HIOKI

9335

WAVE PROCESSOR

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Contents

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Introduction

Thank you for purchasing this HIOKI "9335 WAVE PROCESSOR." To get the maximum performance from the unit, please read this manual first, and keep this at hand.

Trademarks
- Pentium is a registered trademark of Intel Corporation.
- Microsoft, Windows, Windows Vista, and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.

Notes on Use

In order to ensure safe operation and to obtain maximum performance from the unit, observe the cautions listed below.

- Always hold the disc by the edges, so as not to make fingerprints on the label side or scratch the printing.
- Never touch the recorded side of the disc. Do not place the disc directly on anything hard.
- Do not wet the disc with volatile alcohol or water, as there is a possibility of the label printing disappearing.
- To write on the disc label surface, use a spirit-based felt pen. Do not use a ball-point pen or hard-tipped pen, because there is a danger of scratching the surface and corrupting the data. Do not use adhesive labels.
- Do not expose the disc directly to the sun's rays, or keep it in conditions of high temperature or humidity, as there is a danger of warping, with consequent loss of data.
- To remove dirt, dust, or fingerprints from the disc, wipe with a dry cloth, or use a CD cleaner. Always wipe radially from the inside to the outside, and do no wipe with circular movements. Never use abrasives or solvent cleaners.
- In the interests of ongoing product developments, there may be minor discrepancies between screen displays and the operating instructions, and in the data conversion process.
- HIOKI cannot accept any responsibility for the results of using this product.

The following symbols are used in this Instruction Manual to indicate the relative importance of cautions and warnings.

> **(NOTE)** Denotes items of advice related to performance of the equipment or to its correct operation.

Chapter 1
Overview

1.1 Product Overview

The 9335 WAVE PROCESSOR offers the following features:

1. Waveform display

The waveform files recorded by the HIOKI MEMORY HiCORDER can be displayed on a PC monitor. The displayed waveform data can be magnified or compressed and scrolled. Even large-capacity waveform files can be loaded and displayed at high speed.

2. Print

The waveforms recorded by the HIOKI MEMORY HiCORDER can be printed in detail, along with hard copies of the waveform window produced from a printer.

3. Search function

The date/time, voltage levels, maximum and minimum values, and any other necessary data can be searched.

4. Numerical operation

Average value, maximum value, standard deviation, and various other data can be obtained by calculation.

5. Text convert function

The waveform files recorded by the HIOKI MEMORY HiCORDER can be converted into text format for processing by such spreadsheet software as Microsoft Excel.

6. X-Y synthesis

The waveform data can be X-Y synthesized before being displayed on the screen.

1.2 Specifications

General specifications

Supplied media	One CD-R
Operating environment	PCs running Windows. Pentinum (233MHz) or higher-level CPU, with at least 64MB of memory Video capabilities with 1024 x 768 resolution or higher and 256 or more colors Minimum hard disk space required for installation 5 MB or more CD-ROM drive required
OS	Windows XP (32bit), Windows Vista (32bit), Windows 7 (32bit/64bit), Windows 8 (32bit/64bit), Windows 10 (32bit/64bit)

Supported recorders	HIOKI 8807-01, 8808-01, 8807-51, 8808-51, 8714-01, 8715-01, 8730-10, 8731-10 HIOKI 8870-20, 8870-21, MR8870-20, MR8870-30, MR8880-20, MR8880-21 HIOKI 8826, 8835, 8835-01, 8841, 8842, 8720, 8860, 8861, 8860-50, 8861-50 (Can not load the waveform data with different sampling rates) Compatible input units: 8936 ANALOG UNIT, 8937 VOLTAGE/TEMP UNIT, 8938 FFT ANALOG UNIT, 8939 STRAIN UNIT, 8940 F/V UNIT, 8946 4ch ANALOG UNIT, 8947 CHARGE UNIT 8956 ANALOG UNIT, 8957 HIGH RESOLUTION UNIT, 8958 16ch SCANNER UNIT, 8959 DC/RMS UNIT, 8960 STRAIN UNIT, 8961 HIGH VOLTAGE UNIT HIOKI 8855 Compatible input units: 8950 ANALOG UNIT, 8951 VOLTAGE/CURRENT UNIT, 8952 DC/RMS UNIT, 8953-10 HIGH RESOLUTION UNIT, 8954 VOLTAGE/TEMP UNIT, 8955 F/V UNIT HIOKI 8825 Compatible input units: 8907 ANALOG UNIT, 8908 TEMPERATURE UNIT, 8909 FFT ANALOG UNIT HIOKI 8840 Compatible input units: 8916 ANALOG UNIT, 8917 DC/RMS UNIT, 8918 TEMPERATURE UNIT, 8919 FFT ANALOG UNIT, 8928 STRAIN UNIT HIOKI 8847, MR8847-01, MR8847-02, MR8847-03, MR8847A, MR8827, MR8740, MR8741 Compatible input units: 8966 ANALOG UNIT, 8967 TEMP UNIT, 8968 HIGH RESOLUTION UNIT, 8969 STRAIN UNIT, 8970 FREQ UNIT, 8971 CURRENT UNIT, 8972 DC/RMS UNIT, 8973 LOGIC UNIT, U8974 HIGH VOLTAGE UNIT, MR8990 DIGITAL VOLTMETER UNIT HIOKI MR8875, MR8875-30 Compatible input units: MR8901 ANALOG UNIT, MR8902 VOLTAGE/TEMP UNIT, MR8903 STRAIN UNIT, MR8904 CAN UNIT, MR8905 ANALOG UNIT

Function specifications

● File loading	
Loadable data format	MEMORY HiCORDER files Memory functions ("mem" file extension) HI-Speed functions ("mem" file extension) Recorder functions ("rec" file extension) Realtime functions ("rec" file extension) (only MR8880 MEMORY HiCORDER) RMS functions ("rms" file extension) Power functions ("pow" file extension) XY Recorder functions ("xyc" file extension) (only 8847 MEMORY HiCORDER)
Maximum loadable file size	Maximum size handled by supported MEMORY HiCORDER (The size of files that can be handled may be smaller, depending on the PC's operating environment.)
Overwrite save	Possible (Existing files can be overwritten with title comments, channel comments, and scaling data.)
● Text conversion	
Data conversion format	Selectable from CSV format, text (tab separated), or text (space separated)
Applicable data	All data or data between cursors
Data interleaving	Data can be interleaved at fixed intervals
Conversion method	Analog waveform data is converted into voltage values Pulse waveform data is converted in integration or revolution values Logic data is converted into binary values (1 or 0).
Conversion channels	Selectable
Header contents	Title, trigger date/time, time-axis range, comments, setting conditions for each channel
Collective conversion	Specified multiple files can be converted simultaneously.
● Display	
Waveform display	Shows waveform data images. May be scrolled along the time-axis. May be magnified or compressed along the time-axis. Allows repositioning of the zero position or magnification/compression of one channel at a time. Supports variable settings on each channel.
X-Y synthesis display	Possible in "MEM", "REC" (envelope off) , "POW" or "XYC" function format. A range of data to synthesize can be specified.
Digital display	Digital values can be displayed for waveform data.
Cursor function	Two cursors (A and B) can be manipulated independently. Time value and voltage value display

Maximum displayed channels	256 analog channels 2 pulse channels 72 logic channels
Gauge display	Time gauge (selected from absolute time, relative time, seconds, or data count) Voltage-axis gauge (maybe shown or hidden for each separate channel)
Diagram input	May be entered at any position. Text, line, arrow, circle, or square
Copy to clipboard	Waveform screen (bitmap format/extended meta format) Cursor value, digital value, file information, or calculation result (text format)
Search function	Date/time search, maximum search, minimum search, level search, or window search
● Printing	
Compatible printers	The printers supported depend on the OS being used. Color and monochrome print possible
Print range	All data, screen-displayed range, or specified range
Print format	Not divided; divided by 2, 4, 8, or 16; 2, 4, 8, or 16 columns; XY1 screen, XY2 screen, or XY4 screen; gauge; channel comments can be set to print
Print preview	Possible
Waveform screen hard copy	Possible
● Other	
Tool function	Any executable file registered can be executed.

Chapter 2
Setup

2.1 Minimum System Configuration

The 9335 requires the following hardware and software:

Computer main unit
- OS: Windows XP, Vista, 7, 8 or 10
- Pentinum 233MHz or higher
- At least 64 MB of memory
- Minimum free hard disk space: 5 MB (used for installation)
- CD-ROM drive (used for installation)
- Display unit capable of displaying with a resolution of 1024 x 768 dots or higher (using small fonts)

NOTE To load data from the MEMORY HiCORDER into your computer, you must have FD and MO drives, and a PC card. To load waveforms, you must have sufficient free space on your hard disk for the waveform data.

2.2 Installation and Uninstallation

Installation

Install the 9335 software by following the procedure below:
1. Close all currently active applications.
2. Insert the CD-R included with your package into the PC's CD-ROM drive.
3. Run the SETUP file from the CD-R.
   For example, if your CD-ROM drive is drive R (if not, use the letter representing the CD-ROM drive on your computer), select "**Start"** - "**Run**" from the Windows menu, enter R:\9335ENG\setup.exe, then click <**OK**>.
4. This launches the 9335 installer. Follow the instructions displayed on screen.

(NOTE)
- When running another application, you may be unable to install the 9335 software. Close all applications that can be closed before installing the 9335 software. In particular, virus protection software may inhibit installation. In such cases, set up the virus protection software to permit installation.
- When upgrading versions, uninstall the old version of 9335 before installing the new version of 9335. After installation, confirm the version information on the "**Help**" menu.
- The 9335 software may not be registered on the Start menu, depending on your computer's operating environment. In such case, start "**Wpro.exe**" directly from the folder in which it was installed.

Uninstallation

To uninstall the 9335 software, follow the procedure described below:
1. Close all currently active applications.
2. Insert the CD-R included with your package into the PC's CD-ROM drive.
3. Run the SETUP file from the CD-R.
   For example, if your CD-ROM drive is drive R (if not, use the letter representing the CD-ROM drive on your computer), select "**Start**" - "**Run**" from the Windows menu, enter R:\9335ENG\setup.exe, then click <**OK**>.
4. This launches the 9335 uninstaller. Follow the instructions displayed on screen.

2.3 Starting and Quitting the Wave Processor

Starting the Wave Processor

Select "**Programs**" - "**HIOKI**" - "**9335 Wave Processor**" - "**9335 Wave Processor"** from the Windows Start menu.

Quitting the Wave Processor

Select "**File**" - "**Exit**" from the Wave Processor menu. Otherwise, click the **close** button at the upper-right corner of the main window.

Chapter 3
Waveform Window

3.1 Loading Waveform Files

The waveform window is displayed when you load any waveform file
("mem", "rec", "rms", "pow" or "xyc" file extension) recorded with the
MEMORY HiCORDER.

1. Select "**Open Waveform File**" from the "**File**" menu to display the "**Open
   File**" dialog box.
2. Select the desired file to load and click the "**Open**" button.

About waveform settings files
Closing the loaded waveform file (by clicking the **close** button at the upper-
right corner of the main window to close all windows) automatically creates
a settings file (".hps" file extension) under the same name as the loaded file
in the same folder containing the loaded file. Opening the waveform file will
now load the settings file automatically, with the saved settings reflected in
the loaded file, provided that a settings file with the same name exists in the
same folder. If you do not want to load these settings, manually delete the
settings file.

Halting waveform drawing
The system may require some time to redraw waveforms representing large
amounts of data. To abort waveform drawing, press the **Esc** key on the
keyboard. Click the "**Update**" button on the toolbar to redraw the waveform
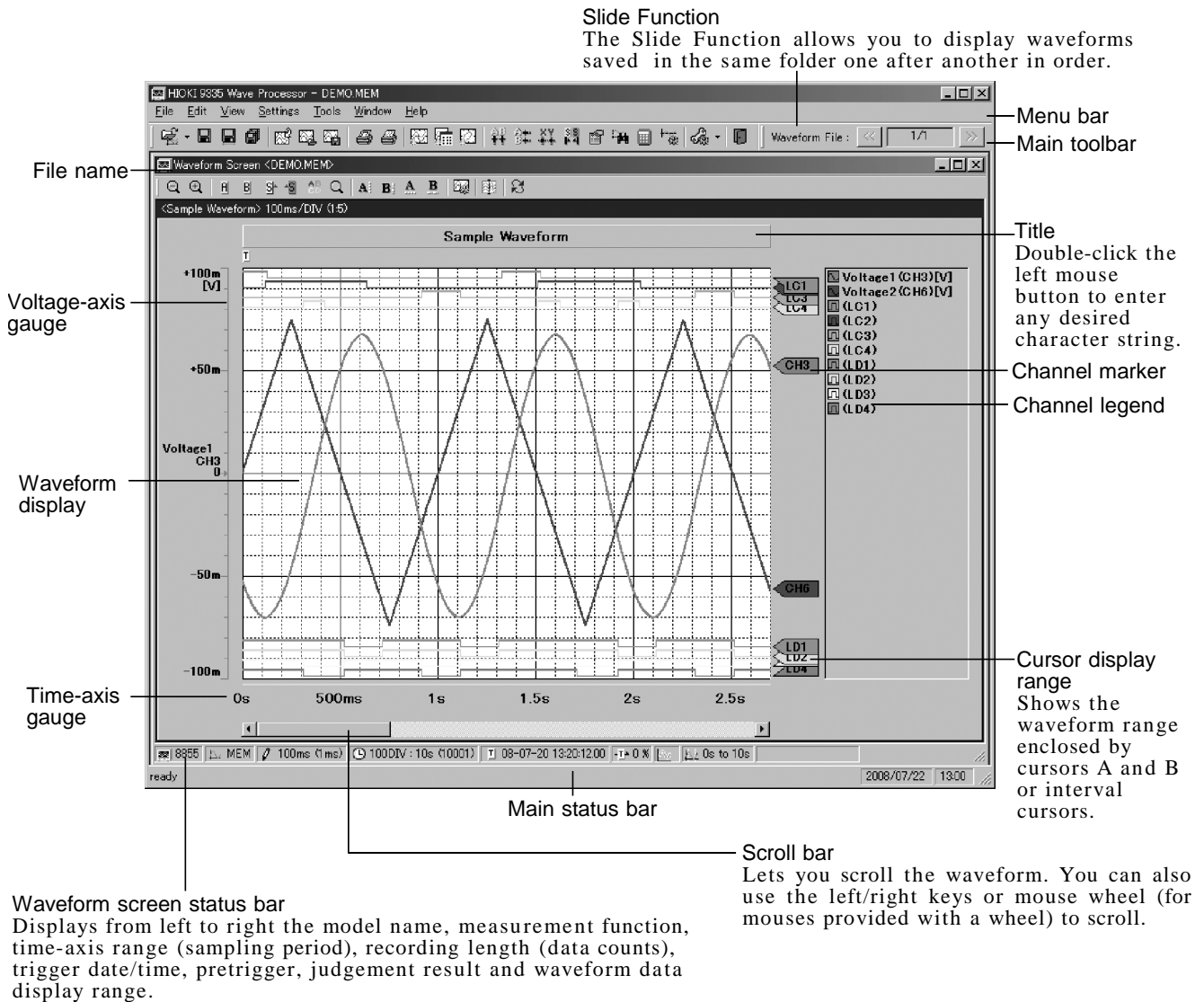window.

Loading large files
Very large waveform files may not be loadable by Windows due to limited
system resources. In such case, close all other active applications, then try
reloading. Depending on the specific configuration of your computer, you
may still be unable to load the waveform file.
With Windows 95, 98, and Me, OS limitations restrict loadable file sizes to
a maximum of 1 Gbyte.

3.2 Working in the Waveform Window

The waveform window is displayed when you load a waveform file.

Slide Function
The Slide Function allows you to display waveforms saved in the same folder one after another in order.

Menu bar

Main toolbar

File name

Title
Double-click the left mouse button to enter any desired character string.

Voltage-axis gauge

Channel marker

Channel legend

Waveform display

Cursor display range
Shows the waveform range enclosed by cursors A and B or interval cursors.

Time-axis gauge

Main status bar

Scroll bar
Lets you scroll the waveform. You can also use the left/right keys or mouse wheel (for mouses provided with a wheel) to scroll.

