# User's Manual

# Model 707751
# Waveform Editor

IM 707751-61E
2nd Edition

YOKOGAWA
Yokogawa Meters & Instruments Corporation

**IM 707751-61E**
**2nd Edition**

Thank you for purchasing the Waveform Editor (Model: 707751). This User's Manual contains useful information about the installation, the functions, and the operating procedures of the Arbitrary Waveform Editor (Model: 707751). This manual assumes that you will be using data created by the Arbitrary Waveform Editor on the 4-CH, 100 ks/S D/A Module WE7281 or the 10 MHz Function Generator Module WE7121.
To ensure correct use, please read this manual thoroughly before operation. Keep this manual in a safe place for quick reference in the event a question arises.

The manuals listed below are contained in the measuring station and module packages. Please refer to them, also.

| Manual Title | Manual No. | Description |
|---|---|---|
| WE7000 User's Manual | IM707001-01E | Comes with the measuring station WE800/WE400 |
| 4-CH, 100 ks/S D/A Module WE7281 User's Manual | IM707281-01E | Comes with the 4-CH, 100 ks/S D/A Module WE7281 |
| 10 MHz Function Generator Module WE7121 User's Manual | IM707121-01E | Comes with the 10 MHz Function Generator Module |

## Package

This package contains the following items.

- Waveform Editor (Model: 707751) setup disk: 1 CD-ROM disk
- User's Manual IM707751-61E (this manual): 1 piece

## Notes

- The contents of this manual describe Arbitrary Waveform Editor Ver 1.1.2. If you are using another version of the software, the operating procedures or the figures given in this manual may differ from the actual software.
- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.
- Copying or reproducing any or all of the contents of this manual without YOKOGAWA's permission is strictly prohibited.

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## Revisions

1st Edition: October 1999
2nd Edition: August 2000

Disk No. WE12
2nd Edition: August 2000 (YK)
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# Notes on Using This Product

## Agreement

**Restriction on Use**

Use of this product (this utility software and manual) by more than one computer at the same time is prohibited. Use by more than one user is also prohibited.

**Transfer and Lending**

Transfer or lending of this product to any third party is prohibited.

**Guarantee**

Should a physical deficiency be found on the original disk or this manual upon opening the product package, please promptly inform Yokogawa. Yokogawa will replace the disk free of charge only if the claim is made within seven days from the date you received the product.

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## Symbols used in this manual

**Unit**

k Denotes 1000. Example: 100 kHz

K Denotes 1024. Example: 720 KB

**Displayed characters**

Alphanumeric characters enclosed with [ ] usually refer to characters or setting values that are displayed on the screen.

***Note***

Provides information that is important for operating the instrument properly.

# PC System Requirements

## Hardware

**PC**

PC on which Windows 95/98 or Windows NT 4.0 runs.
CPU: Pentium 133 MHz or higher

**Internal Memory**

32 MB or more (48 MB or more recommended)

**Hard Disk**

Minimum free space of 20 MB. (However, this depends on the data size of the waveform being edited.)

This software uses two temporary files for Undo operations. For example, the temporary file size of data consisting of 10 blocks, 10 channels, and data length of 100,000 (same for all blocks) is derived by the following equation.
10 (blocks) × 10 (channels) × 100,000 (points) × 2 (bytes) + Header size (several KB) = Approx. 19.1 MB.
In this case, the minimum hard disk space is approximately 38.2 MB (two temporary files).

**Drive**

One CD-ROM drive. This is used to install this software.

**Mouse**

Mouse supported by Windows95/98 or Windows NT 4.0

**Display**

Display supported by Windows 95/98 or Windows NT 4.0 with a minimum resolution of 800-by-600 and 256 colors (analog RGB).

## OS

Microsoft Windows 95/98 or Windows NT 4.0

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# Installing the Software

## Before Installation

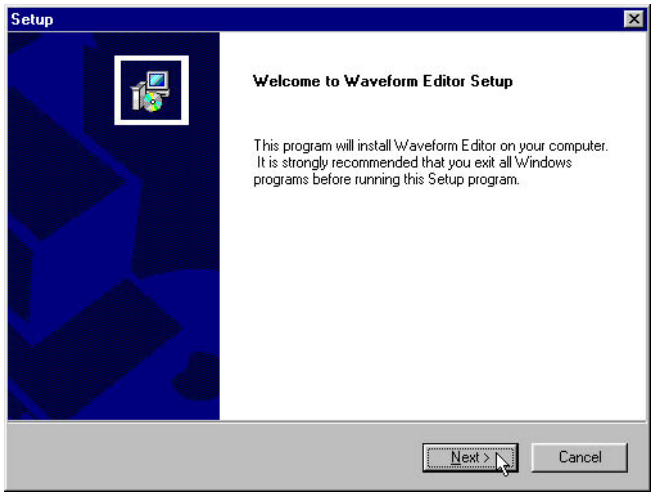
Have the setup CD-ROM ready. Exit all programs that are currently running before starting the installation.

The following procedures are for installing the software on Windows95/98.

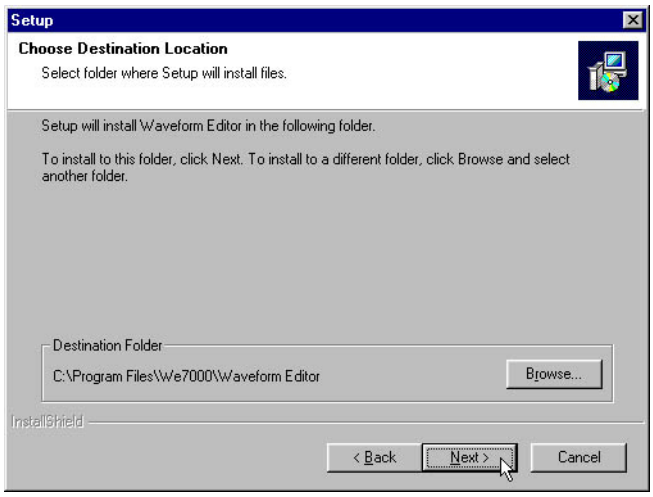
## Procedure

1. Start Windows 95/98.
2. Insert the CD-ROM into the CD-ROM drive.
   The installation program will start automatically. If the CD-ROM's auto run function is disabled, you must start the program manually. Start setup.exe located at the root of the CD-ROM.

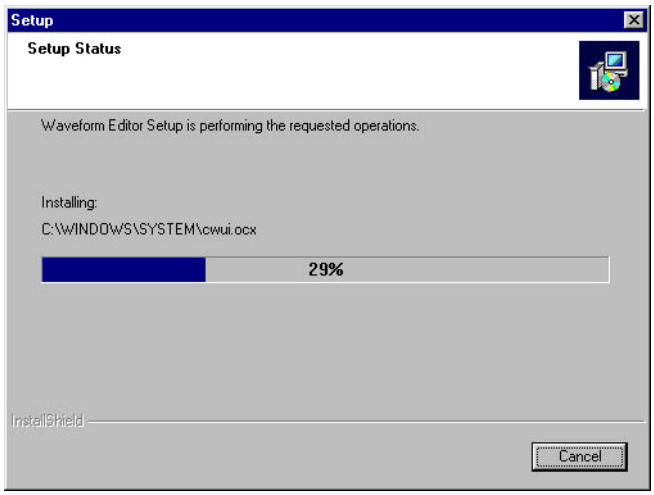
   The following dialog box will be displayed.



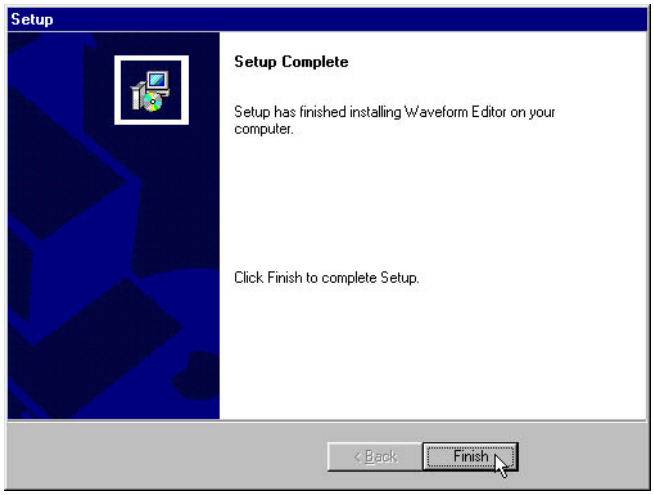

3. To continue the installation, click the [Next] button.
   The dialog box for the setting the destination folder to install the software will be displayed. The default directory is [C:\ProgramFiles\We7000\Waveform Editor\]. To change the destination folder, click [Browse...] and select the desired folder.



