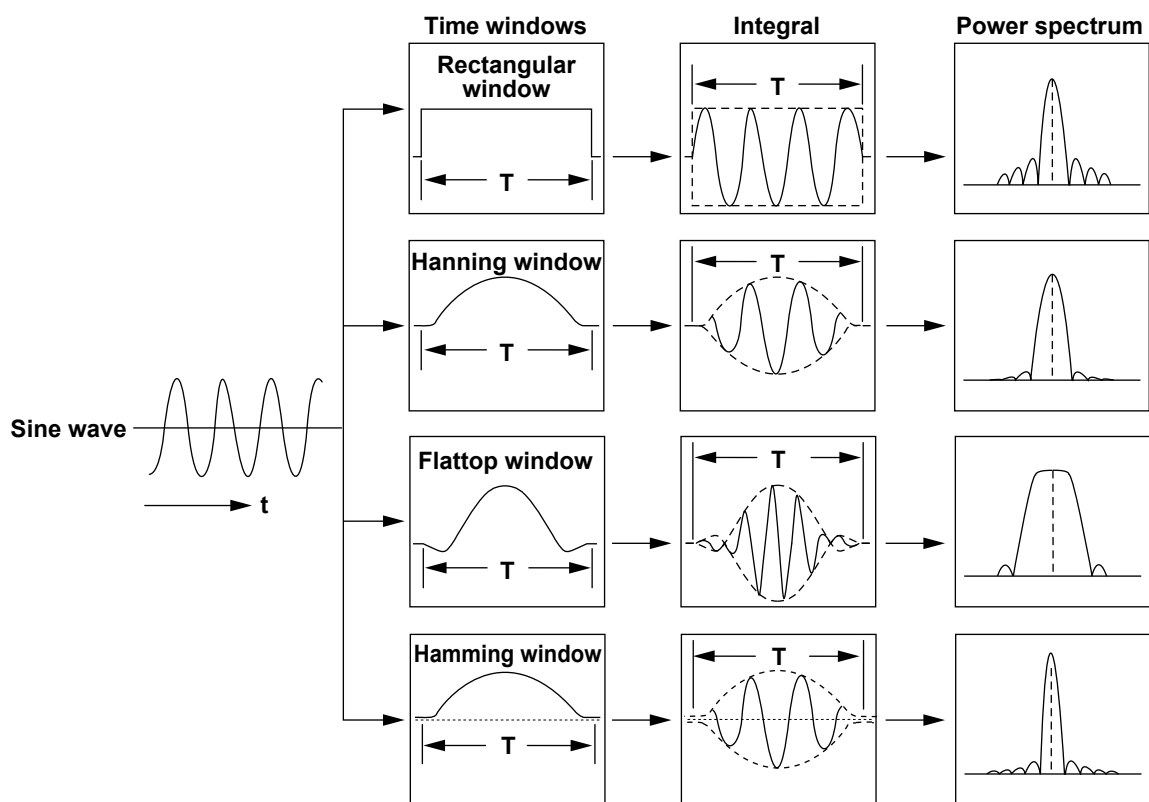
$$\text{Rectangular window:} \quad W(t) = u(t) - u(t - T) \qquad U(t): \text{Step function}$$

$$\text{Hanning window:} \qquad W(t) = 0.5 - 0.5\cos(2\pi\tfrac{t}{T})$$

$$\text{Flattop window:} \qquad W(t) = \{0.54 - 0.46\cos(2\pi\tfrac{t}{T})\}\frac{\sin\{2\pi(1 - 2t/T)\}}{2\pi(1 - 2t/T)}$$

$$\text{Hamming window:} \qquad W(t) = 0.54 - 0.46\cos(2\pi\tfrac{t}{T})$$

Procedure

Displaying FFT Waveforms and Math Range

When you register an FFT expression, the FFT waveform will be displayed on the FFT View panel.
In addition, an FFT bar indicating the computation range will be displayed above the overview
waveform on the Overview panel.
FFT View on the **FFT View** tab become selectable. Click **FFT View** to show or hide the FFT View
panel.

FFT View Panel

Example displaying FFT view waveforms and properties
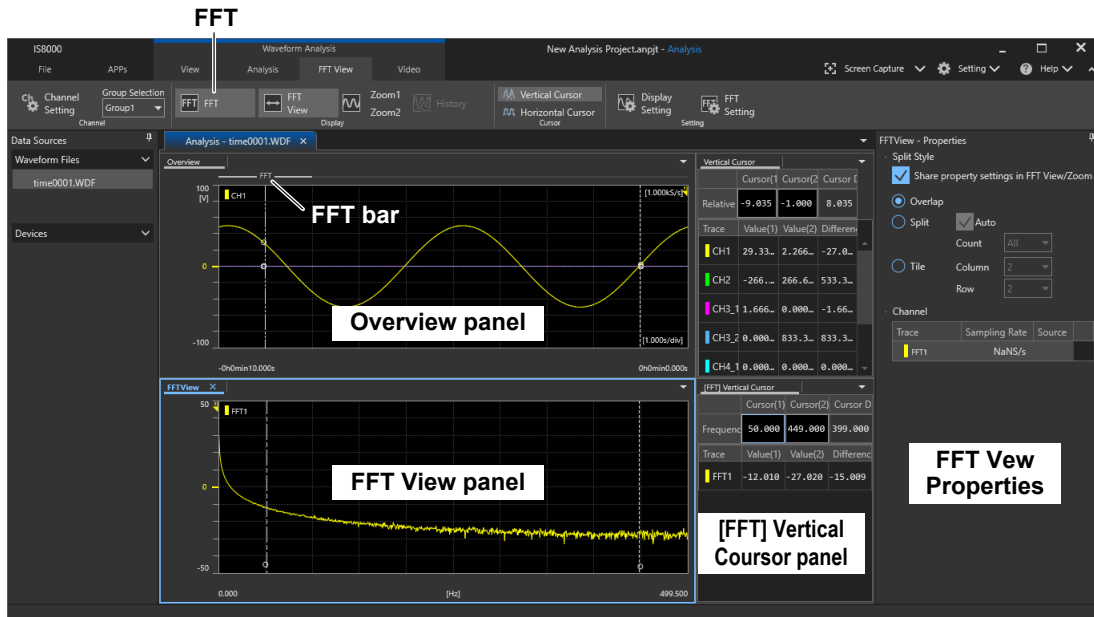
* If the FFT is not active on the FFT View tab, FFT view, [FFT] vertical cursor, and horizontal cursor
  panels will not be displayed.

FFT View Properties

The following items are displayed in the property display area. Click ◢ in front of each item to
expand or collapse the display.

Split Style

FFT view waveforms can be displayed separately by trace names.

• **Share property setting in FFT View/Zoom**

Check Box	Description
ON	The split style setting is shared among FFT view waveforms and zoom 1 and 2 waveforms. • Cursor measurement values use the settings of the FFT View panel. • When the display style is **Split,** detailed settings such as Auto, Count, and Tile Column and Row are not shared. Set these separately for the FFT view and zoom waveforms.
OFF	The split style setting is not shared among FFT view waveforms and zoom 1 and 2 waveforms. Set these separately for the FFT view and zoom waveforms.

- • **Overlap, Split, and Tile**
  ► page 4-10

Channel (Channel)
The trace names, sample rates, source file names of the channels displayed on the FFT View panel are shown in a table.

Setting the FFT Start Time and the Number of FFT Points

- • When you drag the middle of the FFT bar, the math range is displayed in light blue, and you can change the FFT start time with the math time fixed.
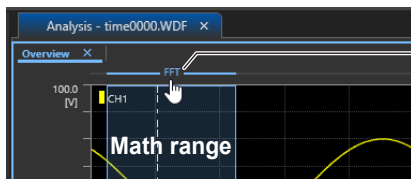
Moves the FFT start time
(the math time is fixed)

- • The math time is the length corresponding to the number of FFT points. You cannot change the math time with the FFT bar.
  ► step 3 on page 4-86

- • The FFT result will not be displayed if the FFT operation range contains sections without FFT source waveform signals.

Procedure

Displaying Zoom Waveforms

On the **FFT View** tab, click **Zoom 1** or **Zoom 2** to show or hide zoom waveforms.

Zoom 1 and 2 Panels

The areas enclosed by the zoom frames (zoom1 and 2) on the FFT view waveform appear zoomed.

Note ────────────────────────────

FFT operation is not possible on logic waveforms or WT5000's PP waveforms.

Example displaying zoom waveforms (overlap display) and properties

Select the scrolling speed

Select the scrolling direction or stop scrolling

Drag to move the section to zoom

Zoom 1 properties

Zoom 1 and 2 Properties

The following items are displayed in the property display area. Click ◢ in front of each item to expand or collapse the display.

Split Style

Zoom waveforms can be displayed separately by trace names.

• **Share Property Setting in FFT View/Zoom**
  The split style setting can be shared among FFT view waveforms and zoom 1 and 2 waveforms. ► page 4-94

• **Overlap, Split, and Tile**
  ► page 4-10

Channel (Channel)

The trace names, sample rates, source file names of the channels displayed in the zoom 1 and 2 panels are shown in a table.

Position

• Offset

When you click the ⇕ **Y** button, the vertical movement mode can be turned on or off for the zoom waveform.

• View range

When you click the following items, you can set the zoom area to any position and zoom in or out of the target zoom waveform.

Item		Description
Drag to set the range		When you click this button and drag the FFT view waveform to any position, the zoom area is set to the area that results from dragging.
Horizontal	–/+	Each time you click [-] or [+], the waveform is expanded or reduced horizontally.
Vertical	–/+	Each time you click [-] or [+], the waveform is expanded or reduced vertically.

Horizontal auto scroll

The target zoom waveform can be scrolled horizontally automatically.

Item	Description
◀	Scrolling starts to the left.
■	Scrolling stops.
▶	Scrolling starts to the right.
Scroll Speed	You can select the auto scroll speed. From the drop-down list, you can select **x1** (normal speed) or **x2** (double speed).

Shortcut key description

► page 4-13

Procedure

Displaying History Waveforms

On the **FFT View** tab, click **History** to show or hide the [FFT] History panel.

    * Valid only when an FFT operation is performed on a history waveform.

The history waveform FFT is exclusive to histories. FFT operations are performed for each history.

The FFTs of histories can be displayed overlapped in the FFT View panel.
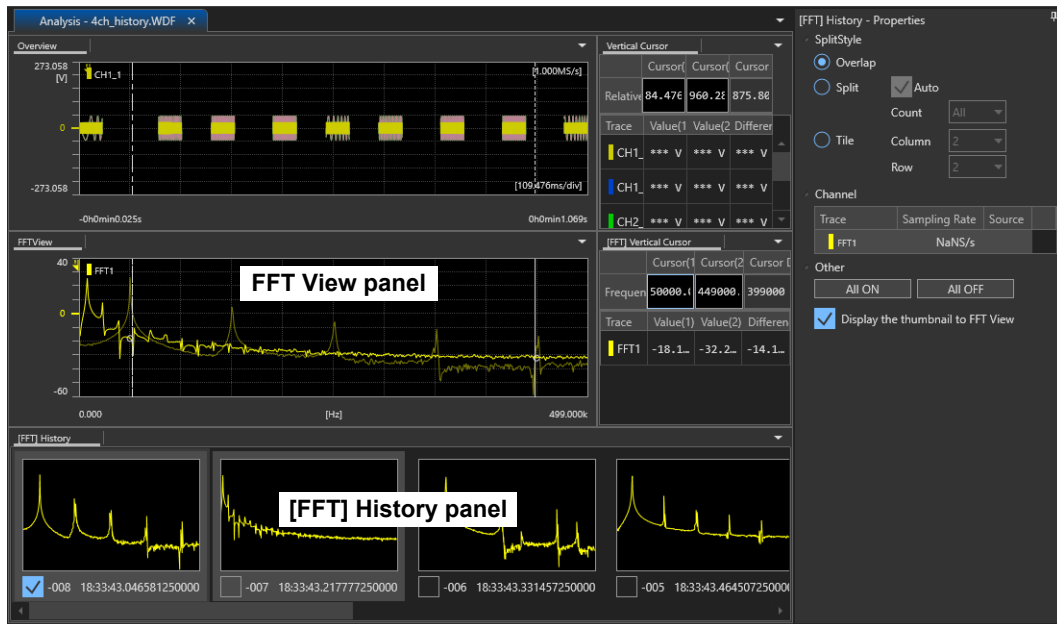
Note

- When a history waveform and a non-history waveform are displayed on the same axis, FFT operations cannot be performed.
- The FFT bar is not displayed for FFTs of history waveforms.

[FFT] History Panel

The [FFT] History panel displays history waveforms.

Example displaying FFT history waveforms and properties

Procedure

Measuring with Vertical Cursors

On the **FFT View** tab, click **Vertical Cursor** to display two vertical cursors in the FFT View panel. The vertical cursor panel displays the measured value at each cursor position (frequency), the differences in frequencies and measured values between the two cursors, and so on.

[FFT] Vertical Cursor Panel

► This is similar to the Vertical Cursor Panel in section 4.4.
Read "overview" as "FFT view and "view" as "zoom."

Measuring with Horizontal Cursors

On the **FFT View** tab, click **Horizontal Cursor** to display two horizontal cursors in the FFT View panel. The horizontal cursor panel displays the measured value at each cursor position (time), the differences in times and measured values between the two cursors, and so on.

[FFT] Horizontal Cursor Panel

► This is similar to the Horizontal Cursor Panel in section 4.4.
Read "overview" as "FFT view and "view" as "zoom."

Example displaying [FFT] vertical cursor panel, [FFT] horizontal cursor panel, and properties
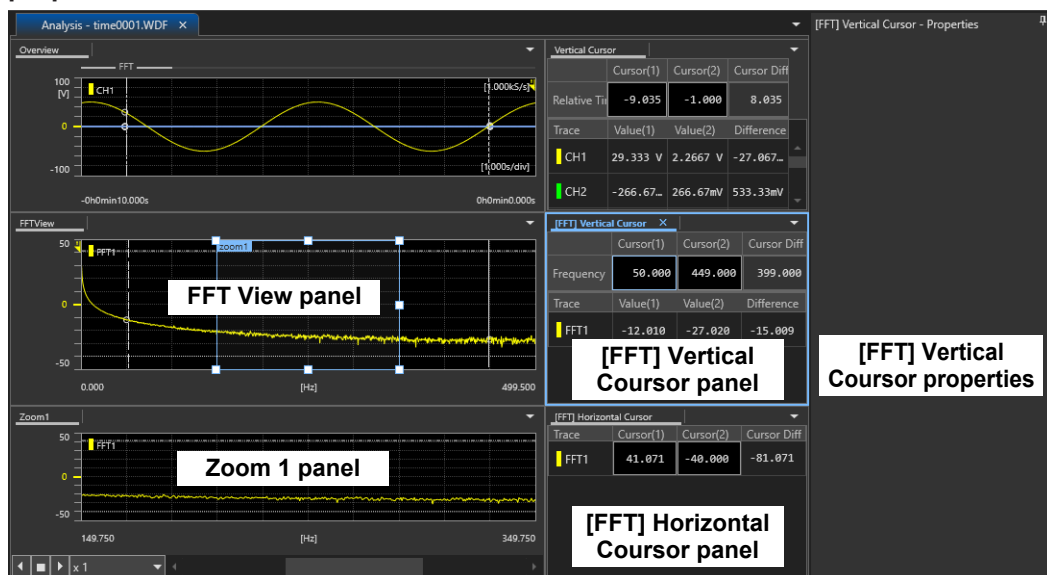
Saving the Analysis Results of FFT Waveforms

The analysis results of FFT waveforms can be saved to a file.

Exporting Analysis Results to a File

On the **File** tab, click **Export to File**.
► "Exporting a File" on page 3-41.

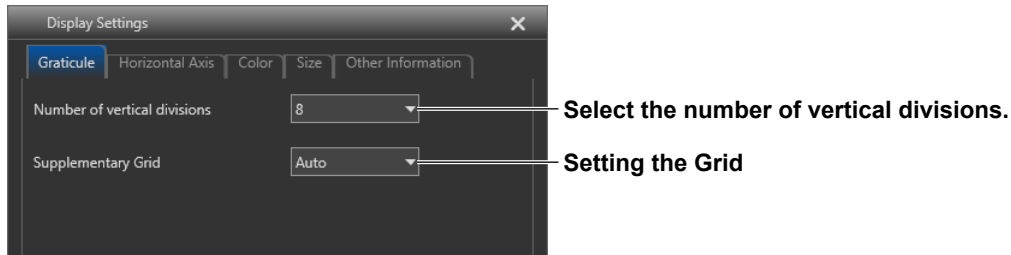**Procedure**

Configuring the FFT Waveform Display

On the **FFT View** tab, click **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.

Grid

When you click the **Graticule** tab, the following item appears.

Select the number of vertical divisions.

Setting the Grid

Setting the Grid

Item	Description
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.

Horizontal Axis

When you click the **Horizontal Axis** tab, the following items appear. You can set the horizontal scale and whether to show or hide the DC components.


Set the scale (LINEAR, LOG).

DC component display (On, Off)

Color

This is the same as the display setting for measured data. ► page 4-36

Waveform and Grid Line Weight

This is the same as the display setting for measured data. ► page 4-37

Other

When you click the **Other information** tab, the following items appear. You can set the waveform interpolation display. ► page 4-37


Set the waveform interpolation display (Off, Line).
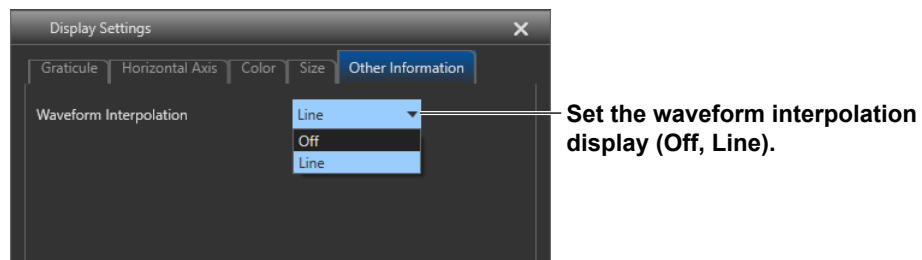
Note

Supplementary grid and horizontal scale can be set only when the horizontal axis unit is Hz.

4.12 High-speed Camera Synchronization Measurement (FS1 option)

You can synchronize video data of high-speed cameras saved through online monitoring and waveform data of a measuring instrument and analyze them.*

>   * You can also synchronize any other video files (saved by means other than high-speed cameras) and a waveform and analyze them.
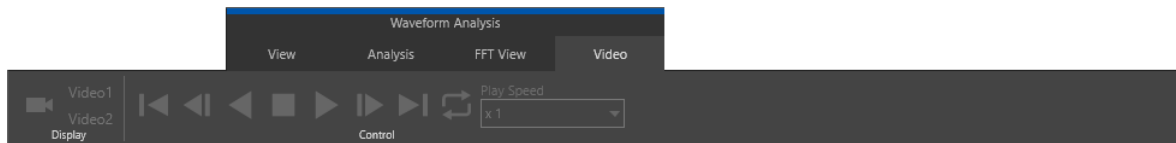
For details, see the User's Manual, IM IS8000-61EN.

Acquiring Data (Online Monitoring)

This chapter explains how to monitor waveforms of measuring instruments and acquiring waveform data using the USB or Ethernet interface.

5.1 Connecting to Instruments

Refer to the instruction manuals for the measuring instruments, and connect the instruments to your PC using USB or LAN cables.

If you are connecting the instruments to your PC through USB for the first time after purchase, you must install the USB driver. Install the USB driver in the PC according to the Installation Manual, IM IS8000-04EN.

Note

DL950 Operation Mode and Motion Mode

- Connect the DL950 with the operation mode set to Scope.
  If you connect the DL950 through DAQ with the operation mode set to Recorder, it is automatically changed to Scope.
  For details on the operation mode, see the DL950 manuals.
- When you connect the DL950 through DAQ, the DL950 Motion Mode (page 5-21) is automatically set to FreeRun.

Procedure

1. Start this software. A launcher appears.

2. Click **DAQ, DAQ (WT),** or **DAQ (IEC 2k-9kHz).**[1, 2]

    1 To connect only the WT5000, select **DAQ (WT)**.

    2 Select **DAQ (IEC 2k-9kHz)** when connecting a WT5000 to measure harmonics complying with the IEC 61000-4-7 Annex B (2k-9kHz) standard. This feature is available when the IEC harmonics/flicker measurement feature (/G7 option) is installed in the WT5000.

    A Device Search window opens. ► section 3.4

    Instruments connected to the PC via USB are automatically detected and displayed in a table.

3. If the instrument to be connected is not displayed in the table, select the communication interface (WIRE) type under **Auto** or select the detailed wire type under **Manual**, and click **Search**.

4. From the table of detected instruments, select the instrument you want to connect, and click **Next** or **Open**.

- **Next**
  The Channel Setting window opens. ► sections 3.5, 5.2
  If you click **Next** in the Channel Setting window, the DAQ setting window opens. ► sections 3.6, 5.9

- **Open**
  The Control tab of the Monitor ribbon appears, and you can immediately execute monitoring (measurement) and recording (data acquisition).
  Depending on the function selected in step 2, the status displayed will vary as follows.
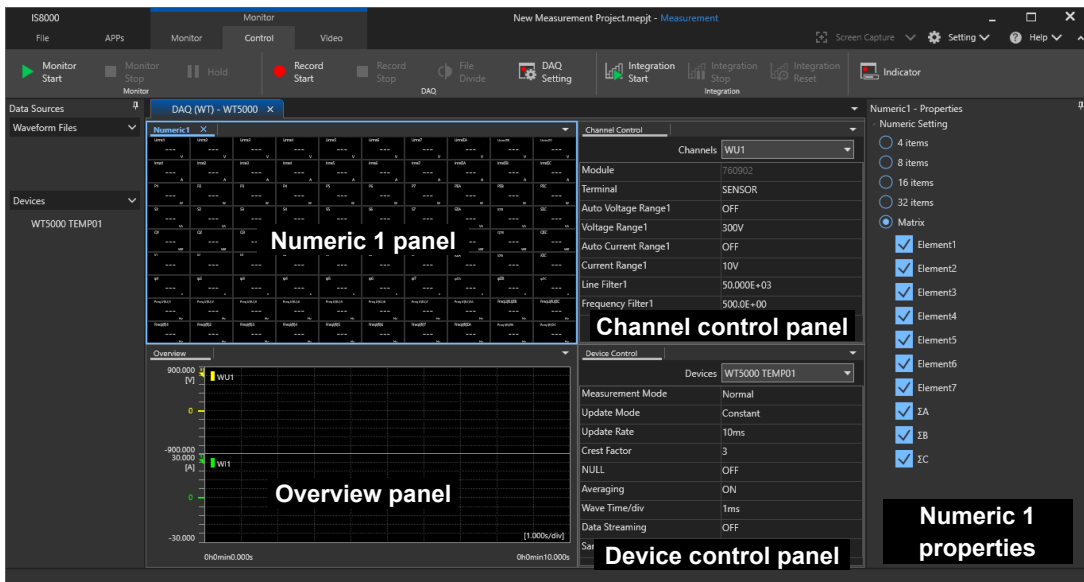
When Connected via DAQ

A DAQ - (host name) tab window opens. This is an example when a DL950 is connected.
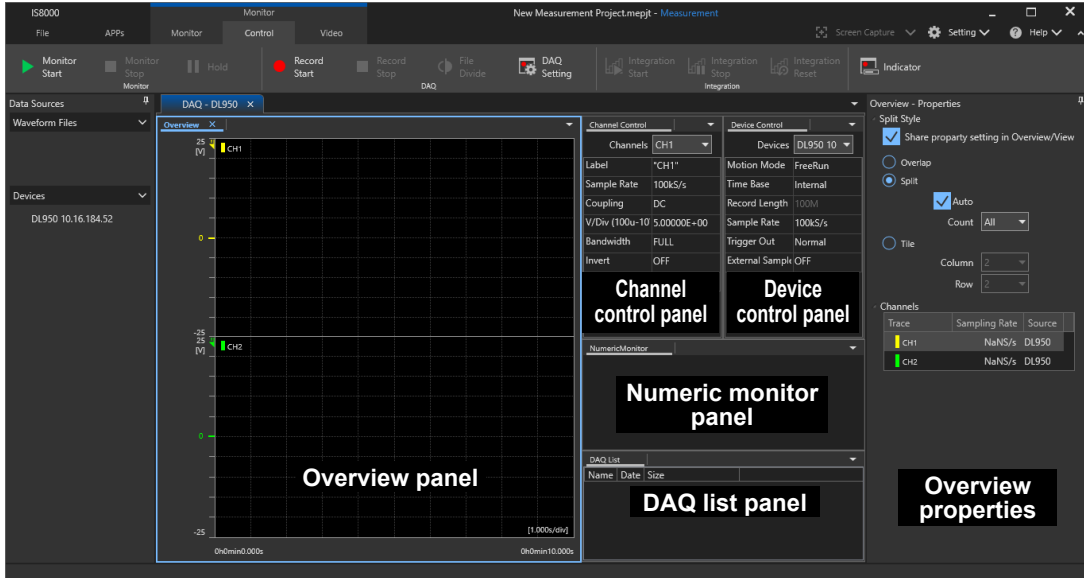
When Connected via DAQ (WT) (WT5000 only)

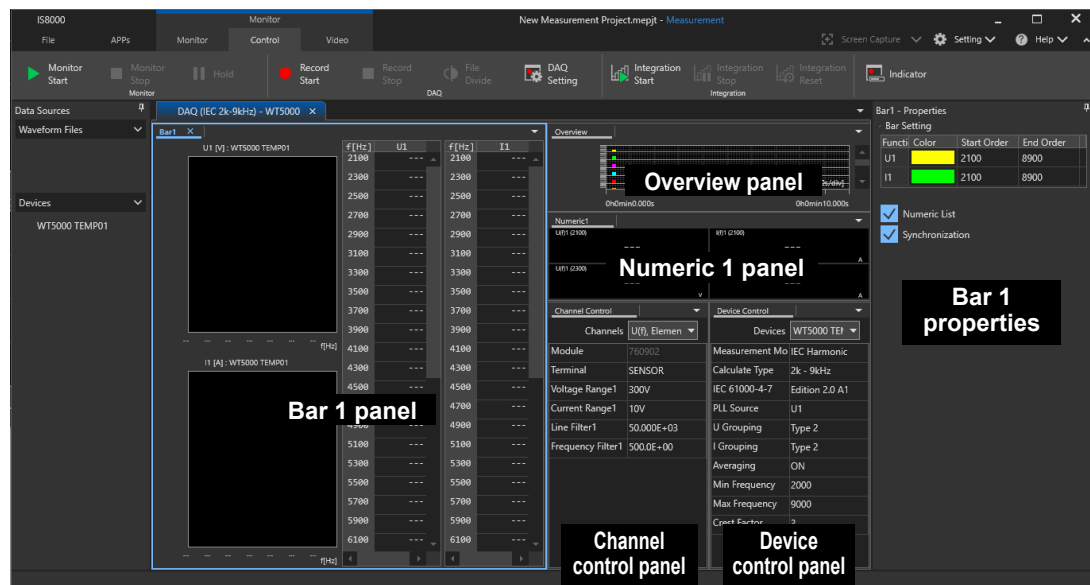A DAQ (WT) - (host name) tab window opens.

Displayed panels	Default setting		Reference
Numeric panel	Matrix display		page 5-9
Overview panel	PP waveforms (WU1, WI1)		page 5-5
Device control panel	Measurement mode	Normal	page 5-24
	WaveTime/div	maximum update rate setting at start (1/10)	

When Connected via DAQ (IEC 2k-9kHz) (WT5000 only)

DAQ (IEC 2k-9kHz) - (host name) tab window opens.

Displayed panels	Default setting		Reference
Bar panel	Display by frequency according to IEC61000-4-7 Annex B (2k-9kHz) standard		page 5-10
Overview panel	Display channel: Numeric display Preset 25 (page 3-23)		page 5-5
Numeric panel	4-value display		page 5-9
Device control panel	Measurement Mode	IEC Harmonic	page 5-12
	Calculate Type	2k - 9kHz	
	IEC 61000-4-7	Edition 2.0 A1	
	PLL Source	U1	
	U Grouping	Type2	
	I Grouping	Type2	
	Averaging	ON	
	Min Frequency	2000	
	Max Frequency	9000	
	Crest Factor	3	

Explanation

Monitor Ribbon
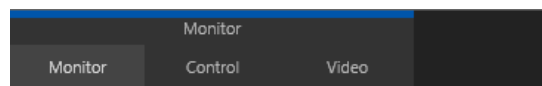
This is a ribbon for online measurement. Click a tab to switch the ribbon.

Tab	Description	Refer To
Monitor	Displays measured data of connected measuring instruments.	Section 5.2 to section 5.7
Control	You can execute monitoring (measurement) and recording (data acquisition).	Section 5.8 to section 5.11
Video	This is a high-speed camera synchronization option feature.	Section 5.12

5.2 Waveform/Power Display Window

This section explains how to configure the display channels for measurement data (waveforms, power values) of connected instruments on this software.

The settings are the same as those in the Channel Setting window of Smart Setup described in section 3.5.
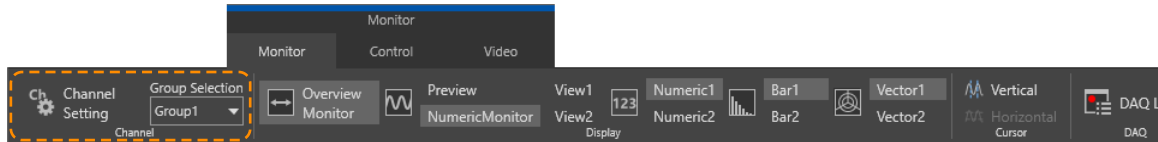
Procedure

Channel Setting Window

You can set display groups and measurement conditions for each channel to acquire channel information from the connected measuring instrument and display it on this software.