Waveform screen status bar
Displays from left to right the model name, measurement function, time-axis range (sampling period), recording length (data counts), trigger date/time, pretrigger, judgement result and waveform data display range.

* For time-axis representation, you can select "**DIV**" (see Section 3.2.4, paragraph 5). Data counts per division vary with the MEMORY HiCORDER model, so refer to the user's manual provided with your model.

3.2.1 Waveform Window Menu

The waveform window contains the following menus:

[**File**] ─── [Open Waveform File]: Loads a waveform file. (See 3.1.)

─── [Convert All]: Converts all waveform data into text. (See 4.1.)

─── [Convert Between Cursors]: Converts a specified section of data into text. (See 4.2.)

─── [Batch Conversion]: Converts multiple specified waveform files into text. (See 4.3.)

─── [Save Waveform File]: Saves a waveform file over the existing file. (See 3.1.)

─── [Screen Print] ─── [Print]: Prints a waveform screen. (See 6.1.1.)

─── [Preview]: Shows a preview of the printed waveform window. (See 6.1.2.)

─── [Page Settings]: Sets screen print. (See 6.1.3.)

─── [Waveform Detail Print] ─── [Print]: Prints waveforms in detail. (See 6.2.1.)

─── [Preview]: Shows a preview of the detailed print. (See 6.2.2.)

─── [Page Settings]: Sets detailed printing. (See 6.2.3.)

─── [Printer Settings]: Sets a printer.

─── [Exit]: Terminates Wave Processor.

[Edit] ─── [Capture Waveform Screen]: Copies the waveform window to the clipboard. (See 3.14.)

─── [Capture Settings] : Sets a screen hard copy. (See 3.14.1.)

[View] ─── [Waveform View]: Opens another instance of the waveform window.

─── [Logging View]: Displays waveform data numerically. (See 3.13.)

─── [XY View]: Displays waveform data on XY axes. (See Chapter 5.)

─── [Waveform Control]: Displays the Waveform Operations dialog box. (See 3.9.1.)

─── [Waveform Info]: Shows amp and other information for each channel. (See 3.6.)

─── [Time-Axis Cursor]: Displays the Time-Axis Cursor dialog box. (See 3.3.)

─── [Volt Cursor]: Displays the Voltage Cursor dialog box. (See 3.4.)

─── [Section Cursor]: Displays the Interval Specify Cursor dialog box. (See 3.5.)

─── [Search]: Displays the Search dialog box. (See 3.7.)

─── [Parameter Calculation]: Displays the Numerical Operation dialog box. (See 3.8.)

─── [Toolbar] ─── [Main Toolbar]: Show/hides the main toolbar.

─── [Wave Toolbar]: Show/hides the waveform window toolbar.

─── [Status Bar] ─── [Main Status Bar]: Show/hides the main status bar.

─── [Wave Status Bar]: Show/hides the waveform window status bar.

[Settings] ─── [Graph Settings]: Sets graphic waveform display. (See 3.2.5.)

─── [CH Settings]: Sets channel comments and scaling. (See 3.10.)

─── [Display Range Settings]: Sets a range of data to be displayed in the waveform window. (See 3.2.6.)

─── [Template]: Save or load a template file.

[Tools] ─── [Set Tools]

[Window] ─── [New Window]: Opens another instance of the same window as the currently active window.

─── [Cascade]: Displays all windows in overlapping format.

─── [Tile]: Displays all windows one below another.

─── [Arrange Icons]: Lines up the minimized windows.

─── [Close]: Closes the currently active window.

─── [Close All]: Closes all windows.

[Help] ─── [About 9335 Wave Processor]

3.2.2 Main Toolbar

This is the toolbar in the main window.
All functions of the main toolbar are available in menus.
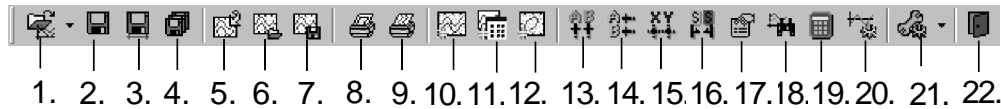
1. Open Waveform File
Loads a waveform file. Click the arrow to the right of this button to see a list of previously loaded files.
2. Convert All
Converts the entire range of waveform data into text.
3. Convert Between Cursors
Converts a specified section of data into text.
4. Batch Conversion
Converts multiple specified files into text.
5. Automatically Load a Template File
Load a waveform display condition template file automatically at loading a waveform file.
6. Load a Template File
Load a waveform display condition template file.
7. Save a Template File
Save a waveform display conditions to a template file.
8. Screen Print
Prints a waveform screen.
9. Waveform Detail Print
Prints a waveform in detail.
10. Waveform View
Opens another instance of the waveform window.
11. Logging View
Displays waveform data numerically.
12. XY View
Displays waveform data on XY axes.
13. Time-axis Cursor
Displays the "**Time-Axis Cursor**" dialog box.
14. Volt Cursor
Displays the "**Volt Cursor**" dialog box.
15. XY Cursor
Displays the "**XY Cursor**" dialog box.
16. Section Cursor
Displays the "**Section Cursor**" dialog box.
17. Waveform info
Shows amp and other information for each channel.
18. Search
Displays the "**Search**" dialog box.
19. Parameter Calculation
Displays the "**Parameter Calculation**" dialog box.
20. Waveform Control
Displays the "**Waveform Control**" dialog box.
21. Tools
Allows you to start other applications. (For more information, see 3.11, "Using Tools.")
22. Exit
Terminates Wave Processor.

3.2.3 Waveform Window Toolbar

This is the waveform window toolbar.

1. **Zoom Out / In**
   Magnifies/compresses the time axis of the waveform screen.

2. **Cursor A Operation Mode**
   Left-click (the left mouse button) anywhere in the waveform display area when this button is enabled to move cursor A to that position. Hold down the | Shift | key and left-click to move the voltage A cursor to that position.

3. **Cursor B Operation Mode**
   Left-click anywhere in the waveform display area when this button is enabled to move B to that position. Hold down the | Shift | key and left-click to reposition the voltage B cursor.

4. **Section Start Cursor Operation Mode**
   Left-click anywhere in the waveform display area when this button is enabled to reposition the interval start cursor.

5. **Section End Cursor Operation Mode**
   Left-click (the left mouse button) anywhere in the waveform display area when this button is enabled to reposition the interval end cursor.

6. **Comment Operation Mode**
   When this button is enabled, you can enter or edit comments. The comments do not track waveforms when scrolled.

   How to enter comments
   (1) Click the **comment input operation mode** button on the toolbar.
   (2) Drag the mouse in the waveform display area (by holding down the left mouse button and moving the mouse) to set the size of the comment input box. Enter a character string in the comment box.
   (3) After entering a comment, left-click outside the comment box to finish entering comments.
   (4) After entering comments, you can move the comment by dragging to another position.
   (5) To edit existing comments, point to the desired comment and double-click the left mouse button while the **comment input operation mode** button on the toolbar is enabled. Otherwise, right-click the desired comment to display a popup menu, then use the popup menu to change character colors and other display parameters.

7. **Waveform Zoom Operation Mode**
   Left-click anywhere in the waveform display area when this button is enabled to magnify the time axis, centering on that position. Otherwise, hold down the | Shift | key and left-click to compress the time axis.

8. **Display Cursor A**
   Shows or hides cursor A.

9. **Display Cursor B**
   Shows or hides cursor B.

10. **Display Volt Cursor A**
    Shows or hides voltage-axis cursor A.

11. Display Volt cursor B

Shows or hides voltage-axis cursor B.

12. Graph Settings

Sets a waveform graph. (See 3.2.5.)

13. Split

The waveform window can be split into as many as four sections. An approximate dividing line is shown in the window when you click the **split window** button, so left-click at the appropriate position. This is convenient when, for example, you want to observe the beginning and the ending parts of the same waveform at the same time. Click the **split window** button again to restore single-window display.

14. Update

Updates the waveform window.

3.2.4 Popup Menu

Right-click anywhere in the waveform window to display a popup menu.
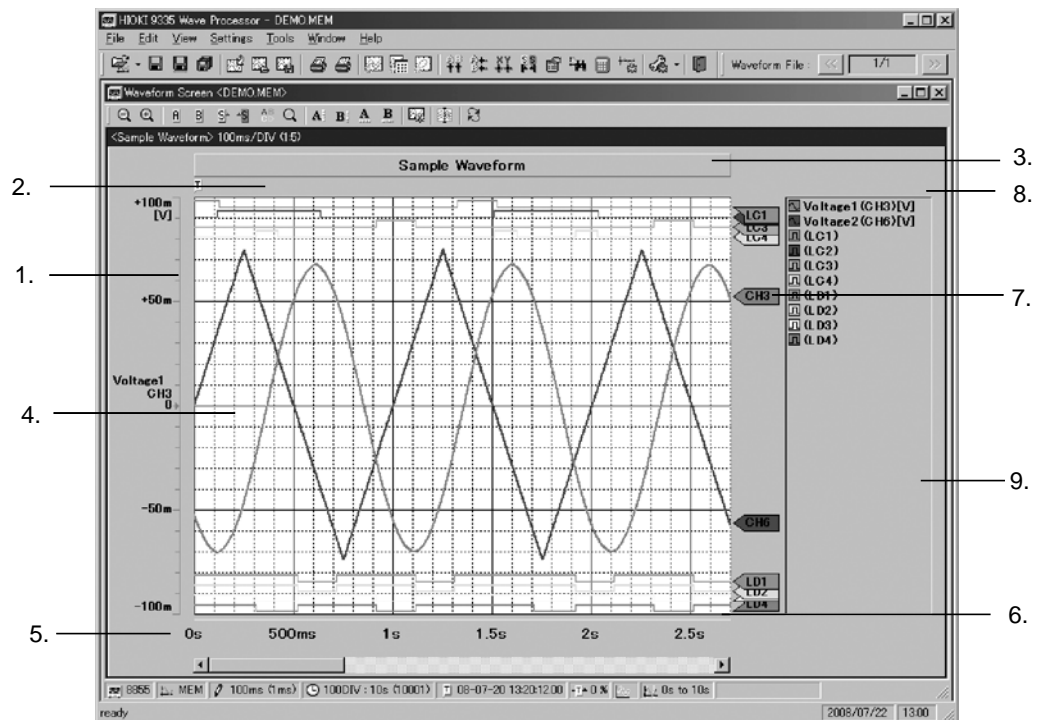
1. Gauge display

Gauge Type Select the display method for the gauge from the following:

None No gauges are displayed.

Upper/Lower For channels that have gauges turned on, the gauge for the channel with the smallest number is displayed. Voltage values are displayed only above and below the gauge.

Detail For channels that have gauges turned on, the gauge for the channel with the smallest number is displayed. Voltage values are displayed for every five divisions.

Multiple For channels that have gauge display turned on, gauges are displayed for as many channels as specified by gauge counts, beginning with the channel with the smallest number.

Show Zero Position Shows or hides zero position marker.

Gauge Counts For multiple gauge types, set the number of gauges you want to display.

Channel Changes the display of channel information.

Numeric Format Changes the display method for voltage values.

Resize Changes the size (width) of the gauge display area. The display area is enclosed in dotted lines. Drag the left and right-side squares (located near the center of the area) to resize as desired.

Text Color Set the colors of the numeric values of the gauge.

Font, Vertical Font Set the fonts for the characters displayed on the gauge.

2. Marker display

Cursor A to Search marker Set to show or hide each marker.

Jump Scrolls the waveform window to a specified position.

3. Title

Edit Edit the title character string.

Transparent Makes the background transparent.

Border Displays the border.

Text Color to border color 2 Changes the display color for each element.

Resize Changes the size (height) of the title display area. The display area is enclosed in dotted lines. Drag the square located near the center of the display area to resize as desired.

Font Changes the title font.

Property Sets the border color, style, etc.

4. Waveform display window

Zoom In, Zoom Out Magnifies or compresses the window along the time-axis. You can also select the time per division. Selecting All compresses the waveform to fit in the window.

Show Waveform Shows or hides analog, pulse and logic waveforms simultaneously.

Divide Graph Up to 16 graphs can be displayed.

Grid Shows or hides the horizontal line, horizontal auxiliary line, vertical line, and vertical auxiliary line.

Jump Scrolls the waveform to the trigger point, post trigger point, cursor A or B position, start or end position of an interval, or search position.

Color Sets waveform background color, grid line color, and auxiliary line color.

5. Time-axis display

Type Select the method of displaying the time axis from the following:

None Does not show time.

Upper/Lower Shows the time at both ends of the window.

Detail Shows the time at every 5 divisions.

Time Notation Sets the method of displaying time. Select from Date, Trigger Time, Second, Data Number, or Div.

Resize Changes the size (height) of the time-axis display area. The display area is enclosed in dotted lines. Drag the square located near the center of the display area to resize as desired.

Text Color, Font Change the character color and font.

6. Display cursor status

Show Cursor Status Shows or hides the cursor range.

AB Cursors Status Color, Section Cursor Status Color Set colors for each cursor status.

7. Channel marker

Type Sets the content to be displayed for the channel marker.

Analog CH Marker, Pulse CH Marker, Logic CH Marker Shows or hides the respective channel markers.

Resize Changes the size (width) of the channel marker display area. The display area is enclosed in dotted lines. Drag the square located near the center of the display area to resize as desired.

Text Color, Font Sets the character color and font used in the channel marker.

8. Waveform window periphery

Set Display Range (See 3.2.6.)

Zoom In, Zoom Out Magnifies or compresses the window along the time-axis.

Split Window The waveform window can be split into as many as four sections. Equivalent to Split Window on the waveform toolbar.

Refresh Redraws the waveform window.

Show Shows or hides each display area.

Template Save or load a template file.

Capture Produces a hard copy of the screen according to the settings set in Section 3.14.1, "Setting Hard Copy," which can then be pasted onto other applications.

Toolbar, Status bar   Shows or hides each bar.

9. Display waveform legend

Channel Changes the display of channel information.

Show Waveform Shows or hides analog, pulse and logic waveforms simultaneously.

Resize Changes the size (width) of the waveform legend display area. The display area is enclosed in dotted lines. Drag the left and right-side squares (located near the center of the display area) to resize as desired.

Text Color, Font Sets the character color and font of the waveform legend.

Hold down the ⎢ Shift ⎢ key while right-clicking any channel to display a menu described below.

Waveform Controll Displays the waveform operation window.

Show Waveform, Display Gauge Shows or hides waveforms or gauges. (Gauges can only be displayed for analog or pulse waveforms.)

Waveform Color Sets waveform colors.

Graph Selects a graph to display the waveform.

Line Width Selects the line width of waveforms. (Available for analog or pulse waveforms only)

Position Sets the logic waveform display position. (Available for logic waveforms only)

Top Draws the waveform of the selected channel on top of all other waveforms. (Available for analog waveforms only)

Hold down the ⎢ Ctrl ⎢ key while right-clicking any channel to set waveform color.

3.2.5 Setting Waveform Graphs

Set the display method for waveform graphs.

Click the "**Set Graph**" button on the waveform window toolbar or select "**Set Graph**" from the "**Settings**" menu to display the "**Waveform Graph Settings**" dialog box.
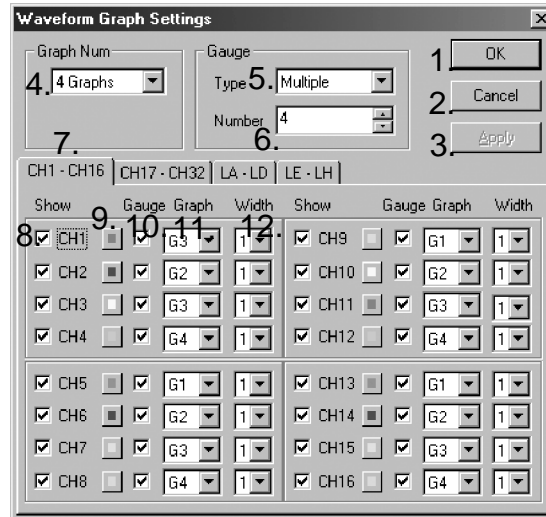
1. OK button
   The new settings are reflected in the graph. The dialog box is closed.
2. Cancel button
   The new settings are canceled (i.e., not reflected in the graph). The dialog box is closed.
3. Apply button
   The new settings are reflected in the graph, but the dialog box is not closed.
4. Select number of divided graphs
   The graph can be divided vertically into as many as 16 smaller windows.
   * Depending on the window size, not all graphs may be displayed.
5. Select gauge type
   Select the voltage-axis gauge from "**None**," "**Upper/Lower**," "**Detail**," or "**Multiple**."
   None   No gauges are displayed.
   Upper/Lower For channels that have gauge display turned on, the gauge for the channel with the smallest number is displayed. Voltage values are displayed only above and below the gauge.
   Detail For channels that have gauge display turned on, the gauge for the channel with the smallest number is displayed. Voltage values are displayed at every five divisions.
   Multi For channels that have gauge display turned on, gauges are displayed for as many channels as specified by gauge counts, beginning with the channel with the smallest number. Voltage values are displayed only above and below the gauge.
6. Gauge counts
   For multiple gauge types, set the number of gauges you want to display. For channels that have gauge display turned on, gauges are displayed for channels sequentially, beginning with the channel with the smallest number.
7. Channel select tab
   Select the channels you want to set.