4. After setting the destination folder, click the [Next] button.
   Program files will be copied to the hard disk and the progress will be displayed with a graph.




   The installation is complete when the following dialog box appears.

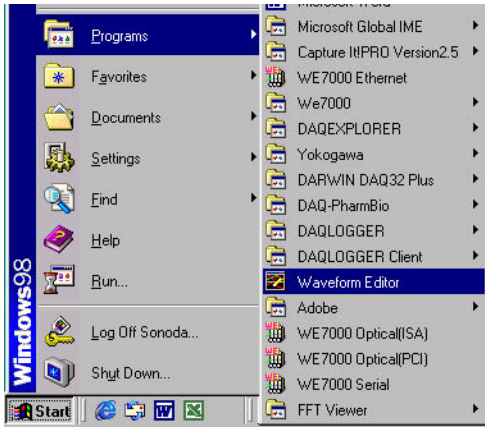



5. Click the [Finish] button to terminate the installation program.

# Starting and Exiting the Arbitrary Waveform Editor

## Starting the Software

When the Arbitrary Waveform Editor is installed, [Waveform Editor] is registered in the start menu (see the figure below). To start the program, click [Waveform Editor]



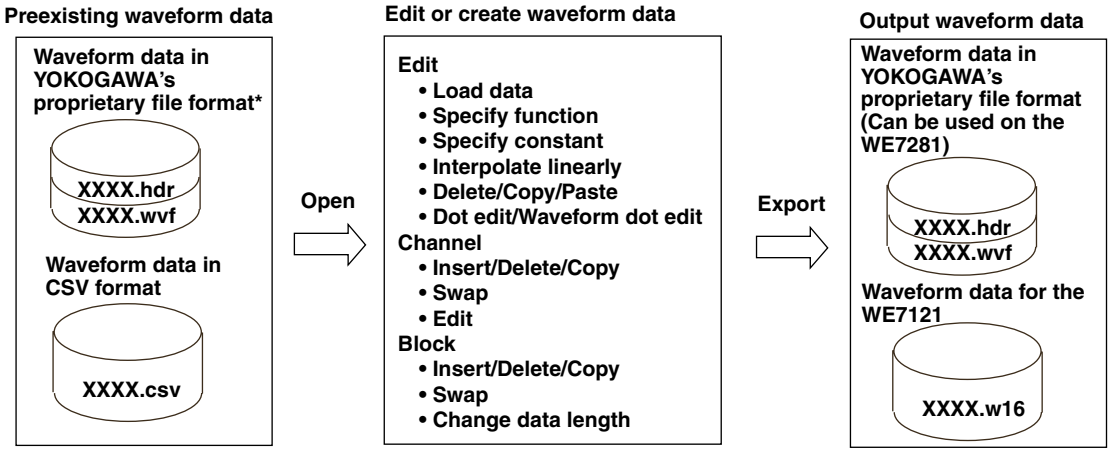

## Exiting the Software

1. Click [Exit] from the [File] menu or click the “X” button in the upper right portion of the window.

2. The following dialog box appears. Click the [OK] button.

# 1.1 Overview

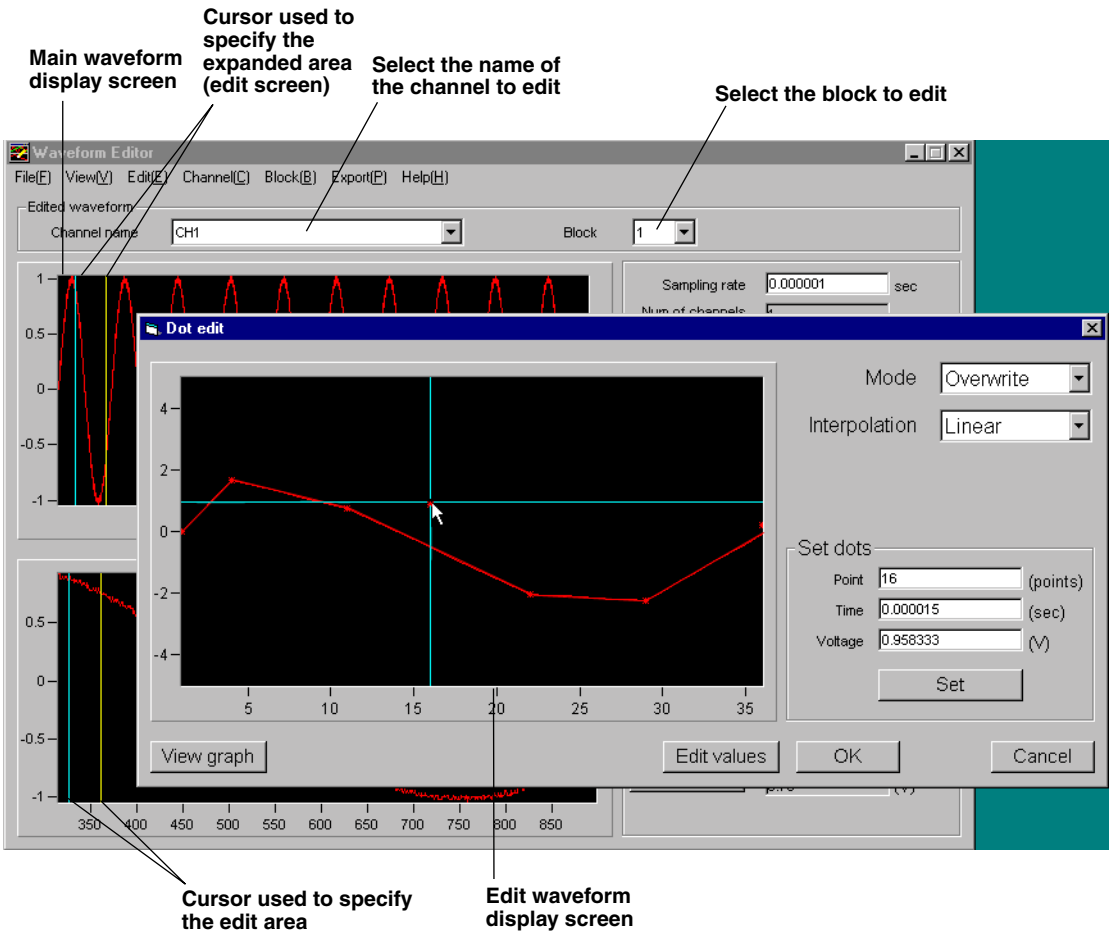
The Waveform Editor can be used to open preexisting waveform data files, edit the waveform data, and save the resultant data in a specified file format. It can also be used to create new waveform data and save them in a specified file format.




*** Waveform data that are saved to files with ".wvf" extensions. These files are saved using the WE7000 measurement modules or other YOKOGAWA instruments. (However, there may be some waveform data files that cannot be loaded correctly such as those containing logic waveforms.)**

### Edit screen example

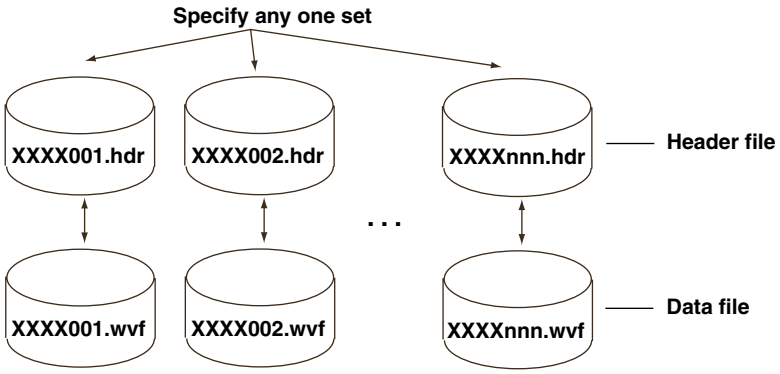
The following figure shows a case where the waveform dot edit function is being used to edit a section of the loaded waveform at the dot level.