1. On the **Monitor** tab, click **Channel Setting**. A Channel Setting window opens.

2. Refer to section 3.5, and set the waveform display conditions, groups, and so on for each channel.

When a WT5000 Is Connected and Data Streaming Is Set to ON*

    * Data streaming measurement condition settings ► page 5-22
      Data streaming feature (DS option) is required in the WT5000.

Selecting DS/PP Waveforms

A column for selecting DS/PP waveforms appears in the list of measurement conditions of each channel.

In addition to the acquisition channels of data streaming (DS) waveforms, channels can be added to acquire PP waveforms (waveform display data).
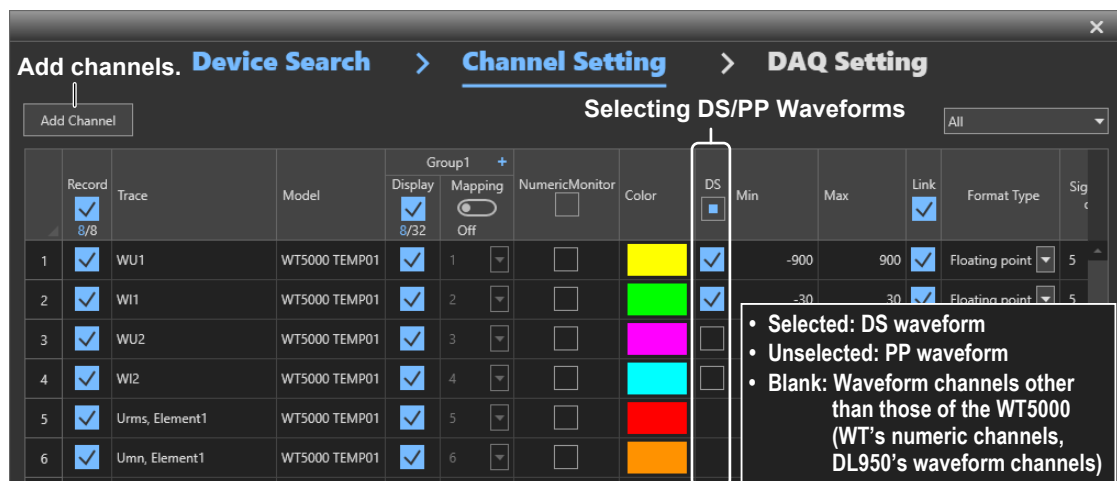

Trace Names of DS/PP Waveforms

"Data Streaming" or "PP Compress" indication is added to the trace names in the overview waveform display and file export settings.

5.3 Using the Window

This section explains the following operations:

- Displaying Overview Waveforms
- Displaying Preview Waveform (When a WT5000 is connected)
- Displaying Numeric Monitor
- Displaying View Waveforms
- Moving and Zooming Waveforms

- Numeric Display (When a WT5000 is connected)
- Displaying Harmonic Bar Graphs (When a WT5000 is connected)
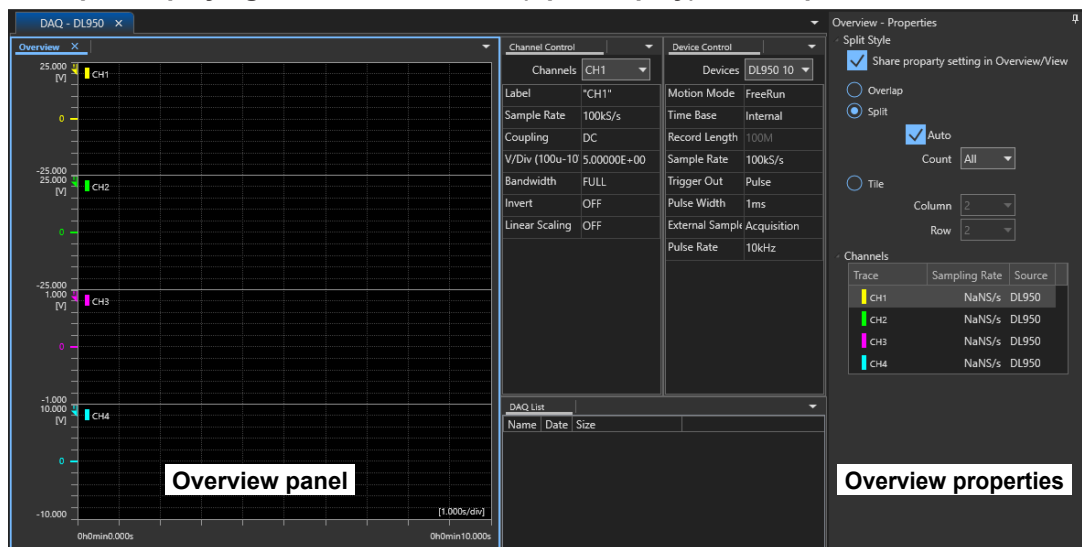- Displaying Vector (When a WT5000 is connected)
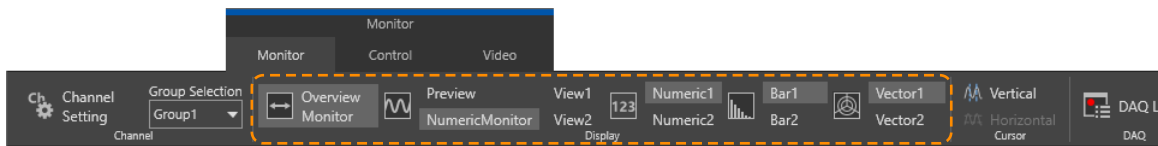
Procedure

Displaying Overview Waveforms

1. When a connection is established with a measuring instrument, a DAQ-(host name) tab window opens. You can show or hide Overview panel by clicking **Overview Monitor** on the **Monitor** tab.

Overview panel

2. When you start measuring or recording, the entire waveform data is displayed in the Overview panel.

- Starting and stopping measurements ► section 5.8
- Starting and stopping recording ► section 5.9

Example Displaying the Overview Panel (Split Display) and Properties

When waveforms are overlapped, clicking the top waveform causes the waveform under it to become active.

Overview Properties

► page 4-10

The position setting is not available.

Procedure

Displaying Preview Waveform (When a WT5000 is connected)
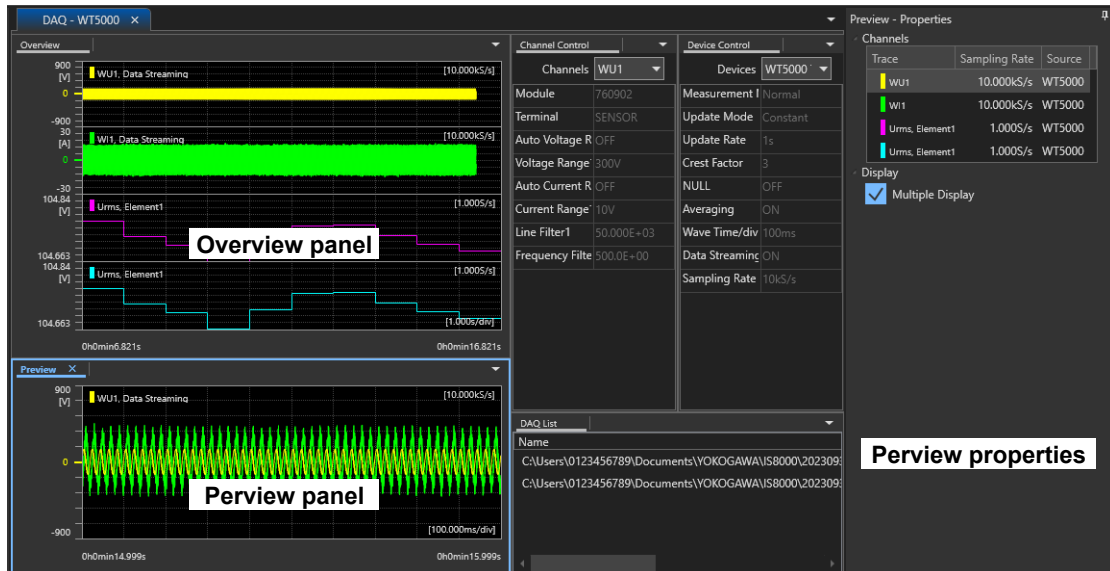
1. On the **Monitor** tab, click **Preview** to show or hide the preview panel.

Preview Panel

The most recent DS or PP waveform is displayed.

WT5000 waveform channels selected in the channel settings in section 5.2 are shown in the preview display.

* WT5000 numeric channels and DL950 waveforms are not shown in the preview display.

Preview Properties

Channel (Channel)

► page 4-10

Multiple Display (Multiple Display)

Check Box	Description
ON	A trace with the same sample rate as the selected trace is overlaid.
OFF	The trace you select in the list of channels in the properties is shown in preview.

Procedure

Displaying Numeric Monitor

1. On the **Monitor** tab, click **Numeric Monitor** to show or hide the numeric monitor panel.
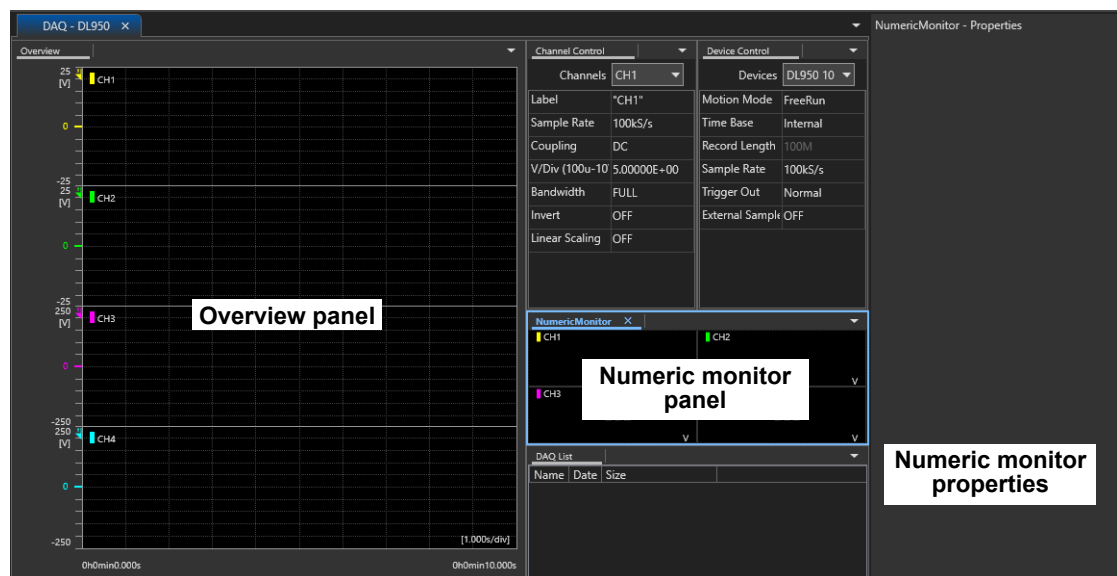
Numeric Monitor Panel

The current measured values are displayed numerically.

The numeric monitor allows you to view the values of measurement data acquired from the measuring instruments that this software is connected to at 300 ms cycles.*

   * Data acquisition interval may increase depending on the connected instruments.

The channels displayed on the numeric monitor are those selected in the channel settings in section 3.5 .

Numeric Monitor Properties

There are no settings.

Procedure

Displaying View Waveforms

1. On the **Monitor** tab, click **View1** or **View2** to show or hide the View 1 or 2 panel.

View 1 and 2 Panels

The waveform in the area enclosed by the zoom frame (view 1 and 2) on the overview waveform appears zoomed.

► page 4-12

View 1 and 2 Properties

► page 4-12

Here, read Position as Scaling. The offset setting is not available.

Procedure

Moving and Zooming Waveforms

► page 4-29

Note

The waveform displayed in the Overview panel when a DL950 is connected shows the maximum and minimum values over a given number of points because of its high-speed display. If the range of a given number of points exceeds one dot of the resolution of the waveform display screen, maximum and minimum values are displayed continuously. To view the actual values, use the following method.

• Open the recorded waveform data using offline analysis, and view the data. ► section 4.3
• Display the Remote Control ribbon, click Trigger Mode, and zoom in on the waveform. ► chapter 6

Procedure

Numeric Display (When a WT5000 is connected)

For display channel settings, see "When a WT5000 is connected" on page 3-13.

1. On the **Monitor** tab, click **Numeric1** or **Numeric2** to show or hide the Numeric 1 or 2 panel.
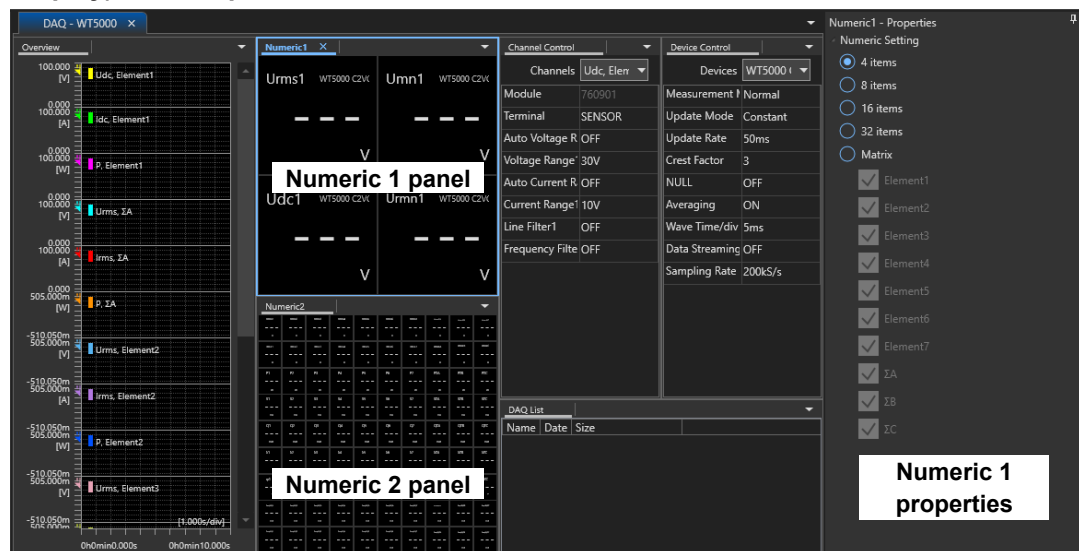
Numeric 1 and 2 Panels

The WT's measurement data is displayed numerically.

• You can change the numeric display format in the property display area.

• You can change the measurement function, harmonic order, displayed items of elements, and devices in the numeric display setting dialog box. ► page 5-27.

You cannot change the settings while measured data acquisition is in progress.

Example Displaying the Numeric 1 Panel (4-value Display), Numeric 2 Panel (Matrix Display), and Properties

Numeric 1 and 2 Properties

You can set the numeric display format in the property display area.

Numeric Data Display

Display Format	Description
4 items	4-value display. Four numeric data values are displayed in two columns.
8 items	8-value display. Eight numeric data values are displayed in two columns.
16 items	16-value display. 16 numeric data values are displayed in four columns.
32 items	32-value display. 32 numeric data values are displayed in four columns.
Matrix	Matrix display. A table of numeric data is displayed with measurement functions listed vertically and symbols indicating elements and wiring units listed horizontally. Data can be displayed for all connected units and for all measurement modes (850 channels max.).* * For 17 functions × (7 elements + 3 wiring units) × 5 units max.
Select element to display	Show or hide the elements and wiring units by selecting or unselecting the check boxes of Element 1 to 7, ΣA , ΣB , and ΣC.

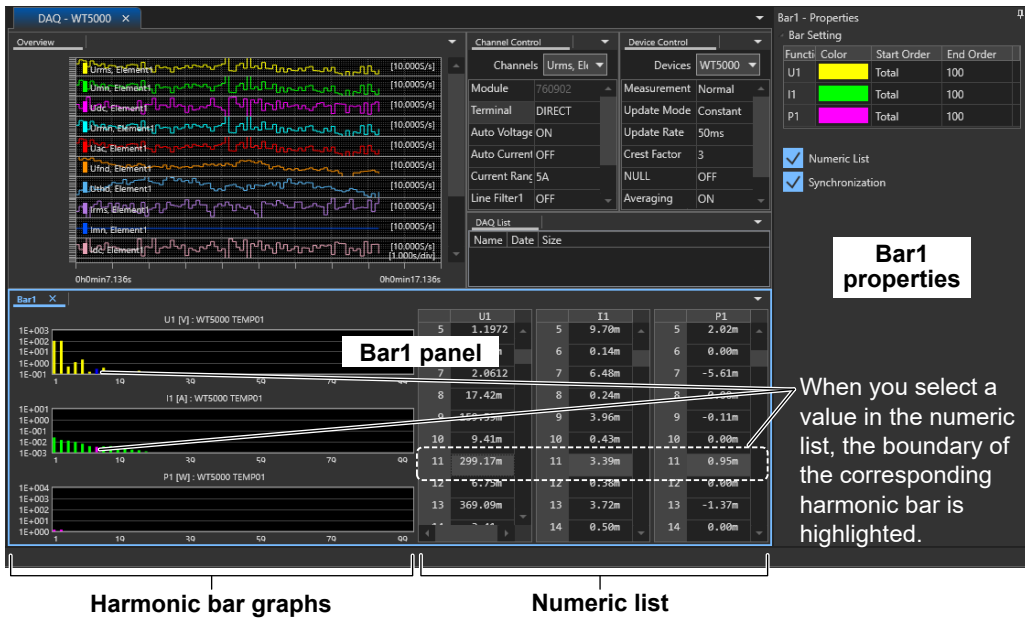Display example ► page 4-23

Procedure

Displaying Harmonic Bar Graphs (When a WT5000 is connected)

1. On the **Monitor** tab, click **Bar1** or **Bar2** to show or hide the Bar 1 or Bar 2 panel.
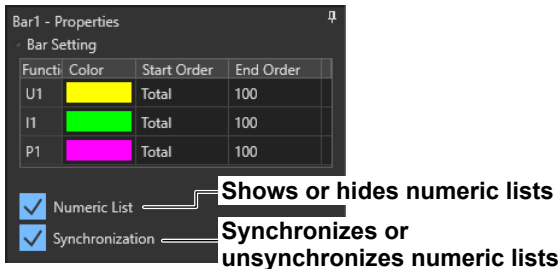
Bar 1 and 2 Panels

- Harmonic measurement data is displayed in a bar graph and numeric list for each harmonic. On the Bar 1 and 2 panels, you can display harmonic bar graphs and numeric lists. Up to three of these elements can be displayed.
- You can change the number of bar graphs to display, the measurement function, displayed items of elements, and devices in the bar graph display setting dialog box. ▶ page 5-30

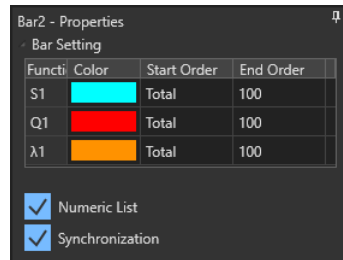**Example Displaying the Bar 1 Panel and Properties**

Bar1 properties

Bar1 panel

When you select a value in the numeric list, the boundary of the corresponding harmonic bar is highlighted.

Harmonic bar graphs   Numeric list

Bar 1 and 2 Properties

Bar1 properties

Shows or hides numeric lists

Synchronizes or unsynchronizes numeric lists

Bar2 properties

Bar setting items are displayed in the property display area.

- Function
- Color
- Start Order and End Order

- Numeric List
- Synchronization

Setting details ▶ page 4-25

Harmonic bar graph display complying with IEC 61000-4-7 Annex B (2k-9kHz)

When **DAQ (IEC 2k-9kHz)** is selected in the launcher, measurements are taken under the following measurement conditions, and the bar graph and numeric list are displayed by frequency.

Setting the Measurement Conditions
- Measurement Mode: IEC Harmonic
- Calculate Type: 2k - 9kHz
- IEC 61000-4-7: Edition 2.0 A1

Harmonic bar graphs   **Numeric list**

Note

When Calculate Type is 2k - 9kHz and IEC 61000-4-7 is Edition 1.0 in the measurement conditions, U(f) and I(f) in the numeric list are displayed as "---." "f" represents frequency.

Explanation

Measurement Conditions when the Measurement Mode is IEC Harmonic*

*   IEC harmonics/flicker measurement feature (/G7 option) is required for WT5000.

•   For the measurement conditions when the measurement mode is Normal, see page 5-24.

•   For details on the IEC harmonic measurement settings, see the WT5000 user's manuals.

Setting	Description	
Calculate Type	2k - 9kHz:	Select this item to measure harmonics complying with IEC 61000-4-7 Annex B (2k-9kHz). Measurements are made using the software's internal computation process. For details on expressions, grouping, and averaging, see page 5-13.
	Harmonic Order:	Measurements are made using the computation process of IEC harmonics mode on the WT5000 measuring instrument.
IEC 61000-4-7	Edition 1.0, Edition 2.0, Edition 2.0 A1	
PLL Source	U1, I1, U2, I2, U3, I3, U4, I4, U5, I5, U6, I6, U7, I7, Ext Clk	
U Grouping	OFF, Type 1, Type 2, Type 3,* Type 4*	
I Grouping	OFF, Type 1, Type 2, Type 3,* Type 4*	
Averaging	ON, OFF	
Crest Factor	3, 6, 6A	

*   This can be selected when the WT5000 firmware version is 3.61 or later and Calculate Type is Harmonic Order.

Settings when Calculate Type is 2k - 9kHz

Min Frequency	2000, 2100, 2500
Max Frequency	8900, 9000, 9900, 10000

Settings when Calculate Type is Harmonic Order

Min Order	0, 1
Max Order	40, 50, 150, 180, 200

Default Values

•   **When Calculate Type is 2k - 9kHz**

Item	Setting
IEC 61000-4-7	Edition 2.0 A1
PLL Source	U1
U Grouping	Type 2
I Grouping	Type 2
Averaging	ON
Min Frequency*	2000
Max Frequency*	9000
Crest Factor	3

•   **When Calculate Type is Harmonic Order**

Item	Setting
IEC 61000-4-7	Edition 2.0 A1
PLL Source	U1
U Grouping	Type 2
I Grouping	Type 2
Averaging	ON
Min Order	1
Max Order	180
Crest Factor	3

*   The center frequency within the range of Min Frequency to Max Frequency is the target of the calculation. For details on the center frequency, see the expression on the next page.

Voltage Grouping and Current Grouping (U Grouping/I Grouping)

Item	Description
OFF	The middle harmonic components are not included in the harmonic components.
Type 1	Harmonic subgroups are treated as components of the frequency's harmonics.
Type 2	Harmonic groups are treated as components of the frequency's harmonics.
Type 3*	Interharmonic center subgroups are treated as components of the frequency's harmonics.
Type 4*	Interharmonic groups are treated as components of the frequency's harmonics.

*   This can be selected when the WT5000 firmware version is 3.61 or later and Calculate Type is Harmonic Order.
     For details on interharmonic center subgroups and interharmonic groups, see the WT5000 user's manual or section 1.7 in Harmonic/Flicker Software User's Manual (IM IS8000-63EN).

Harmonics when Calculate Type is 2k - 9kHz are obtained from the components of harmonic subgroups and harmonic groups with respect to the center frequency.

Select the grouping setting from OFF, Type1, and Type2.

Note

For grouping when Calculate Type is Harmonic Order, the calculation expression for IEC harmonic mode specified in the WT5000 instrument is applied.

IEC 61000-4-7 Annex B (2k-9kHz) harmonic measurement

This section describes the calculation expression, grouping, and averaging for measuring harmonics complying with IEC 61000-4-7 Annex B (2k-9kHz)* with this software.

* Complies with IEC 61000-4-7 Annex B (2k-9kHz) only when the grouping is Type 2

For terms related to IEC harmonic measurements., see the WT5000 user's manuals.

Expression when Calculate Type is 2k - 9kHz

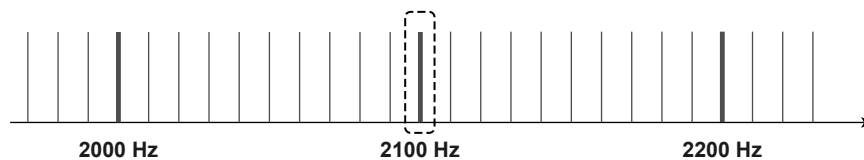$$G_b = \sqrt{\sum_{f=b-95Hz}^{b+100Hz} C_k^2}$$

Type 1: -5 to +5 Hz

Type 2: -95 to +100 Hz

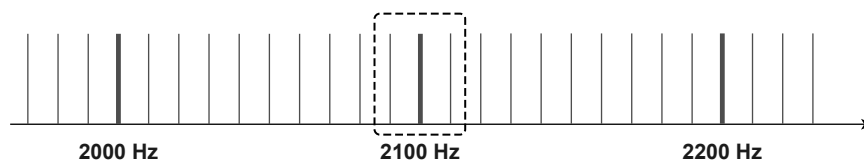b: Center frequency 2100, 2300, ..., 8900 Hz

Grouping

The figure below shows the harmonics when OFF, Type 1, and Type 2 are used, using the case where the center frequency is 2100 Hz as an example.
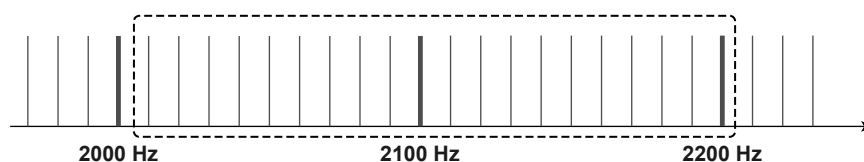
Type = OFF (2100 Hz only), no grouping

Type 1 = 2095 to 2105 Hz, harmonic subgroup

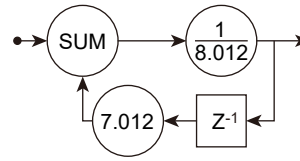**Type 2 = 2005 to 2200 Hz, harmonic group**

Averaging

When Calculate Type is 2k - 9kHz and Edition is 2.0, 2.0A1

Smoothing: Time constant: 1.5 s

Smoothing filter coefficient (window width: 200 ms)

Note

- When Calculate Type is 2k - 9kHz and Edition is 1.0, there is no averaging process.
- When Calculate Type is Harmonic Order, computation is performed in the WT5000.

THC (Total Harmonic Current)

The sum of the rms values of harmonic current components from orders 2 to Max Order.

$$\sqrt{\sum_{k=2}^{Max\ Order} I(k)^2}$$

I(k): rms current of each harmonic
k: harmonic order

Procedure

Displaying Vector (When a WT5000 is connected)

1. On the **Monitor** tab, click **Vector1** or **Vector2** to show or hide the Vector 1 or Vector 2 panel.

Vector 1 and 2 Panels

- The relationship of the phase difference and magnitude (rms value) between the fundamental waves U(1) and I(1) of each element assigned to the selected wiring unit is displayed using vectors. The positive vertical axis is set to zero (angle zero), and the vector of each input signal is displayed.

- You can change the vector display source (element or wiring unit) and the device in the numeric display setting dialog box. ► page 5-32

Example showing the Vector1 panel and properties (vector display of wiring unit A)

Numeric display (magnitude) of input element 1

Numeric display (magnitude) of input element 2

Numeric display (magnitude) of input element 3

Numeric display (phase difference) of wiring unit A

Vector 1 and 2 Properties

Vector source

Set the zoom factor.

Set the display colors.

Turns the numeric display on and off

Vector setting items are displayed in the property display area.

- Vector Source (Object)
- Voltage Zoom Factor (U Mag), Current Zoom Factor (I Mag)
- Color
- Numeric Display (Numeric)

Setting details ► page 4-28

5.4 Measuring with Cursors

This section explains the following operations:
- Measuring with vertical cursors
- Measuring with horizontal cursors
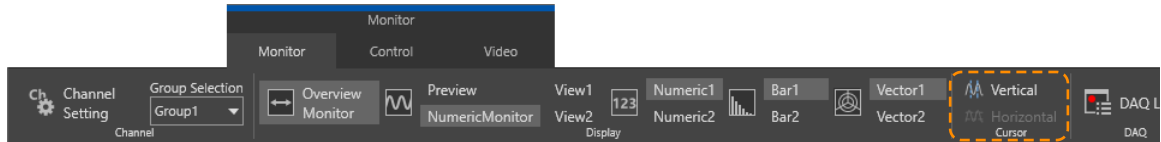
Procedure

The procedure is the same as with the cursor measurement of offline analysis.
► section 4.4

Measuring with Vertical Cursors

1. On the **Monitor** tab, click **Vertical** in the Cursor group to display two vertical cursors in the Overview and View panels.

Measuring with Horizontal Cursors

1. On the **Monitor** tab, click **Horizontal** in the Cursor group to display two horizontal cursors in the Overview and View panels.

Note

The cursor values on the online monitor display maximum and minimum values over a given number of points.

When DL950 power math or motor dq analysis waveform data (timestamp format) is displayed
The timestamp data value at the cursor position is displayed. If the data is not available, the previous data value is displayed.