8. Show/hide channel

   Select the check box for any channel to display the waveform for that channel.

9. Waveform color setting button

   Set the waveform color for each channel.

10. Show/hide voltage gauge

    Select the check box for any channel to display the voltage gauges for that channel. The number of gauges that can be displayed is limited by the gauge type and gauge count set.

11. Select display graph

    If the graph is divided, select a graph to use to display the waveform for each channel.

12. Select line width

    Select the line width of waveforms.

If you selected logic channels on the channel select tab, the dialog box includes the following set items:
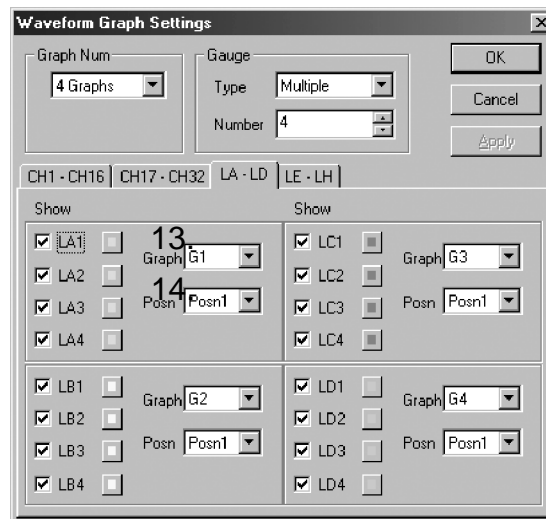

13. Select display graph

    If the graph is divided, select a graph you want to use to display the logic waveform for each logic unit.

14. Select display position

    Select the position at which to display the logic waveform for each logic unit. If the graph is not divided, the top is "**Posn1**" and the bottom is "**Posn8**." The number of positions that can be set varies with the number of divided graphs.

3.2.6 Setting Display Ranges

You can set a range of waveform data you want displayed in the waveform window. If you are loading waveform data for the first time, the entire range of data is displayed.

Select "**Change Display Range**" from the "**Settings**" menu to display the "**Set Waveform Display Range**" dialog box. Otherwise, double-click the "**waveform data display range**" area on the waveform window status bar to invoke the dialog box.

The dialog box initially displays a range of data enclosed by the interval-specifying cursor.
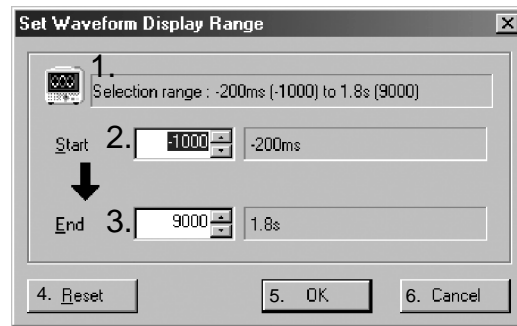
1. Display specifiable range
2. Set start point
   Set the first point of the waveform data you want to display. The relative time at that point (time from the trigger) is shown to the right.
3. Set end point
   Set the last point of the waveform data you want to display. The relative time at that point is shown to the right.
4. Reset button
   The start and end points are reset to the entire data range.
5. OK button
   The new settings are reflected in the graph. The dialog box is closed.
6. Cancel button
   The new settings are canceled (i.e., not reflected in the graph). The dialog box is closed.
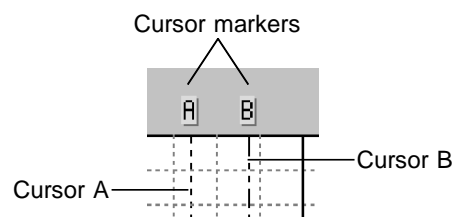
3.3 Time-Axis Cursors

The time-axis cursors let you read the voltage values at the cursor positions on each channel.

3.3.1 Manipulating Cursors

Click the "**Display cursor A**" or "**Display cursor B**" button on the waveform toolbar to display time-axis cursors on the screen.
To move a cursor, drag the cursor marker or cursor in waveform window (by holding down the left mouse button while dragging). Otherwise, click the "**Cursor A operation mode**" or "**Cursor B operation mode**" button on the waveform toolbar, then left-click at the desired position in the waveform window.

3.3.2 Displaying the Time-Axis Cursor Dialog Box

To read the time value at the cursor position and the voltage value on each channel, display the Time-Axis Cursor dialog box.
Click the "**Display time-axis cursor window**" button on the main toolbar to display the "**Time-Axis Cursor**"dialog box, or select "**Time-Axis Cursor**" from the "**Settings**" menu to display the dialog box. Drag the edge of the dialog box to resize.
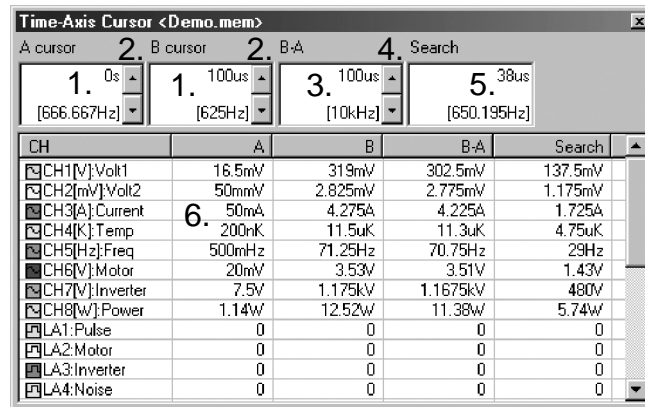
1. Time value display
   Shows the time value at the cursor position. Shown below is the frequency for the time from the beginning of waveform data.
2. Button for moving the cursor
3. Cursors A & B time difference display
   Shows the time difference between cursors A and B. Shown below is the frequency for the time difference.
4. Button for moving cursors A and B simultaneously
5. Search position display
   Shows the time value as search result. Shown below is the frequency from the beginning of waveform data to the search position. (Refer to Section 3.7, "Searching Waveform Data.")
6. Voltage value display
   Shows the voltage values at the positions of cursors A and B on each channel, and the difference in voltage values between both cursors. If search results are available, the voltage values at search positions are also displayed. Voltages on logic channels are indicated by binary values (1 or 0).

Popup menu
Right-click in the dialog box to display a popup menu.
Copy cursor position Copies the time values at the cursor positions to the clipboard (from where they can be pasted onto "**Notepad**" or other applications).
Copy selected channel Copies the voltage values on selected channels in the voltage value display area to the clipboard. Left-click to select a channel. Hold down the Ctrl or Shift key while left-clicking to select multiple channels.
Copy all Copies the time values at cursor positions and the voltage values for all channels to the clipboard.
Numeric display Sets the format in which to show voltage values. Select from "**Exponential**," "**Floating-point**," or "**Auxiliary unit**." Display of the unit of measure can be turned on or off.

Maximum value/minimum value, Mean value   May be selected when the type of waveform data is the recorder function (".rec" file extension), realtime function (".rec" file extension) (envelope on) or rms value function (".rms" file extension). The voltage values are shown as maximum and minimum values, or as a mean value.

Move to search position   Moves cursor A or B to the search position.

3.4 Voltage Cursors

The voltage cursors let you read the voltage values for specified channels.

3.4.1 Manipulating Cursors

Click the "**Display voltage cursor A**" or "**Display voltage cursor B**" button on the waveform toolbar to display voltage cursors on screen.

To move the cursor, drag the cursor marker or cursor in the waveform window (by holding down the left mouse button while dragging). Otherwise, click the "**Cursor A operation mode**" or "**Cursor B operation mode**" button on the waveform toolbar and hold down the ⬚Shift⬚ key as you left-click at an appropriate position in the waveform window to move the cursor.
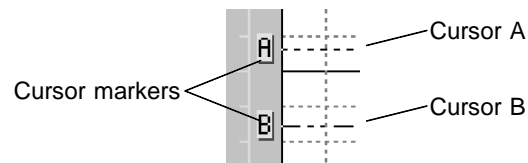
3.4.2 Displaying the Voltage Cursor Dialog Box

To read the voltage values at cursor positions, display the "**Volt Cursor**" dialog box. Click the "**Display voltage cursor window**" button on the main toolbar to display the dialog box, or select "**Volt Cursor**" from the "**View**" menu to display the dialog box.
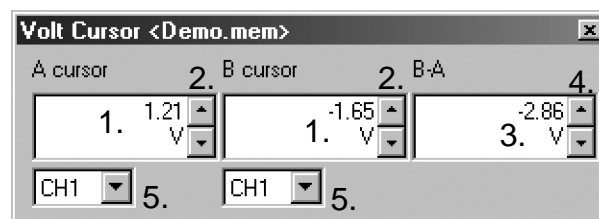
1. Time value display
   Shows the voltage values for specified channels.
2. Button for moving the cursor
3. Cursors A & B voltage difference display
   Shows the voltage difference between cursors A and B.
4. Button for moving cursors A and B simultaneously
5. Select channel
   Select the channel whose voltage you want to see.
   Popup menu
   Right-click in the dialog box to display a popup menu.

Copy cursor value Copies the voltage values at cursor positions to the clipboard (from where they can be pasted onto "**Notepad**" or other applications).

Exponential, Floating-point, Auxiliary unit Sets the format in which voltage values are displayed.

Show unit Turns the displayed unit of measure on or off.
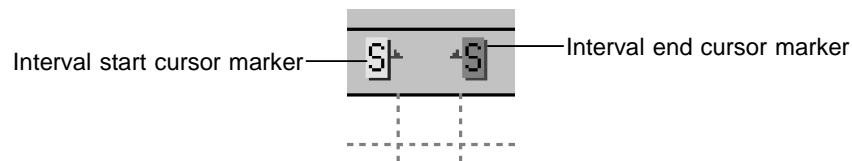
3.5 Interval-specifying Cursors

Use the interval-specifying cursors to specify an interval from the beginning to the end point of a waveform when performing text conversion, numerical operations, or searches.

3.5.1 Manipulating Cursors

Interval-specifying cursors are displayed by default. If such cursors are not displayed, right-click in the marker display area and select "**Section Cursor**" from the popup menu.

To move the cursor, drag the cursor marker (by holding down the left mouse button while dragging). Otherwise, click the "**Interval start cursor operation mode**" or "**Interval end cursor operation mode**" button on the waveform toolbar and click at an appropriate position in the waveform window to move the cursor.

Interval start cursor marker———————————————Interval end cursor marker

3.5.2 Displaying the Interval-specifying Cursor Dialog Box

Displaying the Interval-specifying Cursor dialog box lets you read the exact positions of the interval-specifying cursors. You can also finely adjust the cursor positions.

Click the "**Display interval-specifying cursor window**" button on the main toolbar to display the "**Section Cursor**" dialog box, or select "**Section Cursor**" from the "**View**" menu to display the dialog box.
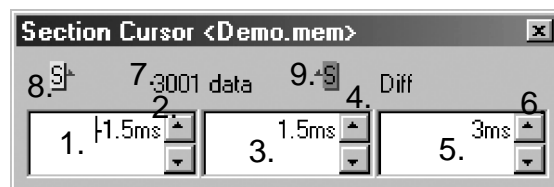
1. Interval start cursor position time value display
   Shows the time value at the interval start cursor position.
2. Button for moving the interval start cursor
3. Interval end cursor position time value display
   Shows the time value at the interval end cursor position.

4. Button for moving the interval end cursor

5. Interval-specifying cursors time difference display
   Shows the time difference between the interval-specifying cursors.

6. Button for moving the interval-specifying cursors simultaneously

7. Shows data counts within the interval. Use this value as an approximate amount of data when performing text conversion.

8. Interval start icon

9. Interval end icon

Popup menu

Right-click the interval start or interval end icon to display a popup menu. You can use this popup menu to move the interval start or interval end cursor to the position of cursor A or B, the beginning or ending position of an interval, or the trigger or post trigger position, or search position.

3.6 Waveform Information Dialog Box

The information dialog box shows settings information for each channel. Click the "**Display waveform information window**" button on the main toolbar to display the dialog box, or select "**Waveform Information**" from the "**View**" menu.

Popup menu

Right-click in the dialog box to display a popup menu.
Copy selected range Copies a selected range of information to the clipboard (from where the information can be pasted onto Notepad or other applications). Left-click to select a range. To select multiple ranges, hold down the | Ctrl | or | Shift | key while left-clicking.
Copy all Copies all information to the clipboard.

3.7 Searching Waveform Data

You can search for waveform data by date/time, maximum/minimum value, or voltage level. If you execute a search, the waveform window scrolls until the search position is reached, with a search marker shown at the top of the waveform window. The time value and voltage value at the search position are displayed in the "**Time-Axis Cursor**" dialog box.
Click the "**Display search window**" button on the main toolbar to display the Search dialog box, or select "**Search**" from the "**View**" menu.

3.7.1 Search by Date/time

Specify a date/time or a time from the trigger before you search.

1. Click the "**DATE/TIME**" tab of the Search dialog box to display the date/time search window.
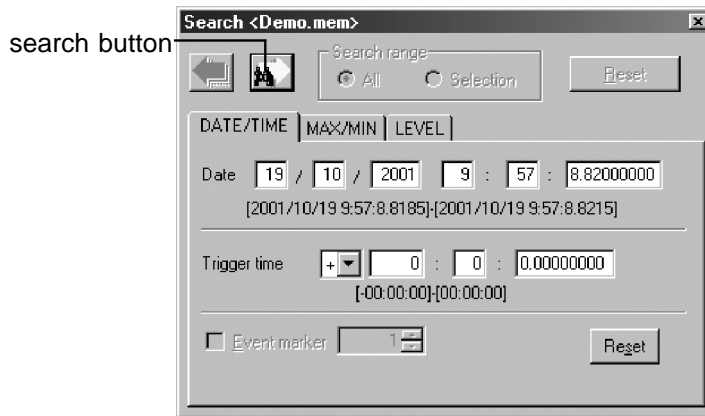
search button

2. Enter any date/time or time from the trigger. "**Date**" and "**Trigger time**" are interlocked.

3. Click the **search** button.

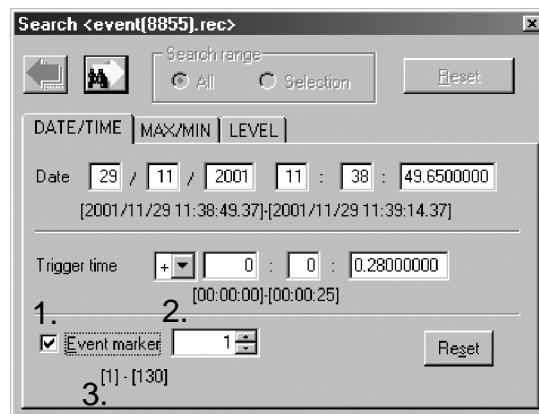4. Click the **Reset** button to set the date/time at the trigger position.

Searching for event marks

If the waveform data contains an event mark, you can search for the position of the event mark. The position of the specified event mark number is displayed for "**Date**" and "**Trigger time**" in the dialog box.

1. Event mark search check box
   Selecting this check box lets you search for an event mark.
2. Event mark number input
   Specify an event mark number. The position of the specified event mark number is displayed for "**Date**" and "**Trigger time**" in the dialog box. The event mark of the specified number in the waveform window is indicated by an asterisk.
3. Event mark range

3.7.2 Search by Maximum, Minimum, Maximal, or Minimal Value

You can search for maximum/minimum position or the maximal/minimal position (convex/concave) on a specified channel.