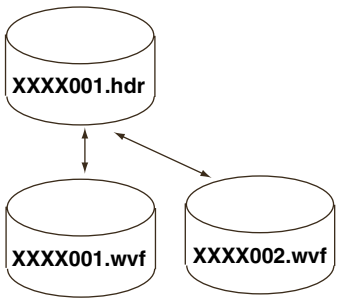
# 1.2 Files that can be Opened

### Waveform Data in YOKOGAWA's Proprietary File Format (Binary Waveform Data File)

As indicated in the figure below, data are stored using a pair of files, including a header file (hdr file) and a data file (wvf file). When collecting waveform data to multiple files on the WE7000 measurement modules, each data file must have a corresponding header file. In addition, if a file consists of waveform data divided into multiple blocks, the sampling interval (waveform output interval) and the number of channels must be the same among all blocks.

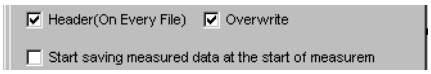



**[Example of a file that is not supported]**




***Note***

When saving measured data on the WE7000 measurement modules using the "Save Acquisition Data" function, check the [Header (on every file)] box in order to create a header file for each waveform data file.



## Waveform data in CSV format

- Handled as a single block of data from one channel.
- The maximum number of data points that can be loaded is 4 Mpoints.
- It is assumed that only voltage data are registered.
- The channel name, range, unit, and the D/A output rate during waveform output (sampling rate on this software) are assumed as follows.

  Channel name: CH1

  Voltage range: See “Calculating the Voltage Range and Determining the Voltage” on the next page.

  Unit: V

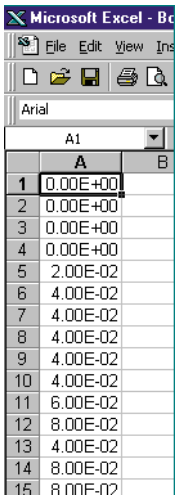
  Waveform output interval: 1.0 s
- If the data are saved as one line and m columns, the value of m is taken to be the number of samples.
- If the data are saved as n lines and m columns, the value of n is taken to be the number of samples.
- When the data are saved to multiple columns, the data in the first column are used.

***Note***

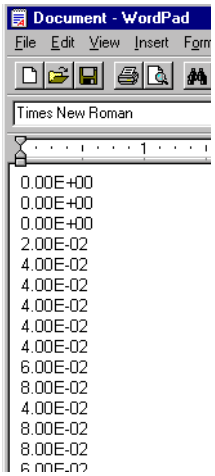
If measured data from WE7000 measurement modules are saved in the CSV file format, the file cannot be used directly. In order to use the waveform data in the file, copy only the section containing the waveform data to another file and use that file.

### Data Creation Example

[Using Excel]




[Viewing on the WordPad]



## Calculating the Voltage Range and Determining the Voltage

All loaded data are handled as though they are voltage data. The voltage range of the loaded channel is determined by the following method.

1. Determine the maximum (RMax) and minimum (RMin) values of the data.
   **For wvf files**
   Based on the information in the header file (see page 1-9), the following equation is used to determine the values.
   RMin = VResolution × VMinData + VOffset
   RMax = VResolution × VMaXData + VOffset
   **For CSV files**
   RMin = The minimum value of the loaded data
   RMax = The maximum value of the loaded data

2. Determine the maximum voltage of the data.
   The larger of the absolute values of RMin and RMax is taken to be VMax (Maximum value of the voltage range).

3. Determine the voltage range
   The voltage range is determined by comparing whether or not VMax is within +2.5% of the voltage range span (±1 V, ±2 V, ±5 V, ±10 V) to be used in the software.
   Example: If VMax = 5.2, the voltage range is set to ±5 V.
   If VMax = 5.3, the voltage range is set to ±10 V.

4. Convert the loaded data to voltage values.
   If the voltage range determined in step 3 is "±1 V," "±2 V," "±5 V," or "±10 V," each value (Xi) is converted to voltage (ADi) using the following equation.
   ADi = Xi × (Voltage range/32000)
   If the voltage range determined in step 3 exceeds "±10 V," RMin and RMax are normalized to ±10 V.
   The voltage range is set to "±10 V," and the following equation is used to convert each value (Xi) to voltage (ADi).
   ADi = Xi × (10/32000)

***Note***

Any data points loaded into the 4-CH, 100 ks/S D/A module WE7281 that exceed the output voltage range by one percent or more, are output at the maximum voltage.

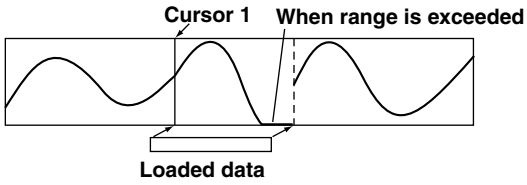
# 1.3 Waveform Edit Function/Channel Management/ Block Management

## Waveform Edit Function

The following types of editing are possible on loaded or newly created waveforms. You can select overwrite, sum, or insert (data points after the insertion point are shifted backwards and those that exceed the waveform display section are discarded) for the following operations: load data, specify function, specify constant, paste, and dot edit/ waveform dot edit. The following descriptions are given with the premise that overwrite is specified.

### Load data

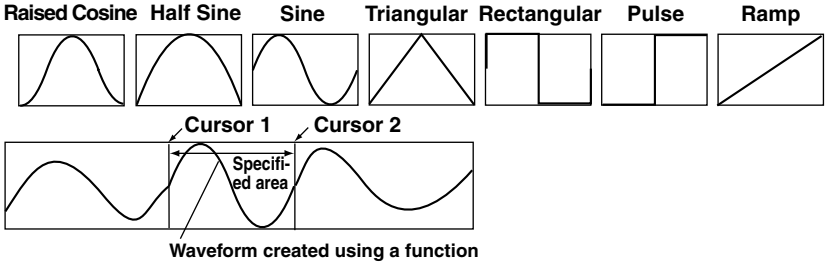
Select the block and channel of the waveform data of the selected file and load one channel of data. The data after the cursor 1 position are overwritten with the loaded data. However, the loaded data are converted using the voltage range of the channel being edited. Thus, data exceeding the range are set to the maximum/minimum values of the voltage range. In addition, if the length of the loaded data is greater than "(data length) – "data position of cursor 1), the section of the data that exceeds the waveform display section are not loaded.




### Specify function

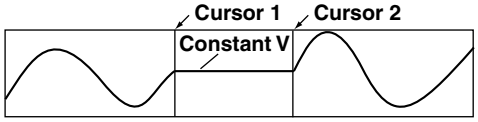
The waveform data in the specified area are replaced with waveform data created using the following equation (or waveform).

Raised Cosine: $Va \times (1 - \cos(2\pi t/T))$, Half Sine: $Va \times \sin(\pi t/T)$, Sine wave: $Va \times \sin(2\pi ft + \Phi)$, triangular wave, rectangular wave, pulse wave, and ramp wave.



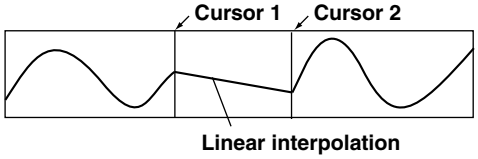

### Specify constant

The waveform data in the specified area are replaced with a specified constant value.



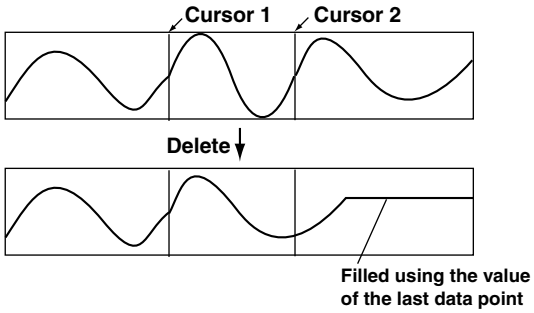

### Interpolate linearly

The waveform data in the specified area are replaced with linearly interpolated values between the first and last values in the specified area.