5.5 Displaying a List of Recorded Data

This section explains how to display a list of recorded data.
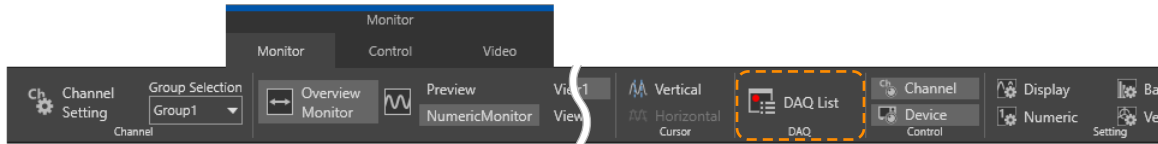
Procedure

1. On the **Monitor** tab, click **DAQ List** to show or hide the DAQ List panel.

DAQ List Panel

2. When you start recording, the following items of recorded data are displayed in a list.

Starting and stopping recording ► section 5.9

Item	Description
Name	The recording destination folder and file name are displayed.
Date	You can specify the display format with the record setting in the DAQ setting window. ► page 3-25
Size	The size of the recorded data file is shown.

Example Displaying the DAQ List Panel and Properties
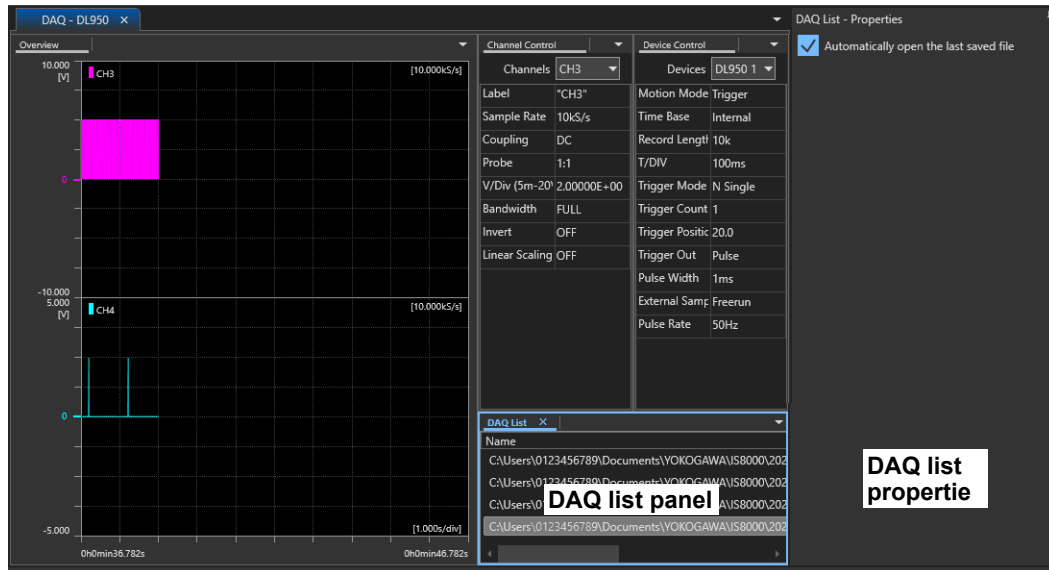
Opening a Recorded Data File

When you double-click a file in the DAQ List, an Analysis-(file name) tab window opens, and the waveforms of recorded data are displayed in the Overview panel. You can continue offline analysis.

Opening the File Automatically When Recording Ends

You can set whether to automatically open the file saved last after a recording stops. Use the **Automatically open the last saved file** ON/OFF check box in the property display area.

Check Box	Description
ON	File saved last is opened automatically when a recording stops. A new Analysis-(file name) tab window opens, and the waveforms of recorded data are displayed in the Overview panel.
OFF	The file saved last is not opened automatically.

5.6 Setting the Measurement Conditions on the Measuring Instrument

This section explains the following operations:

- Simple Channel Control Settings: channel settings
- Simple Instrument Control Settings: trigger, waveform acquisition conditions
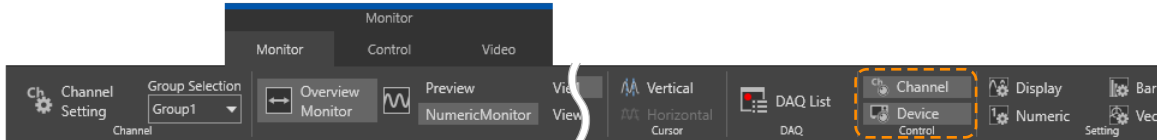
Note

- The operation here directly changes the parameters of the connected measuring instrument itself.
- Changes made to the measurement conditions of the measuring instrument will not be reflected in the measurement conditions on the IS8000 Software ("List of Measurement Conditions of Each Channel" under "Channel Setting Window" of section 3.5).

Procedure

Simple Channel Control Settings

1. On the **Monitor** tab, click **Channel** in the Control group to show or hide the channel control panel.

Channel Control Panel

2. Select the channel you want to configure from the drop-down list at the top of the panel. You can also select by clicking the channel you want to configure from the list of channels in the property display area.

*3.* Set the channel measurement conditions.

Example Displaying the Channel Control Panel and Properties
The settings displayed for each channel vary depending on the instrument being controlled and the installed modules.

• When a DL950 Is Being Controlled

For each measurement channel, you can set signal input conditions, such as input coupling, probe attenuation, and bandwidth limit, and main amplitude measurement conditions.

Select a measurement channel.   **Set Devices to DL950.**
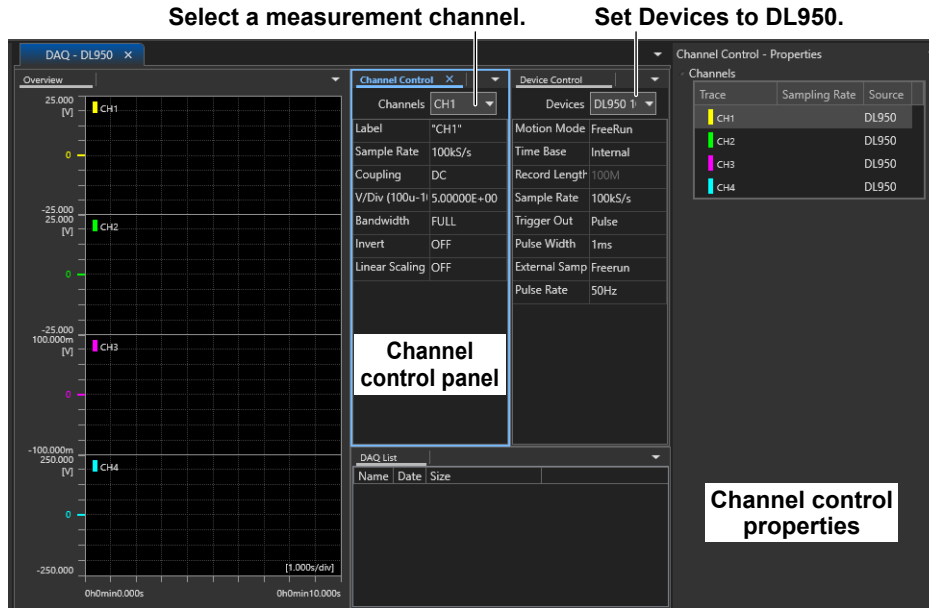
• When a WT5000 Is Being Measured

For each measurement channel, you can set the module name display, terminal (the target for setting the current range), although voltage range, voltage range, auto current range, current range, line filter, frequency filter, and so on.

Select a measurement channel.   **Set Devices to WT5000.**
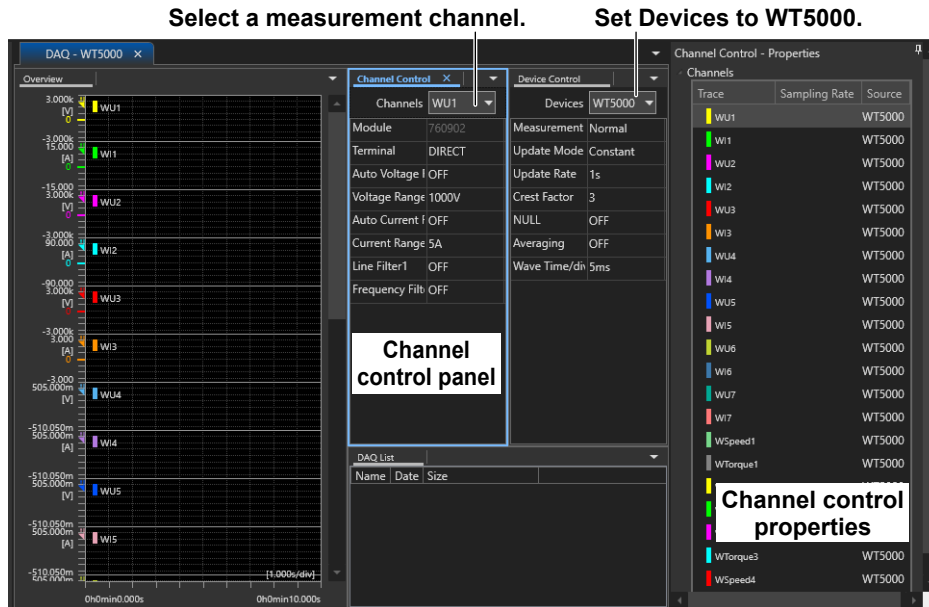
List of Channels in the Property Display Area

When you click the channel control panel, the property display area shows the measurement channel trace names, sample rates, and instrument names in a list. When you click a channel on the list, the channel to be configured in the channel control panel changes.

Simple Instrument Control Settings

1. On the **Monitor** tab, click **Device** in the Control group to show or hide the device control panel.

Device Control Panel

2. When multiple devices are connected and displayed synchronously, select the instrument you want to configure from the drop-down list at the top of the panel.

3. Set each item.

Example Displaying the Device Control Panel and Properties
The settings vary depending on the instrument being controlled and the installed modules.
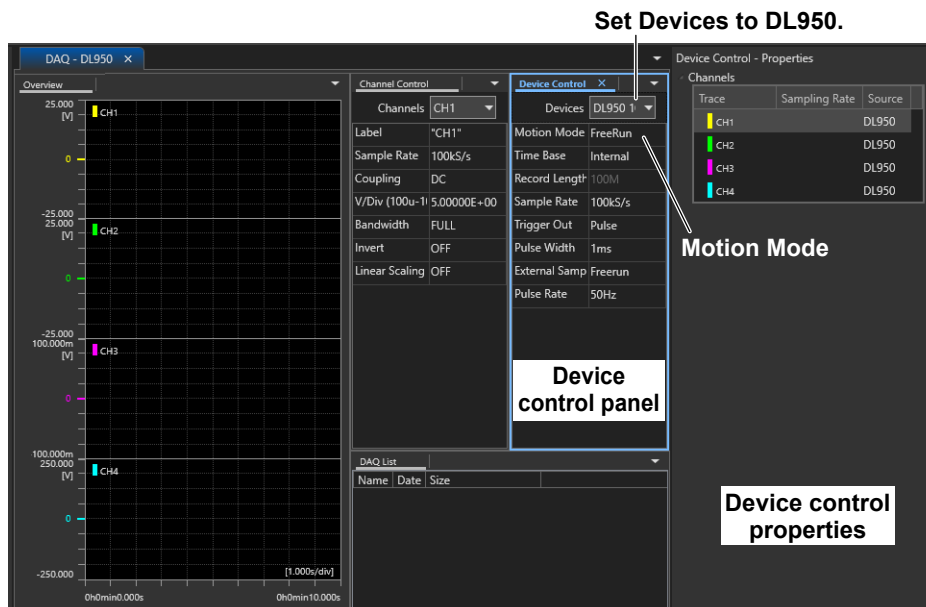
- **When a DL950 Is Being Controlled**
  You can set the recording operation mode, time base, record length, frequency and so on.

Set Devices to DL950.

Motion Mode

Device control panel

Device control properties

Motion Mode

The following two types are available.

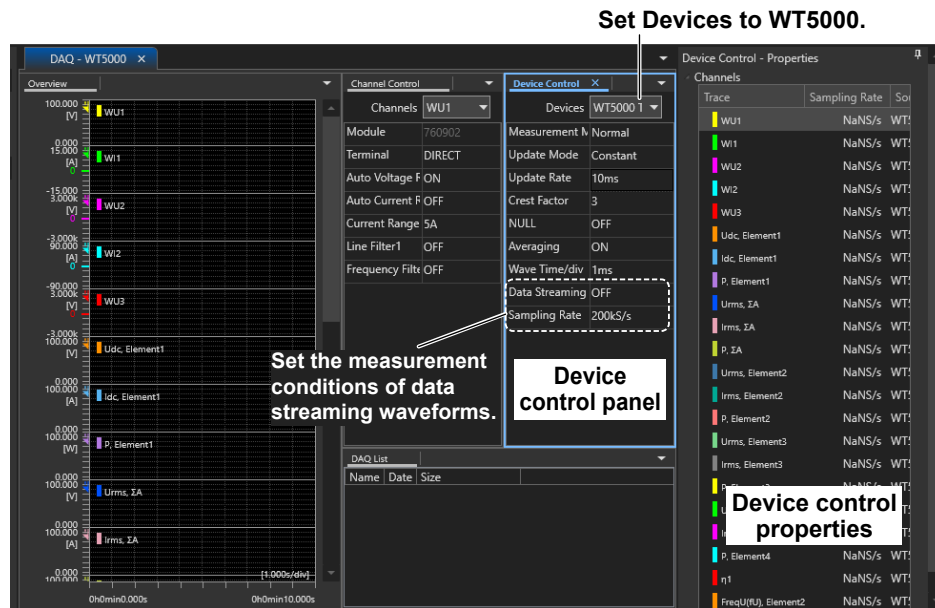| Motion mode	Description
FreeRun	Data is acquired immediately when measurement is started. Data acquisition continues until measurement is stopped.
Trigger	Data is acquired after you start a measurement when trigger conditions are met. Data acquisition stops when data is acquired for the specified length of time. In Trigger mode, set the mode (Auto, Auto Level, Normal, Single, N Single, On Start), measurement time, and trigger count. The setting range is determined by the number of measurement channels and sample rate.

Note

When a DL950 is connected through DAQ, the operation mode is automatically set to FreeRun. When the connection is closed, the mode changes to Trigger.
If data is acquired in Trigger mode, the DL950 will stop at the specified trigger count, but the IS8000 data acquisition will not stop in sync.

- **When a WT5000 Is Being Measured**
  You can set the data update interval, crest factor, the null feature on/off state, the averaging on/off state, and so on.

Set Devices to WT5000.

Set the measurement conditions of data streaming waveforms.

Device control panel

Device control properties

Measurement Conditions of Data Streaming Waveforms

You can turn data streaming on or off and specify the sample rate in the following cases.

- Available when the data streaming feature (DS option) is installed in the WT5000
- WT5000 setting conditions

Setting	Description
Measurement Mode	Normal
Update Mode	Constant
Update Rate	50 ms to 1 s (When the waveform sample rate is 2 MS/s or more, Update Rate is 100 ms to 1 s.)

- Communication interface
  USB3.0 or later for USB, 1 GB or better for Ethernet

- Number of streams that can be acquired

Sampling rate	USB3.0 and later	Ethernet 1 GB or better
10 kS/s	22 streams	22 streams
20 kS/s	22 streams	22 streams
50 kS/s	22 streams	22 streams
100 kS/s	22 streams	22 streams
200 kS/s	22 streams	22 streams
500 kS/s	14 streams	6 streams
1 MS/s	6 streams	4 streams
2 MS/s	2 streams	2 streams

List of Channels in the Property Display Area

When you click the Device Control panel, the property display area shows the measurement channel trace names, sample rates, and instrument names in a list. The displayed contents are the same as when you click Channel Control panel.

Explanation

Settings on the Channel Control Panel

When a DL950 Is Being Controlled

The displayed settings vary depending on the measured item (installed module).

For details on measurement items, modules, settings, and their ranges, see the measuring instrument User's Manual, IM DL950-01EN, or the Getting Started Guide, IM DL950-03EN.

For the conditions that allow monitoring and DAQ (data acquisition) when Motion Mode (see page 5-21) is set to Trigger, see Appendix 2.

When a WT5000 Is Being Controlled

For details on the settings, and their ranges, see the measuring instrument User's Manual, IM WT5000-01EN, or the Getting Started Guide, IM WT5000-03EN.

Settings on the Device Control Panel

For details on the settings and their ranges,, see the user's manual for the instrument.

When a DL950 Is Being Controlled

Setting	Description
Motion Mode	FreeRun, Trigger

Example of settings displayed when the operation mode is set to FreeRun

Setting	Description
Time Base	Internal, External
Record Length	Can be set when Motion Mode is set to Trigger Fixed to 100 M for Free Run ► Getting Started Guide, IM DL950-03EN.
Sample Rate	Can be set when the Motion Mode is set to FreeRun and the time base is Internal. ► Getting Started Guide, IM DL950-03EN.
Trigger Out	Pulse, Normal
Pulse Width	Can be set when Trigger Out is Pulse. 1 ms, 50 ms, 100 ms, 500 ms
External Sample Output	OFF, Acquisition, Freerun

When a WT5000 Is Being Controlled

Settings	Description
Measurement Mode	Normal, IEC Harmonic ► User's Manual, IM WT5000-01EN

• When the Measurement Mode Is Norma

Example of displayed settings

Settings	Description
Update Mode	Constant, Trigger, Auto
Update Rate	• Update interval setting range on the WT5000: 10 ms to 20 s (data streaming update interval: 50 ms to 1 s) • When Update Mode is set to Auto, you can select either 10 ms or 50 ms.
Crest Factor	3, 6, 6A
Zero-level compensation (Null)	ON, OFF
Averaging	ON, OFF
Wave Time/div	PP waveforms' time scale (time per grid division) on the measuring instrument. On the monitor, a single PP waveform is displayed using a time scale magnified 10 times (up to the update rate). * Fixed to 100 ms/div when data streaming is on.
Data Streaming*	ON, OFF Can be specified only when the data streaming feature (DS option) is installed in the WT5000. • When the data streaming feature is disabled, the following indication is displayed depending on the reason for the disabled state.
Sample Rate*	Can be specified only when the data streaming feature (DS option) is installed in the WT5000.

Indication	Reason for the disabled state
Disabled (No/DS option) ...	No DS option
Disabled (Invalid license) ...	No DS license
Disabled (Slow connection) ...	The connection speed is not compatible with DS (not at least USB 3.0 or Ethernet 1 G).

*   For details, see "Measurement Conditions of Data Streaming Waveforms" on page 5-22.

Note

Timeout period when the update mode is set to Auto (WT5000)

To display the measurement results of each period correctly, check that the timeout period is greater than the time limit for detecting the period of the input waveform.

You can view the timeout period setting using the menu icon on the WT5000 control screen.

Click the **Update Rate/Averaging** icon > Update Rate/Averaging menu > Time Out

For details, see the WT5000 user's manual.

• When the Measurement Mode Is IEC Harmonicl

For the measurement conditions for IEC Harmonic mode, see page 5-12.

5.7 Configuring the Window Display Settings

This section explains the following display setting operations.
- Configuring the Waveform Display (grid, horizontal scale, color, waveform and grid line thickness, waveform interpolation display)
- Configuring the Numeric Display (function, harmonic, measuring instrument, element)
- Configuring the Bar Graph Display (function, element, measuring instrument)
- Configuring the Vector Display (elements and wiring units, measurement instruments)
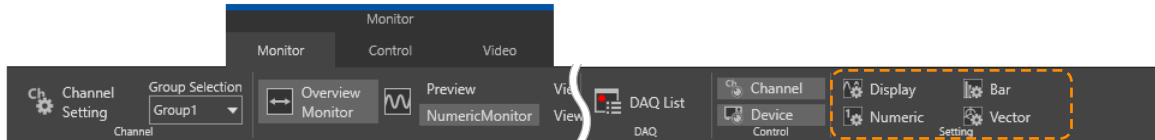
Procedure

Configuring the Waveform Display

1. On the **Monitor** tab, click **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.

Grid
If you click the **Graticule** tab, you can set the number of vertical scale divisions of the waveform display.
► section 4.5

Horizontal Axis Display Format
When you click the **Horizontal Axis** tab, the following items appear. You can set the horizontal axis display format.

Select the type of time to display on the horizontal scale.

Select the number of decimal places.
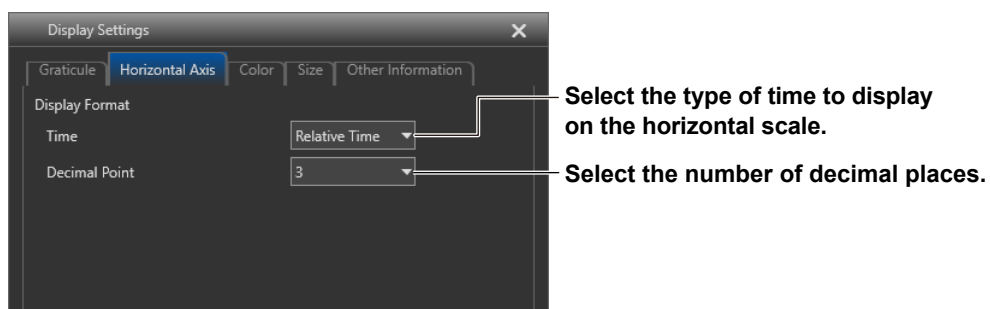
Type of time to display on the horizontal scale ► section 4.5

Color
If you click the **Color** tab, you can set the window background, grid, and text colors with a color palette.
► section 4.5
   * You can change the waveform colors in the Channel Setting window. ► sections 3.5, 5.2

Waveform and Grid Line Weight

If you click the **Size** tab, you can set the waveform and grid line weights.

► section 4.5

Waveform Interpolation Display Setting

When you click the **Other Information** tab, the following items appear. You can set the waveform interpolation display.

Set the waveform interpolation display.

Configuring the Numeric Display

Only When a WT5000 Is Connected

1. On the **Monitor** tab, click **Numeric1** or **Numeric2**. The Numeric 1 or Numeric 2 panel is displayed, and numeric setting commands are enabled.

2. On the **Monitor** tab, click **Numeric Setting** to open a numeric value setting dialog box.

3. From the **Change Numeric** drop-down list, select the panel you want to edit.

4. Use **Record items** to select the recording mode.

   You can set multiple channels you want to record at once.

Recording mode	Description
Displayed before recording*	Numeric data is recorded for the channels that are displayed.
All	Numeric data is recorded for all channels.
Selected	You can select the channels to record one by one. ► "Record" on page 5-28 If there is at least one channel configured to be recored for each display format, the text color of the display format tab will be blue. (See the figure below.)

  *   If a display item is switched after recording has started, only the display item at the start of recording will be recorded, not the display item switched later.

5. Select the display type tab you want to use.

   The background color of the selected tabs is blue.

Recording mode: Selected

4-, 8-, 16-, and 32-value Displays
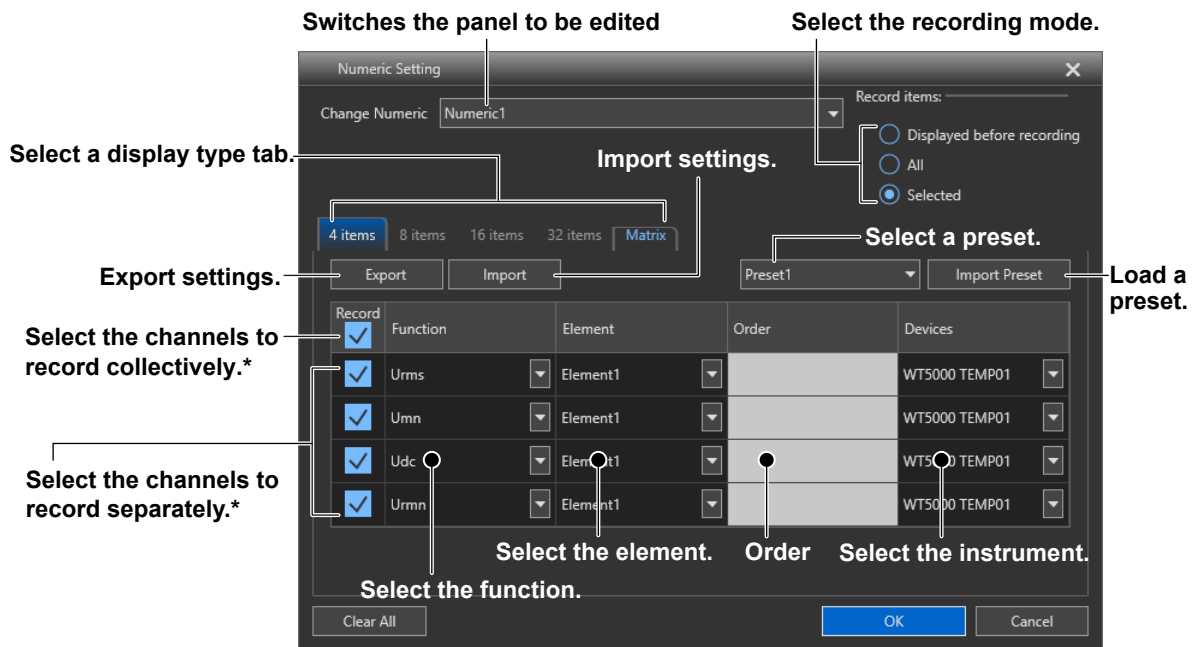
  * Available when the recording mode is set to **Selected**

Exporting or import settings, selecting and loading a preset ► page 3-13

Recording mode: Displayed before recording

Matrix Display

Switches the panel to be edited

Select the recording mode.

Select the instrument.

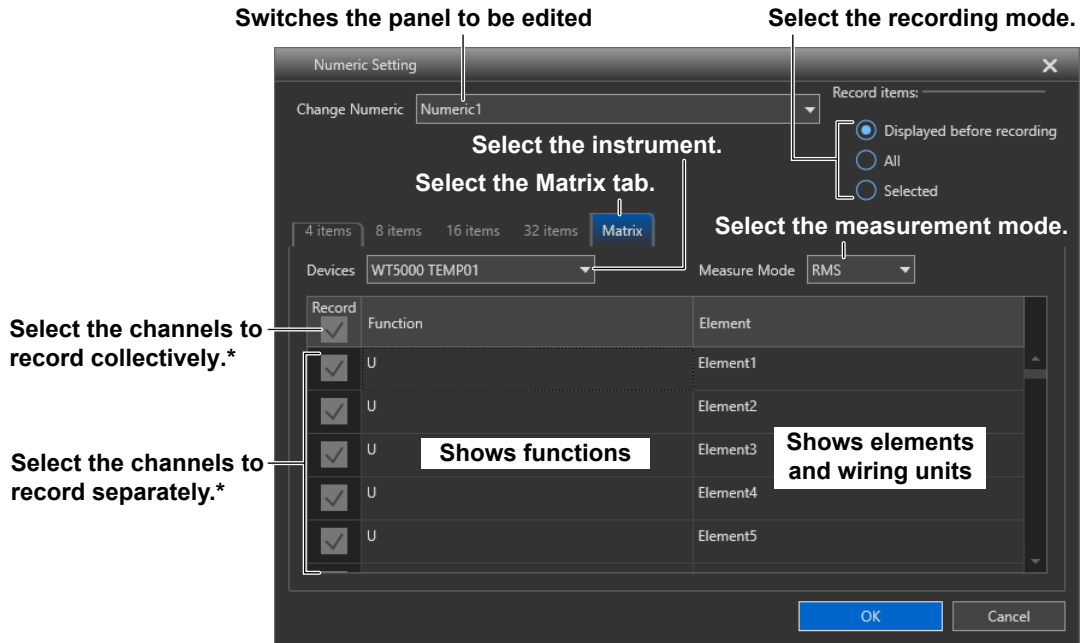Select the Matrix tab.

Select the measurement mode.

Select the channels to record collectively.*

Shows functions

Shows elements and wiring units

Select the channels to record separately.*

* Available when the recording mode is set to **Selected**

• **Devices**

When multiple measuring instruments are connected, you can select the instrument number of the measuring instrument you want to measure with from the drop-down list.

For 4-, 8-, 16-, and 32-value displays, you can select it for each channel.

• **Measure Mode**

When matrix display is in use, you can select the measurement mode of the function from the following:

RMS, MEAN, DC, RMEAN, AC

* For the function measurement mode symbols and their meanings, see the WT User's Manual.

• **Record**

When the recording mode is set to **Selected**, you can select the channels to record one by one. Use the **Record** check boxes to make the selection.

Check Box	Description
ON	The target numeric data will be recorded.
OFF	The target numeric data will not be recorded.

- **Function**

  The function of each channel is displayed. For 4-, 8-, 16-, and 32-value displays, you can change the function to be measured. Click the displayed function of a channel, and select the function from the drop-down list.

  *   For the function symbols and their meanings, see the WT User's Manual.

- **Element**

  The element of each item is displayed. For 4-, 8-, 16-, and 32-value displays, you can change the element setting.

  If the launcher's DAQ (IEC 2k-9kHz) feature is used, the frequency is displayed.

  Frequency input range: 2000 to 10000

- **Harmonic Order (Order)**

  For 4-, 8-, 16-, and 32-value displays, the harmonic order to be edited is displayed.

  This is blank for functions that cannot display harmonics or frequencies.

  To change a harmonic or frequency, click the displayed harmonic you want to change, and select a new value from the drop-down list.