1. Click the "**MAX/MIN**" tab of the Search dialog box to display the maximum/minimum search window.

backward search button

Search <Demo.mem>

Search range
All   Selection   Reset

DATE/TIME | MAX/MIN | LEVEL

Method   CH   Filter[DIV]
Maximal Value   CH1   OFF
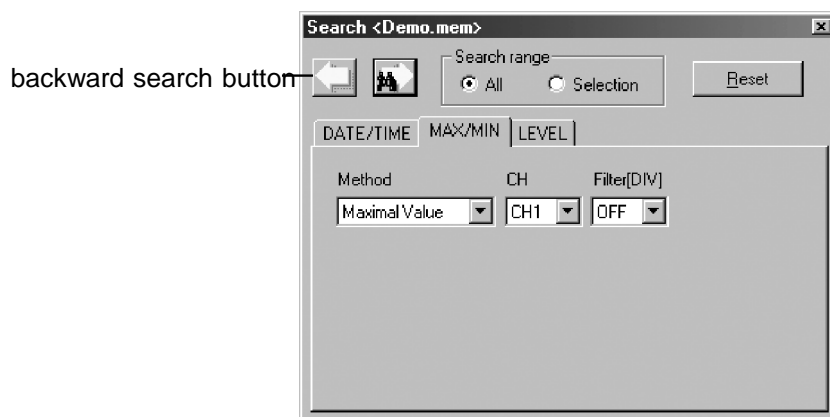
2. Set the range of search.
   ALL Entire range of the waveform data
   Selection Data in a section of waveform specified with interval-specifying cursors

3. Select the method and channel. For maximal/minimal value searches, you must also select a filter (in DIV units). The se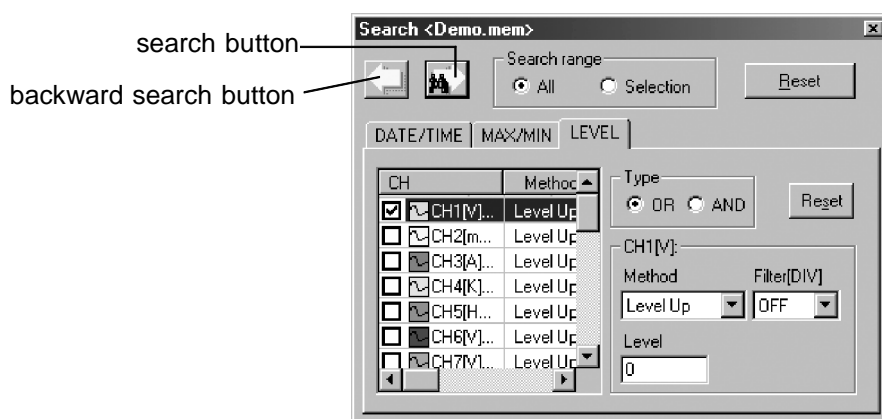arch uses moving-averaged data (moving-averaged over as many divisions as specified for the filter). This is useful when the waveform contains noise. If there are two or more maximum or minimum values, the first maximum or minimum position found by the search is used.

4. Click the **search** button to jump to the search position.

5. For maximal/minimal search, the system searches for the next point (to the right) from the current search position each time you click the **search** button. To repeat the search from the beginning of the waveform, click the **Reset** button.

6. Click the **backward search** button during maximal/minimal search to, search for the previous point (to the left) from the current search position.

3.7.3 Search by Level

You can search the position at which the waveform crosses a specified voltage level (level-up or level-down) or the position at which the waveform falls in or out of a specified voltage range.

1. Click the "**LEVEL**" tab of the Search dialog box to display the level search window.

search button

backward search button

Search <Demo.mem>

Search range
All   Selection   Reset

DATE/TIME | MAX/MIN | LEVEL

CH   Method
CH1[V]...   Level Up
CH2[m...   Level Up
CH3[A]...   Level Up
CH4[K]...   Level Up
CH5[H...   Level Up
CH6[V]...   Level Up
CH7[V1...   Level Up

Type
OR   AND   Reset

CH1[V]:
Method   Filter[DIV]
Level Up   OFF

Level
0

2. In the channel list, select the check box for the channel you want to search. Multiple channels can be selected.

3. Select a search condition. Note that search results differ when multiple channels are selected, depending on the search condition.
OR A point at which conditions are met for one of the selected channels
AND A point at which conditions are met for all of the selected channels

4. Set the search method for each selected channel. Left-click any desired channel in the channel list to display the settings for that channel to the right, allowing you to select the search method.
Level Up A point at which the waveform crosses the voltage specified for "**LEVEL**" in the upward direction
Level Down A point at which the waveform crosses the voltage specified by "**LEVEL**" in the downward direction
Window-in A point at which the waveform falls within the voltage range specified by the upper and lower-limit values
Window-out A point at which the waveform goes out of the voltage range specified by the upper and lower-limit values
If the selected channels are logic channels, specify a logic pattern.
High A point at which the data has the binary value of 1
Low A point at which the data has the binary value of 0
If you set a filter, no search is made unless the condition continues for as many divisions as set for the filter. This is useful when the waveform contains noise.
Click the **Reset** button to deselect the check boxes for all channels and to reset the search method to the initial setting.

5. Click the **search** button to jump to the search position.

6. Each time you click the **search** button, the system searches for the next point (to the right) from the current search position. To repeat the search from the beginning of the waveform, click the "**Reset**" button.

7. Click the **backward search** button to search for the previous point (to the left) from the current search position.

3.8 Numerical Operation

Various calculations can be performed.
Click the "**Parameter Calculation**" button on the main toolbar to display the "**Parameter Calculation**" dialog box, or select "**Parameter Calculation**" from the "**View**" menu. Drag the edge of the dialog box to resize.

Calculation execute button

Calculation setting button
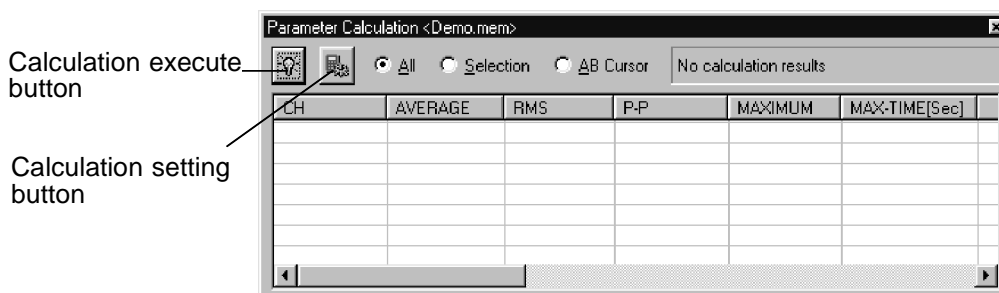
For the recorder function, realtime function (envelope on) or rms value function waveform data, calculations can be performed to find the "average value, rms (root mean square) value, peak-to-peak value, maximum value, time for maximum value, minimum value, time for minimum value, standard deviation, and time for level."

3.8.1 Setting Calculations

Set the calculation you want to perform and the channel on which you want the calculation to be performed. In standard settings, all kinds of calculations are performed on all channels.

1. Click the **calculation setting** button to invoke the "**Calculation Settings**" dialog box.
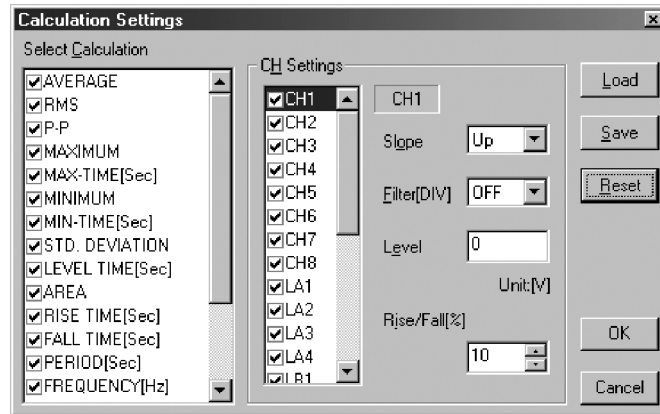
2. Select the check box for the calculation you want to perform.
   Each calculation item is detailed below.

(1) Average value

Calculates the average value (V) of the waveform data.

$$AVE = \frac{1}{n} \sum_{i=1}^{n} di$$

AVE   average value
n   number of data samples
di   i-th data of the source channel

(2) RMS value

Calculates the RMS (effective) value (V) of the waveform data. When scaling is used, the value is calculated after scaling.

$$RMS = \sqrt{\frac{1}{n} \sum_{i=1}^{n} di^2}$$

RMS   effective value
n   number of data samples
di   i-th data of the source channel

(3) Peak-to-peak value

Calculates the peak-to-peak (maximum-minimum) value of the waveform data.

(4) Maximum value

Calculates the maximum value of the waveform.

(5) Time for maximum value

- Calculates the time interval to the maximum value of the waveform (in seconds).

• If there are two maximum value points, the time to the first point is calculated.

(6) Minimum value

Calculates the minimum value of the waveform.

(7) Time to minimum value

• Calculates the time interval to the minimum value of the waveform (in seconds).

• If there are two minimum value points, the time to the first point is calculated.

(8) Standard deviation

Calculates the standard deviation (V) of the waveform data.

$$\sigma = \sqrt{\{\sum_{i=1}^{n}(di - AVE)^2/n\}}$$

σ   standard deviation
AVE   average value
n   number of data samples
di   i-th data of the source channel

(9) Time for level

This operation searches from the beginning of the calculation range for the point at which the waveform crosses the specified level, then finds the time from the trigger at that point.

(10) Area value

Calculates the area bordered by the signal waveform and the zero position (potential 0 V).

$$S = \sum_{i=1}^{n} |di| \cdot h$$

S   Area value
n   number of data samples
di   i-th data of the source channel
$h = \Delta t$ sampling period

Shaded area is calculated

Cursor A   Cursor B
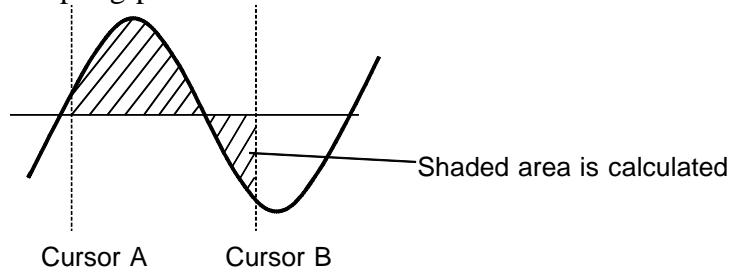
(11) Rise time
(12) Fall time

• From the captured waveform data, the 0% and 100% level is determined, and the rise time (s) is taken as the time required to go from 10% to 90% (fall time: from 90% to 10%).

• In the captured waveform data, the first rising slope (or falling slope) is used to make the calculation.

• When range cursors are used, the time calculated here is for the first occurrence of a rising slope (falling slope) in the waveform interval enclosed by the cursors.
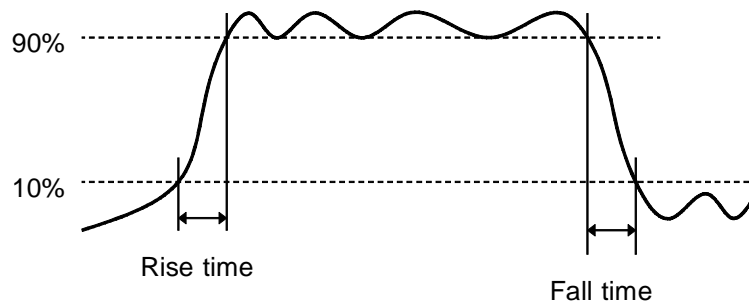
It is possible to set values of the rise time (10% to 90%) and of the fall time to (90% to 10%).

(13) Period

(14) Frequency

• Displays the period (s) and frequency (Hz) of the signal waveform.

• The calculation is performed by determining the middle point of the signal amplitude and then measuring the interval from the point when that level is crossed (in rising or falling direction) to the point when it is next crossed.

(15) Pulse width

Calculates the time difference between the point where the rising or falling waveform intersects the set level and the intersection of the next opposite slope.

(16) Duty Ratio

The ratio is calculated according to the time difference between the point where the rising waveform intersects the set level and the intersection of the next opposite slope. It can also be calculated according to the time difference between the point where the falling waveform intersects the set level and the intersection of the next opposite slope.

$$\text{Duty Ratio} \quad \frac{\text{Tu-d}}{\text{Tu-d} + \text{Td-u}} \times 100 \ (\%)$$

Tu-d: Time from rise to fall (s)

Td-u: Time from fall to rise (s)

(17) ON counts

This operation counts the number of times the signal has crossed the set level upward or downward.

(18) ON time, OFF time

This operation finds the time for which the signal remains above the set level (ON time) and the time for which it remains below the set level (OFF time).

3. Select the check box for a channel to be calculated.

4. Set each channel. Left-click any desired channel in the channel list to display settings for that channel to the right.
Slope This parameter is used when calculating time for level, period, frequency, pulse width, and duty cycle.
Filter, Level These parameters are used when calculating time for level, period, frequency, pulse width, duty cycle, ON counts, ON time, and OFF time. Calculations are performed with respect to the specified level. The signal is not assumed to have crossed the level until it remains above or below the level as long as set for Filter.

Rise/fall This parameter is used when calculating the rise time and fall time. If you set 20% here, the rise time is defined as a 20% to 80% rise time: the fall time is defined as a 80% to 20% fall time.

5. Click "**OK**" to reflect the new settings.

6. Click the "**Save**" button to save calculation settings. Enter a name for the calculation settings, then click "**OK**."
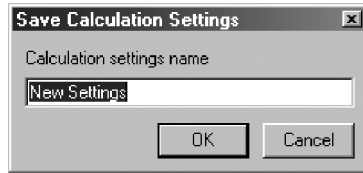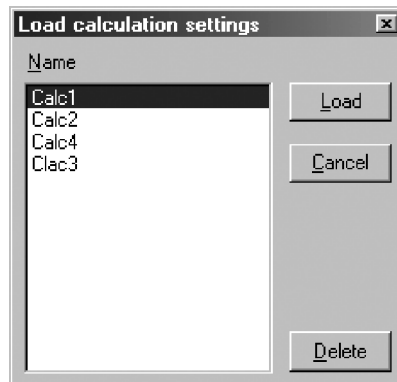

7. Click the **Load** button to load previously saved calculation settings. Select the settings name you want to load, then click "**Load**." Click "**Delete**" to delete the selected settings.

3.8.2 Executing Calculations

Execute numerical operations on a selected range of waveform data as follows:

1. Set a range of waveform data in which you want to perform calculations.
ALL Entire range of waveform data
Selection Data in a section of waveform specified with interval-specifying cursors
AB Cursor Data in a section of waveform specified with AB cursors.

2. Click the **calculation execute** button.

Calculation execute button

Calculation setting button

3. Right-click in the calculation dialog box to display a popup menu.
Copy selected range Copies the calculation results for a selected range of waveform to the clipboard (from where they can be pasted onto "**Notepad**" or other applications). Left-click to select a range. To select multiple ranges, hold down the Ctrl or Shift key while left-clicking.

Copy all Copies all calculation results to the clipboard.
Floating-point display Shows the calculation results in floating-point format.
Exponential display Shows the calculation results in exponential format.

3.9 Manipulating the Waveform on Each Channel

This section explains how to manipulate the waveform in each section. Click the "**Display waveform operation window**" button on the main toolbar to display a waveform operation dialog box, or select "**Waveform Control**" from the "**View**" menu to display the dialog box.
Drag the edge of the dialog box to resize.

3.9.1 Waveform Operations

You can magnify or compress the waveform on each channel and move the zero position of the waveform. The zero position is defined to be 0% at the bottom of the graph, 100% at the top of the graph, and 50% at the center of the graph.
Left-click the desired channel to display the channel settings on the right.