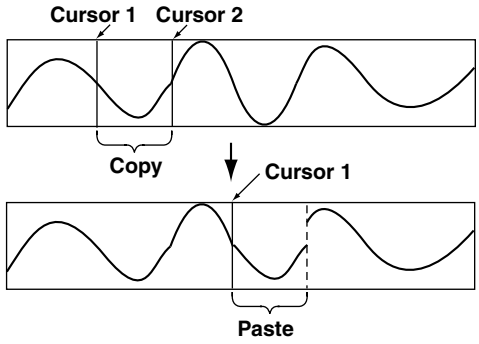
**Delete**

The waveform data in the specified area are deleted, and waveform data subsequent to the deletion area are shifted forward.



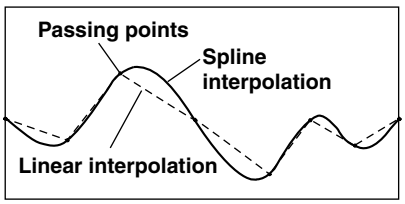

**Copy/Paste**

The waveform data in the specified area are copied and pasted to the start position that is specified.

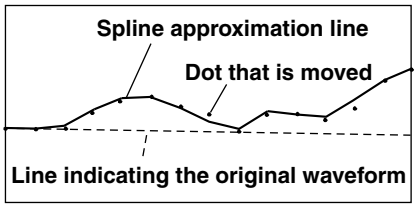



**Dot edit/Waveform dot edit**

In dot edit, each data point (dot) of the waveform data can be entered numerically to create a waveform. As shown in the figure below, you can also plot points through which the waveform is to pass and then interpolate linearly or by using a 3rd order spline to create the waveform. The number of dots that you can plot is 2 to 1000 points. You can overwrite, sum, or insert (data points after the insertion point are shifted backwards and those that exceed the waveform display section are discarded) the created waveform to the specified area of the waveform being edited.

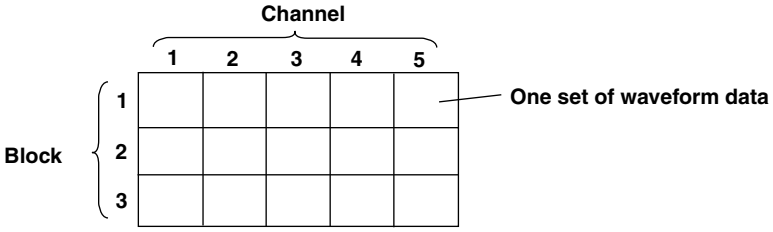



In waveform dot edit, each data point (dot) of the waveform data in the specified area can be changed. In addition to entering numeric values of the dots to edit the waveform, you can change some of the dots so that the rest of the dots fall on the spline curve that is defined by the changed dots. You can also delete preexisting dots and interpolate linearly or by using a spline, as in the dot edit.



## Channel Management

Waveform data can be created by dividing the data into blocks and dividing each block into channels. The following operations are possible in units of channels using the same number of blocks.




**Insert above/Insert below**

1Channels can be added up to a total of 80. The new channels can be added before or after the reference channel (target channel). The channel number in this section refers to the number that is necessary when assigning waveform data to channels on the D/A module. It is not the same as the channel name (the “label” that is used in the WE7000 scale conversion function). The length of the waveform data of the inserted channel is the same as that of the preexisting channel and the value is set to “0 V.”

**Delete**

You can delete the specified channel and reduce the number of channels.

**Copy**

You can copy the waveform data of the specified channel to another channel. Only waveform data are copied. The channel name and unit at the copy destination are not changed. However, the voltage range is changed to the voltage range of the destination channel.

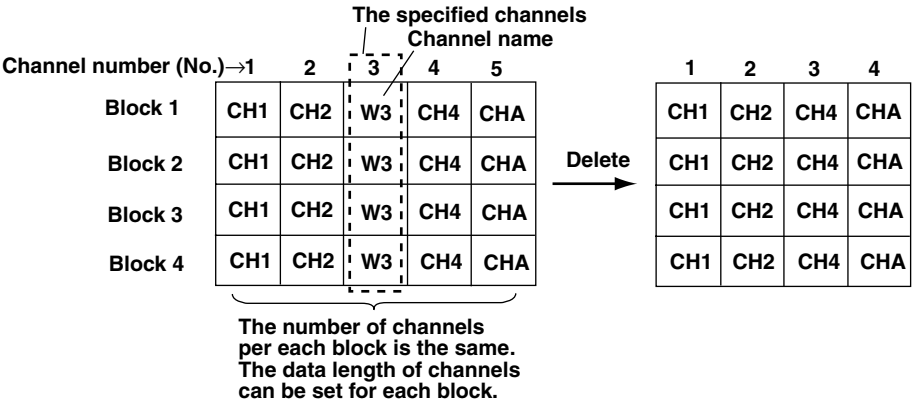
**Swap**

You can swap waveform data between two specified channels. This changes the channel number (order) that is used when loading the data to the D/A module. The channel name, voltage range, and unit are also swapped.

**Edit**

You can change the channel name, voltage range, and unit of the waveform data from the specified channel.

**[Conceptual Diagram of Channel Management]**



## Block Management

The following operations are possible in units of the waveform data block.

**Insert above/Insert below**

Blocks can be added up to a total of 256. The new blocks can be added before or after the reference block (target block). The data length per channel can be specified for the added blocks. The waveform data of the added blocks are set to “0 V.”

**Delete**

You can delete the specified block and reduce the number of blocks.

**Copy**

You can copy all the waveform data of the specified block to another block.

**Swap**

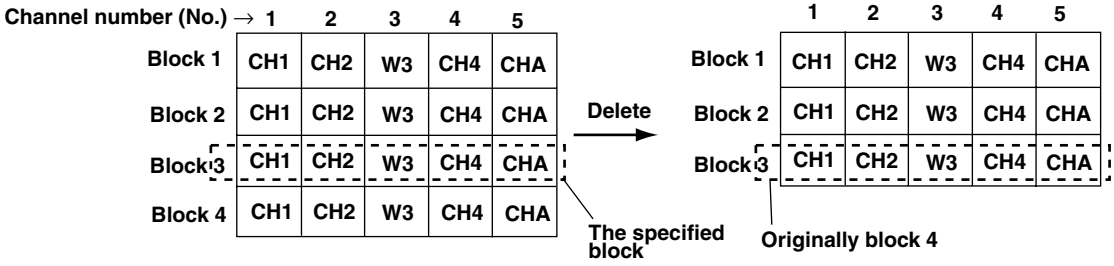
You can swap all the waveform data between two specified blocks.

**Change data length**

The data length (number of data points) per block for each channel can be changed in the range “1 to 4,194,304.”

If the specified data length is greater than the current data length, any data that extend beyond the original data length are set to “0 V.”

**[Conceptual Diagram of Block Management]**



# 1.4 Output Waveform Data

The waveform data that have been edited can be exported to the following two file formats.