  *   For details on harmonics, see the WT User's Manual.
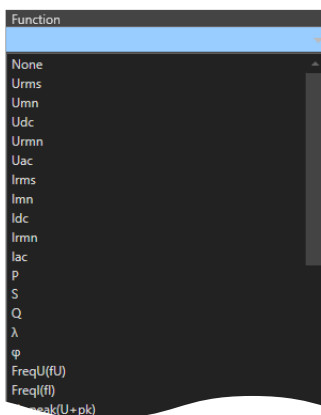
Select the function.   **Select the harmonic.**
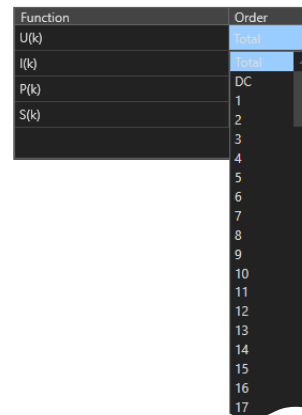
6. If you changed the settings, click **OK**.

Selecting the Input Element or Wiring Unit to Be Measured

7. When you click the following items, the display contents of the WT Numeric Viewer panel will change.

    - Input element options: 1 to 7
    - Wiring unit options: ΣA, ΣB, ΣC

Configuring the Bar Graph Display

Only When a WT5000 Is Connected

1. On the **Monitor** tab, click **Bar1** or **Bar2**. The Bar 1 or Bar 2 panel is displayed, and bar setting commands are enabled.

2. On the **Monitor** tab, click **Bar Setting** to open a dialog box for setting the WT harmonic bar graph.

3. From the **Change Bar** drop-down list, select the panel you want to edit.
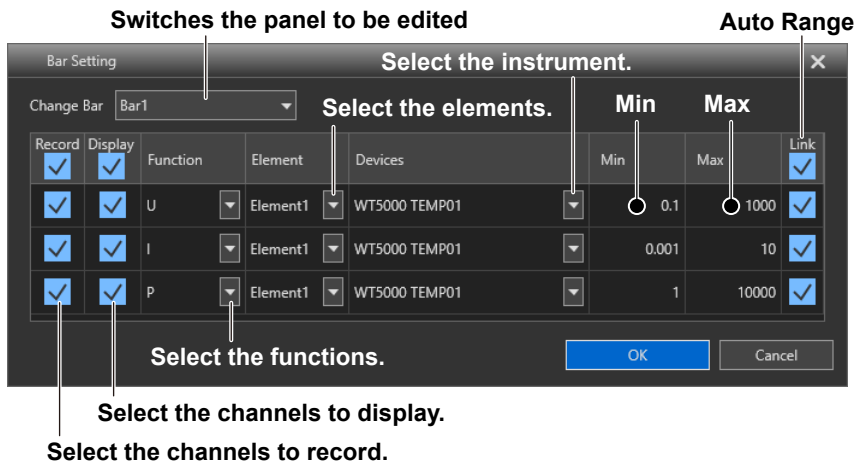
Example when Bar1 is selected

You can use the check boxes in the title line to collectively turn on or off the settings of the corresponding columns.

*   **Record**

    Set whether to record each channel with the check box.

Check Box	Description
ON	The target harmonic data will be recorded.
OFF	The target harmonic data will not be recorded.

*   **Display**

    Show or hide the bar graph of each channel with the check box.

Check Box	Description
ON	Bar graphs are shown.
OFF	Bar graphs are not shown.

*   **Function**

    From the drop-down list, select the function to display on the bar graph .

    The bar graph is displayed for the combination of the function and element that you select.

	Bar1 panel	Bar2 panel
Default setting	U, I, P	S, Q, λ

    Only U and I are valid when the DAQ (IEC 2k-9kHz) feature is in use.
    *   For the function symbols and their meanings, see the WT User's Manual.

*   **Element**

    Select which element to display on the bar graph.

- **Devices**
  When multiple measuring instruments are connected, you can select the instrument number of the measuring instrument you want to measure with from the drop-down list.

- **Minimum (Min) and Maximum (Max)**
  Set the maximum and minimum values for displaying harmonic bar graphs.

- **Auto Range (Link)**
  For each channel, you can select whether to automatically set the minimum and maximum values. Use the **Link** check boxes to make the selection. The default setting is ON.

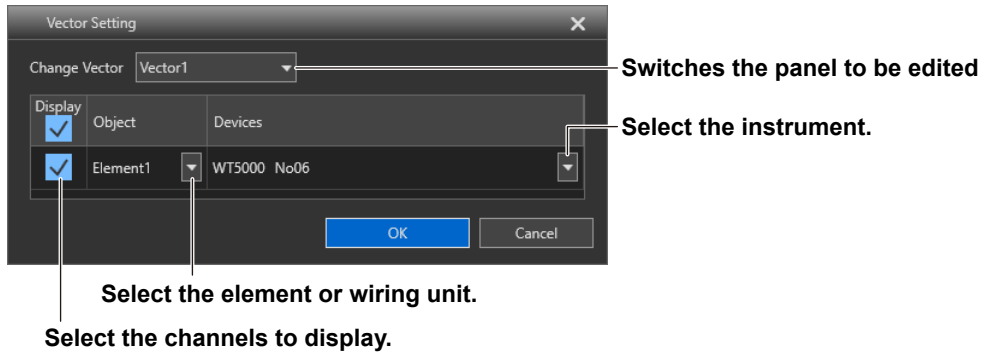| Check Box	Description
ON	The minimum and maximum values are calculated from the voltage range and current range and applied to the Min and Max displays.
OFF	You can directly change the values displayed for Min and Max.

Configuring the Vector Display

Only When a WT5000 Is Connected

1. On the **Monitor** tab, click **Vector1** or **Vector2.** The Vector1 or Vector2 panel is displayed, and vector setting commands are enabled.

2. On the **Monitor** tab, click **Vector Setting** to open the vector display setting dialog box.

3. From the **Change Vector** drop-down list, select the panel you want to edit.

Example when Vector1 is selected

Switches the panel to be edited

Select the instrument.

Select the element or wiring unit.

Select the channels to display.

You can use the check boxes in the title line to collectively turn on or off the settings of the corresponding columns.

• **Display (Display)**
  Show or hide the vector graph of each vector source with the check box.

Check Box	Description
ON	Vectors are displayed.
OFF	Vectors are not displayed.

• **Vector Source (Object)**
  Select the object to display the vector of. From the drop-down list, you can select from the following elements and wiring units.
   Element 1 to 7, ΣA, ΣB, ΣC

• **Devices**
  When multiple measuring instruments are connected, you can select the instrument number of the measuring instrument you want to measure with from the drop-down list.

5.8 Starting and Stopping the Monitoring Operation (Measure)

This section explains the following operations:

- Starting monitoring
- Stopping monitoring
- Pausing monitoring
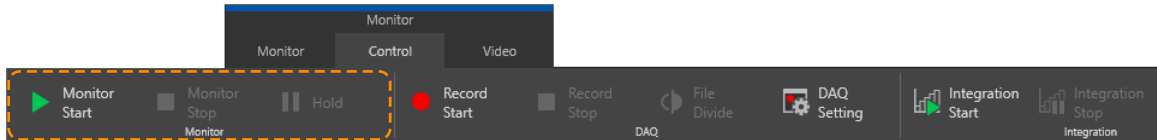
Procedure

Starting Monitoring

1. On the **Control** tab, click ▶ **Monitor Start** to start a measurement.

When a measurement is started, data is acquired in the internal memory of the measuring instrument.

The Overview panel of the DAQ - (host name) tab window of this software displays the waveforms of measured data in real time.

Note

- Even when a monitoring is started, measured data is not recorded to the storage device of the measuring instrument or PC.
- While monitoring, you can change the measurement conditions (see section 5.6) from the channel control panel and measurement control panel.

When a DL950 Is Connected
- You cannot start monitoring with the following settings.
  - The display is in roll mode.
    Roll mode is enabled when the trigger mode is set to auto, auto level, single, or on-start, and the time axis setting is greater than or equal to 100 ms/div.
  - When dual capture mode is on
- Monitoring is not available when the trigger mode is set to on-start.
- When the DL950 firmware version is 1.10 or later and the trigger mode is auto, auto level, or normal, data is acquired in sync with triggers. When the trigger mode is Single N, waveforms are not displayed while monitoring. The data is acquired and saved after monitoring is finished.

  When the DL950 is in Trigger Mode
  Trigger data points are displayed with the beginning aligned even when the sample rates are different.

When a WT5000 Is Connected
- You cannot start monitoring with the following settings.
  - When the update mode (Update Mode) is trigger (Trigger)
  - When the temporary memory is insufficient
    The maximum memory size is 10 MB (1 MB for a single PP waveform). Consider reducing the number of channels, increasing T/Div, and decreasing the monitoring display time.
- When the data update rate (Update Rate) is 10 ms, harmonic data cannot be monitored.
- If the data update rate (Update Rate) is less than 1 s, waveforms of measured data are not displayed on the Overview panel even if you start the monitoring of PP waveform data.
- If you change the Motor Config settings after connection, the Speed, Torque, and Aux data may not be acquired.
- When you start monitoring, you will not be able to operate the WT5000 from its control panel.

Stopping Monitoring

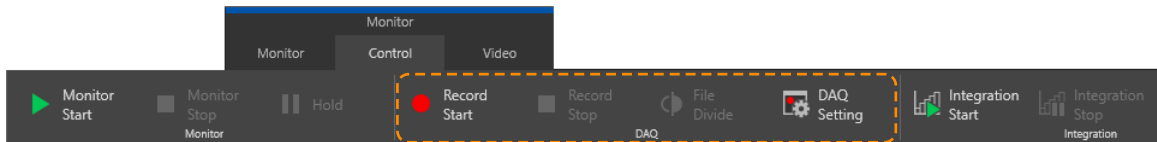*2.*   On the **Control** tab, click ▇ **Monitor Stop** to stop the measurement.

Pausing Monitoring

2.   On the **Control** tab, click ▐▌ **Hold** to pause the measurement.

5.9 Starting and Stopping the Recording Operation

This section explains the following operations:

• Starting recording
• Stopping the Recording
• Dividing recordings
• Setting record conditions

Procedure

Starting Recording

1. On the **Control** tab, click ⬤ **Record Start** to start recording measured data.*

    * If the measurement is stopped when you click **Record Start**, both measurement and recording will start.

When a recording is started, data is acquired to the storage device of the PC.

Stopping the Recording

2. On the **Control** tab, click ⬛ **Record Stop** or ⬛ **Monitor Stop** to stop recording.

Command	Description
Record Stop	The recording will stop, but measurement will continue.
Monitor Stop	Both recording and measurement will stop.

Note

When a DL950 Is Connected
► This is similar to the note in section 5.8. Read "monitoring" as "recording."

    When the DL950 is in Trigger Mode
    • When the trigger mode is N Single, all trigger data values are acquired.
    • When the trigger mode is Single or N Single, the DL950 will stop automatically. After the DL950 stops, stop the recording on this software.

When a WT5000 Is Connected
► This is similar to the note in section 5.8. Read "monitoring" as "recording."

Dividing Recordings

2. On the **Control** tab, click ◖▶ **File Divide** to divide the file being recorded and start recording to another file.

The divided file that has been recorded can be opened in offline analysis.

Setting Record Conditions

On the **Control** tab, click **DAQ Setting** to display a DAQ Setting window. Set the recording conditions.

This window is the same as that displayed in the simple wizard. ► section 3.6

Explanation

Recorded Data Files

- When you start recording, the file information (recording destination folder and file name, date, size) is displayed in the DAQ List panel. ► section 5.5
- When you stop or divide a recording, the file information is updated.

When a Recording Is Divided

When a recording is divided, a link file (.wlk extension) will be created.
When you open a link file, all the divided files are opened as a single continuous waveform.

Analyzing Recorded Data

- You can double-click a recorded data file to analyze it offline.
- The recorded data file can also be opened automatically in the Analysis-(file name) tab window when recording is completed. ► section 4.3
- The arrangement of the panels (overview panel, numeric panel, etc.) in the tab window used during recording is also carried over to the analysis tab window.

Note ────────────────────────────────

Controlling the IS8000 Software from an external application

You can control the IS8000 Software from an external application for purposes such as creating an add-on application for motor efficiency mapping. The repetition of Record Start and Monitor Stop can be controlled.

- Using the API, you can control the following IS8000 Software functions from an external application.

| Online Monitor, DAQ (Data Acquisition)	• Monitor Start
	• Record Start
	• Hold
	• Monitor Stop
	• Divide

For details, see the API User's Manual, IM D037-01EN.

5.10 Starting and Stopping Integration

When a WT5000 is connected, integrated values can be displayed.

This section explains the following operations:
- Starting integration
- Pausing and stopping integration
- Resetting integration
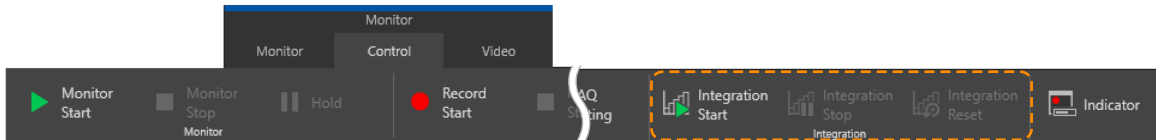
Procedure

1. Check the following points before starting integration.

   - Set a measurement function or element so that the integrated value is displayed in the Numeric 1 or Numeric 2 panel. ▶ "Configuring the Numeric Display" on page 5-27
   - With the data from the WT5000 (hereafter referred to as the WT) being monitored (measured) on the IS8000 Software, start integration. If the values integrated on the WT are not being acquired by the software, integrated values will not be displayed even when integration is started.
   - You cannot start integration when recording is in progress.

Starting Integration

2. On the **Control** tab, click **Integration Start**.

   Integration will start on all elements installed in the WT.

Pausing and Stopping Integration

3. On the **Control** tab, click **Integration Stop**.

   Integration will pause on all elements installed in the WT.

If you click Integration Stop before the specified integration time is reached, integration will pause.
If you click **Integration Start** in this condition, integration will resume.

If Integration Is Paused or Integration Has Been Completed by Reaching the Specified Integration Time
If you click **Integration Reset** and then **Integration Start**, integration will be reset, and integration will start from the beginning.

Resetting Integration

4. On the **Control** tab, click **Integration Reset** in the Integration group.

Integration on all elements installed in the WT will be reset.

- If you click **Integration Reset**, the integrated data in the WT will be cleared, but the integrated values will remain in the software.
- If integrated values are displayed in the Numeric1 or Numeric2 panel of the software, the integrated values will remain displayed. If you start integration again, the integrated values will be updated.

Explanation

The integration operation is executed on all elements of all connected WT5000s. Individual integration is not possible.

This software can display the integrate values of active power (watt hour), the current (ampere hour), the apparent power (volt-ampere hour), and the reactive power (var hour) values.

5.11 Displaying the Overrun Indicator

You can check the risk of overruns with the overrun indicator.

Procedure

Displaying the Overrun Indicator
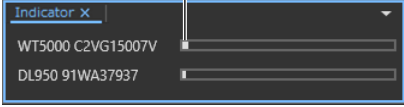
1. On the **Control** tab, click **Indicator** to show or hide the indicator panel.

Indicator Panel

Indicators are displayed for each measuring instrument (up to five).

Target instruments: DL950, WT5000

5.12 Playing Videos (FS1 option)

When a measuring instrument and a high-speed camera are connected to the PC and the high-speed camera synchronization feature (FS1 option) is activated, video commands become available.
Videos and waveforms can be recorded and saved.

For details on the features and how to use them, see the separate user's manual (IM IS8000-61EN).
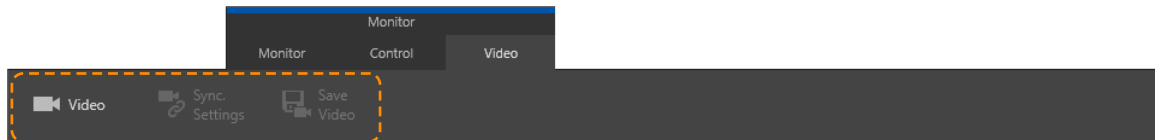
Controlling an Instrument from a PC (remote control)

This chapter explains how to control measuring instruments remotely from a PC.

► For the applicable instruments and available communication interfaces, see page 1-10.

6.1 Controlling an Instrument from a PC

Procedure

Opening the Remote Control Window

1. Start this software. A launcher appears.

2. Click **Remote Control**. ► section 3.2

A Device Search window opens. ► section 3.4

Instruments connected to the PC via USB are automatically detected and displayed in a table.

3. If the instrument to be connected is not displayed in the table, select the communication interface (WIRE) type under **Auto** or select the detailed wire type under **Manual**, and click **Search**.

4. From the table of detected instruments, select the instrument you want to connect, and click **Open**.

A Remote Control - (host name) window opens.

- The screen of the connected measuring instrument (Remote Control window) is transferred and displayed on the Remote Control panel.
- The control keys or knobs of the measuring instrument are displayed on the keypad panel.

Example When a DL950 Is Connected
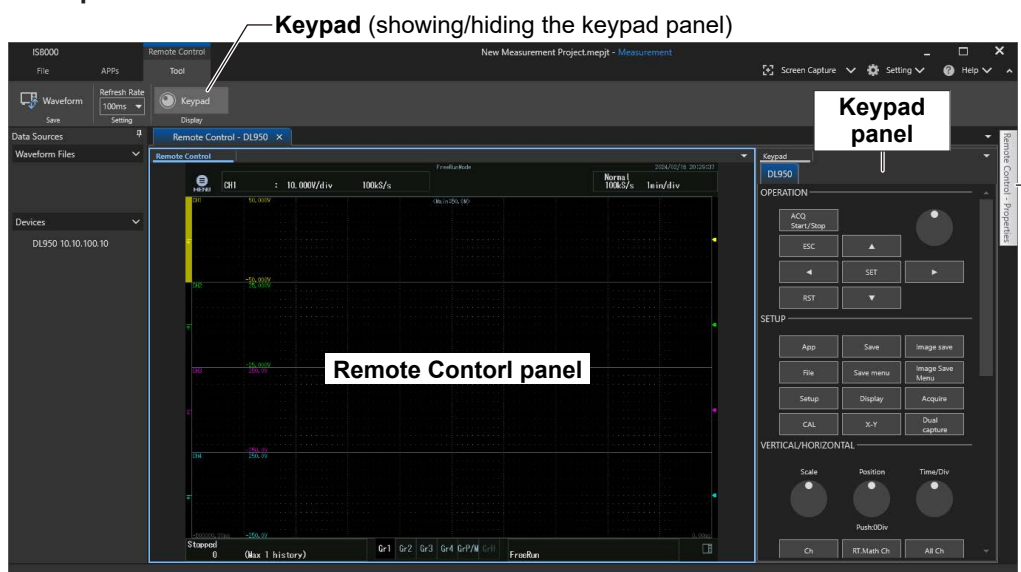
In this example, the properties display area is minimized by clicking the pin icon 🔲 in the Remote Control properties.

Example When a WT5000 Is Connected
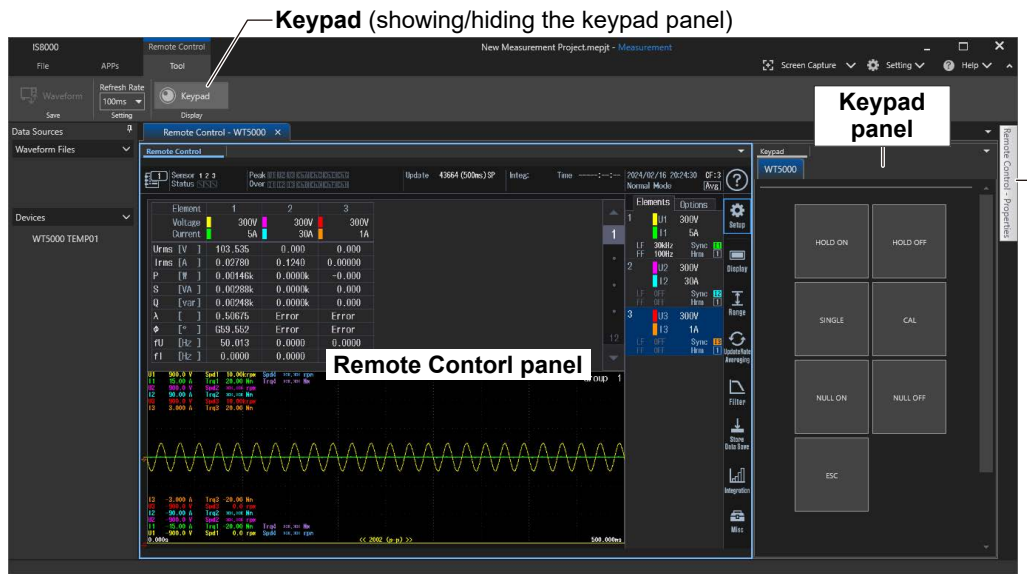
Keypad (showing/hiding the keypad panel)

In this example, the properties display area is minimized by clicking the pin icon 📌 in the Remote Control properties.

Keypad Panel

Click on the **Tools** tab > **Keypad** on the Remote Control ribbon to show or hide the keypad panel.

The button corresponding to the connected measuring instrument is displayed. The buttons displayed will vary from model to model. Use the buttons to control the instrument (Remote Control window).

Keypad Panel Display Position and Button Layout

- The keypad panel display position can be changed.
  See page 3-36 for instructions on how to change the panel display position.
- If a DL950 is connected, the button layout changes according to the keypad panel shape.
  The layout of the control keys and knobs differs slightly from that of the measuring instrument.

Display example
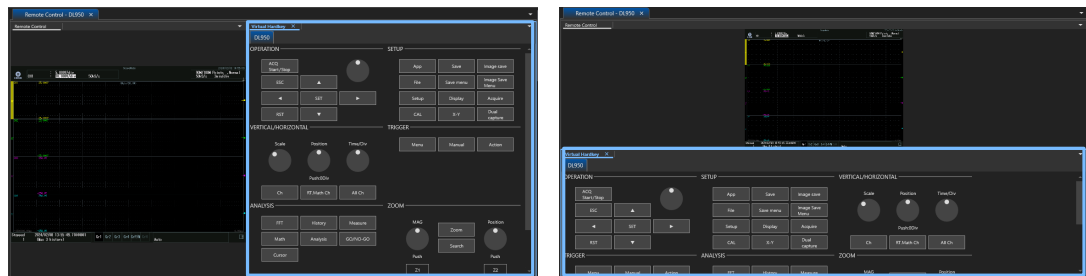
Using the Remote Control Window

You can use the keypad to operate and control the Remote Control window.
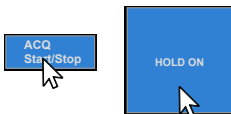
Note ───

When you connect a DL850 series instrument, you cannot control the Remote Control window using the mouse or touch panel.

You can control it by starting XWirepuller from the **APPs** tab and connecting the instrument.

──

Basic Keypad Operations

When you move the mouse pointer over a button (control key or knob) on the keypad, the button color changes to blue and the remote control window is ready to be operated.

Operation	Display	Behavior
Click	ACQ Start/Stop	HOLD ON	Same as pressing the control key on the instrument
• Rotate the mouse wheel up (to the back) • Press the up or right arrow key.		• Increases the value • Same as rotating the knob or jog dial to the right
• Rotate the mouse wheel down (to the front) • Press the down or left arrow key.		• Decreases the value • Same as rotating the knob or jog dial to the left

Explanation

Refresh Rate

You can select the refresh rate of the remote control window from the **Refresh Rate** drop-down list on the **Tool** tab of the Remote Control ribbon.

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

Keypad Panel

When a DL950 Is Connected

The buttons corresponding to the control and execution keys/knobs shown below are displayed.

Menu Operation and Waveform Acquisition Start/Stop

ACQ Start/Stop Key

(bright green): Waveform acquisition is in progress when lit.

Jog dial

Setup

Vertical Scale and Horizontal Scale

Triggering

Waveform Measurement and Analysis

Waveform Zoom and Search

Utility

When a WT5000 Is Connected

The buttons corresponding to the control keys in the HOLD/SINGLE/NULL/CAL section and the ESC key are displayed.

6.2　Saving Instrument Data to the PC

When you connect to a DL series instrument, you can save waveform data to the PC (ACQ Save).

Procedure

1. On the **Tool** tab of the **Remote Control** ribbon, click **Waveform**. A Save As dialog box appears.

2. Set the file save destination and file name, and then click Save.

The file type is Yokogawa waveform file (*.wdf).

A progress bar appears, and downloading starts from the measuring instrument to the PC.

When the download is complete and **Close** appears, click it.

3. When saving is complete, a message appears.

- When you click **OK**, an Analysis-(file name) tab window opens, and you can analyze the waveforms of the saved file offline.
- Click **Cancel** to close the message window.
  If an anpjt file is specified in the layout default settings,* the tab window will open reflecting the specified layout when it is opened.
  * From the Setting menu, select Layout > Initial setting. (See page 3-53.)

Explanation

Saved Waveforms

All waveforms, including math waveforms, displayed in the remote control window are saved.

Supported Models

- DL950
- DL850 series
- DL350
- DLM5000 series
- DLM3000 series

Managing Files

This chapter explains the following operations:
- Displaying lists of instrument files and pc files
- Transferring files
- Downloading Data Recorded Using Flash Acquisition

7.1 Displaying Lists of Instrument Files and PC Files

This section explains the following operations:
- Renaming files and folders
- Creating and deleting files and folders

Procedure

1. On the launcher, select **File Manager**. A Device Search window opens.

2. Connect to the instrument by referring to section 3.4.
   A File Manager-(host name) tab window, File Manager panel, and File Manager ribbon appear.

File Manager Panel

File Overview Display
When you select a file on the PC, the file information (path, file name, file size, date accessed, and comment) is displayed.

File Manager Ribbon

File Manager Tab
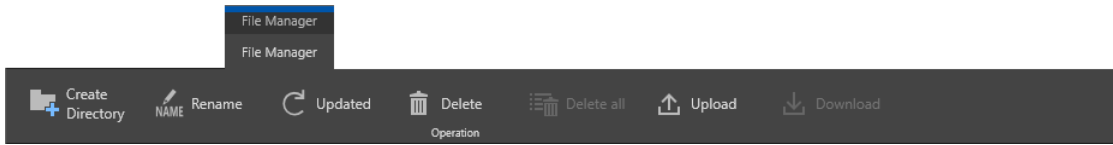
Group/Command	Description
Operation	
Create Directory	Creates a new directory (folder). This is valid when a folder is selected.
Rename	You can rename folders and files on the PC. This is valid when a folder or file on the PC is selected.
Updated	Updates the file list in the File Manager panel.
Delete	Deletes the selected files or folders. This is valid when a file is selected.
Delete all	Deletes all recorded data in the Flash ACQ folder. This is valid when the Flash ACQ folder is selected. ► section 7.3
Upload	Transfers files from the PC to the instrument. This is valid when a folder or file on the PC is selected.
Download	Transfers files from the instrument to the PC. This is valid when a file on the instrument is selected.

Creating a Folder

On the **File Manager** tab, click **Create Directory** to open a folder name input dialog box. Enter a folder name, and click **OK**.

Note

- Folders are created in the current directory of the file list.
- Only ASCII characters (e.g., alphanumeric characters) can be used for folder names and uploaded file names.

Renaming a File and Folder

1. From the PC file list, select a file or folder you want to edit.

2. On the **File Manager** tab, click **Rename** to open a folder name input dialog box. Enter a folder name, and click **OK**.

Updating the File List

On the **File Manager** tab, click **Updated** to update the information in the file list.

Deleting a File or Folder

1. From the file list, select a file or folder you want to delete.

2. On the **File Manager** tab, click **Delete**. A delete confirmation message appears.

3. Click **OK** to delete the file or folder selected in step 1.

Note

File Operations Shortcut Menu

When you right-click a file or folder in the right column of the file list, you can select the following operations from the shortcut menu.

Menu Item	Procedure
Create Directory	Creates a folder. The following folder names cannot be used. AUX, CON, PRN, NUL, CLOCK, COM0 to COM9, LPT0 to LPT9
Rename	Can be used when you select a file or folder in the PC.
Reload	Refreshes with the latest information
Delete	Can be used when a file or folder is selected.
Download	Can be used when you select a file in the instrument.
Upload	Can be used when you select a file in the PC.

When a file in the instrument is selected
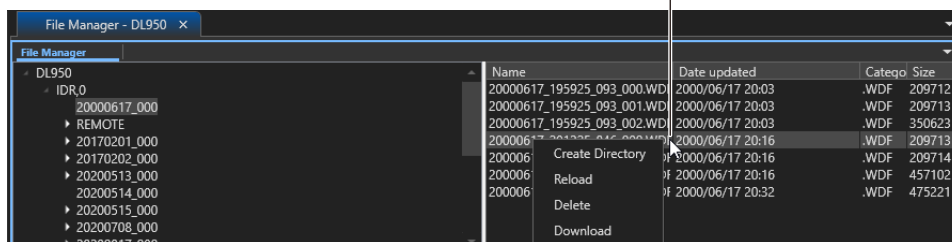
When a file on the PC is selected
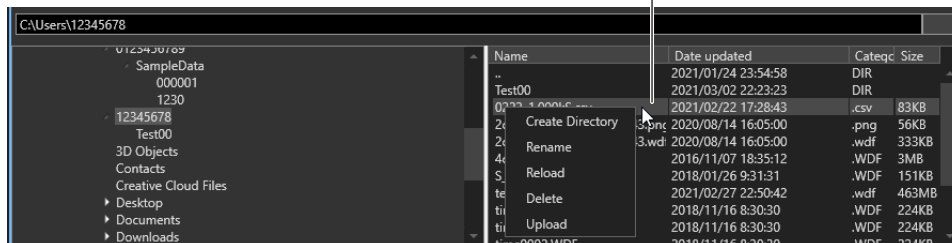
7.2 Transferring Files

This section explains the following operations:
- File download (instrument → PC)
- File upload (PC → instrument)

Procedure

File Download (instrument → PC)

1. Refer to section 7.1, and select the save destination folder from the PC file list in the bottom area of the File Manager panel, or enter the same destination.