1. Changing the magnifying factor and zero position
You can select the option "**Zoom/Position**" to set a magnifying factor and zero position. This also displays the upper and lower-limit values of the graph.
Change magnifying factor Select from the magnifying factor select box.
Move position Enter a value in the zero position input box, then press the ⎡Enter⎤ key. You can also use the up/down buttons or slider to enter a value. The colored range of the slider represents the upper and lower limits in the window (0% to 100%).
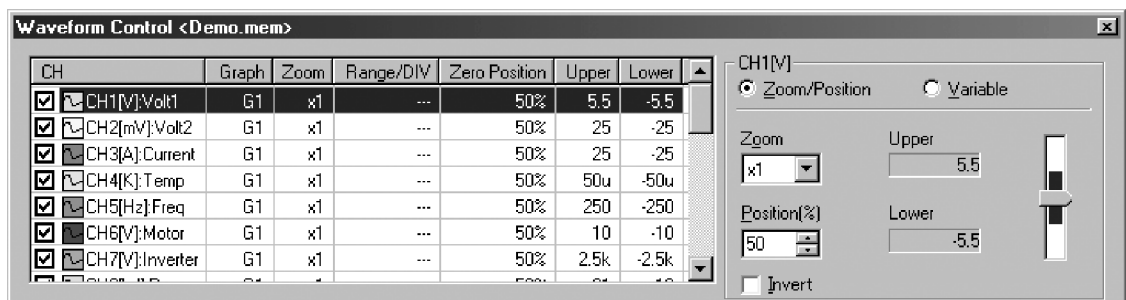
2. Setting the upper and lower-limit values of the waveform window
When the option "**Variable**" is selected, you can set the lower-limit voltage values of the waveform window. Clicking the **Reset** button sets the magnifying factor and the zero position to x1 and 50%, respectively.
Upper-limit/Lower-limit values Enter a voltage in the upper-limit value or lower-limit value input box, then press the ⎡Enter⎤ key. The zero position and unit/DIV are immediately changed.
Display range/DIV, Zero position Enter a voltage in the "**Range/DIV**" input box, then press the Enter key. Enter the zero position as a percentage in the "**Position**" input box, then press the ⎡Enter⎤ key. The upper-limit and lower-limit values change immediately.

3.9.2 Setting Others

Change waveform color

Show/hide waveform

Invert waveform
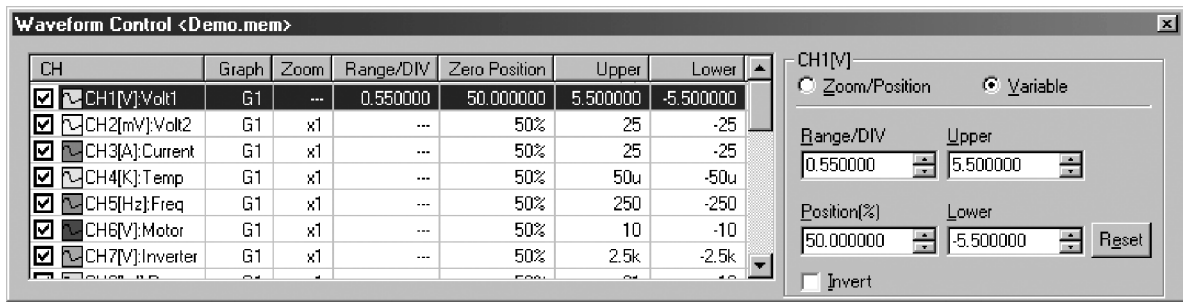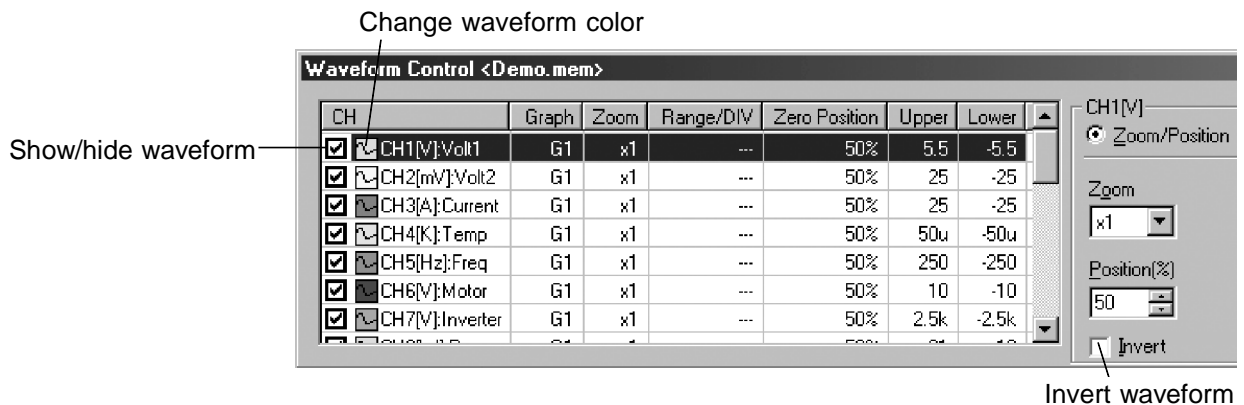
1. Show/hiding waveforms
   You can choose to show or hide the waveform for any channel by selecting the check box for that channel in the channel list.

2. Changing waveform colors
   You can change the waveform color for any channel by clicking the icon for that channel in the channel list.

3. Drawing a waveform on top (analog waveforms only)
   Point to any channel in the channel list and double-click the left mouse button. The selected waveform is displayed on top of all other waveforms in the waveform window. This facility should prove helpful when multiple waveforms overlap and you have difficulty viewing a particular waveform.

4. Copying channel setting
   The same settings (magnifying factor, zero position, and variable) for a channel are easily copied and set for other channels.
   Specify source to copy Select the channel from which you want to copy and click the right mouse button. Select "**Copy CH Settings**" from the ensuing popup menu.
   Reflect settings in other channels Select the channel to which you want settings to be copied and click the right mouse button. Select "**Paste CH Settings**" from the popup menu.

5. Invert waveform (analog waveforms only)
   Select the check box to invert the plus and minus sides of the waveform.

3.10 Setting Scaling and Channel Comments

This section explains how to set scaling and comments for each channel. Select "**CH Settings**" from the "**Settings**" menu to display a "**Channel Settings**" dialog box. Use the channel select tab in this dialog box to select the channel for which you want to enter settings. After setting scaling and comments for that channel, click the **OK** or **Apply** button to reflect your settings.

* The scaling and channel comments are reflected in the waveform, logging, and XY synthesis windows currently open for the same waveform file.

3.10.1 Setting Scaling

The scaling function lets you convert voltages into a physical quantity to be measured. The gauge divisions and cursor readouts display scaled values.

1. Set by conversion ratio
   Set the physical quantity per V (EU/V), an offset, and a unit name so that voltage values are converted into the corresponding value in units you have set. After selecting "**Ratio**" for the scaling method, enter your desired conversion ratio, offset, and unit name.

2. Set by two points
   Set the voltage values at two points and set the conversion values and unit names for the respective points before performing conversion. After selecting "**Point**" for the scaling method, enter the pre-conversion voltage values at two points and the post-conversion values and unit names for the respective points.

3.10.2 Setting Channel Comments

Channel comments set with the MEMORY HiCORDER can be edited.
Comments are displayed in the waveform window, detail print, and various
settings windows. Enter a character string in the "**Comment**" input box
provided for each channel.

3.11 Using Tools

Any application can be registered to the **tool** button, and once registered can
be launched simply by clicking the button.

3.11.1 Registering Applications

You can register up to five applications to the **tool** button.
Select "**Set Tools**" from the "**Tools**" menu, and the "**Set Tools**" dialog box is
displayed. Or click the arrow to the right of the **tool** button on the toolbar
and select "**Set Tools**" from the resulting menu.
After setting up the tool, click **OK**.
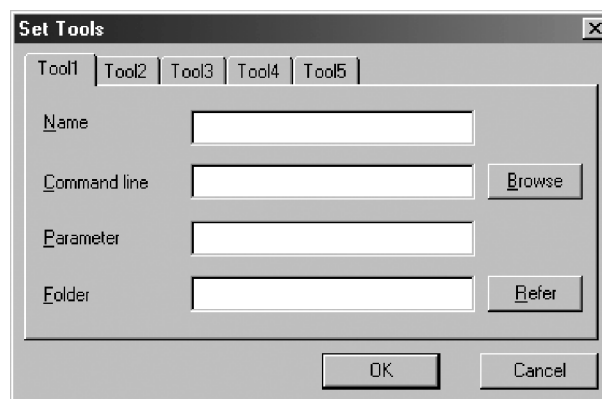
1. Name

   Enter the name of the application.
2. Command line

   Enter the execution file of the application.
3. Parameter

   Enter the parameter or file name which is to follow the execution command.
4. Folder

   Enter the runtime directory of the application.

3.11.2 Executing the Tool

Before you can execute the tool, you must have at least one application
registered to it.
Select the "**Tools**" menu or click the arrow to the right of the **tool** button on
the toolbar. The registered applications are listed on the menu. Select an
application, or click the **tool** button to invoke the previously used
application.

3.12 Saving Waveform Data over Existing Data

Title comments, channel comments, and scaling can be saved over the existing data.
Select "**Save Waveform File**" from the "**File**" menu to save these settings over the existing file.

* Because the previous settings are deleted when saved over the existing file, be sure to produce a backup of the file beforehand.

3.13 Numeric Display of Waveform Data

The loaded waveform data can be displayed numerically. The data for analog channels are represented by voltage values (if scaling is turned on, by scaled voltage values), the data for pulse channels are represented by integration or revolution values (if scaling is turned on, by scaled values), while the data for logic channels is represented by binary 0 and 1.
Select "**Logging Window**" from the "**View**" menu, or click the "**Display logging window**" button on the toolbar. A logging window is displayed.
Multiple logging windows can be displayed by repeating this procedure.

Logging Screen <Demo.mem:2>						
Date	CH1[V]:Volt1	CH2[mV]:Volt2	CH3[A]:Current	CH4[K]:Temp	CH5[Hz]:Freq	CH6[V]:Motor
S 10/19/2001 9:57:8.8185	-60.5m	-475m	-550m	-1.55u	-8.5	-410m
10/19/2001 9:57:8.818501	-66m	-500m	-600m	-1.7u	-9.25	-440m
10/19/2001 9:57:8.818502	-66m	-525m	-650m	-1.8u	-10	-480m
10/19/2001 9:57:8.818503	-71.5m	-550m	-700m	-1.95u	-10.75	-510m
10/19/2001 9:57:8.818504	-71.5m	-575m	-750m	-2.05u	-11.75	-550m
10/19/2001 9:57:8.818505	-77m	-625m	-800m	-2.15u	-12.25	-590m
10/19/2001 9:57:8.818506	-77m	-625m	-850m	-2.3u	-13.25	-630m
10/19/2001 9:57:8.818507	-88m	-675m	-875m	-2.45u	-13.75	-670m
10/19/2001 9:57:8.818508	-88m	-700m	-925m	-2.45u	-14.75	-710m
10/19/2001 9:57:8.818509	-93.5m	-725m	-975m	-2.6u	-15.25	-740m
A 10/19/2001 9:57:8.81851	-93.5m	-750m	-1	-2.75u	-16	-780m
10/19/2001 9:57:8.818511	-93.5m	-800m	-1.05	-2.85u	-16.5	-810m
10/19/2001 9:57:8.818512	-99m	-825m	-1.125	-3u	-17.5	-850m
10/19/2001 9:57:8.818513	-104.5m	-850m	-1.175	-3.1u	-18.25	-890m
10/19/2001 9:57:8.818514	-104.5m	-900m	-1.175	-3.25u	-19	-920m
10/19/2001 9:57:8.818515	-104.5m	-900m	-1.25	-3.35u	-19.75	-960m
10/19/2001 9:57:8.818516	-110m	-925m	-1.275	-3.45u	-20.25	-1
10/19/2001 9:57:8.818517	-115.5m	-950m	-1.3	-3.6u	-21.25	-1.03
10/19/2001 9:57:8.818518	-115.5m	-1	-1.375	-3.7u	-22	-1.08
10/19/2001 9:57:8.818519	-121m	-1.025	-1.4	-3.85u	-22.75	-1.11
B 10/19/2001 9:57:8.81852	-126.5m	-1.05	-1.45	-3.9u	-23.5	-1.15
10/19/2001 9:57:8.818521	-132m	-1.1	-1.475	-4.05u	-24.25	-1.18
10/19/2001 9:57:8.818522	-132m	-1.1	-1.55	-4.2u	-25	-1.21
10/19/2001 9:57:8.818523	-126.5m	-1.15	-1.6	-4.3u	-25.5	-1.25
10/19/2001 9:57:8.818524	-132m	-1.2	-1.625	-4.4u	-26.5	-1.3
10/19/2001 9:57:8.818525	-143m	-1.225	-1.675	-4.55u	-27.25	-1.33
10/19/2001 9:57:8.818526	-143m	-1.225	-1.7	-4.7u	-28	-1.36
10/19/2001 9:57:8.818527	-148.5m	-1.25	-1.75	-4.8u	-28.75	-1.4

8855 | MEM | 100us (1us) | 30DIV : 3ms(3001) | 01-10-19 09:57:08.82 | T 50 % | Waveform Screen <Demo.mem:1>

Logging window status bar

Title of the reference waveform window

If a logging window is displayed while the waveform window is active, the logging window will contain the active waveform window cursors. The logging window status bar shows the title name of the waveform window being referenced. If a display range was set for the waveform window, that range of waveform is logging-displayed. (See 3.2.6.)

For recorder function, realtime function (envelope on) or rms value function waveform data, the logging window has tabs labeled "**MAX/MIN**" and "**Average**" at the bottom of the window. If you select the "**MAX/MIN**" tab, both the maximum and minimum values are displayed. If you select "**Average**," the average of the maximum and minimum values is displayed.

* Logging display may not be produced, depending on the operating environment of your computer. In this case, narrow the display range of the waveform window before reattempting logging display. (See 3.2.6.)

3.13.1 Logging Window Menus

[File] ─────── [Open Waveform File]
 ├── [Convert All]
 ├── [Convert Between Cursors]   } Equivalent to functions on the waveform window menu
 ├── [Batch Conversion]
 ├── [Save Waveform File]
 ├── [Logging Print] (See 6.3)
 ├── [Logging Print Preview] (See 6.3)
 ├── [Logging Print Settings] (See 6.3)
 ├── [Printer Settings]   } Equivalent to functions on the waveform window menu
 └── [Exit]
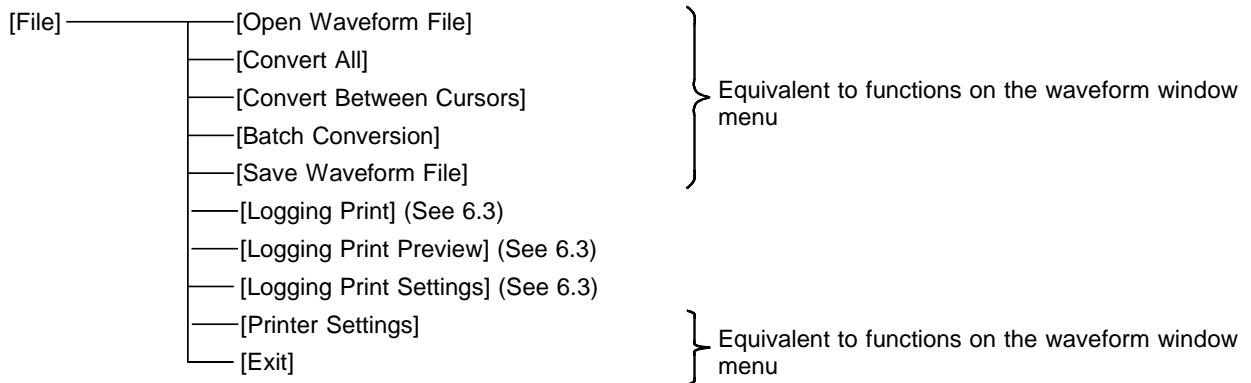
[Edit] ─────────── [Copy] : Copies a selected range of numeric values to the clipboard. (See 3.13.3.)