### Waveform data in YOKOGAWA's proprietary file format (binary waveform data file)

Waveform data are exported to a file in binary format that can be used on the 4-CH, 100 ks/S D/A module WE7281. The file extension is "*.wvf." When this format is used to export the file, a header file ("*.hdr" extension) in ASCII format is also exported. The following table contains an example of a header file.

| Item | | Fixed | Value | Description |
|---|---|---|---|---|
| $Publicinfo | FormatVersion | Fixed | 1.01 | |
| | Model | Fixed | WE7281 | |
| | Endian | Fixed | Ltl | |
| | DataFormat | Fixed | Block | |
| | GroupNumber | | L | Number of groups (see note 1) |
| | TraceTotalNumber | | M | Number of channels of the data to be edited |
| | DataOffset | Fixed | 0 | |
| $Group1 | TraceNumber | | M' | Number of channels in the group (see note 1) |
| | BlockNumber | | N | Number of blocks of the data to be edited |
| | TraceName | | AAAA · · A | Channel name in the group |
| | BlockSize1<br>.<br>BlockSizeN | | XXX.XXXXXXX | Data length/CH for the channels in the group<br>Set for each block.<br>(see note 2) |
| | VResolution1<br>.<br>VResolutionN | | XXX.XXXXXXX | Range resolution for the channels in the group<br>Set for each block.<br>(see note 2) |
| | VOffset1<br>.<br>VOffsetN | Fixed | 0.000000e+000 | Offset value for the channels in the group<br>Set for each block.<br>(see note 2) |
| | VDataType | Fixed | IS2 | |
| | VUnit | | AAAA · · A | Unit for the group |
| | VPlusOverData | Fixed | 32001 | Same for all channels. |
| | VMinusOverData | Fixed | -32001 | Same for all channels. |
| | VIllegalData | Fixed | NAN | Same for all channels. |
| | VMaxData | Fixed | 32000 | Same for all channels. |
| | VMinData | Fixed | -32000 | Same for all channels. |
| | HResolution | | 1.000000e-001 | Specified sampling interval (same for all channels) |
| | HOffset | | 0.000000e+000 | |
| | Hunit Fix | | S | |
| | Date | | XXXX/XX/XX | Date created (see note 3) |
| | Time | | XX:XX:XX | Time created (see note 3) |
| $PrivateInfo | PtraceName | Fixed | CHX(X: 1 to) | Default value of the header generation DLL |
| | PlinearMode | Fixed | OFF | Default value of the header generation DLL |
| | PlinearSlope | Fixed | 1.000000e+000 | Default value of the header generation DLL |
| | PlinearIntercept | Fixed | 0.000000e+000 | Default value of the header generation DLL |
| | PlinearUnit Fix | ? | | Default value of the header generation DLL |

Note 1: $GroupX is created in groups of four channels.
Example: When TraceTotalNumber = 7
$Publicinfo:$GroupNumber is set to 2.
Information regarding CH1 to CH4 are registered in $Group1. TraceNumber is set to 4.
Information regarding CH5 to CH7 are registered in $Group1. TraceNumber is set to 3.

Note 2: BlockSize, VResolution, and VOffset of $GroupX are created for each block. N is the number of blocks. However, all blocks will contain the same data.

Note 3: Date and Time of $GroupX are set to the last date and time when you edited the data.
Example: If new data are created and directly exported to a file, the date and time will correspond to when the data were created.

### Waveform data for the WE7121 (FG module file)

Waveform data are exported to a file in a format that can be used on the 10 MHz Function Generator Module WE7121. The file extension is "*.w16."

Since the file contains only one channel of waveform data, the waveform data of the specified block and channel are exported.

The waveform data file is exported according to the following specifications so that it can be used in the function generator.

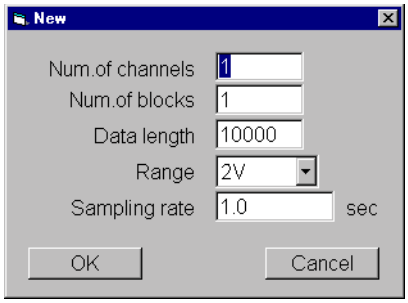
| | |
|---|---|
| Amplitude direction: | Data points are assigned values by taking the minimum value of the edited waveform to be "1" (negative side of Vp-p) and the maximum value to be 4095 (positive side of Vp-p). |
| Time axis direction: | Exports 16384 points from the beginning of the edited waveform. |
| Number of data points: | If the number of data points is less than 16384, the remaining section is filled with "2048" (0 V). If the number of data points exceeds 16384, all points beyond the 16384th point are discarded. |

# 2.1 Creating New Waveform Data

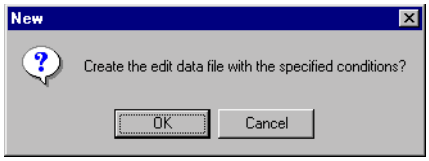
## Procedure

1. Select [New] from the [File] menu.

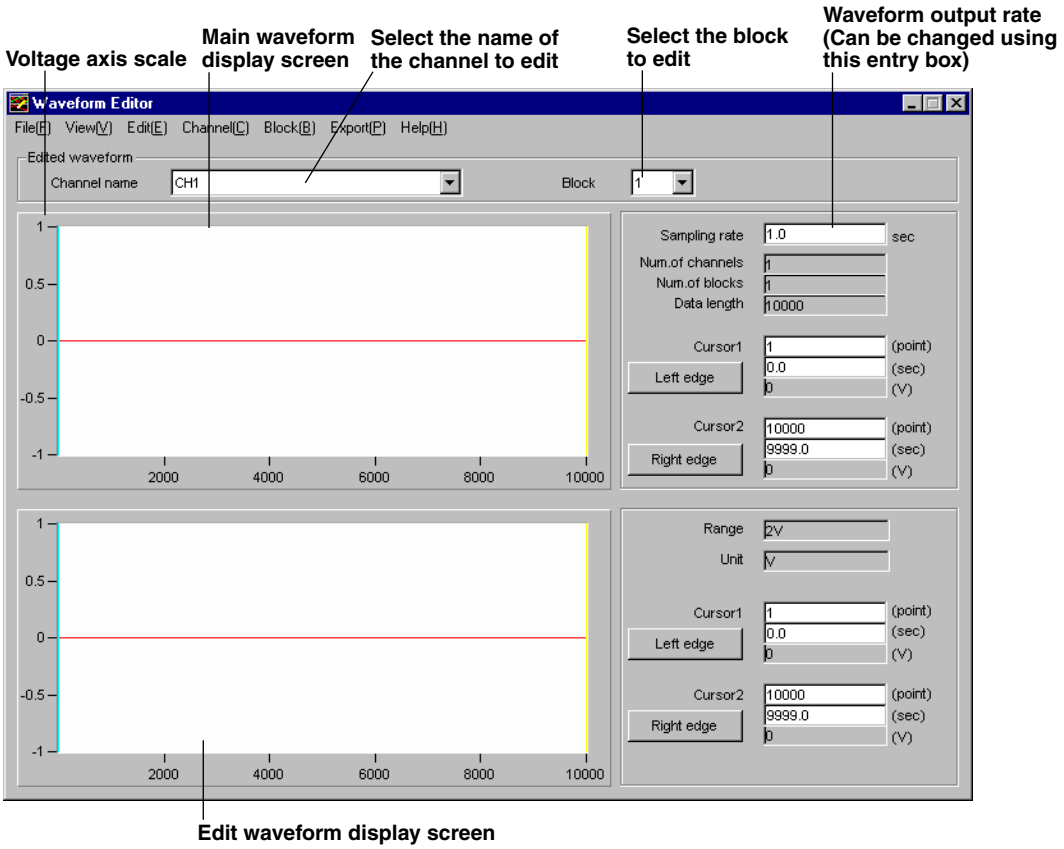
2. In the dialog box shown below, set the [Num. of channels], [Num. of blocks], [Data length] (number of data points), [Range] (voltage range), and the [Sampling rate] (waveform output rate), and click the [OK] button.




3. In the following dialog box, click the [OK] button.
   If you click the [Cancel] button, the screen returns to the dialog box in step 2.




   The waveform edit window opens.



## Explanation

**Number of channels**

Select a value in the range from 1 to 80.
When creating waveform data for the Function Generator Module WE7121, use the default value [1].

**Number of blocks**

Select a value in the range from 1 to 256.
When creating waveform data for the Function Generator Module WE7121, use the default value [1].

**Data length**

Select a value in the range from 1 to 4,194,304.
When creating waveform data for the WE7121, set the value to [16384] (the data length used by the WE7121 when generating arbitrary waveforms). When creating waveform data to be generated in the FG mode on the 4-CH, 100 kS/s D/A Module WE7281, set the value to [65536] (the data length used by the WE7281 when generating arbitrary waveforms in the FG mode).