2. From the instrument file list in the top area, select the file you want to download.

3. On the **File Manager** tab, click **Download**. The file is transferred from the instrument to the PC.

File Upload (PC → instrument)

1. Refer to section 7.1, and select the save destination folder from the instrument file list in the top area of the File Manager panel.

2. From the PC file list in the bottom area, select the file you want to upload.

3. On the **File Manager** tab, click **Upload**. The file is transferred from the PC to the instrument.

7.3 Downloading Data Recorded Using Flash Acquisition

This section explains the following operations:
- Downloading recorded data (DL950 → PC) and converting to an MDF file
- Flash ACQ folder and recorded data operation
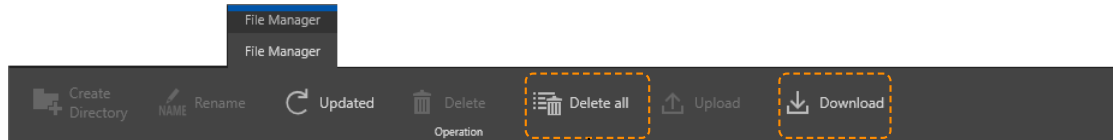
Delete all (vaild only when the Flash ACQ folder is selected)

Flash acquisition is a waveform acquisition feature that can be used when the dedicated flash memory (/ST2 option) is installed in the DL950. Acquired waveforms are saved as recorded data in the DL950 dedicated flash memory. For details, see the DL950 manuals.

When a DL950 is connected, recorded data in the dedicated flash memory can be downloaded to the PC. Downloaded recorded data is converted into an MDF file.

Note
- When the DL950 is running on an external clock, recorded data cannot be downloaded.
- When the DL950 operation mode is set to Recorder, recorded data cannot be downloaded. Change the mode to Scope to download.

Procedure

Downloading Recorded Data (DL950 → PC) and Converting to an MDF File

1. Refer to section 7.1, and select the save destination folder from the PC file list in the bottom area of the File Manager panel, or enter the same destination.

2. From the DL950 file list in the top area, select **FLAS** (Flash ACQ folder).
   The recorded data in the dedicated flash memory is listed on the right side of the top area.

3. Select the recorded data you want to download.

4. On the **File Manager** tab, click **Download**. The recorded data is transferred from the DL950 dedicated flash memory to the PC and converted to an MDF file.

Note

Shortcut menu

When you select data in the right column of the data list and right-click it, a shortcut menu appears.
You can select the following operations.

Menu Item	Operation
Reload	Refreshes with the latest information
Download	Can be used when recorded data in the Flash ACQ folder is selected
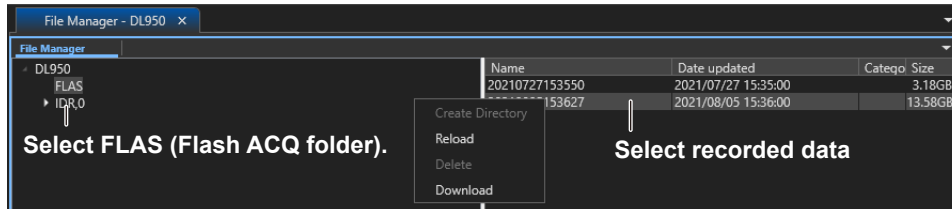
Flash ACQ Folder and Recorded Data Operation

• You cannot upload recorded data or files from the PC to the Flash ACQ folder.
• You cannot rename the recorded data in the Flash ACQ folder.

Clearing All Recorded Data

1. Refer to section 7.1. From the list of files in the DL950 in the top section, select **FLAS** (Flash ACQ folder).

The Delete all command is enabled.

2. On the **File Manager** tab, click **Delete all**.

All recorded data in the Flash ACQ folder is cleared.

Note

You cannot delete recorded data individually.

Generating Reports (RP1 option)

This chapter explains how to use the application for generating reports.*
You can export the loaded waveform's data measurement and analysis conditions and waveforms in a report format on a single sheet. You can select the items to include in the report and change the report layout as you like. You can also collectively generate reports containing various types of measurement data using the same layout.

    *   RP1, Report Generator Option

8.1   Overview of Creating Reports

Steps to Create Reports

- Display the data file to create a report   Chapter 4
- Create a report template   Section 8.2
- Edit the layout of parts (items)   Section 8.3
- Edit the content of the report   Section 8.4
- Generate the report (print, export to file)   Section 8.5

Procedure

Loading and Displaying Files

1.   Load the measured data you want to generate a report of and analyze the data.

Loading Files Containing Measured Data Offline
Click **File Open** on the launcher, or on the **File** tab of the start window, click **Open** to load files.

Displaying the Analysis Results of Measured Data
Display in the window the necessary information, such as zoom and cursor values, for generating a report of the loaded measured data. (See section 2.1 and chapter 4.)

Starting the Report Generator Application

2.   On the **APPs** tab, click **Report**.

The Report Generator application starts. The Report Editor toolbar and view appear in a new window.
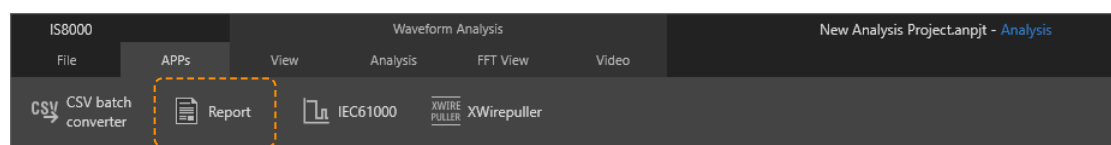
Report Editor Window

3. The first time you use this application, create a new template.

4. In the layout view, select the items to include in the report from the parts panel, and arrange them.

5. In the preview view, check how the actual report will look like, and set the displayed content of parts in the preview setting panel.

• Layout view

Displays the preview view

Toolbar

Page panel

Parts panel

Layout setting panel

• Preview view

Displays the layout view

Page panel

Preview panel

Preview setting panel

Toolbar

Creates a new template

Select a template.

Switches the view
The view is switched between layout and preview.

Batch report generation

Print a report

Duplicates a template

Deletes a template

Exports a report to a file
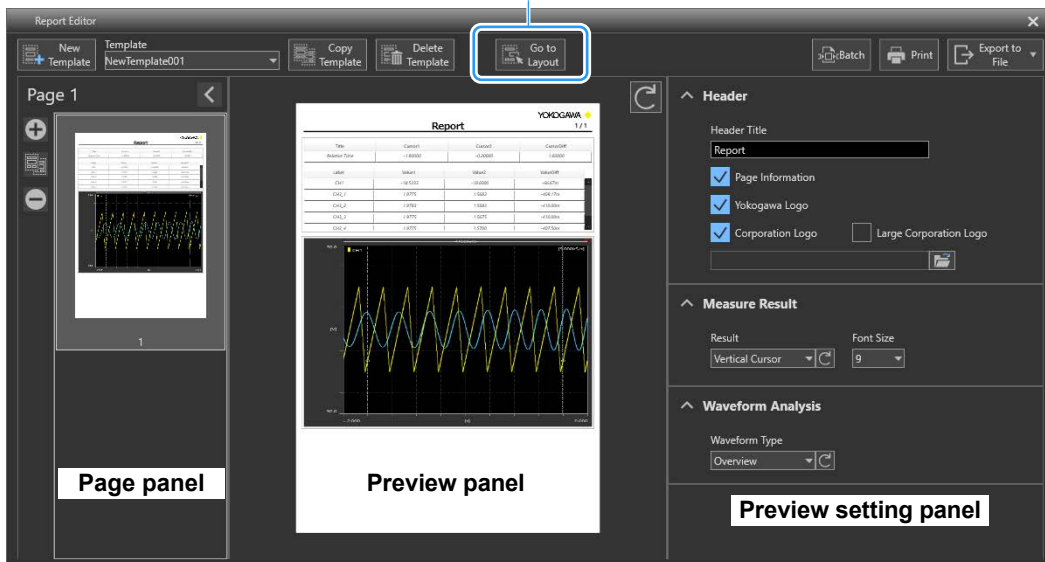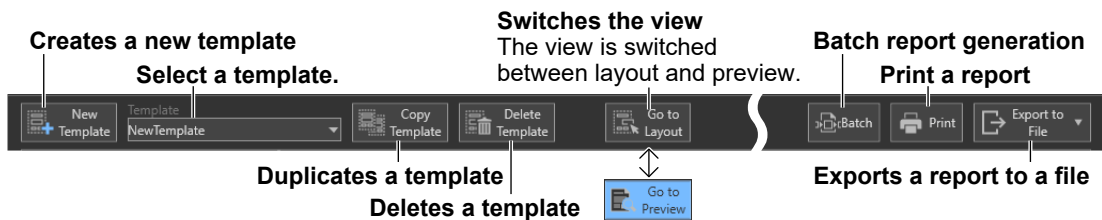
Explanation

Templates

You can create a layout of item parts you plan to use frequently in reports and save it to a template.
You can select a saved template from a menu that appears when you click the template selection button.
Templates can be duplicated and deleted.

Layout View

Page Panel

Thumbnails of page layouts you created are displayed. You can click ⊞ to add a new layout or click ⊟ to delete a selected layout.
When you add a layout, a new layout setting dialog box appears that you can use to set the report size, orientation, report title, and so on.
Click ◁ in the upper right to minimize the display area.

Layout Setting Panel

For each page, you can set the layout of items (parts) to include in reports.
Select a part you want to use from the parts panel at the right side of the window, and drop it on the layout setting panel. You can move and delete the arranged parts.

Parts Panel

Text, images, values, and other items that you can include in reports are listed.

Template Parts
- Waveform Analysis (2×2, 4×4)
- Measure Result (2×4, 4×4)
- Comment (1×2, 2×2)
- Picture (2×2, 4×4)

Custom Parts
You can also create new parts.

Preview View

Page Panel

Thumbnails of pages in the created report are displayed in the left side of the window.
Operations such as adding and deleting layouts are the same as those of the page panel of the layout view.

Preview Panel

An image of the report that will be exported is displayed in the center of the window.
Click ↻ in the upper right to update the display.

Preview Setting Panel

You can set a header for each page in the report.
You can set the contents (properties) of each part shown in the preview panel.

Batch Report Generation

You can select an existing template (layout) and collectively generate reports of multiple measurement files with the same configuration. ► section 8.6

Printing Reports (Print)

► section 8.5

Exporting Reports to Files

You can export reports to Excel, Word, and PDF files.

► section 8.5

8.2 Creating a Report Template

This section explains how to create a report template.
- Create a new template
- Arrange (lay out) parts
- Set headers
- Add, duplicate, and delete layouts
- Duplicate and delete templates

Procedure

1. On the **APPs** tab, click **Report**.

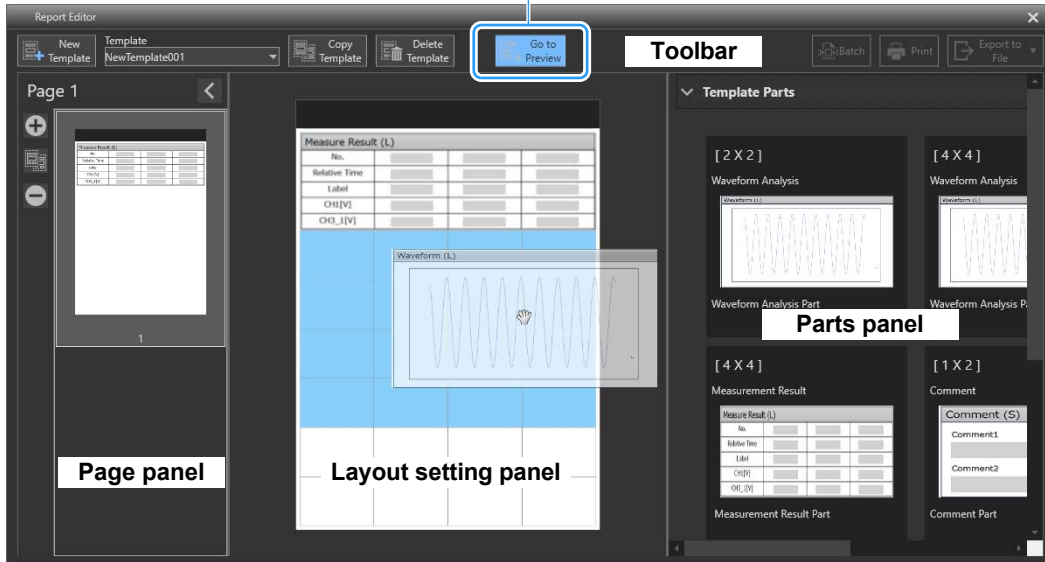The Report Generator application starts. The Report Editor tools and view appear in a new window.

Creating a New Template

2. On the Report Editor window's toolbar, click **New Template**. The following dialog box appears.

Report size (A4) — Report orientation (portrait, landscape)

Enter the title of the first page.

Enter the template name.

Confirm button — Cancel button
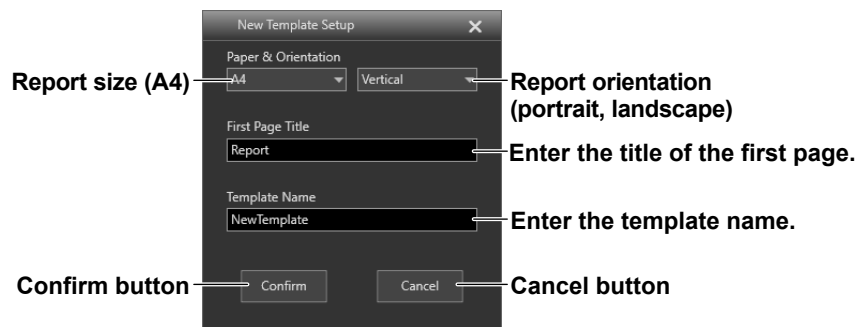
3. Enter the report size, orientation, the title of the first page, and template name, and click **Confirm**. The layout view appears.

Layout View
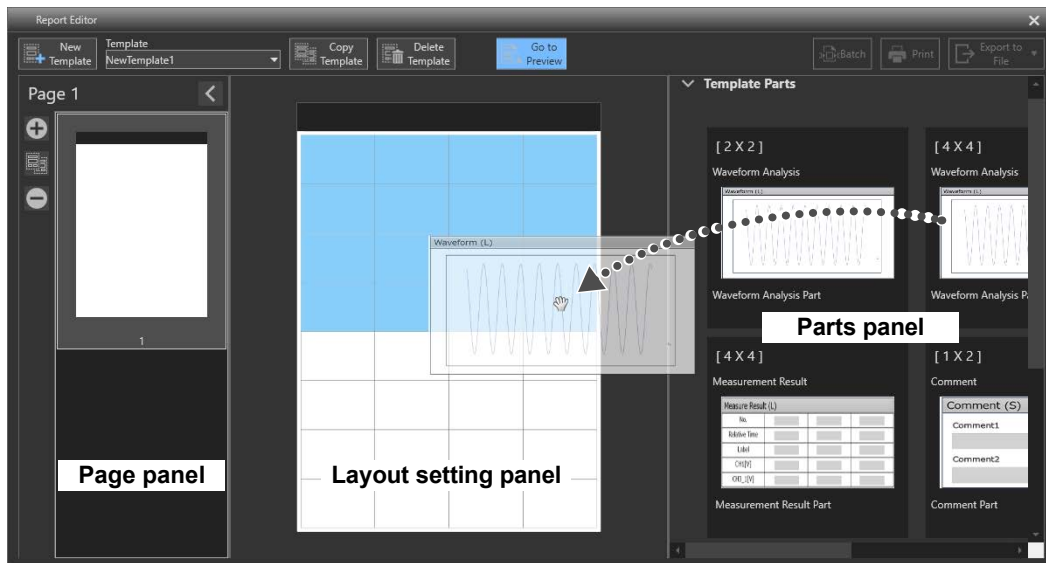
- Page panel: A thumbnail of a blank page is displayed as the first page.
  ⊕: Adds a layout
  ▦: Duplicates a layout
  ⊖: Deletes a layout

- Layout Setting Panel
  A grid is displayed that divides one page into 32 (8 x 4) frames. One frame is the minimum size for arranging parts.

- Parts Panel
  Click **Template Parts** to expand the list of parts. [n×n] indicates the size of each part.

Arranging Parts

4. You can arrange parts using one of the following two methods.

- **Double-click**
  When you double-click a part on the parts panel, the part is automatically placed in the first available area from the top left of the report. The part cannot be placed if there is no available area.

- **Drag and Drop**
  Drag a part from the parts panel, and drop it in the layout setting panel on the left to place the part in the report.

For editing the layout of parts that have already been arranged, see section 8.3.

5. On the toolbar, click **Go to Preview**. A preview view appears.

Preview View
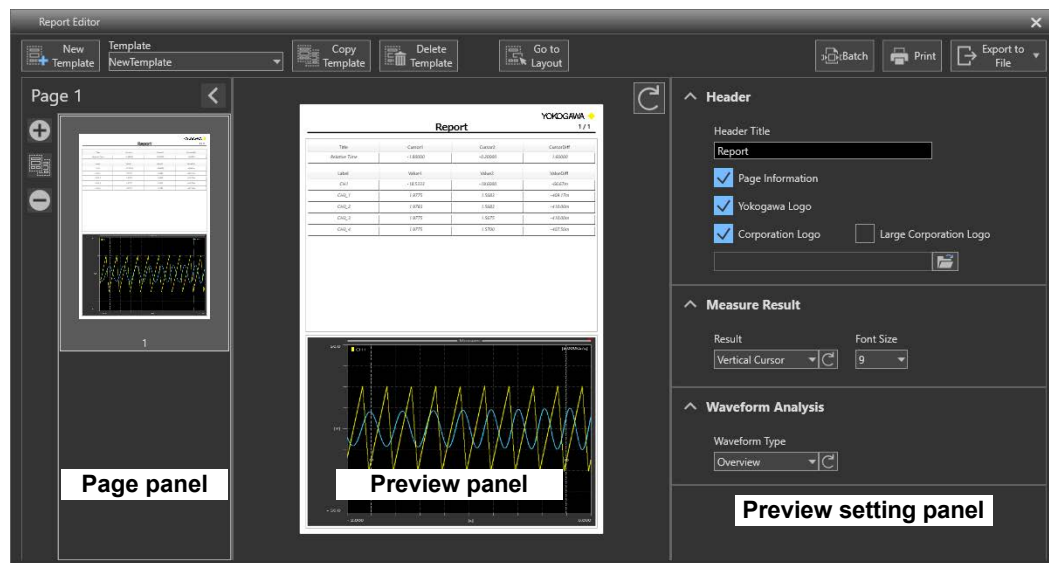
- Page panel: A preview of the first page is displayed in a thumbnail.
  ⊞: Adds a layout
  ▤: Duplicates a layout
  ⊟: Deletes a layout

- Preview Panel
  A preview of the contents that will actually appear in the report is displayed. You can check the displayed contents.
  ↻: Updates the measurement data display

- Preview setting panel: You can edit the display contents of each part while viewing the preview.
  ► section 8.4

6. To change the layout of parts, click **Go to Layout** on the toolbar to switch to the layout view. For details on editing, see section 8.3.

Setting Headers

7. Set the logo on the first page, report title, page number display, and so on.
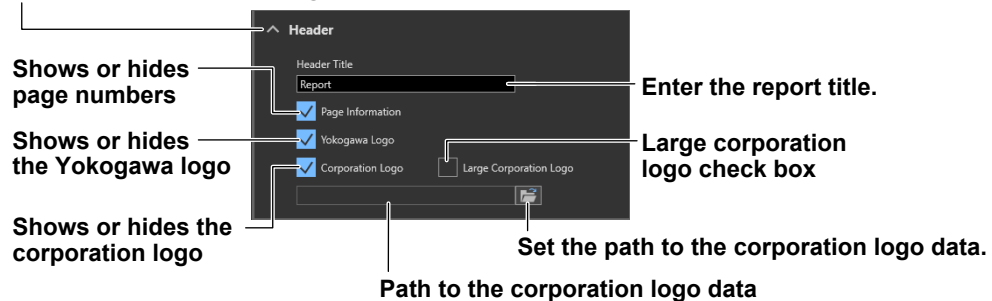
Example When a Company Logo Is Set

**Corporation logo
display position**   **Title**

Page number

When the Large Corporation Logo check box is selected
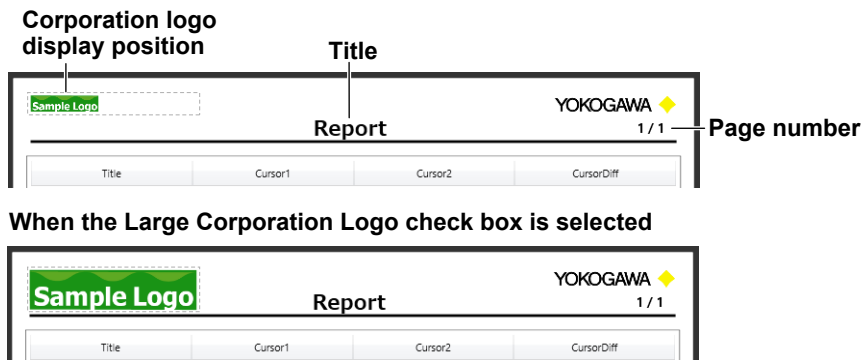
8.   Set the displayed content of various parts. ► section 8.4

Adding a Layout

1.   On the left side of the page panel of the layout view or preview view, click ⊞. The following window appears.

Report size (A4)

**Report orientation
(portrait, landscape)**

Enter the header title.

Confirm button

Cancel button
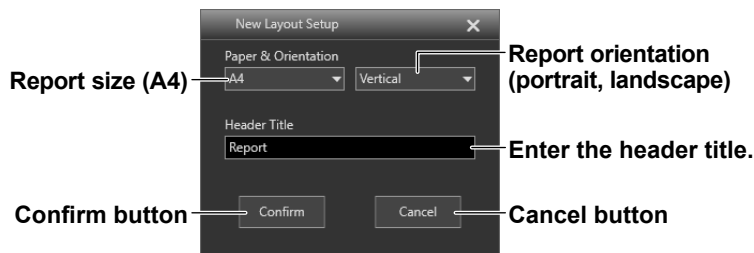
2.   Select the size of the layout to add and the report orientation.

3.   Enter the header title of the layout to add, and click **Confirm**.
      A blank page is added to page 2.

Arranging Parts

4.   If the preview view is displayed, click **Go to Layout** on the toolbar to switch to the layout view.

5.   Arrange parts. ► page 8-6

6.   On the toolbar, click **Go to Preview** to switch the view to preview.

7.   Check the displayed contents.

8.   If necessary, set the header for the second page (see the previous section), and edit the displayed contents of parts. ► section 8.4

Duplicating a Layout

1. In the page panel of the layout view or preview you, select the thumbnail of the page you want to duplicate.

2. Click ▦ on the left side of the page panel. The following window appears.

Enter the header title.

Confirm button
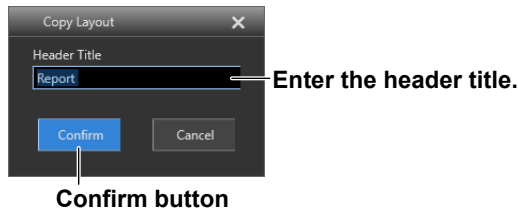
3. Enter the header title, and click **Confirm**. The layout is duplicated, and its thumbnail is displayed at the end.

4. To edit the layout, click **Go to Layout** on the toolbar to switch to the layout view. ► section 8.3

5. If necessary, set the header for the duplicated page (see the previous page), and edit the displayed contents of parts. ► section 8.4

Deleting a Layout

1. In the page panel of the layout view or preview you, select the thumbnail of the layout you want to delete.

2. Click ▱ on the left side of the page panel. A confirmation message appears.

3. Click **Yes**. The selected layout is deleted.

Duplicating a Template

1. On the toolbar, click **Copy Template** to display a dialog box for entering our new template name.

2. Enter a template name, and click **Confirm**. The displayed template is duplicated with a new template name.

Deleting a Template

1. On the toolbar, click **Delete Template**. A confirmation message appears.

2. Click **Yes**. The displayed template is deleted.

Explanation

Saving Templates and Layouts

If you edit the layout or the displayed content of various parts, they are saved in the selected layout or template.

► sections 8.3, 8.4

8.3 Editing the Layout of Parts (Items)

Displaying the Layout View

1. Refer to page 8-2. On the toolbar of the Report Editor review, click the **Template** button, and select the template to edit.

The selected template layout is displayed in the view.

2. On the toolbar, click **Go to Layout**. The layout view appears.

- Click **Template Parts** in the parts panel to expand the list of parts.

- If the item you want is not available in the template parts, use **Customize Part** to create a new part.
► page 8-14

Arranging Parts

3. You can arrange parts using one of the following two methods.

- **Double-click**
When you double-click a part on the parts panel, the part is automatically placed in the first available area from the top left of the report. The part cannot be placed if there is no available area.

- **Drag and Drop**
Drag a part from the parts panel, and drop it in the layout setting panel on the left to place the part in the report.
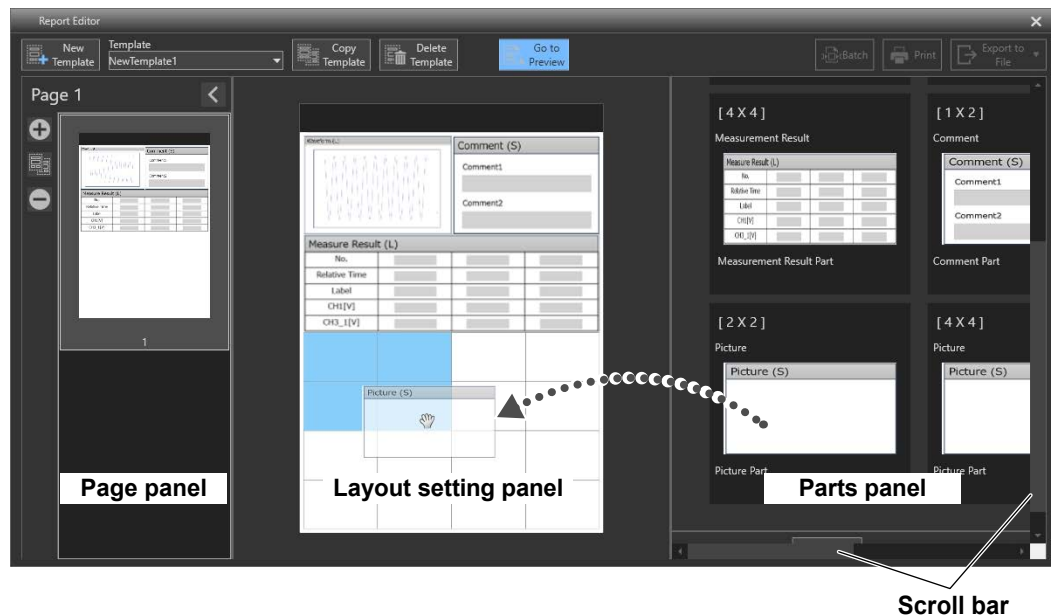
Moving a Part

3. You can move a part by dragging an already placed part and dropping it in an available area within the layout setting panel.

Deleting a Part

3. You can delete parts using one of the following two methods.

- **Double-click**
  When you double-click a part already placed in the report, the part is deleted.

- **Drag and Drop**
  When you drag a part already placed in the report to the parts panel, a trash bin mark appears. When you drop the part, the part is deleted.

When a trash bin mark appears in the parts panel turns light blue, drop the part.
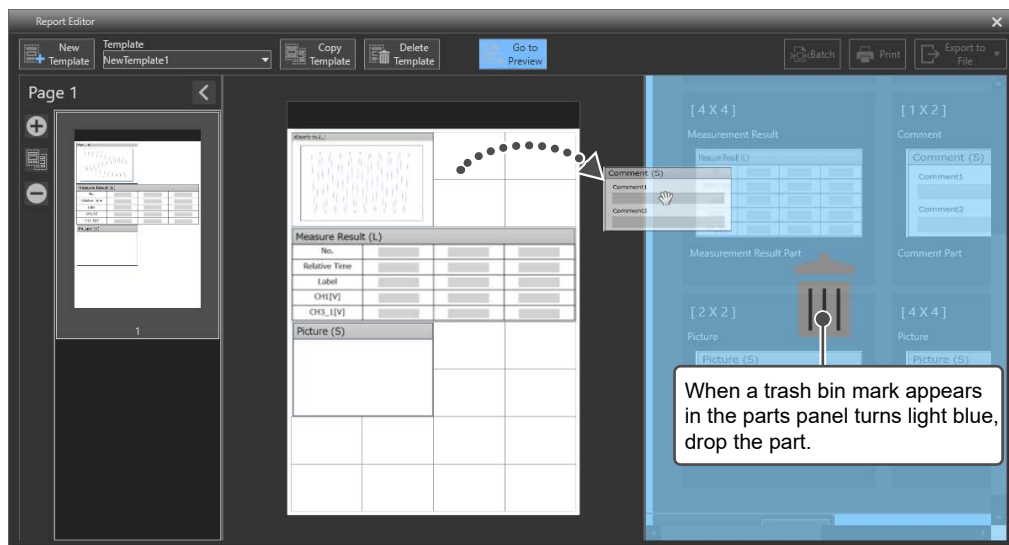
Checking the Displayed Content of Parts

4. On the toolbar, click **Go to Preview**. A preview view appears.

Set the displayed content of various parts. ▶ section 8.4

Explanation

Layout Setting Panel

The arrangement area of the layout setting panel is divided as follows:

Template part size

[1 × 2]

[2 × 2]

[2 × 4]

[4 × 4]

Rows: 8 divisions

Columns: 4 divisions
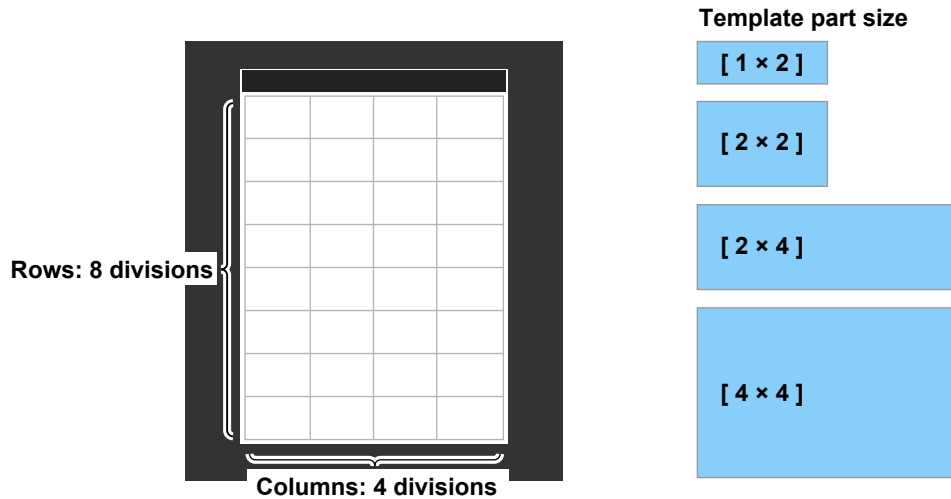
Report Parts

You can select the following parts.