[View] ─────── [Waveform View]
 ├── [Logging View]
 ├── [XY View]
 ├── [Waveform Info]
 ├── [Toolbar] ──────── [Main Toolbar]
 │   └── [Logging Toolbar]
 └── [Status Bar] ─────── [Main Status Bar]
                        └── [Logging Status Bar]

[Settings] ─────── [CH Settings]

[Tools] ─────────── [Set Tools]

[Window] ─────── [New Window]
 ├── [Cascades]
 ├── [Tile]
 ├── [Arrange Icons]
 ├── [Close]
 └── [Close All]

[Help] ─────────── [About 9335 Wave Processor]

Equivalent to functions on the waveform window menus
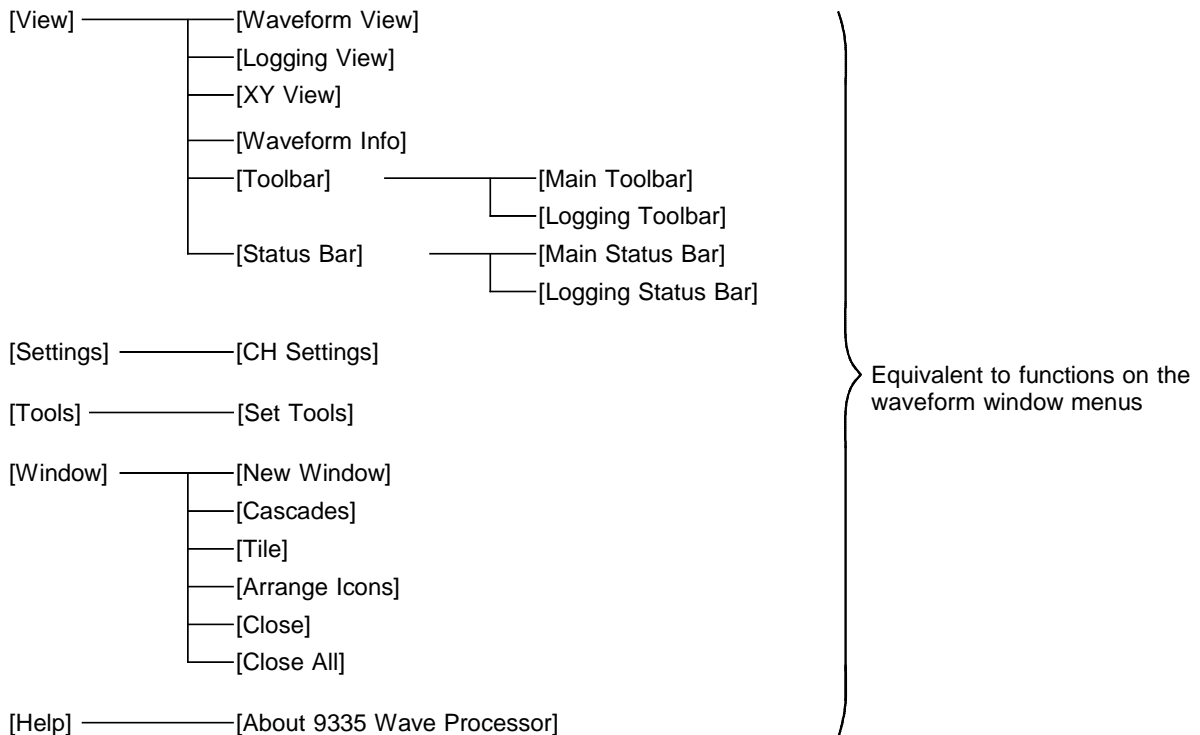
3.13.2 Logging Window Toolbar

1.   2.   3.

1. Channel display setting button
   Selects the channel to be displayed. Click this button to display the dialog box, select the check box for the channel you want to display, and click **OK**.

2. Thin out
   Sets a time interval at which intervals the numeric values are displayed.
3. Cursor search
   If any referenced waveform window is referenced, you can quickly scroll through the numeric display window until you reach the cursor A or B positions, the interval cursor, or the search position. Click the button for the marker for which you want to search.

3.13.3 Other Operations

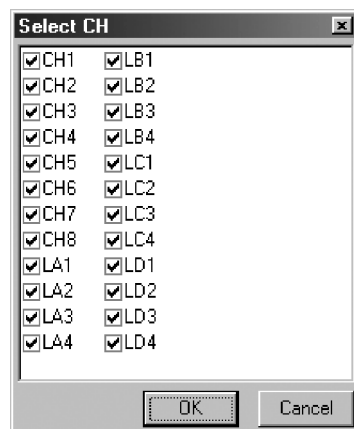Right-click in the logging window to display a popup menu.
Copy Copies a selected range of data in the logging window to the clipboard, from where it can be pasted into "**Notepad**" or other applications. To select multiple lines, hold down the Ctrl or Shift key while left-clicking.
Show Waveform Shows or hides analog, pulse and logic waveforms simultaneously.
Time Notation Changes the display method for the time shown at the leftmost position of the window. Select from "**Date**", "**Trigger Time**", "**Second**", or "**Data Number**."
Logging Sets a time interval at which intervals the numeric values are displayed.
Numeric Format Changes the display method for voltage values. Select from "**Exponential**," "**Floating-point**," or "**Auxiliary unit**."
Move Cursor When a reference waveform window is specified, you can move cursors to any position in the specified waveform window. Cursor A, cursor B, section start cursor, or section end cursor can be moved to a selected position in the numeric display window.

3.14 Waveform Window Hard Copy

When waveform windows are saved to a file or copied to the clipboard, you can paste waveform images into a word processor or other applications.

3.14.1 Setting Hard Copy

Set the method for producing a screen hard copy. If you select "**Capture Settings**" from the "**Edit**" menu, the "**Capture Settings**" dialog box is displayed.
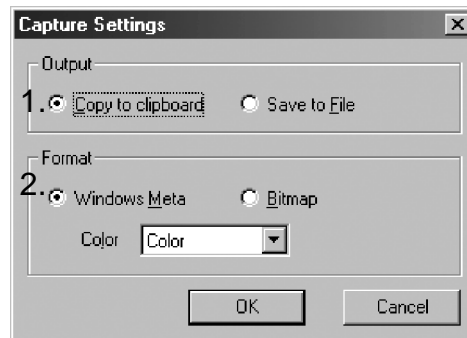
1. Set output destination

   Transfer to clipboard Copies waveform images to the clipboard.
   Save to file Saves waveform images to a file (always in extended meta format).

2. Output format

   Extended meta format With this format, even if you resize the image pasted into another application, the image will not change shape significantly. If you select this format, be sure to set an output color at the same time.
   Bitmap format Images are copied in bitmap format.

3.14.2 Executing Hard Copy

Select "**Capture Waveform Screen**" from the "**Edit**" menu to execute hard copy. If you selected "**Save to file**" for the output destination, the destination setting dialog box is displayed. Enter a file name and click "**Save**."

Chapter 4
Text Conversion

Once waveform data is converted into text, you can use it in spreadsheet software such as Excel.

* Converting waveform data into text produces a file that is significantly larger than the original file size. Make sure that the hard disk has sufficient space.

4.1 Converting All

The whole of the currently displayed waveform data is converted into text. Select "**Convert All**" from the "**File**" menu or click the **convert all** button on the toolbar to display the "**Convert All**" dialog box. Click **Save** after entering required data into the dialog box.
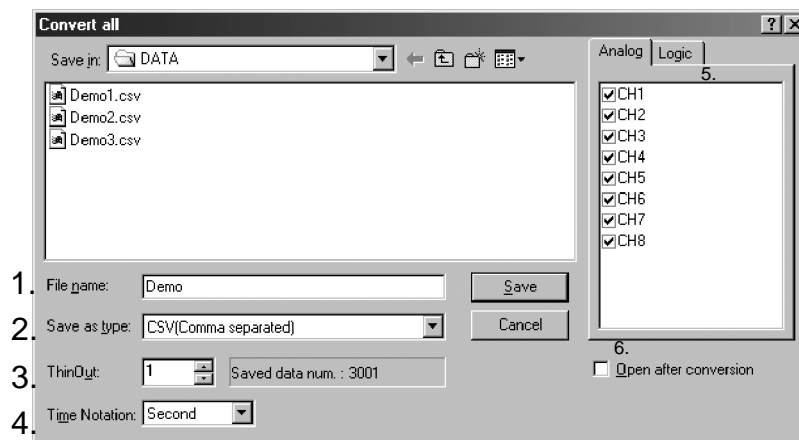
1. Post-conversion file name
2. File format in which to save
   Select from **CSV (comma separated)**, **text (space separated)**, or **text (tab separated)**. CSV format files can be loaded in Excel.
3. Interleaved data counts
   Set the number of interleaved data.
4. Time-axis format
   Select from **Second**, **Date**, **Trigger time**, or **Point**.
5. Select the channels to convert
   Select the channels you want to convert. The greater the number of channels converted, the larger the resulting file size.
6. Open after conversion
   Leave this check box checked to have the resulting file opened in the application associated with it following text conversion.

4.2 Converting Partially

A section of the currently displayed waveform which is enclosed by section-specifying cursors is converted into text.

Select "**Convert Between Cursors**" from the "**File**" menu or click the **Convert Between Cursors** button on the toolbar to display the convert partially dialog box. Fill out this dialog box in the same way as for converting the entire waveform, then click Save.

If you specify "**Binary**" for file type, you can save a section of waveform data enclosed by section-specifying cursors instead of converting the waveform data into text.

By selecting and saving only a necessary part from a large waveform data file, you can significantly reduce display time and processing time when later analyzing that part of the waveform.

4.3 Converting Collectively

Multiple files can be converted into text collectively.

Select "**Batch conversion**" from the "**File**" menu or click the **convert collectively** button on the toolbar to display the "**Batch conversion**" dialog box. After filling out this dialog box, click **Convert...** button.

* The settings for each waveform file (files with the extension ".hps" (see 3.1)) are not loaded.
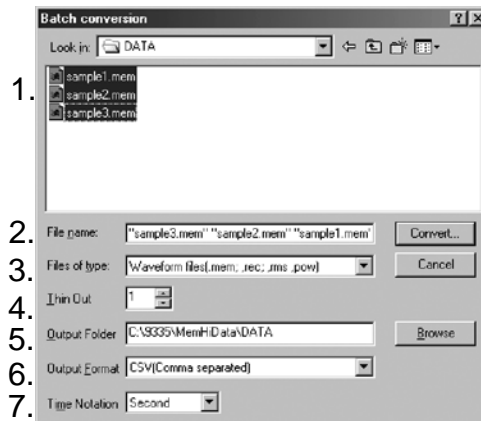
1. File list

   Select the source file you want to convert. Hold down the ⌈Ctrl⌉ or ⌈Shift⌉ key while left-clicking to select multiple files.

2. File name

   The selected files are displayed.

3. File type

   The file format of the files is displayed in the file list.

4. Interleaving counts

5. Output destination folder

   Converted files are stored in this folder. The file names in this folder are inherited from the source files.

6. Save format

   Select from **CSV (comma separated)**, **text (space separated)**, or **text (tab separated)**. CSV format files can be loaded into Excel.

7. Time-axis format

   Select from **Second**, **Date**, **Trigger time**, or **Point**.

Chapter 5
X-Y Synthesis Window

The waveform data can be X-Y synthesized before being displayed on the screen. Up to 16 waveforms can be X-Y synthesized by assigning analog or pulse channels to the X and Y axes. "MEM", "REC" (envelope off), "POW" or "XYC" waveforms can be X-Y synthesized.

* Numerical operations cannot be performed in the X-Y synthesis window.

* Support provided only for searches by date/time. For more information on the search method, refer to 3.7.1. Note also that trace cursor A is displayed at the search position.

5.1 Displaying the X-Y Synthesis Window

1. Load waveform data to display a waveform window beforehand. Using section cursors, set a range of waveform you want to be X-Y synthesized.

2. Click the **X-Y synthesize** button on the waveform toolbar, or select "**XY View**" from the "**View**" menu. The range of waveform enclosed by interval cursors is X-Y synthesized. Display multiple instances of the X-Y synthesis by repeating this procedure.
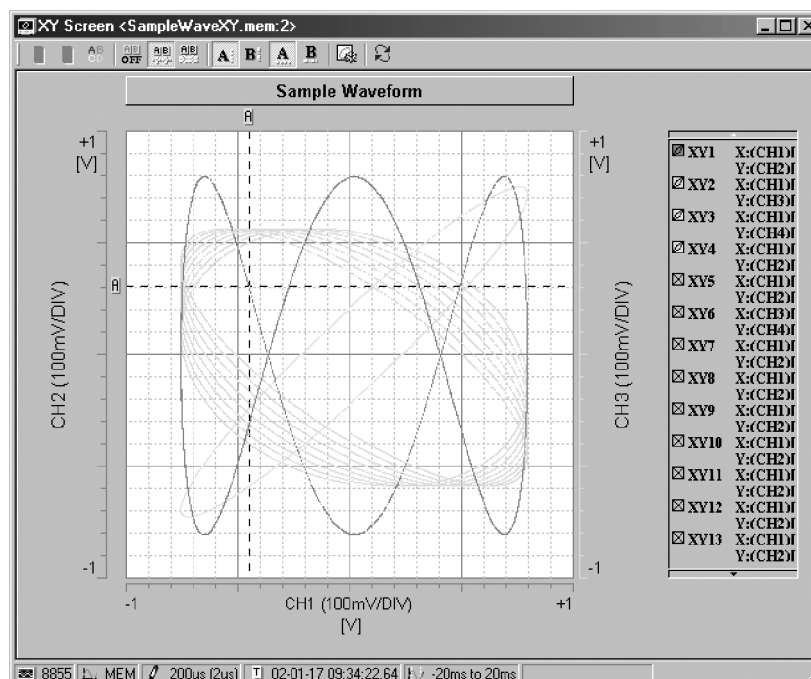
Stopping waveform drawing

For large waveform data files, the system requires more time to redraw the waveform. To abort waveform drawing, press the | Esc | key on the keyboard. Click the "**Update**" button on the toolbar to let the system redraw the waveform window.

5.2 Manipulating the X-Y Synthesis Window

The main toolbar works the same way as in the waveform window. For more information, refer to the description of the waveform window in the earlier section of this manual.

5.2.1 X-Y Window Menus

[File] ── [Open Waveform File]
    ── [Convert All]
    ── [Batch Conversion]
    ── [Save Waveform File]
    ── [Screen Print] ── [Print]
                         ── [Preview]
                         ── [Page Settings]
    ── [Waveform Detail Print] ── [Print]
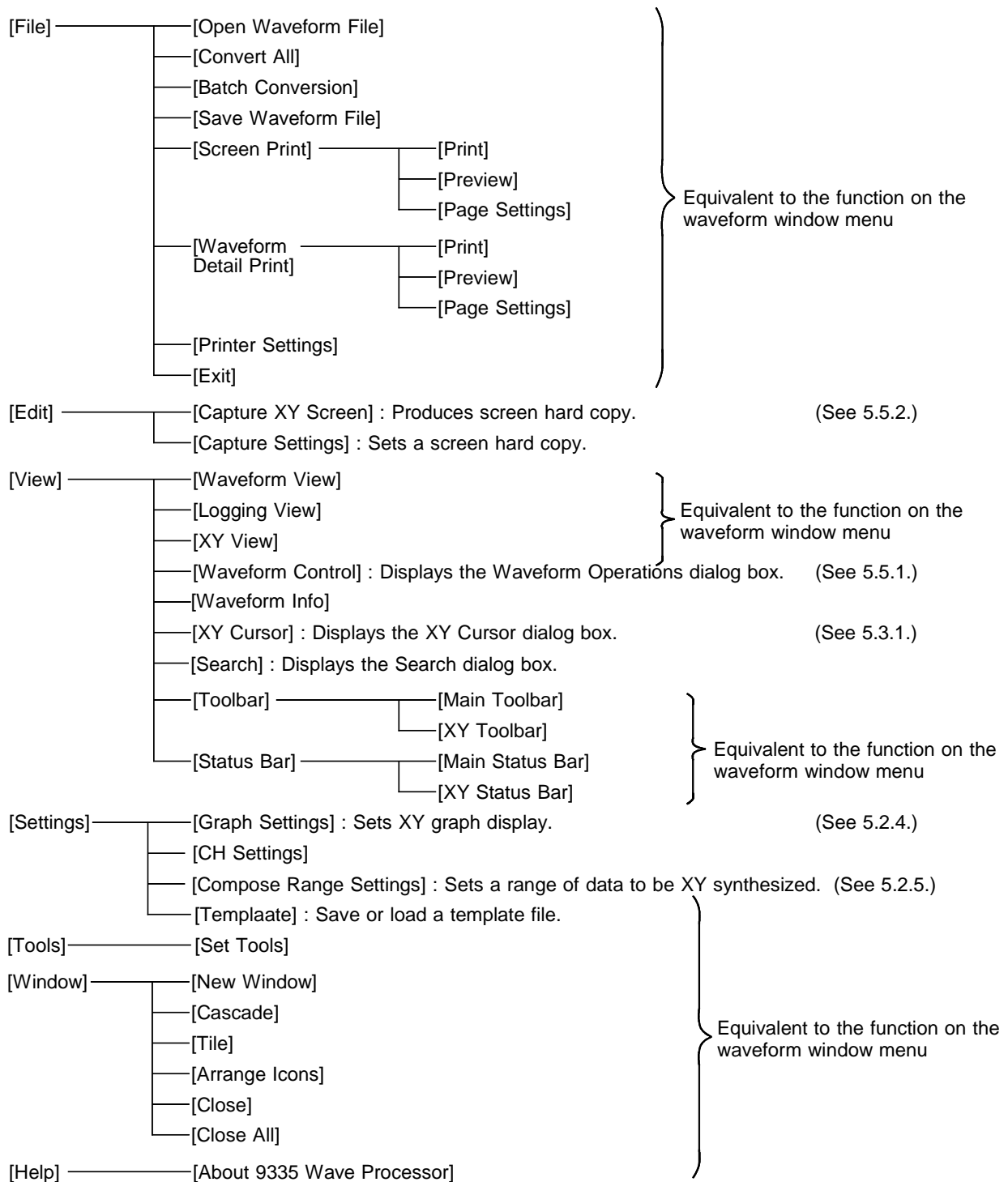   ── [Preview]
                                 ── [Page Settings]
    ── [Printer Settings]
    ── [Exit]

Equivalent to the function on the waveform window menu

[Edit] ── [Capture XY Screen] : Produces screen hard copy.   (See 5.5.2.)
    ── [Capture Settings] : Sets a screen hard copy.