**Range**

Select the voltage range from “±1 V”, “±2 V”, “±5 V”, and “±10 V.”
Select any appropriate range when creating waveform data for the WE7121. When the waveform data are exported, data points are assigned values by taking the minimum value of the edited waveform to be “1” (negative side of Vp-p) and the maximum value to be 4095 (positive side of Vp-p).

**Sampling rate (waveform output rate)**

Select the sampling rate to use when converting the waveform data using the D/A module. Set the value in the range “0.000001 s to 1,000 s.” This setting is ignored when exporting waveform data for the WE7121.

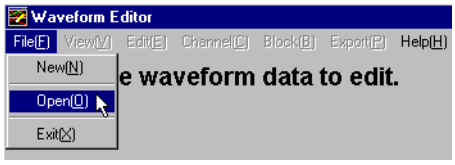
***Note***

- Channel names are set to “CH1 to CHn” (where n is the number of channels), and the unit is set to “V” on all channels.
- Multiple waveform edit windows cannot be opened simultaneously. In addition, you cannot change the size of the waveform edit window.
- If the allowed range of the waveform output rate of the D/A module, that is to load the arbitrary waveform data, is narrower than “0.000001 s to 1,000 s,” values outside the allowed range are changed to the minimum or maximum value at the time of the load.

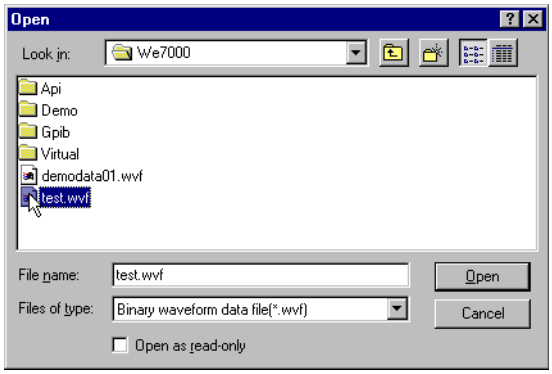
# 2.2 Opening Waveform Data

## Procedure

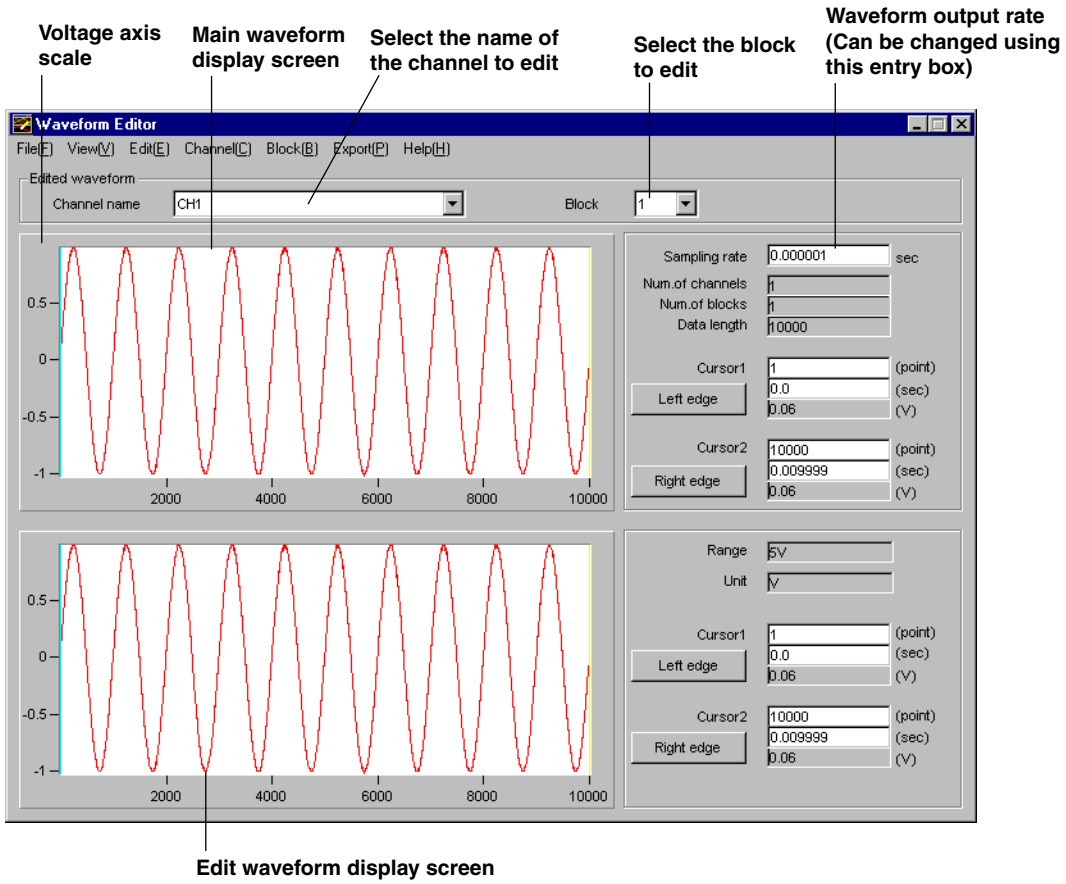
1. Select [Open] from the [File] menu.




2. Select YOKOGAWA's proprietary [Binary waveform data file (*.wvf)] or [CSV file (*.csv)] in the [Files of type] list box in the [Open] dialog box shown below. Then, select the file from the file list displayed and open the file.




The waveform edit window opens.



***Note***

- For the specifications of the waveform data to be loaded, see section 1.2, “Files that can be Opened.” If the specifications of the waveform data being loaded are not appropriate, an error message is displayed.
- When creating waveform data for the WE7121, see the “Explanation” on the previous page for restrictions.
- Multiple waveform edit windows cannot be opened simultaneously. In addition, you cannot change the size of the waveform edit window.

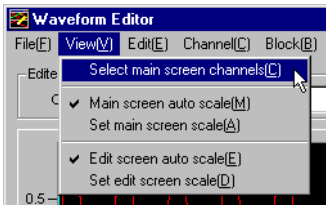
# 3.1 Setting the Waveform Display

## Procedure

### Selecting main screen channels

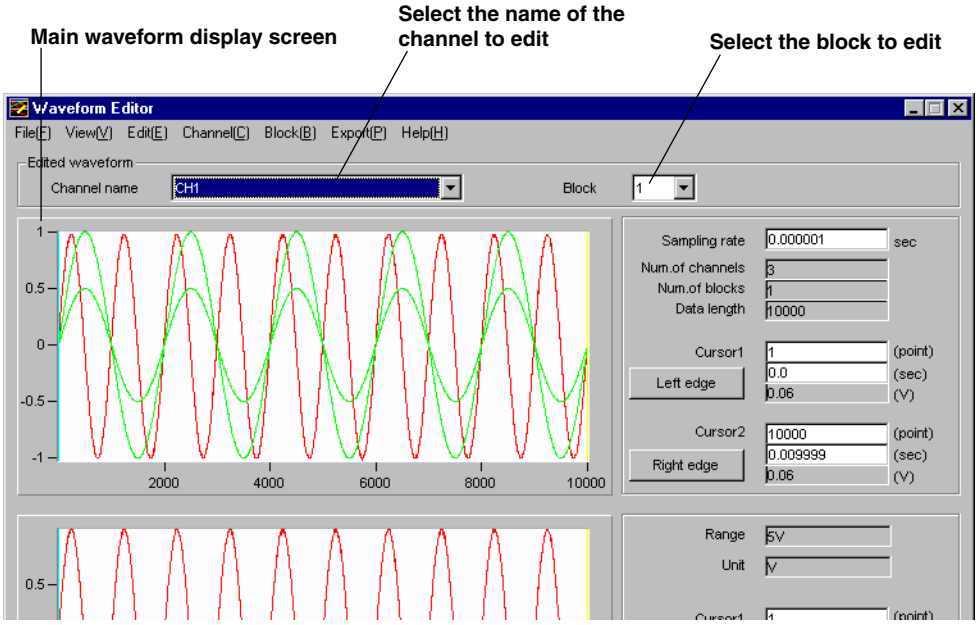
Select the channels that will be displayed in the main waveform display screen. If multiple channels are selected, the waveforms of the selected channels are displayed superimposed.