Template Parts

Part Name	Size*	Description
Waveform analysis (small)	2×2	A small waveform is displayed.
Waveform analysis (large)	4×4	A large waveform is displayed.
Measurement result (small)	2×4	The measured result is displayed.
Measurement result (large)	4×4	The measured result is displayed.
Comment (small)	1×2	A small comment is displayed.
Comment (large)	2×2	A large comment is displayed.
Picture (small)	2×2	A small picture is displayed.
Picture (large)	4×4	A large picture is displayed.

* See the figure above for the parts sizes.

Custom Parts

You can create original parts.

Creating a New Part

1. Click **New Part** to display the following dialog box.

Rows of parts
(1 to 8)

Columns of parts
(1 to 4)

Part type (Comment, Waveform
Analysis, Measure Result, Picture)

Enter the part name
(up to 25 characters).

Enter a description of the part
(up to 50 characters).

Confirm button

Cancel button
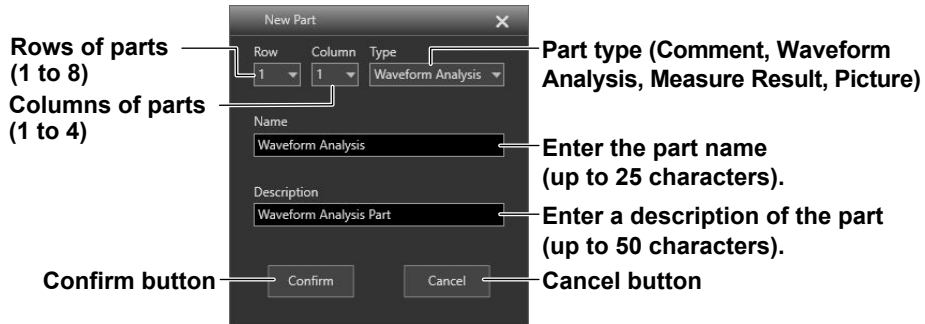
2. Set the part size (row, column), part type, part name, and part description, and then click **Confirm**.

3. Click **Custom Parts** to expand the list of parts. Check that the part you created has been added to the parts list.

Edit the part.

Deletes the part

When you select a part, edit and delete buttons appear.
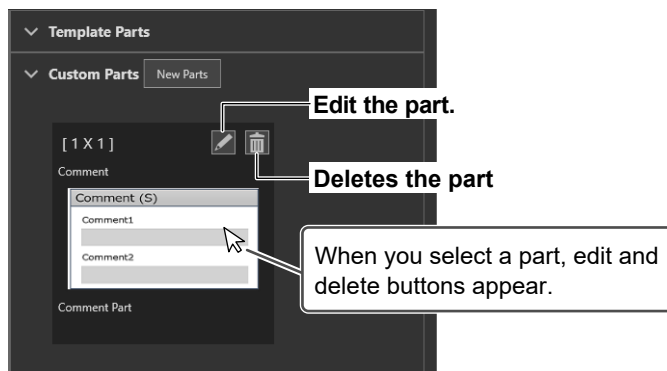
8.4 Editing the Content of the Report

Procedure

Displaying the Preview View

1. Refer to page 8-2. On the toolbar of the Report Editor review, click the **Template** button, and select the template to edit.

 The selected template layout is displayed in the view.

2. If necessary, edit the layout. ► sections 8.2, 8.3

3. On the toolbar, click **Go to Preview**. A preview view appears.
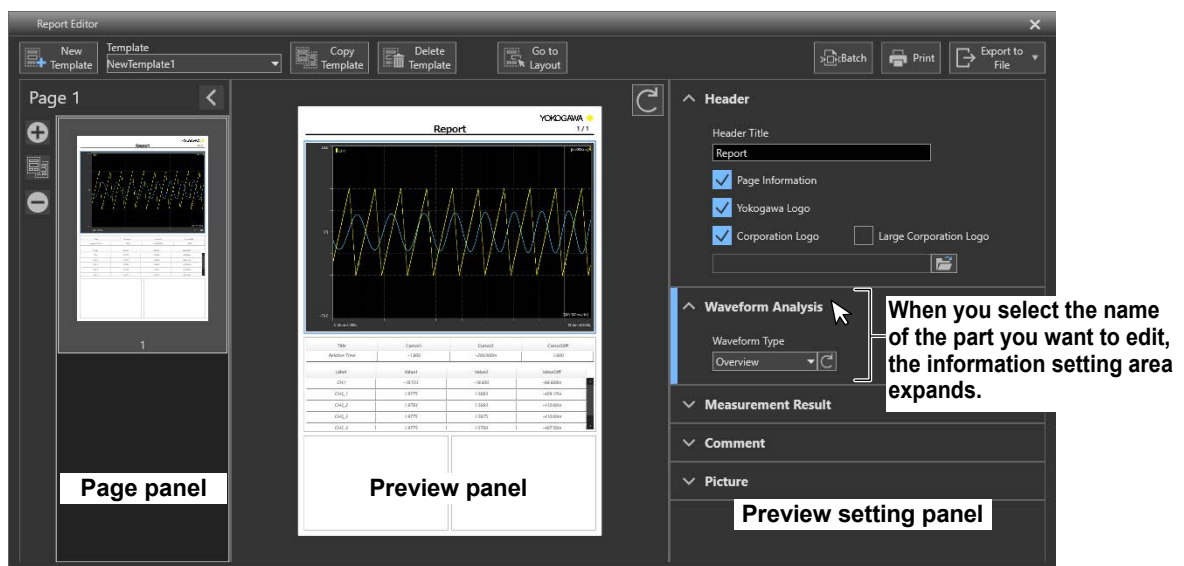
Selecting the Part to Edit

4. In the preview setting panel, click the name of the part you want to edit.
- If the part information setting area is collapsed, click it to expand it.
  If the part information setting area is expanded, clicking the part name will collapse the area.
- The corresponding part is enclosed in a blue frame on the preview panel.

Setting the Items

5. Set the items of the report part.

 The set items are reflected in the preview panel display.

Explanation

Setting Report Parts

Header
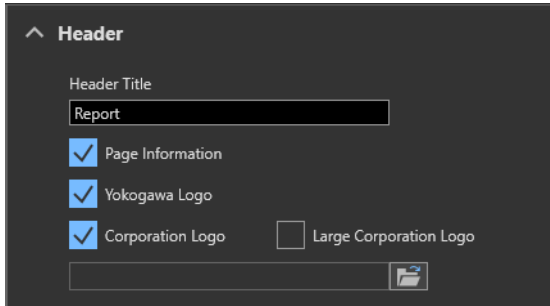
Item	Description
Header Title	Enter the report title. You can enter up to 25 characters.
Page Information	Shows and hides page numbers. ON: In the upper right of the report, page numbers are displayed in the (current page)/(total number of pages) format. OFF: Page numbers are not displayed.
Yokogawa Logo	Shows and hides the YOKOGAWA logo. ON: A YOKOGAWA logo is displayed in the upper right of the report. OFF: A YOKOGAWA logo is not displayed.
Corporation Logo	A specified logo can be displayed in the upper left of the report. ON: A corporation logo is displayed. This is valid when a logo image data is specified. OFF: A corporation logo is not displayed.
Path to the corporation logo data	Displays the path to the logo data
	Specify the logo image data. Selectable file formats: png, bmp
Large Corporation Logo	This is valid when a logo image data is specified. ON: A slightly enlarged logo is displayed in the upper left of the report. OFF: A logo is displayed in the upper left of the report.

* For details on the logo display location, see section 8.2.

Waveform Analysis (Waveform Analysis)

Item	Description
Waveform Type	Select the type of waveforms to display in reports. • Overview • XY 2 • View 1 • Video 1 • View 2 • Video 2 • View 3 • FFT View • View 4 • Zoom 1 • History • Zoom 2 • Dual Capture • [FFT] History • XY 1
	⟳: Click this to update the waveform preview.

Measurement Result

Item	Description
Result	Select the measurement results you want to display.
	• Vertical cursor
	• Horizontal cursor
	• Measured results
	• [FFT] Vertical cursor
	• [FFT] Horizontal cursor
	⟳: Click this to update the preview of the measure results.
Font Size	Set the font size (6 pt to 72 pt).

Comment

Comment edit dialog box

Comment input area

Confirm button

Cancel button

Palette
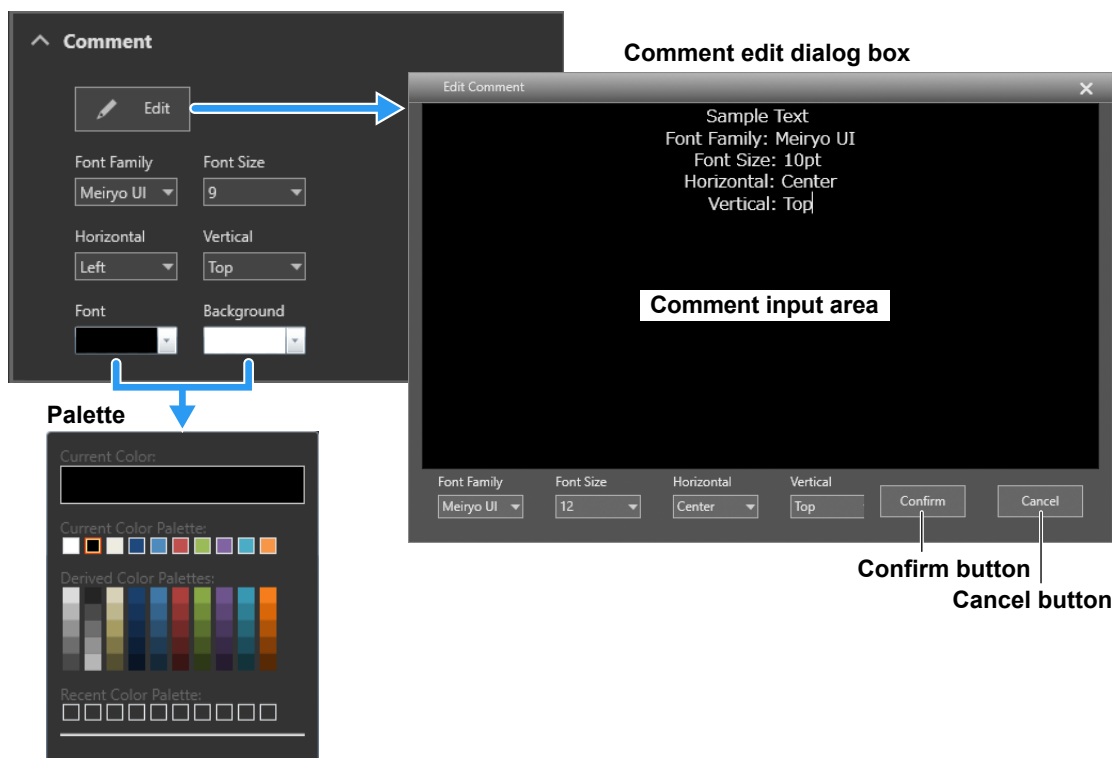
Item	Description	
Edit	Displays a comment edit dialog box.	
	Comment input area	You can enter a comment and check the format.
Font Family*	Font Family*	Select a font from the combo box.
Font Size*	Font Size*	Set the font size (6 pt to 72 pt).
Horizontal*	Horizontal position*	Select left, center, or right.
Vertical*	Vertical position*	Select top, center, or bottom.
	Confirm	The settings entered in the edit dialog box will be confirmed.
	Cancel	The settings entered in the edit dialog box will be canceled.
Font color	Set the font color using a palette.	
Background color	Set the background color using a palette.	

   * The settings in the comment information setting area and comment edit dialog box are synchronized.

Picture

Item	Description
Path to the picture image data	Displays the path to the picture data
	Specify the picture image data. Selectable file formats: png, bmp

8.5   Exporting Reports

This section explains how to print reports and how to export reports to Excel, Word, and PDF file formats.

Procedure

Displaying the Preview View

1. Refer to page 8-2. On the toolbar of the Report Editor review, click the **Template** button, and select the template to output.

The selected template layout is displayed in the view.

2. If necessary, edit the layout. ► sections 8.2, 8.3

3. When you finish editing the layout, on the toolbar, click **Go to Preview**. A preview view appears.

Batch, **Print**, and **Export to File** on the toolbar become available.
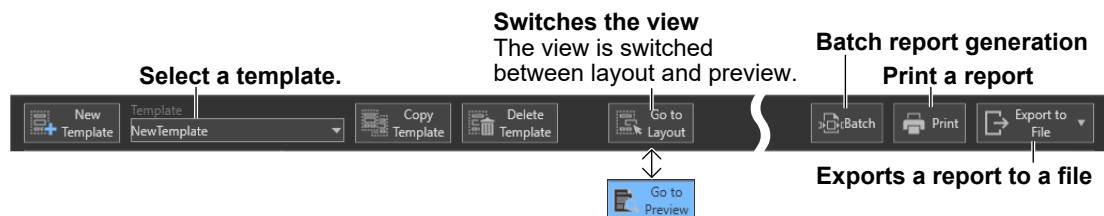
When Printing to a Printer

4. On the toolbar, click **Print**.

A Print dialog box appears.
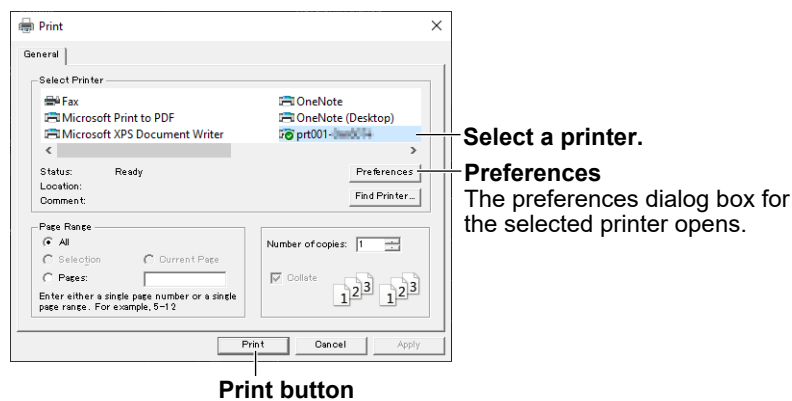
5. Select a printer, and click **Preferences**.

The preferences dialog box for the selected printer opens.

6. Select the paper, print orientation, and the like, and click **OK**. The dialog box closes.

7. Click **Print** in the print dialog box.

The report is printed with the same image as the preview window.

Note

Set the printer settings properly according to your system environment.

When Exporting to a File

Selecting the Output Format

4. On the toolbar, click **Export to File**, and select the export format.

Select Excel (.xlsx), Word (.docx), or PDF (.pdf).
A Save As dialog box appears.

5. Set the file output destination and file name, and then click **Save**.
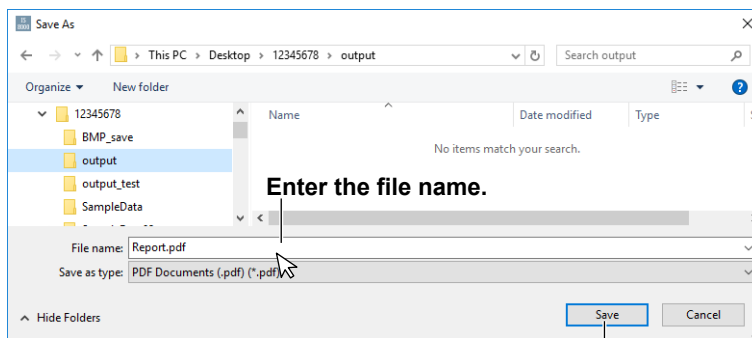
Enter the file name.

Save button

6. When the file is exported successfully, a message appears. Click **OK**.

The report file is saved with the same image as the preview window.

Note

When you print the PDF file on a printer, the layout may become distorted. If this happens, select the Print As Image check box in the printer setup dialog box for your printer, and then print.

8.6 Generating Multiple Reports Collectively

This section explains how to collectively generate reports containing various types of measurement data using the same layout.

Procedure

Displaying the Preview View

1. Refer to page 8-2. On the toolbar of the Report Editor review, click **Template**, and select the template to export collectively.
   The selected template page is displayed in the view.

2. If necessary, edit the layout. ► sections 8.2, 8.3

3. When you finish editing the layout, on the toolbar, click **Go to Preview**. A preview view appears.
   Batch, **Print**, and **Export to File** on the toolbar become available.

4. On the toolbar, click **Batch**. An export file list is displayed in the right side of the view.
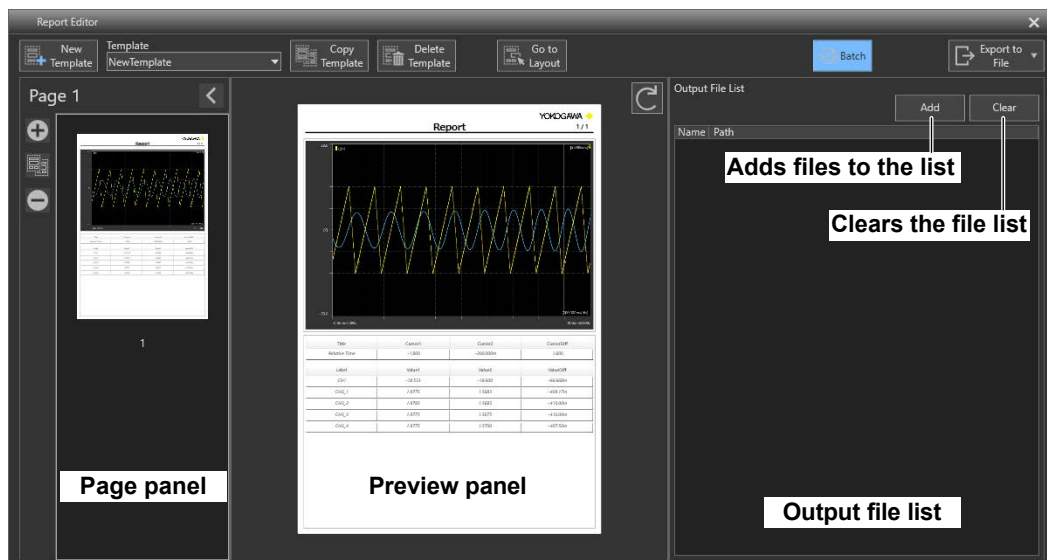
Adding Files to the List

5. Click **Add**. An Open dialog box appears.

6. Select files to include in the batch export, and then click **Open**.
   - The selectable file formats are WDF and MDF.
   - You can select multiple files.

   The names and paths of the selected files are displayed in the export file list.
   - Clicking **Clear** clears all the file names and paths displayed in the file list.

Exporting Files

Selecting the Output Format

7. On the toolbar, click **Export to File**, and select the export format.

Select Excel (.xlsx), Word (.docx), or PDF (.pdf).
A dialog box opens for setting the report export destination.

Specifying the Export Destination Folder

8. Select the file export folder, and click **Select Folder**.

• A file export progress bar appears.
• When all the files are exported, the specified destination folder opens. Check the exported report files.

Troubleshooting and License Management

This chapter explains troubleshooting measures for solving operation, configuration, and license management issues as well as maintenance procedures.

If a message is displayed on the screen, see section 9.2. If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

9.1 Troubleshooting

Operation and Configuration

Problem	Probable Cause and Corrective Action
Unable to connect to the instrument.	• The USB or Ethernet cable may not be connected properly. Check the cable connection. • If connected over an Ethernet network, the specified IP address may be different from the actual IP address of the instrument. Check the IP address assigned to the instrument on the instrument display. • Connection cannot be established if the instrument is turned off. Turn on the instrument power switch.
An overrun error is displayed during data acquisition, and recording stops.	An overrun may occur depending on the PC specifications or load conditions. [PC conditions in which overruns tend to occur] • CPU usage is 50 % or more. • Memory usage is greater than physical memory size (memory swap is occurring). • The active disk period is 50 % or more (performance degradation due to SSD heat generation). Consider the following measures. • Do not run other features such as remote control and file manager. • Decrease the sample rate of the recording channels. • Decrease the number of recorded channels. • Disable antivirus software.
I want to display the channel settings and DAQ settings that were set using the DAQ wizard.	• To display the channel settings, on the Monitor ribbon, click the **Monitor** tab and then **Channel Setting**. • To display the DAQ settings, on the Monitor ribbon, click the **Control** tab and then **DAQ Setting**.
An **** mark is displayed for logic cursor values.	There may be too many number of bits, and the significant digits may be hidden. Expand the cursor value display frame.

Problem	Probable Cause and Corrective Action
The history waveform's FFT bar is not displayed.	• The FFT of history waveforms is taken for each history. Therefore, the FFT bar is displayed on the History panel that can be displayed by selecting **View** and then **History** on the Waveform Analysis ribbon. • When a history waveform and a non-history waveform are displayed on the same axis, FFT operations cannot be performed. ► section 4.11
Measurement, math, and FFT operations cannot be performed on sub waveforms of a dual capture.	Measurement, math, and FFT operations cannot be performed on sub waveforms of a dual capture.
Waveforms cannot be viewed in detail even when the waveform is zoomed on the online monitor.	The waveforms on the online monitor are displayed using peak-to-peak waveforms. If the range of a given number of points exceeds one dot of the resolution of the waveform display screen, maximum and minimum values are displayed continuously. You can view waveforms in detail using either of the following methods. • Record the waveforms for a few seconds, and view the waveforms using offline analysis. • Click **Trigger Mode** on the **Remote Control** ribbon, view the waveforms in trigger mode. If you change to trigger mode, if you click **Monitor Start** or **Record Start** on the online monitor, the mode automatically returns to free run.
When waveforms are shown in split display, I want to freely change the height of the waveforms.	If the **Split** check box is selected in properties, clearing the **Auto** check box will allow you to change the height of the waveform display areas separately.
A parameter initialization error appears at the start of measurement or recording.	The memory may be insufficient. Consider the following measures. • Reduce the number of channels. • Decrease the monitoring display time or the sample rate. • For WT waveform display data (PP waveforms), increase T/DIV.

License Management

Problem	Probable Cause and Corrective Action
License code management	Keep the license certificate (product information sheet). The license code can be displayed on this software, but we recommend you keep the license certificate.
What is the base license code?	It is the first activated license code. ► page 9-14
The license was renewed or an option was added within the valid subscription license period. What happens to the license code?	The newly added license code will be integrated into the base license code, and the current base license code will continue to be the representative license code.
Is it possible to activate using a different license model?	Activation is not possible using a different license model regardless of whether the license is a subscription license model or perpetual license model.
Online and offline activation methods	The activation window changes automatically depending on the PC connection status.
How long is the activation deadline (the period during which activation can be performed)?	Activation is valid for 13 months after purchasing a license. After this deadline, activation is not possible. You will need to purchase a license again.
Where can I find the license expiration date?	Click **License** on the **Help** menu of the IS8000 Software to open the license information view window.

Problem	Probable Cause and Corrective Action
How to move the license information from the first PC to the second	On the second PC, you can obtain the license information of the first PC by execute **Update** in the license information view window of the IS8000 Software. ► section 9.5
Can different options be added to the two PCs of a single license?	The configuration of options is always the same because the two PCs share the same license. If you add an option to the first PC, the same option will be added to the second PC. After activating the software on two PCs, if you add an option to the first PC, the same option is added by clicking **Update** on the second PC.
If you want to use the software on another PC	
• Normal	First, deactivate the software on the PC you will no longer use. Second, activate the software on the PC you will use.
• When reinstalling Windows in the PC	Deactivate the software before reinstalling Windows. Next, reinstall Windows, and then activate the software.
• If the PC malfunctions	If all the licenses you have are in use, you cannot use it on another PC. In such a case, contact your nearest YOKOGAWA dealer.
If your PC breaks but recovers	You can obtain the license information from the license server by activating the software on the PC that recovered.
The license of an add-on package (IS800xEX) cannot be activated.	If the standard feature (IS800x) of the IS8000 software is not installed, you will not be able to activate add-on packages.
If only an add-on package is valid, can I continue to use the software?	If the standard feature (IS800x) is not available, you cannot use the software.
If all the licenses, such as the standard feature and add-on packages of the IS8000 Software, expire, what happens?	• Use of some functions is restricted, but you can continue to use it. ► page vi in the Installation Manual (IM IS8000-04EN) • If you purchase a new license after all the licenses have expired, you will need to activate the license. The software will be managed using a new base license code.
Can I use only the Harmonic/Flicker Software (IS801x)?	Yes. The Harmonic/Flicker Software (IS801x) is a software that can be started from the launcher of the standard feature (IS800x) of the IS8000 Software.* It is a separate product from the IS8000 Software. * The standard feature (IS800x) can start the launcher even when the use of some features are restricted (activation not completed or after license expiration).
Can add-on features (IS800xEX) be used (added) by purchasing the Harmonic/Flicker Software (IS801x)?	No. Add-on features cannot be activated if the standard feature (IS800x) has not been activated.
If I uninstall the software, what happens to the license?	The license information will remain unchanged. (The software will not be deactivated, nor will the PC license file be deleted.)

9.2 Error Messages

Messages may appear on the screen while you are using this software. This section describes the error messages and how to respond to them.

- Standard Feature Error Messages (Error Code: 1 to 4999)
- License Error Messages (Error Code: 5000 to 5999)
- Add-On Package Error Messages (Error Code: 6000 to 6999)

Standard Feature Error Messages

Error Code	Message	Chapter or Section
1	Can't load project file.	—
2	Can't create project file.	
3	Can't start launcher.	
4	This is an unsupported version of the DL950. Please update the firmware.	Section 1.1
5	Failed to connect to the measurement device.	
6	The configuration file is corrupted. Application needs to be restarted.	—
1001	Absolute Time cannot be specified because the waveforms are farther apart than the default in some places.	Section 4.2 and section 4.5
	Absolute time display is not possible if two waveforms are spaced apart more than 24 hours.	
1002	Cannot be added because the maximum number of channel subscriptions (128) has been exceeded.	Section 3.5
1301	Invalid constant in the expression.	Section 4.8
1302	Invalid constant in the expression.	
1303	Invalid expression.	
1304	Invalid expression.	
1305	Invalid expression.	
1306	Invalid expression.	
1307	Invalid expression.	
1308	Invalid expression.	
1309	Invalid math setting.	Section 4.8 and section 4.11
1310	Invalid start time (s).	
1311	Invalid interval (s).	
1312	FFT Start is out of range.	
1313	Math operation failed.	
1314	Filter configuration failed.	
1315	Math operation failed. Check the constant values.	
1316	Math operation failed.	
1317	Start Time or Interval is out of range.	
1318	Start or End is invaied.	
1401	Start Time is out of range.	Section 4.7
1402	Interval is invalid.	
1403	Start Time or Interval is out of range.	
1601	Invalid CSV file.	Section 3.8
1602	Invalid waveform file.	
1603	Failed to save the file.	