[View] ── [Waveform View]
    ── [Logging View]
    ── [XY View]

Equivalent to the function on the waveform window menu

    ── [Waveform Control] : Displays the Waveform Operations dialog box.   (See 5.5.1.)
    ── [Waveform Info]
    ── [XY Cursor] : Displays the XY Cursor dialog box.   (See 5.3.1.)
    ── [Search] : Displays the Search dialog box.
    ── [Toolbar] ── [Main Toolbar]
                   ── [XY Toolbar]
    ── [Status Bar] ── [Main Status Bar]
                      ── [XY Status Bar]

Equivalent to the function on the waveform window menu

[Settings] ── [Graph Settings] : Sets XY graph display.   (See 5.2.4.)
    ── [CH Settings]
    ── [Compose Range Settings] : Sets a range of data to be XY synthesized. (See 5.2.5.)
    ── [Templaate] : Save or load a template file.

[Tools] ── [Set Tools]

[Window] ── [New Window]
    ── [Cascade]
    ── [Tile]
    ── [Arrange Icons]
    ── [Close]
    ── [Close All]

Equivalent to the function on the waveform window menu

[Help] ── [About 9335 Wave Processor]

5.2.2 X-Y Waveform Toolbar

1. 2. 3.   4.   5.   6. 7.

1. **Cursor A operation mode**
   Left-click anywhere in the waveform display area when this button is enabled to move vertical cursor A to that position. Hold down the | Shift | key and left-click to reposition the horizontal cursor A.

2. **Cursor B operation mode**
   Left-click anywhere in the waveform display area when this button is enabled to move vertical cursor B to that position. Hold down the | Shift | key and left-click to reposition horizontal cursor B.

3. **Comment operation mode**
   When this button is enabled, you can enter or edit comments. Enter comments in the same way as in the waveform window.

4. **Cursor mode selection**
   Selects among cursor OFF, the trace cursor, and he voltage cursor.

5. **Cursor display**
   Shows the vertical and horizontal cursors A and B.

6. **Graph settings**
   Sets an XY synthesis window.

7. **Update**
   Updates the waveform window.

5.2.3 Popup Menu

Right-click anywhere in the X-Y synthesis window to display a popup menu.

1. Gauge display

   Works the same way as in the waveform window. The vertical and horizontal axes can be set independently.

   Gauge Type - Dual The gauge is displayed on both sides of the waveform window.

2. Marker display

   Cursor A, Cursor B Shows or hides the respective markers.

3. Title

   Same as the title of the waveform window.

4. Inside the X-Y window

   Show Waveform Shows or hides several waveforms at once.

   Screen Format Up to 16 (4 x 4) graphs can be displayed.

   Grid Shows or hides horizontal, horizontal auxiliary, vertical, and vertical auxiliary lines.

   Color Sets the waveform background, grid line, and auxiliary line colors.

5. Periphery of the waveform window

   Synthesis Range Resets the range of waveform data to be X-Y synthesized. Set the start and end points in the opened "**XY synthesis Range Settings**" dialog box and click **OK**.

   Show Shows or hides each display area.

   Template Save or load a template file.

   Capture Copies the XY screen to the clipboard or saves it to a file, from where it can then be pasted into other applications.

   Toolbar, Status bar Shows or hides each display.

6. Waveform legend display

   Channel Changes channel information display.

   Show Waveform Shows or hides several waveforms at once.

   Resize Changes the size (width) the waveform legend display area. The display area is enclosed by dotted lines. Drag the left or right square at the center of the display area to resize to the desired size.

   Text Color, Font Sets the character color and font for the waveform legend.

5.2.4 Setting XY Graphs

Set how XY graphs are displayed.
Click the "**Set graph**" button on the XY window toolbar or select "**Set Graph**" from the "**Settings**" menu to display the "**Set XY Graph**" dialog box.
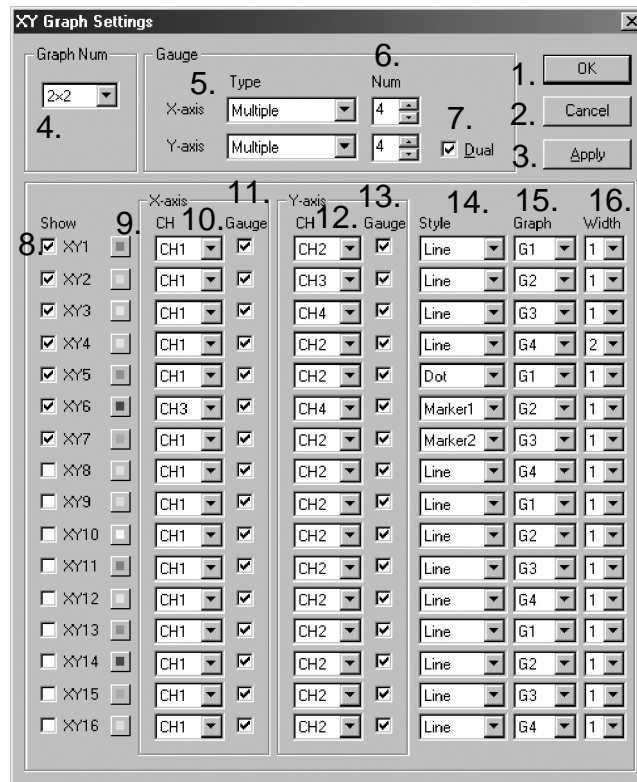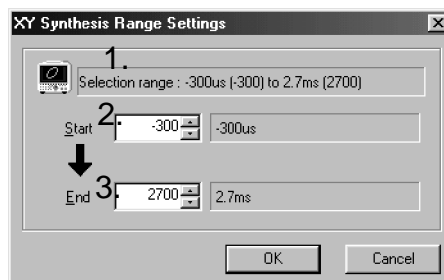

1. OK button

   The new settings are reflected in the graph. The dialog box is closed.

2. Cancel button

   The new settings are canceled (i.e., not reflected in the graph). The dialog box is closed.

3. Apply button

   The new settings are reflected in the graph, but the dialog box is not closed.

4. Select graph divisions

   A graph can be divided into as many as 16 regions (4 x 4).

* Depending on the window size, not all graph subdivisions may be displayed.

5. Select gauge type

   Select the types of X and Y-axis voltage gauges from "**None**," "**Upper/Lower**," "**Detail**," or "**Multiple**," respectively.

   None No gauges are displayed.

   Upper/Lower For channels that have gauge display turned on, the gauge for the channel with the smallest number is displayed. Voltage values are displayed at both ends of the gauge.

   Detail For channels that have gauge display turned on, the gauge for the channel with the smallest number is displayed. Voltage values are displayed at every five divisions.

   Multi For channels that have gauge display turned on, gauges are displayed for as many channels as specified by gauge counts, beginning with the channel with the smallest number. Voltage values are displayed at both ends of the gauge.

6. Gauge counts

For multiple gauge types, set the number of gauges you want to display. For channels that have gauge display turned on, gauges are displayed for channels sequentially, beginning with the channel with the smallest number.

7. Gauge dual

Gauges are displayed on both sides of the graph. This item can only be set for the Y-axis gauge.

8. Show/hide XY

Select the check box for any XY waveform to display the selected XY waveform.

9. Waveform color setting button

Set colors for each XY waveform.

10. Select X-axis channel

Select X-axis channels.

11. Show/hide X-axis gauge

Select the check box for any channel, and the X-axis voltage gauge on that channel is displayed. The number of gauges displayed is limited by the gauge type and gauge counts set.

12. Select Y-axis channel

Select Y-axis channels.

13. Show/hide Y-axis gauge

Select the check box for any channel to display the Y-axis voltage gauge on that channel. The number of gauges displayed is limited by gauge type and gauge counts set.

14. Select interpolation method

Set the method by which the graph is interpolated. Select "**Dot**", "**line**", or "**Marker 1-8**".

15. Select display graph

When the graph is divided, select the graph that shows the waveform you want.

16. Select line width

Select the line width of the waveform.

5.2.5 Setting the XY Synthesis Range

The range of waveform data to be XY synthesized can be set.
Select "**Synthesis Range Settings**" from the "**Settings**" menu or double-click in the "**XY synthesis area**" on the XY window status bar to display the "**XY Synthesis Range settings**" dialog box.

1. Show synthesizable range

2. Set start point
   Set the first point of the waveform data you want to synthesize. A relative time for that point (time from the trigger) is displayed to the right.
3. Set end point
   Set the last point of the waveform data you want to synthesize. A relative time for that point is displayed to the right.
4. OK button
   The new settings are reflected in the graph. The dialog box is closed.
5. Cancel button
   The new settings are canceled (i.e., not reflected in the graph). The dialog box is closed.

5.3 Cursor Function

The cursor function lets you read the voltage values at specified points. Both trace cursors and voltage cursors are available.

5.3.1 Trace Cursors

Shows the point at which the cursor and waveform intersect.

How to use

1. Click the **cursor mode select** button on the XY waveform toolbar to select trace cursor mode.
2. Click the **cursor display** button on the XY waveform toolbar to display the desired cursors.
3. Display the XY Cursor dialog box to read voltage values. Click the **XY cursor** button on the main toolbar, or select "**XY Cursor**" from the "**View**" menu.

XY Cursor dialog box
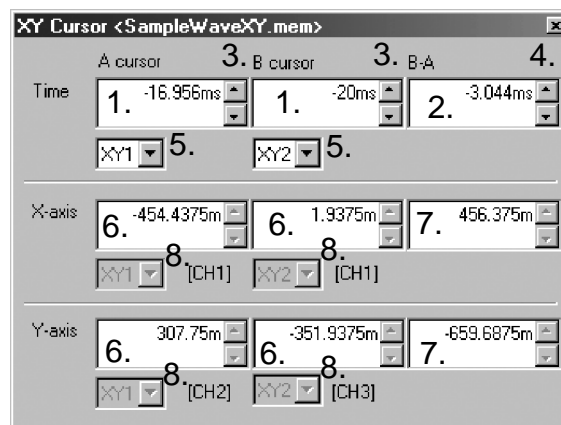
XY Cursor dialog box

1. Time value display area
2. Time difference display area
3. Button for moving cursor
   Click the up or down button to move through the data points in sequence.

4. Button for moving cursors A and B simultaneously
   Click the up or down button to move through the data points in sequence.
5. Select graph
   Select the graphs to be referenced by cursors A and B, respectively.
6. Voltage value display area
7. Voltage difference display area
8. Reference channel

5.3.2 Voltage Cursors

Voltage values on X and Y axes can be read.

How to use

1. Click the **cursor mode select** button on the XY waveform toolbar to select voltage cursor mode.
2. Click the **cursor display** button on the XY waveform toolbar to display the desired cursors.
3. To move the cursor, drag the cursor marker or the cursor in the waveform window (hold down the left mouse button while moving the cursor). Or left-click "**Cursor A operation mode**" or "**Cursor B operation mode**" button on the waveform toolbar and click at any position in the waveform window.
4. Display the XY Cursor dialog box to read voltage values. Click the **XY cursor** button on the main toolbar, or select "**XY Cursor**" Window from the "**View**" menu.

XY Cursor dialog box
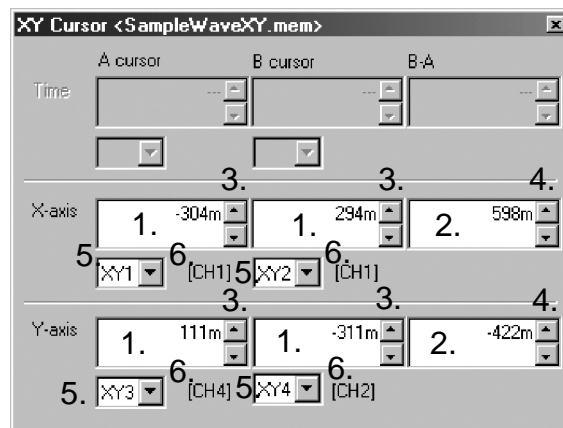
XY Cursor dialog box

1. Voltage value display area
2. Voltage difference display area
3. Button for moving cursor
   The cursor moves in vertically or horizontally.
4. Button for moving cursors A and B simultaneously
   The cursors move at the same time.
5. Select graph
   Select the graphs to be referenced by cursors A and B, respectively.
6. Reference channel

5.3.3 Popup Menu

Right-click in the XY Cursor dialog box to display a popup menu.
Copy cursor value Copies the cursor values in the dialog box to the clipboard, from where they can be pasted into "**Notepad**" or other applications.
Time display Changes the display method for the time shown in the time display area. Select from "**Date**," "**Trigger time**," "**Second**," or "**Data Number**."
Exponential, Floating-point, Auxiliary unit Changes the display format for voltage values.
Show unit Shows or hides the unit of measure in which units the voltage values are displayed.

5.4 Waveform Information Dialog Box

The waveform information dialog box shows information on settings of each channel.
Click the "**Display waveform information window**" button on the main toolbar to bring up this dialog box, or select "**Waveform Info**" from the "**View**" menu. The method of operation in this dialog box is the same as for the waveform window. (See 3.6.)

5.5 Manipulating XY Graphs

5.5.1 Waveform Operations

You can choose to show or hide each XY graph, as well as set the waveform color, magnifying factor, and zero position.
Click the "**Display waveform operation window**" on the main toolbar or select "**Waveform Control**" from the "**View**" menu to display a "**Waveform Control**" dialog box.

Change colors
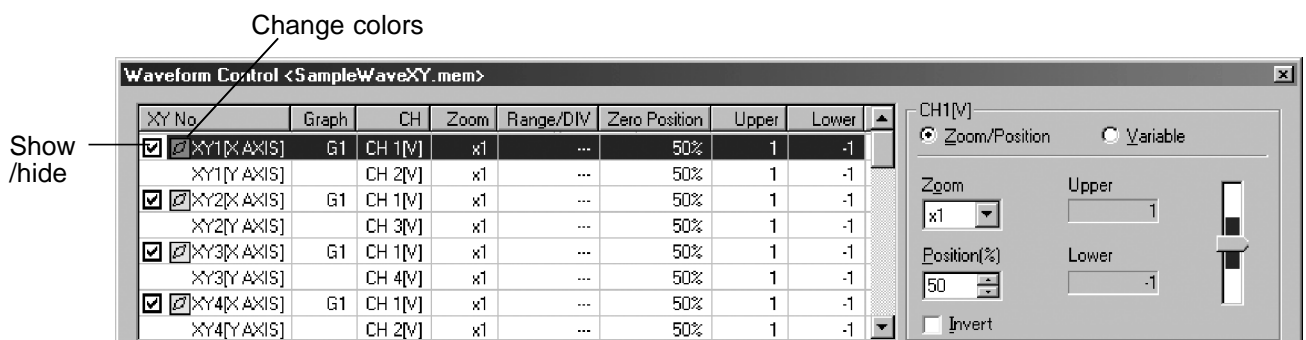
Show/hide

1. Show/hide XY graph
   Select the check box for any desired XY graph.
2. Change waveform color
   Left-click any desired XY graph icon to change waveform color.