1. Click the [Select main screen channels] from the [View] menu.



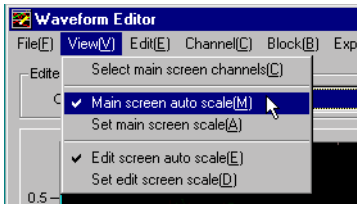

2. In the dialog box shown below, check the boxes for the channels that are to be displayed and click the [OK] button.

As shown in the figure below, the waveform of the channel being edited is displayed in red and all other waveforms are displayed in green.



### Main screen auto scale

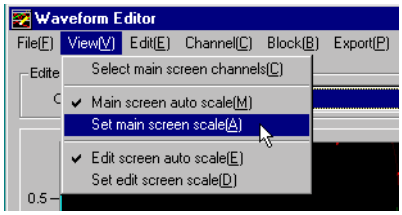
Select whether to use auto scale (the maximum and minimum values of the data are set to full scale) or manual scale (the range specified using the [Set main screen scale] menu) for the display range of the voltage axis of the main waveform display screen.
Click [Main screen auto scale] from the [View] menu. Auto scale is enabled when a check mark is displayed to the left of the [Main screen auto scale] string.



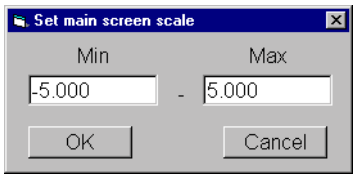

### Setting the main screen scale

Select the range when using manual scale to display the voltage axis of the main waveform display screen.

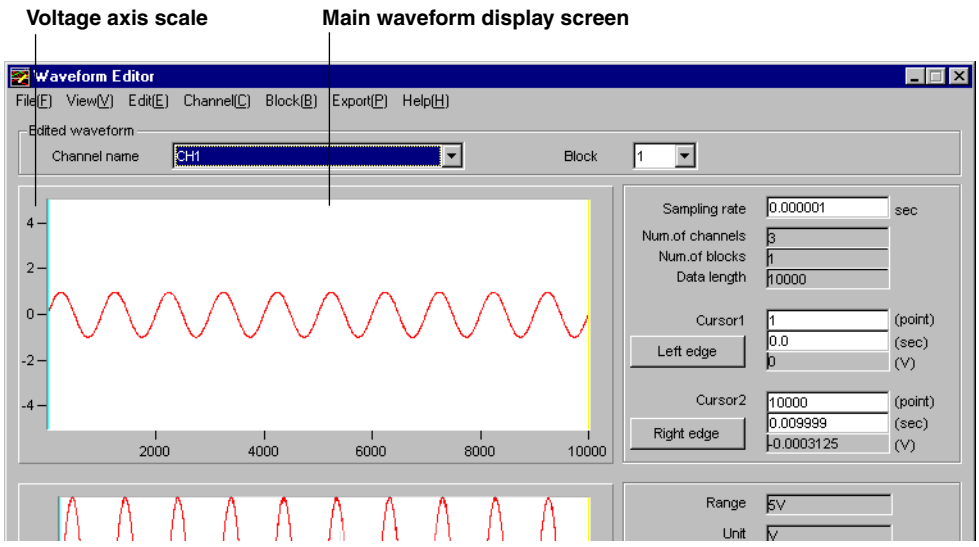
1. Click [Set main screen scale] from the [View] menu.




2. In the dialog box shown below, enter the minimum value [Min] and the maximum value [Max] and click the [OK] button.
The allowed scale range is “-99.999 to 99.999.”



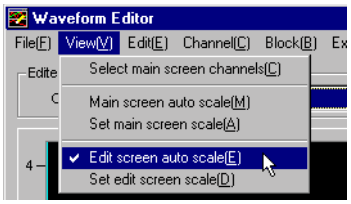

As shown in the figure below, the voltage axis scale of the main waveform display screen changes to the specified values.



### Edit screen auto scale

Select whether to use auto scale (the maximum and minimum values of the data are set to full scale) or manual scale (the range specified using the [Set edit screen scale] menu) for the display range of the voltage axis of the edit waveform display screen.

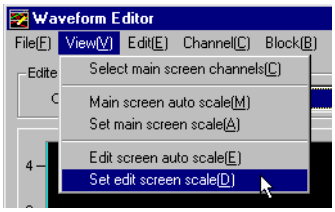
Click [Edit screen auto scale] from the [View] menu. Auto scale is enabled when a check mark is displayed to the left of the [Edit screen auto scale] string.



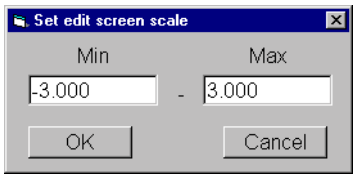

### Setting the edit screen scale

Select the range when using manual scale to display the voltage axis of the edit waveform display screen.

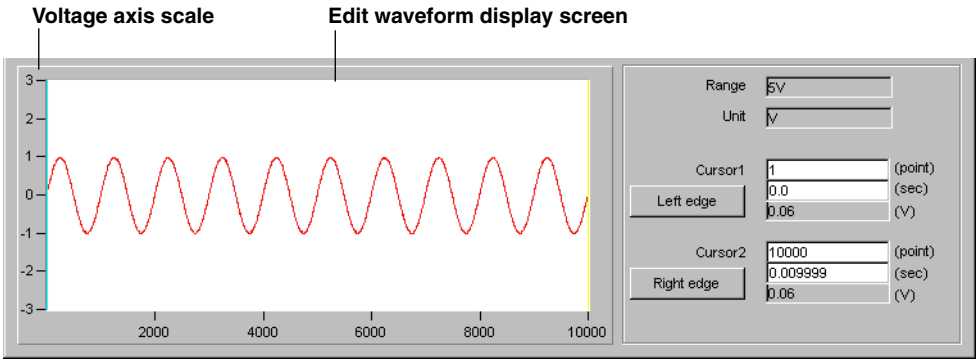
1. Click [Set edit screen scale] from the [View] menu.




2. In the dialog box shown below, enter the minimum value [Min] and the maximum value [Max] and click the [OK] button.
   The allowed scale range is “-99.999 to 99.999.”




   As shown in the figure below, the voltage axis scale of the edit waveform display screen changes to the specified values.