Error Code	Message	Chapter or Section
1701	File read error.	Section 3.8
1702	Not a link file.	
1703	Invalid directory.	
1801	Invalid CSV file.	
1802	Invalid CSV file.	
1803	Data record not found.	
2001	Failed to calculate the cache size.	—
2002	Not enough memory.	Section 3.5 and section 5.6
	Reduce the number of channels, or reduce the sample rate.	
2003	No input value.	Section 3.6 and section 5.9
2004	Invalid input value.	
2005	Input value out of range.	
2006	Invalid start recording time.	
2007	Invalid stop recording size.	
2008	Invalid output folder.	
2009	Invalid drive.	
2010	The number of characters that can be entered has been exceeded.	
2011	Setup transmission error.	Section 5.8 and section 5.9
2012	Setup transmission error.	
2013	START/DAQ preparation error.	
	If waveforms are not displayed or the software does not operate properly even when a measurement or recording is started, reconnect the instrument.	
2014	Setup transmission error.	
	If waveforms are not displayed or the software does not operate properly even when a measurement or recording is started, reconnect the instrument.	
2015	The device is measuring. Stop the device.	
2016	Setup transmission error.	
	If waveforms are not displayed or the software does not operate properly even when a measurement or recording is started, reconnect the instrument.	
2018	Setup transmission error.	
	Reconnect the instrument.	
2019	The number of points displayed in the overview has exceeded the upper limit. Check the number of display points setting.	
	Check the WT5000's Update Rate and Wave Time/div settings or the software's Display Time setting (section 3.6), and change them if the upper limit of the number of display points on the overview is exceeded.	
2020	Overrun occurred.	
2021	Communication error occurred.	
2022	Can't start RecordLength. Please set RecordLength 100M or less.	
2023	Cannot start when the Update Rate is 10ms.	
2024	Cannot start when the Update Mode is Trigger.	
2025	Can't acquire data in Trigger mode because the recording channels include analysis channels. Remove the analysis channels or change to Freerun mode.	Section 5.8 and section 5.9
2026	Turn off realtime recording of data acquisition.	
2027	Stopped for lack of memory.	
2028	Stopped because the memory used was exceeded. Please reduce the Record Length or T/Div.	
2101	In auto range mode, because data update rate doesn't match the actual update rate, the time positions of power values gradually shift.	—

Error Code	Message	Chapter or Section
2102	Can't start when Integration is not set to Reset.	Section 5.8 and section 5.9
2103	Unsupported WT5000 version. Update the firmware.	Section 1.1
2104	Cannot start integration. In order to start, set Time/div for wave bigger than 0.01ms.	Section 5.10
2105	Cannot execute when IEEE 1588 is not in the "Stable" state. To execute, wait until the state becomes "Stable" or turn off IEEE 1588.	
2106	Illegal date-time. Set the correct date and time.	
2107	Cannot start the integration. Turn off streaming, set appropriate conditions and try again.	
2108	Attempted to start integration after integration time has reached its preset value.	
2109	Attempted to start integration while integration is in progress.	
2110	Attempted to stop integration even though integration was not in progress.	
2111	Attempted to reset integration even though integration was in progress or integration mode was not selected.	
2112	Attempted to start integration while measurement of peak overflow was in progress.	
2113	Attempted to start integration in continuous integration mode when integration preset time was set to "0".	
2114	Attempted made to start integration in real time counting integration mode when the end time had already passed.	
2115	An error has occurred in communication. Reconnect the device.	Section 5.8 and section 5.9
2116	Insufficient memory for file storage.	Section 5.6
2117	Data streaming start condition is not met. Check the WT5000 settings.	
2118	Update rate at which data streaming cannot be started. Please change the update rate.	
2119	Number of waveforms for which data streaming cannot be started. Please change the number of waveforms.	
3001	Failed to save file.	Section 6.2
3002	There is no data to be saved. Check if there is any data to be saved.	
3003	ACQ save cannot be executed in SD recording mode.	
3004	Failed to save the file because the file is in use.	
4001	There is already a file with the same name in this directory. Use a different name.	Section 7.1
4002	The device is running. Stop the device and then try again. This error occurs when trying to upload or download files when a DLM is running.	Section 7.2
4003	Can't delete file. This error occurs when trying to delete a file in a format that cannot be deleted (directory, no extension, etc.).	Section 7.1
4004	Can't create directory.	
4005	Cannot upload to the Flash ACQ folder.	Section 7.3
4006	Failed to clear the waveform memory.	
4007	Upload failed.	Chapter 7
4008	Download failed.	
4009	Rename failed.	
4010	Failed to delete the specified folder or file.	
4011	Some items failed to be deleted in the specified folder or file.	

License Error Messages

Error Code	Message	Chapter or Section
5000-125	The license code you entered is not correct. Enter the correct license code.	Sections 2.2 and 2.3[1]
5000-831	The maximum number of licenses has been exceeded.	
5000-1904	The license code has been revoked. It may be integrated into the base license code.	Sections 2.2 and 2.3[1]
	Check the base license code in the license information view window.	Section 9.5 and section 9.6
5000-4040	The activation period has expired. You will need to repurchase a license.	Section 9.5 and section 9.6
5001	A technical error has occurred. Contact our customer service for assistance.	
5002	This license code cannot be activated until 3 months before it expires.	
5003	Already activated.	
5004	Already activated.	
5005	The license model is different.	
5006	Failed to obtain a license.	
5007	Already activated.	
5008	The license code you entered cannot be used to activate the installed software version.	
5009	Not connected to a network.	
5010	Activate the license that includes the basic features first.	

1   Installation Manual (IM IS8000-04EN)

Add-On Package Error Messages

Error Code	Message	Chapter or Section
6001	An invalid view has been selected.	Chapter 8
6002	An invalid character is present.	
6003	An invalid character is present.	
6004	Enter a new name as the same name is already in use.	
6005	An invalid character is present.	
6006	Enter a new name as the same name is already in use.	
6007	Invalid save path.	
6008	Failed to save to the file. Check the save path or save name.	
6009	Failed to export the report.	Section 8.5
6010	Failed to export the report.	
6011	Failed to export the report.	
6012	Failed to print the report.	
6201	Invalid file.	[2]
6202	Invalid video file.	
6203	Cannot be added because it exceeds the maximum number of coaxial displays for video files.	

2   High-speed Camera Synchronization Feature (FS1 Option) User's Manual (IM IS8000-61EN)

9.3 Viewing the Manuals

You can view the manuals for this software in the following manner.

Viewing the Manuals from the Launcher

Click **Manual** at the upper right of the **launcher**.
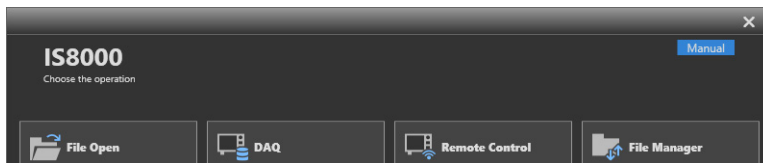
Viewing the Manuals from the Help Menu

On the **Help** menu, click **Manual**.
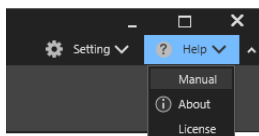
The **Manuals** folder opens. This folder contains the English and Japanese manuals for this software. You can view the PDF data of the manual.
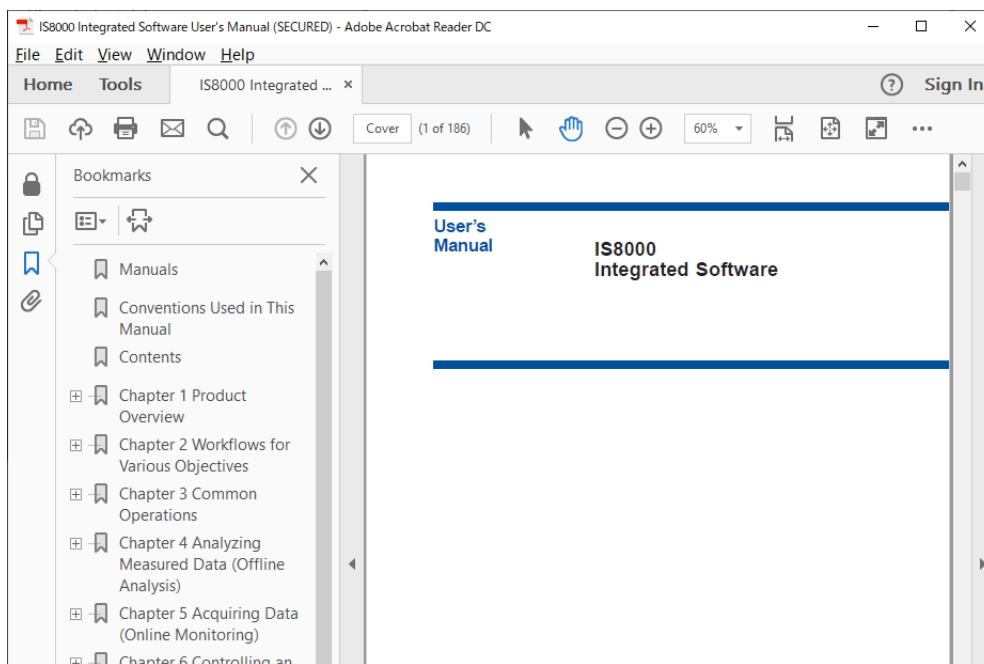
Note

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

9.4　Viewing the Version Information

On the **Help** menu, click **About** to display the software version information.

About	✕
Product Name	: IS8000
Product Version	: 24.1.1.0 |← **Software version**
Company	: Yokogawa Test & Measurement Corporation
Copyright	: Copyright © 2021 Yokogawa Test & Measurement Corporation
This software uses this technology	: MATLAB®. © 1984 - 2021 The MathWorks, Inc.

Close
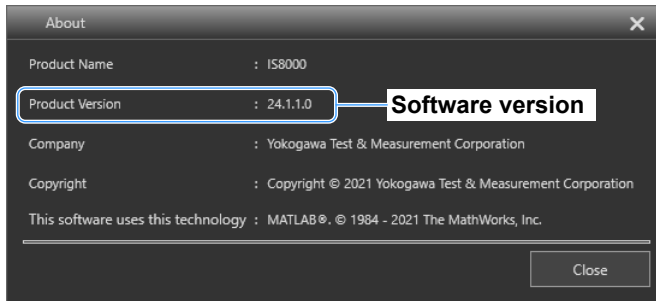
9.5 Managing the License Information

This section describes the following operations.
- Viewing the License Information
- Adding an Add-On Package and Renewing the Expiration Date
- Deactivating the License

Procedure

Viewing the License Information

1. On the **Help** menu, click **License**. The following window appears.

License Information View Window

Subscription License

Updates the license information

License code

License model

A message appears three months before the license expiration date.

License information
- **Product names**
- **Model and suffix**
- **License status**
- **Expiration date**

Activate
Adds an add-on package or renews the expiration date

Deactivate
Deactivates the license

Closes the license information view window

When selected, this window will not be displayed at startup.

Perpetual License

License information
- **Product name**
- **Model and suffix**
- **License status**
- **Available version**

Adding an Add-On Package and Renewing the Expiration Date

To add an add-on package or renew the license expiration date, activate the software in the license information view window using the new or renewed license code.

2. Click **Activate**. An activation window opens.

3. The operation procedure is the same as the initial license activation.

The license code is indicated in the product information sheet issued when an add-on package was added or when the license was renewed.

Online Activation

Enter or view the license code.

Click Activate.

► Proceed to step 2 in section 2.2 in the Installation Manual, IM IS8000-04EN.

Offline Activation

Follow steps 1 to 7 in the window.

Enter or view the license code.

Click Execute.

Specify the license file, and click Select.
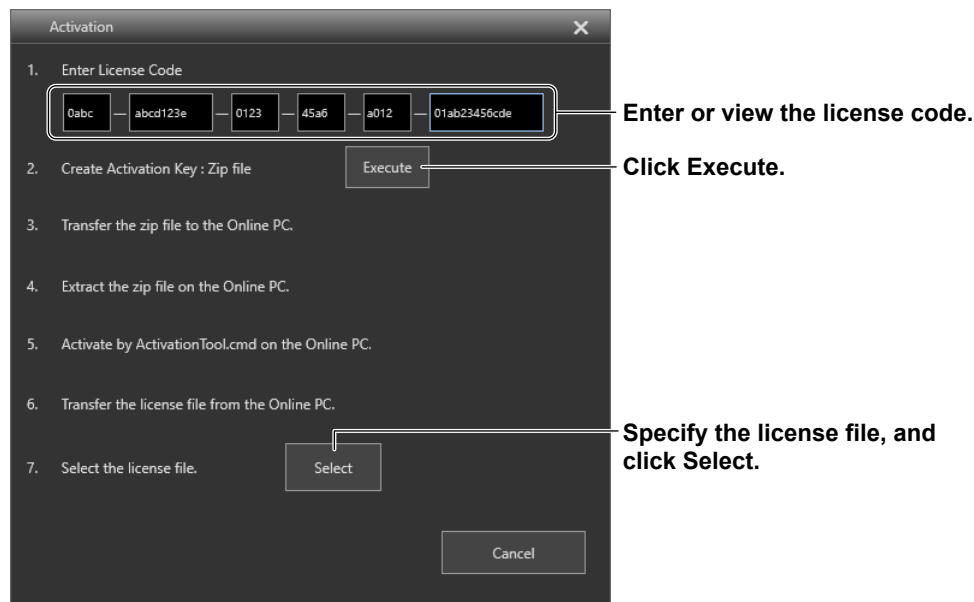
► For details, see the procedure starting with step 2 in section 2.3 in the Installation Manual, IM IS8000-04EN.

When the activation is completed, the license information display is updated.

When a Single License Is Used on Two PCs

When step 2 is completed on the first PC, be sure to update the license information on the second PC.

4. On the second PC, start the IS8000 Software. On the **Help** menu, click **License**.

A license information view window opens.

5. Click **Update** in the upper right of the window. The license status and expiration date in the window will be updated.

Procedure

Deactivating the License

1. On the **Help** menu, click **License**.

The license information view window (page 9-10) appears.

2. Click **Deactivate**.

When a confirmation dialog box appears, click **OK**.

A deactivation window opens.

Online Deactivation
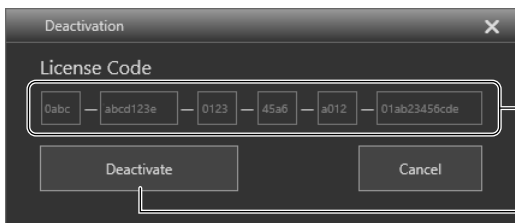
Check that the license code is the same as the license code to be deactivated.

Click Deactivate.

3. Check that the license code displayed is the same as the license code to be deactivated, and click **Deactivate**.

Proceed to step 15.

Offline Deactivation

Follow steps 1 to 7 in the window.
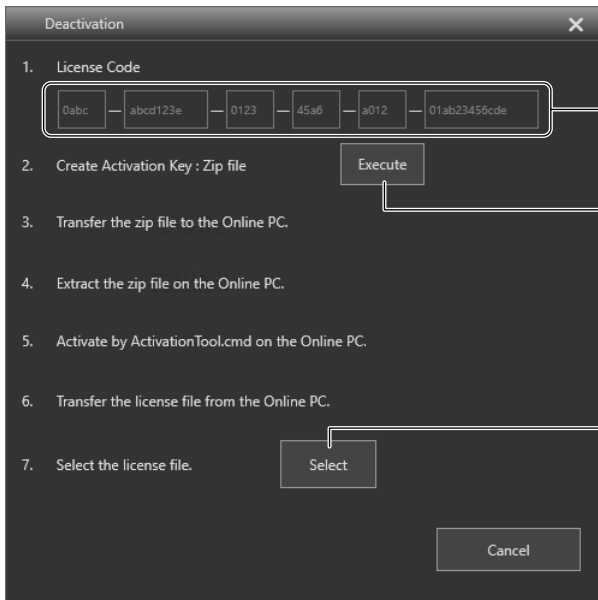
Check that the license code is the same as the license code to be deactivated.

Click Execute.

Specify the license file, and click Select.

Creating a Deactivation Key (Zip file)

3. Check that the license code displayed is the same as the license code to be deactivated, and click **Execute**.

A deactivation key (Zip file) is created.

4. When a confirmation dialog box appears, click **OK**.

A Save As dialog box appears.

5. Specify the location to save the zip file, and click **Save**.

6. When a confirmation dialog box appears prompting you to unzip the Zip file on the online PC, click **OK**.

Note

If you do not want to perform steps 7 and later immediately

There is no problem with selecting **Cancel** to close the deactivation window or closing the IS8000 Software.

You can always start the IS8000 Software and open the deactivation window again, as explained in step 12, and continue with the procedure.

Moving the Zip File to Your Online PC and Creating a License File

7. Move (copy) the created Zip file to any location on your online PC using a USB memory device or other means.

8. Unzip the zip file.

9. Start the unzipped **activation tool** (**ActivationTool.cmd**).*

*   When the extension is not displayed
  1. Click on the **View** tab from the File Explorer menu.
  2. Select the **File name extensions** check box.
     File names with extensions are displayed.

Once the license is activated, the license code and license model to be deactivated will be displayed in the window.

10. Check the displayed information, and click **OK**.

A license file (without extension) is created.

Moving the License File to the Original Offline PC and Selecting It

11. Move (copy) the license file created in step 10 to any location on the original offline PC.

12. Start the IS8000 software on the offline PC, and open the deactivation window. (See the previous page.)

13. Click **Select** to specify where to browse for the license file.

14. Click **OK**. The license file will be stored in the offline PC.

15. When deactivation is completed, a confirmation dialog box appears.

Click **OK** or the "X" in the upper right corner of the dialog box to close it.

The software returns to the no license state.

The IS8000 Software will restart, and the startup window will appear.

For details on the startup window, see section 2.1 in the Installation Manual, IM IS8000-04EN.

Explanation

License Code

The **base license code** is always displayed in the license information view window.

What is the Base License Code?

The first activated license code is called the base license code.

Product licenses that have been added or renewed as a result of adding an add-on package or upgrading the software are integrated into the base license code for management.

License Models

License Model/Message	Description
Subscription	This is a subscription license product.
Please confirm. Some products are about to expire.	• This message will be displayed 3 months before the license expiration date. • The **license information view window** is displayed at startup. To stop displaying the window at start up, clear the check box at the bottom of the window.
The IS80XX license has expired.	This message will be displayed when the license is expired.
Perpetual	This is a perpetual license product.

Updating the License Information

All licenses can be used on two PCs per license.

When an activation is completed on the first PC, you can click **Update** on the second PC to update the license information on the second PC.

Note

When Using a Single License on Two PCs

The license information on the second PC is a copy of the first. The IS8000 software license update and add-on package information is synchronized between the two PCs.

Viewing the License Information

Product Name

The product name managed by the base license code shown in the window is displayed. You can view added and updated add-on packages and the software product name.

Product and Basic Specifications

The product model or the suffix code of the add-on package is displayed.

* You can view the product model and suffix code on the product information sheet.

License Status

• When the license is valid

The product license is displayed.

The license expiration date is displayed in red for the period from three months before the expiration date to the expiration date.

• When the license invalid: Nothing is displayed.

Expiration Date and Available Version

For each product, the license expiration date and available version are displayed.

• Subscription license

The license expiration date (yyyy/mm/dd) is displayed.

• Perpetual license

The available version (display format is year: yyyy - yyyy) is displayed. The yyyy on the right is the upgrade expiration date.

Adding an Add-On Package and Renewing the Expiration Date

When the software currently in use is activated properly, the **Activate** button becomes available, and you will be able to add add-on packages and renew the expiration date.

Note

When Using a Single License on Two PCs

You cannot add separate add-on packages between the two PCs.

Deactivating the License

If you want to uninstall the software, such as when the PC needs to be exchanged, click **Deactivate** to deactivate the license. By deactivating the license, you will be able to activate the software on the new PC using the license code that you have been using up to that point.

9.6 License Expiration Date and Renewal

This manual explains the following IS8000 software licenses.

Subscription License Model

• **IS8001**	**Integrated Software**	**Subscription (1 year)**
• **IS8001EX**	**Integrated Software Add-On Packages**	**Subscription (1 year)**
• **IS8011**	**Harmonic/Flicker Software**	**Subscription (1 year)**

Renewing the License before the Expiration Date

When the expiration dates of all the IS8000 products that you using expire, you will no longer be able to use the base license code that has been already activated. Activate using a new license code. The base license code will be updated.

Perpetual License Model

• **IS8002**	**Integrated Software**	**Perpetual License**
• **IS8002EX**	**Integrated Software Add-On Packages**	**Perpetual License**
• **IS8012**	**Harmonic/Flicker Software**	**Perpetual License**

Behavior after Upgrade Expiration Date

If the software upgrade period expires, you will not be able to make a new version upgrade, but you can continue to use the final version of the year when the version upgrade expires.

Note

IS8002 and IS8012 are separate products. If you activate these products at separate times, the software upgrade expiration dates will also be separate.

IS8001 Integrated Software Subscription

The standard features of the Integrated Software can be used for one year.

License Expiration Date

One year after receiving this software, installing it on your PC, and activating it.
- Please activate the software immediately. The activation deadline is 13 months from shipment.
- The expiration date is until the expiration date of the first activated PC.
- From three months before the expiration date, a message about license renewal will be displayed when you start the software.

Software Upgrade

You can always upgrade to the latest software version within the valid license period.

License Renewal

- The initial license code (base license code) of the software you are using will be inherited by renewing the license within the valid license period, and you will be able to continue using it.
- If you renew the license (purchase a new license) after the valid license period expires, the license code will not be inherited, and a new license code will become the base license code.

Operation after the Valid License Period Expires

After the valid license period expires, only a limited number of the standard features will be available.

Illustration of Activation and License Renewal
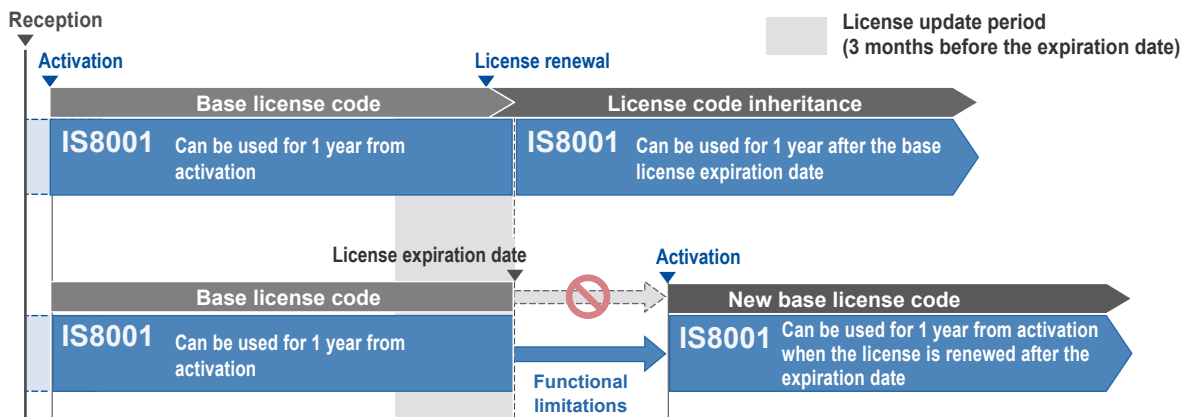
IS8001EX   Add-on Package Subscription

You can use the software for one year by adding features to the **IS8001 Integrated Software Subscription**.

* To use the add-on package, the IS8001 license must be valid.
  (Add-on packages cannot be added to IS8002, IS8011, or IS8012.)

License Expiration Date

One year after receiving this software and installing and activating it.
- Please activate the software immediately. The activation deadline is 13 months from shipment. However, since it operates only within the IS8001 license period, you need to renew the IS8001 license before it expires in order to continue using it for one year.
- The expiration date is until the expiration date of the first activated PC.
- From three months before the expiration date, a message about license renewal will be displayed when you start the software.

Software Upgrade

You can always upgrade to the latest software version within the valid license period.

License Renewal

When the license is renewed within the valid license period, the license is integrated into the IS8001 base license code in use. You can continue to use the software as before.

Operation after the Valid License Period Expires

After the valid license period expires, you will not be able to use this software (the add-on features).

Illustration of Activation and License Renewal

IS8011 Harmonic/Flicker Software Subscription

Harmonic/Flicker Software can be used for one year.

The rest of the license policy is the same as the IS8001.

License Expiration Date

One year after receiving this software and installing and activating it.
- Please activate the software immediately. The activation deadline is 13 months from shipment.
- The expiration date is until the expiration date of the first activated PC.
- From three months before the expiration date, a message about license renewal will be displayed when you start the software.

Software Upgrade

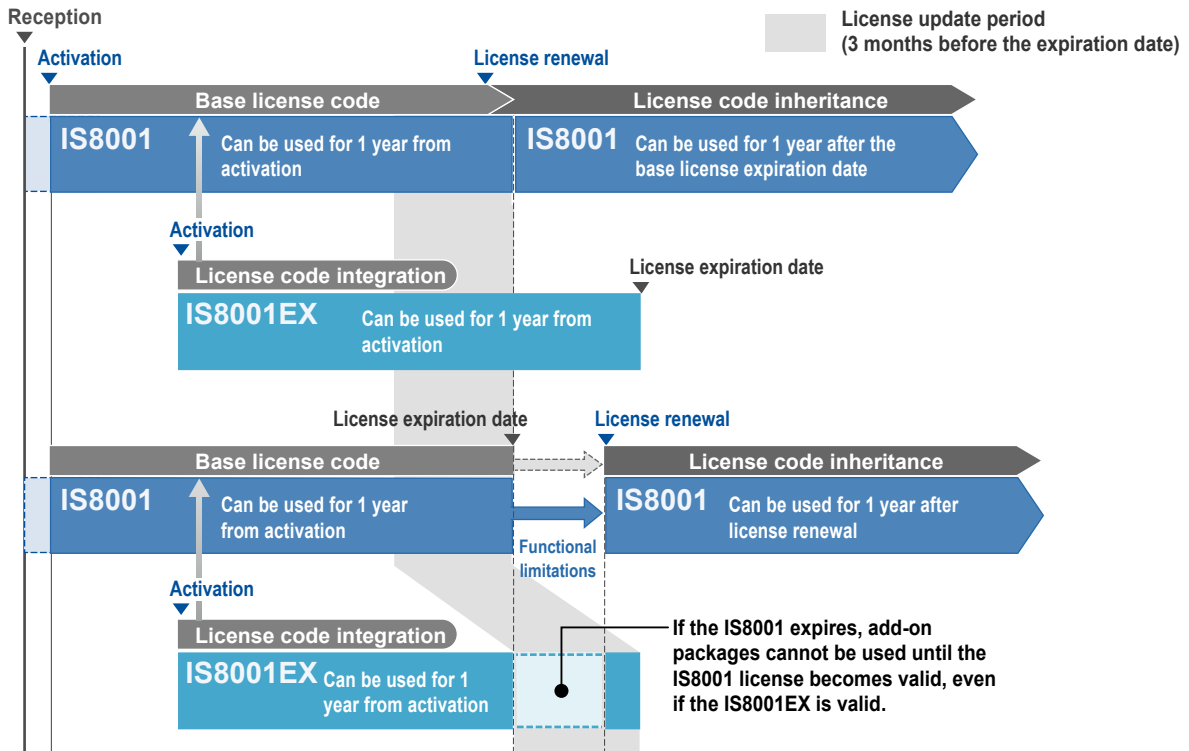You can always upgrade to the latest software version within the valid license period.

License Renewal

- The initial license code (base license code) of the software you are using will be inherited by renewing the license within the valid license period, and you will be able to continue using it.
- If you renew the license (purchase a new license) after the valid license period expires, the license code will not be inherited, and a new license code will become the base license code.

Operation after the Valid License Period Expires

After the valid license period expires, only a limited number of the IS8001 standard features will be available.

Illustration of Activation and License Renewal
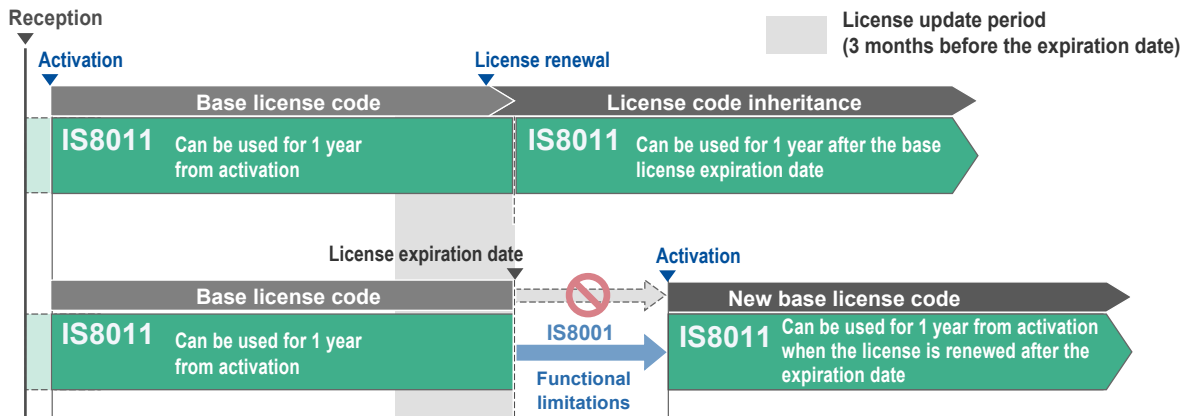
IS8002 Integrated Software Perpetual

The standard features of the Integrated Software can be used indefinitely.

License Expiration Date

Indefinitely after receiving this software and installing and activating it.
Please activate the software immediately.

Software Upgrade

The software can be updated to the latest version for five years from the year following the year the software was shipped.

License Renewal

License renewal is not required.

Illustration of Activation and License Renewal

Example When You Purchase a Perpetual License in 2021
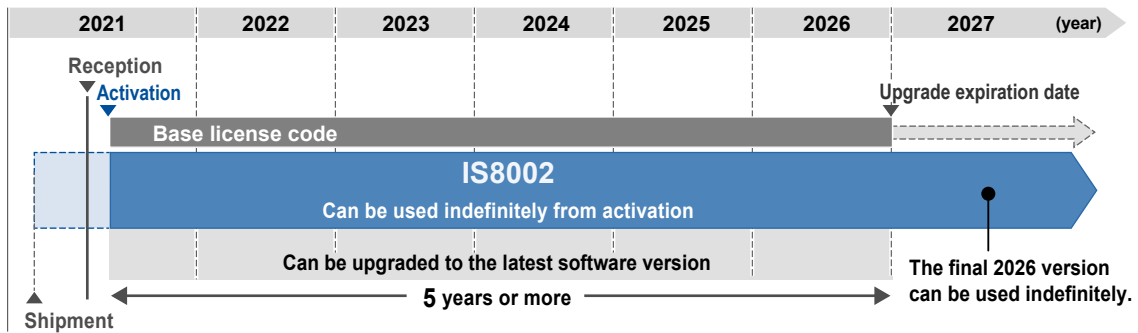
IS8002EX   IS8000 Add-on Package Perpetual

You can use the software indefinitely by adding features to the **IS8002 Integrated Software Perpetual**.