3. Change magnifying factor and zero position
Select the XY waveform you want to work on from the XY graph list (select X and Y axes). The channel information assigned to the axes of the selected XY graph is shown to the right of the list. The procedure is the same as for the waveform window; refer to Section 3.9.1, "Waveform Operations."

* If multiple XY waveforms have the same channel assigned, operations performed on one such XY waveforms is reflected in all other such XY waveforms.

5.5.2 XY Window Hard Copy

If XY windows are saved to a file or copied to the clipboard, you can paste waveform images into a word processor or other applications. The procedure used here is the same as for the waveform window; refer to Section 3.14, "Waveform Window Hard Copy."

* If a large waveform data file is XY synthesized, waveform images may not be pasted in extended meta format into application software.

5.5.3 Setting Scaling and Channel Comments

You can set scaling and comments for each channel. Select "**CH Settings**" from the "**Settings**" menu to display the "**Channel Settings**" dialog box. Use the channel select tab in this dialog box to select the channel for which you want to make settings. After setting scaling and comments for that channel, click the **OK** or **Apply** button to enter your settings. The procedure used here is the same as for the waveform window; refer to Section 3.10, "Setting Scaling and Channel Comments."

* The scaling and channel comments are reflected in all waveform, logging, and XY synthesis windows open for the same waveform file.

Chapter 6
Printing

You can print the loaded waveforms, using screen print or detail print functions.

6.1 Screen Print

Prints waveform screen and X-Y synthesis screen hardcopies.

6.1.1 Printing

While the window for the waveform file you want to print is active, select "**Screen Print**" - "**Print**" from the "**File**" menu. The print dialog box is displayed. After setting up the printer and print range, click **OK**. The system begins printing the selected screen.
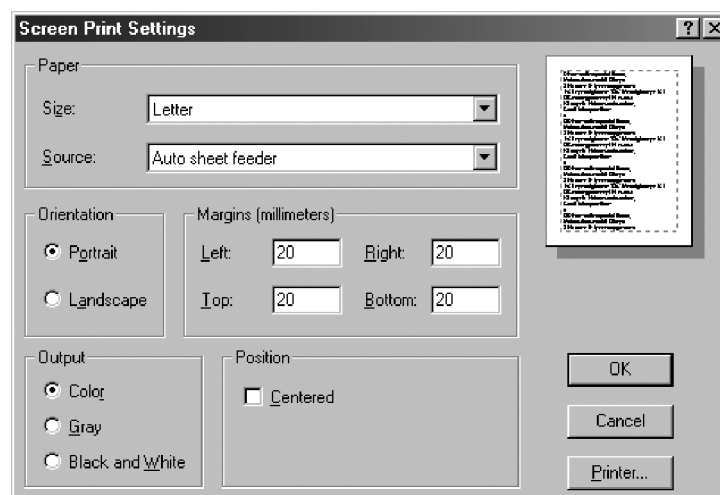
* Depending on the printer being used, XY screens synthesized from large waveform data files may not be printed.

6.1.2 Print Preview

Select "**Screen Print**" - "**Preview**" from the "**File**" menu to preview print results.

6.1.3 Setting Screen Print

Select "**Screen Print**" - "**Page Settings**" from the "**File**" menu to display the "**Screen Print Settings**" dialog box. After setting up the printing method, click **OK**.

6.2 Detail Print

Waveforms are printed in detail.

6.2.1 Printing

While the window for the waveform file you want to print is active, select "**Waveform Detail Print**" - "**Print**" from the "**File**" menu. The print dialog box is displayed. After setting up the printer and print range, click **Print**. The system prints the selected screen according to the current detail print settings. To save the print image in a file, click **Meta files** button.

* Depending on the printer used, XY screens synthesized from large waveform data files may not be printed.

6.2.2 Detail Print Preview

Select "**Waveform Detail Print**" - "**Preview**" from the "**File**" menu to view a print preview displayed according to the current detail print settings.

6.2.3 Setting Detail Print

Select "**Waveform Detail Print**" - "**Page Settings**" from the "**File**" menu to display the "**Waveform Detail Print Settings**" dialog box. Settings made in this dialog box apply to detail prints of all waveform files.
Each item in the Set Detail Print dialog box is explained below.
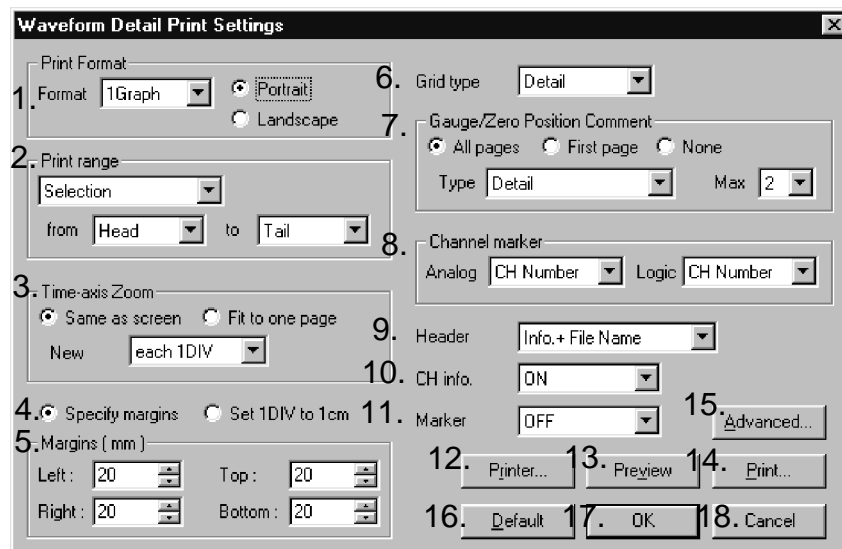
1. Print format
   Set the format of detail print.
   The formats "**1 Graph**" through "**16 Graphs**" correspond to 1-screen through 16-screen settings made when printing to the MEMORY HiCORDER's built-in printer. The graph is divided into 1 to 16 smaller sections, and the channels set in each of such graphs are printed. (the channel to which the graph belongs depends on how the graph was set on the screen when divided.) In the formats "**2 rows**" through "**16 rows**," the graph is printed on a specified number of lines wrapping around at the end of each line. The range of waveforms (in the time-axis direction) that can be printed in one page can be extended. But the greater the number of rows, the smaller the number of logic waveforms printed. (Waveforms with small position numbers have priority.)
   The formats "**XY1**" through "**XY4**" correspond to the XY1 screen through XY4 screen settings entered when printing to the MEMORY HiCORDER's built-in printer. The synthesis waveforms set in each of graphs one to four are printed. (The correspondence of synthesis waveforms to graphs depends on how the graph was set in the screen when divided.) "**Portrait**" and "**Landscape**" set the print orientation.

2. Print range
   Select the waveform section to print.
   If you select "**Display**," the section currently displayed on the screen is printed.
   For "**All**," all sections set in "**Set Waveform Display Range**" for the screen are printed.
   For "**Selection**," you can select a print range from any section, from choices "**Head**," "**Tail**," "**Cursor A**," or "**Cursor B**." Unless both cursors A and B are displayed, you cannot select "**Selection**."

3. Time-axis zoom
   If you select "**Same to screen**," the waveform is printed with the same magnifying factor as the graph being displayed on the screen. If the print range does not fit onto one page, the waveform is printed on multiple pages.
   If you select "**Fit to page**," the time-axis magnifying factor is automatically adjusted so that the print range fits in one page.
   If you select "**each 1 DIV**" or "**each 5 DIV**" in "**New Page**" setting, pages are changed every 1 DIV units or every 5 DIV units, respectively. You cannot select this setting if the time-axis magnifying factor is set to "**Fit to page**."

4. Specify margins, Set 1 DIV to 1 cm
   If you select "**Specify margins**," you can specify the left, top, right, and bottom margins in mm units. The graph is shrunk when printed, according to the set dimensions of margins. Because the grids are adjusted to square shapes when printing XY waveforms, margins may become larger than you set.
   If you select "**Set 1 DIV to 1 cm**," grids are printed in 1 cm units.

* Depending on the printer used, the waveform may not fit in the printable range, and edges may not be printed. Please note that grids can be printed in 1 cm units only with A4 or A3 paper sizes. When printing to other page sizes, select "**Specify margins**" and set the margins before printing.

5. Margins
   Set the **Left**, **Top**, **Right**, and **Bottom** margins in mm units.

6. Grid type
   Select the type of grid from the choices "**OFF**," "**Standard**," "**Detail**," or "**Time-axis**." (When printing XY waveforms, you can select "**OFF**," "**Standard**," or "**Detail**.")

7. Gauge/0 Position comment

For the type of gauge, you can select "**Upper/Lower**", "**Detail**", "**0 Pos comment**", or "**U/L + 0pos**". If you select "**Upper/Lower**," only the upper/lower-limit values on each channel are printed. Although there are many channels, the gauges can be compact. If you select "**Detail**," the upper/lower limit values and each scale value are printed. Since one gauge per channel is printed, the greater the number of channels, the narrower the print range of the waveform. For "**0 pos comment**", comments are printed in the zero position of each channel.

For "**U/L + 0 pos**", both upper/lower-limit values and comments are printed. For "**Max**", set the maximum number of detail gauges you want to attach to one graph. If the graph contains more channels than set here, a set number of detail gauges is printed in the order of channel priority, starting with the highest. However, depending on the selected print format, the number of detail gauges printed may be fewer than that set.

8. Channel marker

Specify how the display mode for the channel markers for the analog, pulse and logic waveforms to be printed. Select "**OFF**," "**CH Number**," or "**Comment**." If a comment character string is not set for a channel although "**Comment**" is selected, "**CH Number**" is printed for that channel.

9. Header

Specify the information you want to include in the header. Select "**Measurement Info.**," "**Info. + Title Comment**," or "**Info. + File Name**."

10. Channel info.

Specify whether you want to print channel information (e.g., range and display magnifying factor). Select "**ON**" or "**OFF**."

11. Marker Value

Specify whether you want to print measurement value at cursor A and B, Event Marker respective positions. Select "**OFF**", "**Cursor**", "**Event Marker**" or "**Both**".

12. Printer

Displays the set printer dialog box.

13. Preview

A print preview is displayed according to the current detail print settings.

14. Print

Displays the print dialog box to let you begin printing.

15. Advanced

Displays the set detail dialog box, allowing you to set the lines and character fonts of graphs.

16. Default

Initialize the detailed print setting.

17. OK

Click OK to finish entering settings.

18. Cancel

The "**Waveform Detail Print Settings**" dialog box is closed, without saving the changes you entered just now. (If you used **Preview** to preview the print image, changes made by that point are applied. Selecting Cancel after preview will not restore the original settings in place before the preview.)

Setting detail

Click the "**Advanced**" button in the "**Waveform Detail Print Settings**" dialog box to display the "**Advanced Settings**" dialog box, allowing you to set the lines and character fonts of graphs.
Each item in this dialog box is explained below.
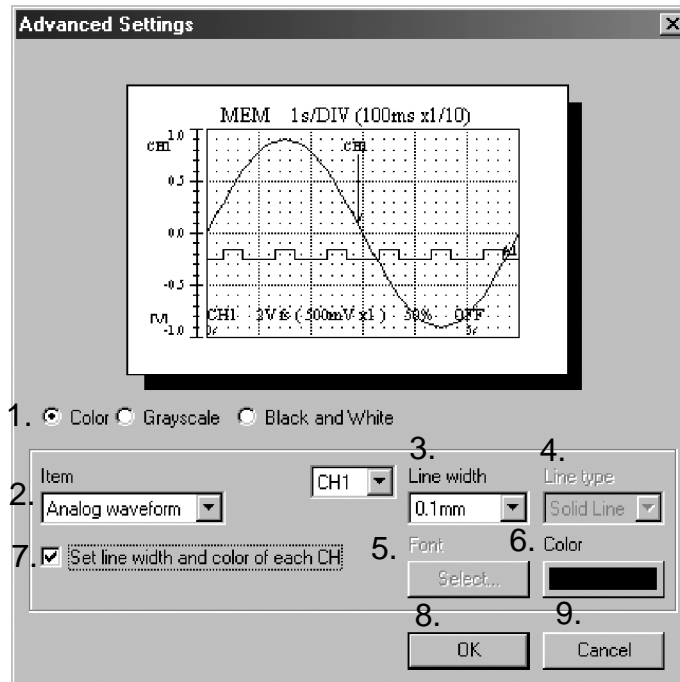
1. Print color
   Select from **Color**, **Grayscale**, or **Black and white**.
2. Specify part
   Select the part of the graph you want to set. Set the following items for the part selected here.
3. Line width
   Set the line widths of waveforms and grids.
4. Line type
   Specify how you want XY waveforms to be printed (dot, line, or marker) and how you want the grid border, vertical line, and horizontal line to be printed (solid or dotted line).
5. Font
   Click the "**Font**" button to display the font dialog box. Select a font.
6. Color
   Clicking the "**Color**" button to display the color dialog box.
   Select a color.
7. Set line width and color on each channel
   This setting item is displayed when you selected "**Analog waveform**," "**Pulse waveform**," "**Logic waveform**," or "**XY waveform**" in the setting item "**Item**."
   Select the check box labeled "**Set line width and color of each CH**," and set the line width and color for each channel. If this check box is deselected, the waveform is printed with the same line width and color as those on the screen.
8. OK
   Click OK to finish entering the settings.
9. Cancel
   The dialog box is closed without saving the changes just entered.

NOTE When using Windows 95/98/Me, note that the image may not be printed correctly on A3 paper due to OS specifications. Therefore, increase the page margins to reduce the print area when printing on A3 paper.

6.3 Logging Printing

6.3.1 Logging Printing

While the logging window of the waveform file you want to print is active, click [**File**] on the menu bar and choose [**Logging Print**]. The "**Print**" dialog box will then appear. Complete the printer settings and click the <**OK**> button. The printer will start printing using the current logging print settings.

6.3.2 Logging print preview

While the logging window of the waveform file you want to preview is active, click [**File**] on the menu bar, then choose [**Logging Print Preview**]. A preview will be displayed according to current logging print settings.

6.3.3 Logging print settings

Click [**File**] on the menu bar, then choose [**Page Settings**] to display the "**Logging Print Settings**" dialog box. The settings made in this dialog box will be applied to the logging printing of all waveform files. Parameters on the "**Logging Print Settings**" dialog box are following.
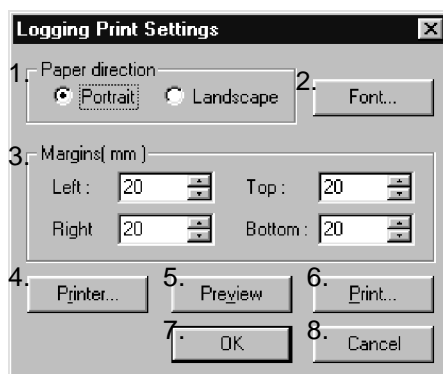
1. Orientation

   Set the page orientation. Choose [**Portrait**] or [**Landscape**].
2. Font

   Click the <**Font**> button to open the "**Font**" dialog box. Select a printing font.
3. Margins

   Set the **Left**, **Right**, **Top**, and **Bottom** margins in units of 1 mm.
4. Printer

   Display the "**Set Printer**" dialog box.

5. Preview

A print preview is displayed according to the current logging print settings.

6. Print

Displays the print dialog box to let you begin printing.

7. OK

Click **OK** to finish entering settings.

8. Cancel

The dialog box is closed, without saving the changes you entered just now. (If you used Preview to preview the print image, changes made by that point are applied. Selecting Cancel after preview will not restore the original settings in place before the preview.)

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