*   To use add-on packages, the IS8002 must be installed and activated, and the IS8002 must be in the upgradeable period.
(Add-on packages cannot be added to IS8001, IS8011, or IS8012.)

License Expiration Date

Indefinitely after receiving this software and installing and activating it.
Please activate the software immediately.

Software Upgrade

You can update the software to the latest version during the upgradeable period of the IS8002 you are using.

License Renewal

License renewal is not required. At the first activation, the license will be integrated with the license code of the IS8002 you are using.

Illustration of Activation and License Renewal

Example When You Purchase a Perpetual License in 2021
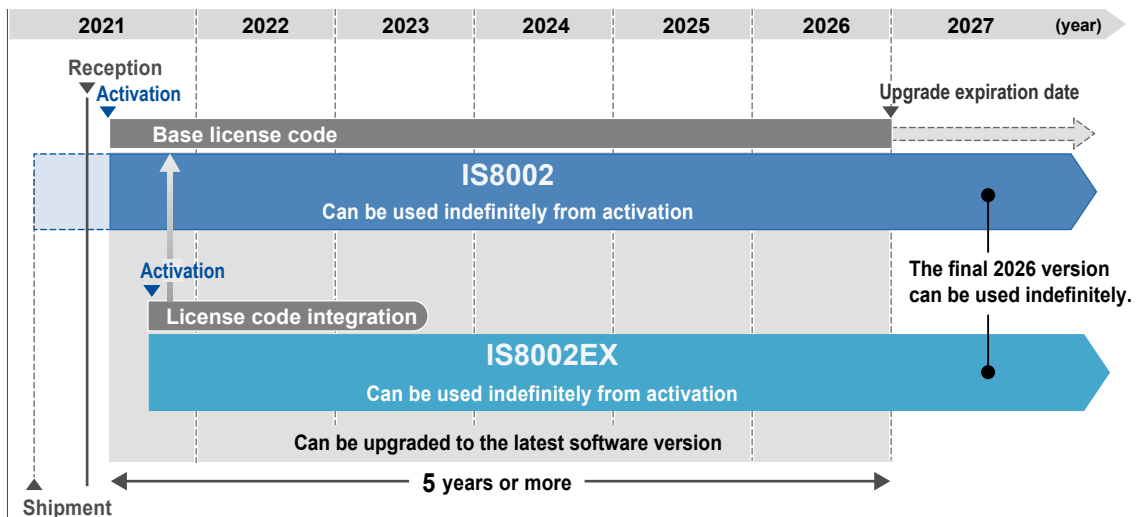
IS8012 Harmonic/Flicker Software Perpetual

Harmonic/Flicker Software can be used indefinitely.

License Expiration Date

Indefinitely after receiving this software and installing and activating it.
Please activate the software immediately.

Software Upgrade

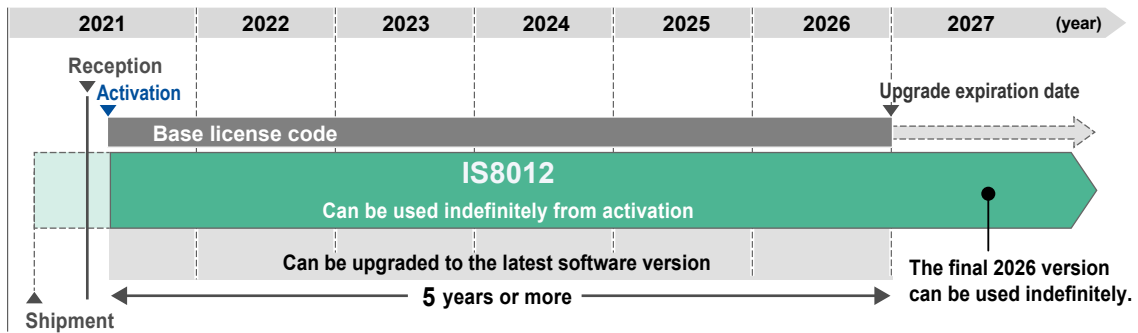The software can be updated to the latest version for five years from the year following the year the software was shipped.

License Renewal

License renewal is not required.

Illustration of Activation and License Renewal

Example When You Purchase a Perpetual License in 2021

Specifications

This chapter explains the specifications of this software.

10.1   Product Specifications

Integrated Software

Model	Suffix Code	Description
IS8001		IS8000 Integrated Software Subscription
IS8002		IS8000 Integrated Software Perpetual
Options	/SY1	Multi-Unit Connection Option
	/MH1	Waveform Math Option (user-defined math)
	/SB1	Serial Bus Analysis Option
	/PR1	Report Generator Option
	/FS1	High-speed Camera Synchronization Option (Photron high-speed camera)
	/EM1	ECU Monitor Synchronization Option (DTS INSIGHT RAMScope)
	/MB1	Modbus/TCP Communication Option

Add-on Packages

Model	Suffix Code	Description
IS8001EX		IS8000 Add-on Package Subscription
IS8002EX		IS8000 Add-on Package Perpetual
Suffix Code	-SY1	Multi-Unit Connection
	-MH1	Waveform Math (user-defined math)
	-SB1	Serial Bus Analysis
	-PR1	Report Generator
	-FS1	High-speed Camera Synchronization (Photron high-speed camera)
	-EM1	ECU Monitor Synchronization (DTS INSIGHT RAMScope)
	-MB1	Modbus/TCP Communication

Harmonic/Flicker Software

Model	Description
IS8011	Harmonic/Flicker Software Subscription
IS8012	Harmonic/Flicker Software Perpetual

10.2 Specifications

Item	Specifications	
Applicable models	DL950/WT5000:	Data acquisition, remote control, offline file analysis
	DLM3000, DLM5000:	Remote control, offline file analysis
	SL1000/DL850 series/DL350:	Offline file analysis
	WT1800 series/WT3000 series:	Offline file analysis
	DLM2000 series/DLM4000 series:	Offline file analysis
	ECU monitor[1]	DTS INSIGHT RAMScope GT122, GT170 (RAM measurement module only)
	High-speed camera[2]	Photron FASTCAM SA-Z, FASTCAM Mini AX/UX[2]/WX[2] series, FASTCAM NOVA S series/R2
	Modbus/TCP-compatible device[3]	
Language	English, Japanese, Chinese (additional languages planned in the future)	
PC requirements	For data acquisition with 10 Gb Ethernet connection; Desktop PC required/Intel Core i7-1165G7 or later, 4 cores (8 threads) or more, 4.7 GHz or faster/ 16 GB or more memory/512 GB or more SSD (NVMe is recommended, Sequential read/write 3 GB/s or faster) For data acquisition with 1 Gb Ethernet/USB connection and offline analysis; Intel Core i5-10210U or later, 4 cores (8 threads) or more, 4.2 GHz or faster/8 GB or more memory/ 256 GB or more SSD (Sequential read/write 400 MB/s or faster)	
Operating system	Windows 10 64 bit, Windows 11[4]	
Communication interface	USB (USBTMC, VISA), Ethernet (VXI-11, HiSLIP, Modbus/TCP[3])	
Display resolution	1366×768 dots or higher, 100 % zoom	
Device connection	Maximum number of connected measuring instruments: 5[5, 6] (However, one ECU monitor, high-speed camera, or Modbus/TCP-compatible device may be connected)	
Online device configuration	Smart setup, remote control	
Data acquisition[6]	Data acquisition (DAQ), real-time waveform monitor DL950 measurement mode: Scope mode (Trigger/[7]FreeRun) and Trigger are available only when the link feature is disabled. WT5000: Numeric display, Harmonic bar,[8, 9] Vector display, Data Streaming[10] (Maximum transfer rate 320 MB/s (10 MS/s × 16ch): 10 GB Ethernet connection) (Maximum transfer rate 6.4 MB/s (200 M/s × 16ch): 1 Gb Ethernet/USB connection) (Maximum continuous recording time Automatically stops when the free storage space falls to less than 10%) (Maximum recording size Automatically stops when the free storage space falls to less than 10%)	
Data display	Waveforms:	Overview (1 window), Perview (1 window),View (up to 4 windows), X-Y (up to 2 windows), Zoom (FFT waveforms, up to 2 windows)[11]
	Numeric:	Numeric monitor, Numeric display (WT5000)
	Graph:	Harmonic bar (WT5000),[8, 9] Vector display (WT5000)
Waveform display format	Single display, split display (up to 32 waveforms), tile display (4x8 max.) History waveform display, dual capture waveform display (ScopeCorder series, DL series)	
Maximum number of displayed waveforms	Up to 32 waveforms per display group, 4 groups total (128 waveforms) (during T-Y display) (Display feature available)	
Coaxial waveform position adjustment	Time, Absolute Time, First, Last, Offset	
Waveform parameter measurement	Up to 28 types including P-P, Amp, RMS, and Freq	
History statistical processing	Automatically measures the waveform parameters on the data of each history waveform and performs statistical processing on the parameters.	
Cyclic statistical processing	Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters.	
Cursors	Vertical (2), horizontal (2)	
Annotation feature	Insert annotation anywhere in the overview, view, and X-Y windows (text, measured value)	
Waveform math[11]	Math waveforms	Up to 16 waveforms (Math1 to Math16)
	Computational accuracy	Single-precision floating-point
	Operators	+, -, x, /, phase shift, ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDF, INTEG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FLT1, FLT2, HLBT, MEAN
	Math points	Up to 12.5 Mpoint 100 Mpoints max. when MATLAB Runtime is installed

Item		Specifications
	FFT math	FFT Up to 16 operations (FFT1 to FF16) Type: LS, RS, PS, PSD, CS, TF, CH Subtype: REAL, IMAG, MAG, LOGMAG, PHASE
	FFT window function	Rect, Hanning, Flat top, Hamming
	FFT points	Up to 2 Mpoint 100 Mpoints max. when MATLAB Runtime is installed
	Digital filter	Gauss, Sharp, IIR
Serial bus signal analysis and search[12]		Waveform analysis and search can be performed on one serial bus signal.
	Analysis	The software can decode frames, fields, and other information from the waveform displayed on the screen. Then, it can display the decoded results and the waveform together on the screen or display a list of detailed decoded results.
	Search	If you set search conditions and perform a search, you can display the waveform expanded with the beginning of the frame, field, or data that meets the search conditions in the center.
	Detected points	The software can search up to 100000 points.
CAN bus signal analysis and search		Analyze or search for CAN (Controller Area Network) bus signals. CAN data can be analyzed and displayed. Waveforms that can be used for CAN bus signal analysis can be selected from loaded waveforms.
	Mode	SOF, ID/Data, Error
	Bit Rate	Select from 33.3 kbps, 83.3 kbps, 125 kbps, 250 kbps, 500 kbps, or 1 Mbps or enter the value directly. The input range is 10 kbps to 1 Mbps (in 0.1 kbps steps).
Remote control	Applicable models	DL950 series, DL850 series, DL350, DLM3000 series, DLM5000 series, WT5000
	Update rate	Options (100 ms, 200 ms (default), 300 ms, 500 ms, 1 s, 2 s, 10 s)
	Waveform saving	Save waveforms in the measurement memory to the PC
File type	Load	MF4 (MDF4.1), WDF, WVF CSV (CSV saved with this software, CSV saved with Xviewer, CSV files of DL950, DL850 series, DL350, DLM5000 series, DLM4000 series, DLM3000 series, DLM2000 series, WT5000, WT3000 series, and WT1800 series). Up to the first 128 channels can be loaded. CSZ IS8000 project file
	Save	MF4 (MDF4.1), CSV, IS8000 project file
File management	File transfer	Between the instrument and the PC, DL950 Flash Acquisition data transfer
Screen capture	Save	Clipboard, png, jpg, gif
CSV batch converter	Load	MF4 (MDF4.1), WDF, WVF
	Save	CSV, CSZ
Report[13]	Output format	MS-Word, MS-Excel, PDF, printer output
	Report parts	Waveform, math result, comment, image
	Page generation	Multiple page generation, copy, preview, layout, part content input
Applications	ECU Monitor Synchronization[1]	
	High-speed Camera Synchronization[2]	
	Modbus/TCP communication[3]	
	Harmonic/Flicker Software[14]	

1   ECU monitor synchronization (EM1 option) is required.
2   High-speed camera synchronization (FS1 option) is required. The number of frames before and after trigger cannot be set for the Mini UX/WX series. (The trigger position is the start of frame.)
3   Modbus/TCP communication (MB1 option) is required.
4   ECU monitor synchronization feature (EM1 option) is not compatible with Windows 11.
5   Multi-unit connection (SY1 option) is required. This option is required to connect multiple instruments, even if the instruments are not synchronized with each other.
6   The specifications of the IS8000 application do not apply to connection of instruments and data collection when multiple instances of the application are running on the same PC.
7   For the conditions that allow monitoring and DAQ (data acquisition) when Motion Mode is set to Trigger, see Appendix 2.
8   When the IEC harmonics/flicker measurement feature (/G7 option) is installed in the WT5000, measurement data display complying with IEC 61000-4-7 Annex B (2k-9kHz) is supported.
9   Interharmonic measurement is available when the IEC harmonics/flicker measurement feature (/G7 option) is installed in the WT5000 and the WT5000 firmware version is 3.61 or later.
10 Data streaming requires the /DS option on the WT5000.
11 Waveform math (MH1 option) is required.
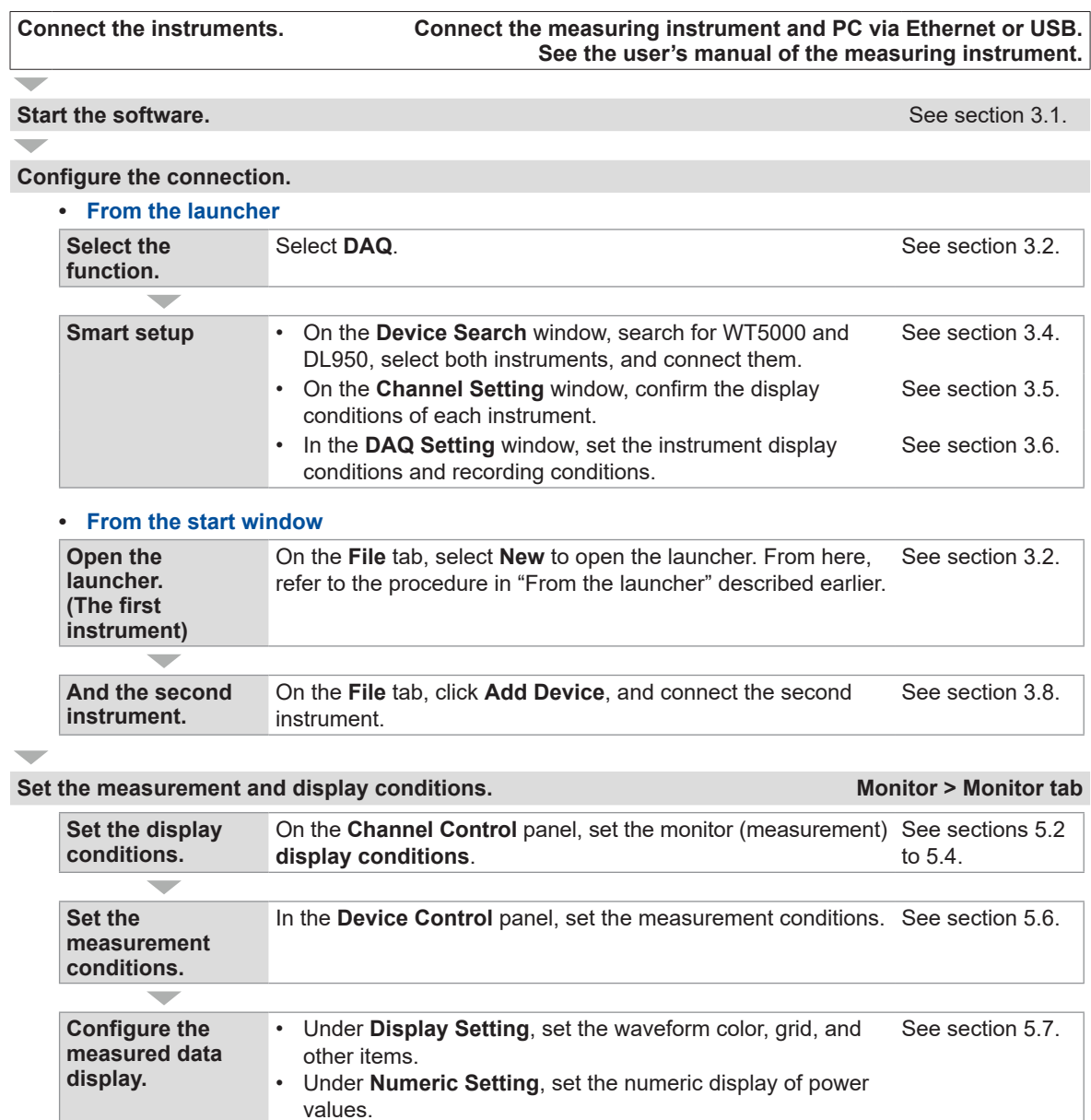12 Serial bus analysis (SB1 option) is required.
13 Report generator (RP1 option) is required.
14 IEC harmonic/flicker software is required.

Appendix

Appendix 1   When Performing Synchronous Measurement of Power and Waveforms

The following flowchart shows how to connect a WT5000 and DL950 and perform real-time monitoring (measurement) and recording in sync.

Connect the instruments.	Connect the measuring instrument and PC via Ethernet or USB. See the user's manual of the measuring instrument.

▼

Start the software.	See section 3.1.

▼

Configure the connection.

• **From the launcher**

Select the function.	Select **DAQ**.	See section 3.2.

▼

Smart setup	• On the **Device Search** window, search for WT5000 and DL950, select both instruments, and connect them.	See section 3.4.
	• On the **Channel Setting** window, confirm the display conditions of each instrument.	See section 3.5.
	• In the **DAQ Setting** window, set the instrument display conditions and recording conditions.	See section 3.6.

• **From the start window**

Open the launcher. (The first instrument)	On the **File** tab, select **New** to open the launcher. From here, refer to the procedure in "From the launcher" described earlier.	See section 3.2.

▼

And the second instrument.	On the **File** tab, click **Add Device**, and connect the second instrument.	See section 3.8.

▼

Set the measurement and display conditions.		Monitor > Monitor tab

Set the display conditions.	On the **Channel Control** panel, set the monitor (measurement) **display conditions**.	See sections 5.2 to 5.4.

▼

Set the measurement conditions.	In the **Device Control** panel, set the measurement conditions.	See section 5.6.

▼

Configure the measured data display.	• Under **Display Setting**, set the waveform color, grid, and other items.	See section 5.7.
	• Under **Numeric Setting**, set the numeric display of power values.	

▼

Continue to the next page.

▼

Execute measurement and recording.		**Monitor > Control tab**
Start and stop measuring.	Click **Start**/**Stop**.	See section 5.8.
Set the record conditions.	**DAQ Setting** (Specify the recording start, stop, division, and save destination settings.)	See sections 3.6 and 5.9.
Start and stop recording.	Click **Record Start**/**Record Stop**.	See section 5.9.

- When Using a Project File
  Tab window and panel positions and various waveform display information can be saved in a project file. The next time you open this file, the display conditions will be restored to what they were when the software was last closed.

Appendix 2 Monitoring and DAQ (Data Acquisition) When the DL950 Is Set to Trigger Mode

Number of Measured Data Points That Can Be Saved and Measurement Conditions

The following two tables are provided.
- DL950 set record length (10 k to 2.5 Mpoint)
- DL950 set record length (5 M to 500 Mpoint)

DL950 set record length (10 k to 2.5 Mpoint)

Relationship between the DL950 time scale and record length settings and the maximum sample rate
(IS8000 waveform display time: 5 s[1])

DL950 Time/Div Setting	Data Record Time	DL950 Set Record Length [Points][2]								
		10 k	25 k	50 k	100 k	250 k	500 k	1 M	2.5 M	≥ 5 M
100 to 200 ns/div	1 to 2 µs	—	—	—	—	—	—	—	—	
500 ns/div	5 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
1 µs/div	10 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
2 µs/div	20 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
5 µs/div	50 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
10 µs/div	100 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
20 µs/div	200 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
50 µs/div	500 µs	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
100 µs/div	1 ms	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
200 µs/div	2 ms	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	
500 µs/div	5 ms	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	20 MS/s	20 MS/s	
1 ms/div	10 ms	200 kS/s	200 kS/s	200 kS/s	5 MS/s	5 MS/s	20 MS/s	100 MS/s	100 MS/s	
2 ms/div	20 ms	200 kS/s	200 kS/s	200 kS/s	5 MS/s	5 MS/s	5 MS/s	50 MS/s	100 MS/s	
5 ms/div	50 ms	200 kS/s	200 kS/s	200 kS/s	2 MS/s	5 MS/s	10 MS/s	20 MS/s	50 MS/s	
10 ms/div	100 ms	100 kS/s	200 kS/s	200 kS/s	1 MS/s	2 MS/s	5 MS/s	10 MS/s	20 MS/s	
20 ms/div	200 ms	50 kS/s	100 kS/s	200 kS/s	500 kS/s	1 MS/s	2 MS/s	5 MS/s	10 MS/s	
50 ms/div	500 ms	20 kS/s	50 kS/s	100 kS/s	200 kS/s	500 kS/s	1 MS/s	2 MS/s	5 MS/s	
100 ms/div	1 s	10 kS/s	20 kS/s	50 kS/s	100 kS/s	200 kS/s	500 kS/s	1 MS/s	2 MS/s	
200 ms/div	2 s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	100 kS/s	200 kS/s	500 kS/s	1 MS/s	
500 ms/div	5 s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	100 kS/s	200 kS/s	500 kS/s	
1 s/div	10 s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	100 kS/s	200 kS/s	
2 s/div	20 s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	100 kS/s	
3 s/div	30 s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	
4 s/div	40 s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	See the next page.
5 s/div	50 s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	50 kS/s	
6 s/div	60 s	100 S/s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	
10 s/div	100 s	100 S/s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	20 kS/s	
20 s/div	200 s	50 S/s	100 S/s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	10 kS/s	
30 s/div	300 s	20 S/s	50 S/s	100 S/s	200 S/s	500 S/s	1 kS/s	2 kS/s	5 kS/s	
1 min/div	10 min	10 S/s	20 S/s	50 S/s	100 S/s	200 S/s	500 S/s	1 kS/s	2 kS/s	
2 min/div	20 min	5 S/s	20 S/s	20 S/s	50 S/s	200 S/s	200 S/s	500 S/s	2 kS/s	
3 min/div	30 min	5 S/s	10 S/s	20 S/s	50 S/s	100 S/s	200 S/s	500 S/s	1 kS/s	
4 min/div	40 min	—	10 S/s	20 S/s	20 S/s	100 S/s	200 S/s	200 S/s	1 kS/s	
5 min/div	50 min	—	5 S/s	10 S/s	20 S/s	50 S/s	100 S/s	200 S/s	500 S/s	
6 min/div	60 min	—	5 S/s	10 S/s	20 S/s	50 S/s	100 S/s	200 S/s	500 S/s	
10 min/div	100 min	—	—	5 S/s	10 S/s	20 S/s	50 S/s	100 S/s	200 S/s	
12 min/div	120 min	—	—	5 S/s	10 S/s	20 S/s	50 S/s	100 S/s	200 S/s	
30 min/div	300 min	—	—	—	5 S/s	10 S/s	20 S/s	50 S/s	100 S/s	
1 h/div	10 h	—	—	—	—	5 S/s	10 S/s	20 S/s	50 S/s	
2 h/div	20 h		—	—	—	—	5 S/s	10 S/s	20 S/s	
3 h/div	30 h		—	—	—	—	—	5 S/s	20 S/s	
4 h/div	40 h		—	—	—	—	—	5 S/s	10 S/s	
5 h/div	50 h		—	—	—	—	—	5 S/s	10 S/s	
6 h/div	60 h		—	—	—	—	—	—	10 S/s	
8 h/div	80 h		—	—	—	—	—	—	5 S/s	
10 h/div	100 h		—	—	—	—	—	—	5 S/s	
12 h/div	120 h		—	—	—	—	—	—	5 S/s	
1 day/div	10 day		—	—	—	—	—	—	—	
2 to 5 day/div	20 to 50 day		—	—	—	—	—	—	—	

1 When the IS8000 waveform monitoring display time is 5 s. If the display time is increased, the upper sample rate limit may decrease under the same conditions.
2 The upper DL950 record length setting limit on the IS8000 is 500 M samples.

DL950 set record length (5 M to 500 Mpoint)

Relationship between the DL950 time scale and record length settings and the maximum sample rate
(IS8000 waveform display time: 5 s[1])

DL950 Time/Div Setting	Data Record Time	DL950 Set Record Length [Points][2]							
		≤ 2.5 M	5 M	10 M	25 M	50 M	100 M	250 M	500 M
100 to 200 ns/div	1 to 2 µs		—	—	—	—	—	—	—
500 ns/div	5 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
1 µs/div	10 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
2 µs/div	20 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
5 µs/div	50 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
10 µs/div	100 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
20 µs/div	200 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
50 µs/div	500 µs		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
100 µs/div	1 ms		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
200 µs/div	2 ms		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
500 µs/div	5 ms		20 MS/s	20 MS/s	20 MS/s	20 MS/s	20 MS/s	20 MS/s	20 MS/s
1 ms/div	10 ms		100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s
2 ms/div	20 ms		100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s
5 ms/div	50 ms		100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s
10 ms/div	100 ms		50 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s
20 ms/div	200 ms		20 MS/s	50 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s
50 ms/div	500 ms		10 MS/s	20 MS/s	50 MS/s	100 MS/s	100 MS/s	100 MS/s	100 MS/s
100 ms/div	1 s		5 MS/s	10 MS/s	20 MS/s	50 MS/s	100 MS/s	100 MS/s	100 MS/s
200 ms/div	2 s		2 MS/s	5 MS/s	10 MS/s	20 MS/s	50 MS/s	100 MS/s	100 MS/s
500 ms/div	5 s		1 MS/s	1 MS/s	1 MS/s	1 MS/s	1 MS/s	1 MS/s	1 MS/s
1 s/div	10 s		500 kS/s	500 kS/s	500 kS/s	500 kS/s	500 kS/s	500 kS/s	500 kS/s
2 s/div	20 s		200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s	200 kS/s
3 s/div	30 s		100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s
4 s/div	40 s	See the previous page.	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s
5 s/div	50 s		100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s	100 kS/s
6 s/div	60 s		50 kS/s	50 kS/s	50 kS/s	50 kS/s	50 kS/s	50 kS/s	50 kS/s
10 s/div	100 s		50 kS/s	50 kS/s	50 kS/s	50 kS/s	50 kS/s	50 kS/s	50 kS/s
20 s/div	200 s		20 kS/s	20 kS/s	20 kS/s	20 kS/s	20 kS/s	20 kS/s	20 kS/s
30 s/div	300 s		10 kS/s	10 kS/s	10 kS/s	10 kS/s	10 kS/s	10 kS/s	10 kS/s
1 min/div	10 min		5 kS/s	5 kS/s	5 kS/s	5 kS/s	5 kS/s	5 kS/s	5 kS/s
2 min/div	20 min		2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s
3 min/div	30 min		2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s
4 min/div	40 min		2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s	2 kS/s
5 min/div	50 min		1 kS/s	1 kS/s	1 kS/s	1 kS/s	1 kS/s	1 kS/s	1 kS/s
6 min/div	60 min		1 kS/s	1 kS/s	1 kS/s	1 kS/s	1 kS/s	1 kS/s	1 kS/s
10 min/div	100 min		500 S/s	500 S/s	500 S/s	500 S/s	500 S/s	500 S/s	500 S/s
12 min/div	120 min		500 S/s	500 S/s	500 S/s	500 S/s	500 S/s	500 S/s	500 S/s
30 min/div	300 min		200 S/s	200 S/s	200 S/s	200 S/s	200 S/s	200 S/s	200 S/s
1 h/div	10 h		100 S/s	100 S/s	100 S/s	100 S/s	100 S/s	100 S/s	100 S/s
2 h/div	20 h		50 S/s	50 S/s	50 S/s	50 S/s	50 S/s	50 S/s	50 S/s
3 h/div	30 h		20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s
4 h/div	40 h		20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s
5 h/div	50 h		20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s
6 h/div	60 h		20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s	20 S/s
8 h/div	80 h		10 S/s	10 S/s	10 S/s	10 S/s	10 S/s	10 S/s	10 S/s
10 h/div	100 h		10 S/s	10 S/s	10 S/s	10 S/s	10 S/s	10 S/s	10 S/s
12 h/div	120 h		10 S/s	10 S/s	10 S/s	10 S/s	10 S/s	10 S/s	10 S/s
1 day/div	10 day		5 S/s	5 S/s	5 S/s	5 S/s	5 S/s	5 S/s	5 S/s
2 to 5 day/div	20 to 50 day		—	—	—	—	—	—	—

1 When the IS8000 waveform monitoring display time is 5 s. If the display time is increased, the upper sample rate limit may decrease under the same conditions.
2 The upper DL950 record length setting limit on the IS8000 is 500 M samples.

Index