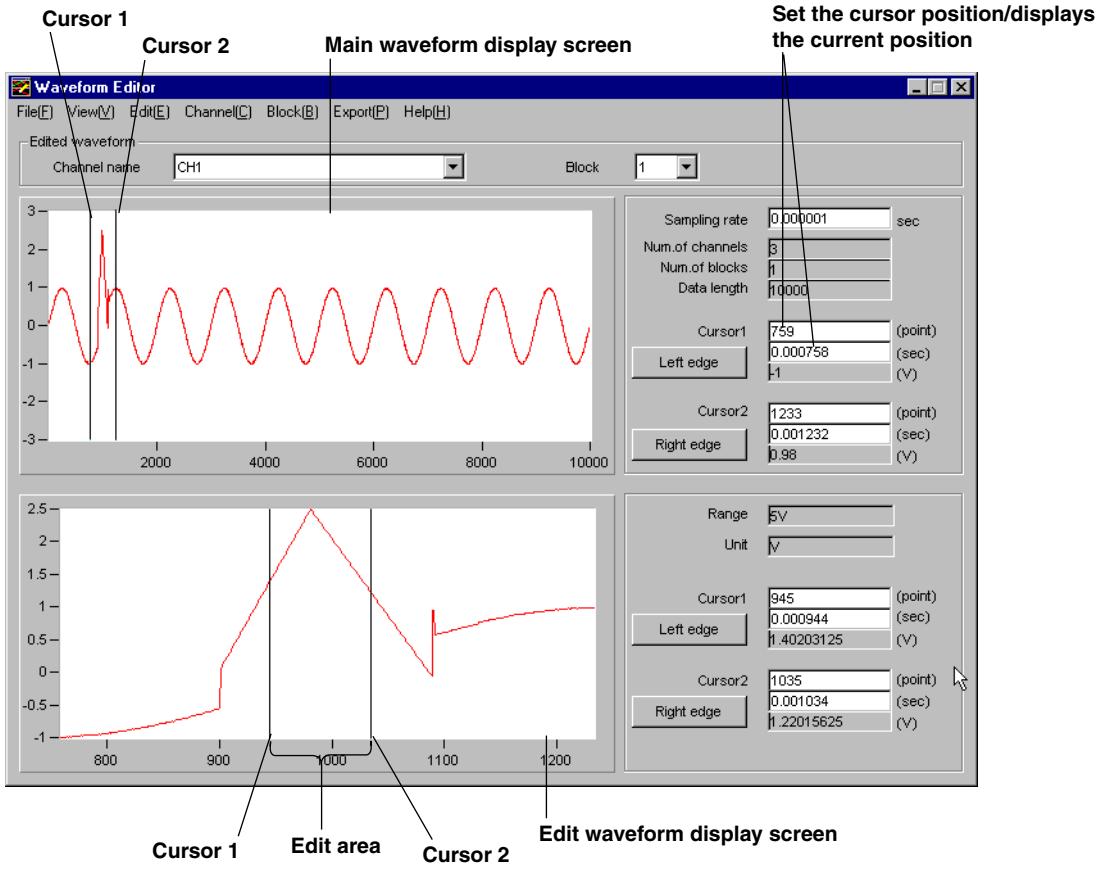

***Note***

The total number of dots in the horizontal direction of the waveform display screen is 1024 points. When displaying waveform data containing more than 1024 points, the waveform is subdivided into sections and the maximum and minimum values of each section are displayed at the same horizontal position.

# 3.2 Selecting the Waveform Edit Area

## Procedure

As shown in the figure below, first, specify the general area that you wish to edit on the main waveform display screen. As default, cursor 1 and cursor 2 are at the left end and right end of the screen, respectively. By moving the pointer to the cursor position and dragging, the cursor can be moved. The area specified by cursor 1 and 2 in the main waveform display screen is displayed over the entire edit waveform display screen. The edit waveform screen also has cursors 1 and 2. The area specified by cursors 1 and 2 in the edit waveform screen is the area that is to be edited. You can also set the area by entering values in the boxes located to the right of the waveform display section. To move cursors 1 and 2 to the ends of the waveform display section, click the [Left edge] or [Right edge] button.




### *Note*

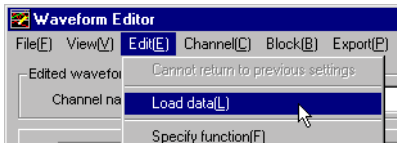
- Various editing operations described in the sections to follow can be performed over the edit area specified by the above procedure. The data position specified by cursor 2 is irrelevant for [Load data] and [Paste] operations.
- For the various editing operations described in succeeding sections, the last operation that was performed can be cancelled by clicking [Undo] from the [Edit] menu. In this case, the cursors return to the ends of the waveform display screen.
- If the right mouse button is clicked on the waveform display screen, [Pair cursor movement] appears. By selecting this menu item, one of the cursors can be used to move both cursors. To cancel this behavior, click the right mouse button again, and select the menu item.

# 3.3 Edit - Load Data

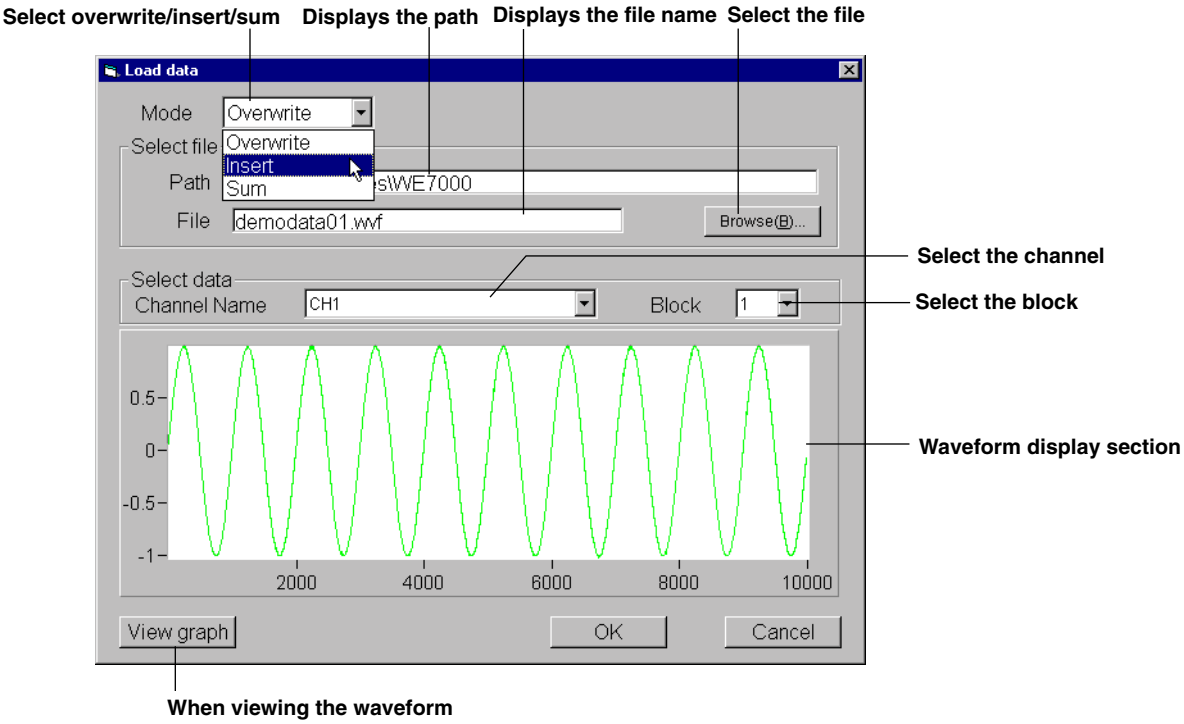
## Procedure

Carry out the following procedures when overwriting, inserting, or summing the loaded waveform data (wvf or CSV format) to the position specified by cursor 1 (see previous section) of the edit waveform display screen.

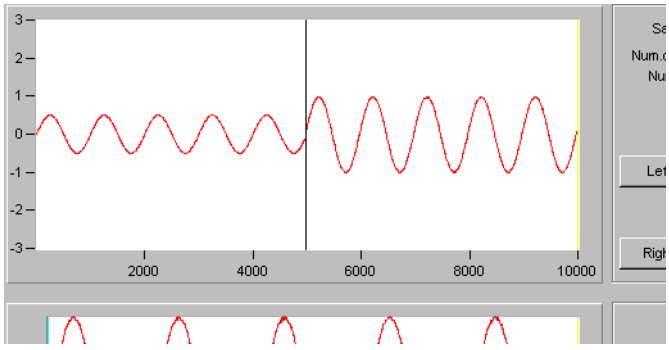
1. Click [Load data] from the [Edit] menu.




2. In the dialog box shown below, Select the file to be loaded. If the file contains data of multiple blocks or channels select the block and channel. Click the [View graph] button to display the waveform of the selected data.




3. In the [Mode] list box, select overwrite, insert, or sum, and click the [OK] button.
4. In the confirmation dialog box, click the [OK] button.
   The waveform of the overwritten/inserted/summed data is displayed (the example below is when the waveform is inserted).



***Note***

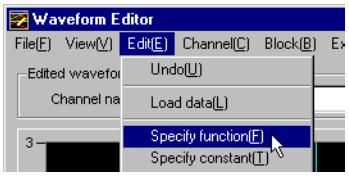
- The types of waveform data files that can be loaded are the same as those that can be loaded using [Open] from the [File] menu. For the specifications of the waveform data, see section 1.2, “Files that can be Opened.”
- The maximum and minimum values of the waveform data being loaded are used as the maximum and minimum values of the scale for the waveform that is displayed in the [Load data] dialog box.
- The settings that are displayed when the [Load data] dialog box is opened are those that were specified the previous time. However, [Mode] is always set to [Overwrite] as default.

# 3.4 Edit - Specify Function

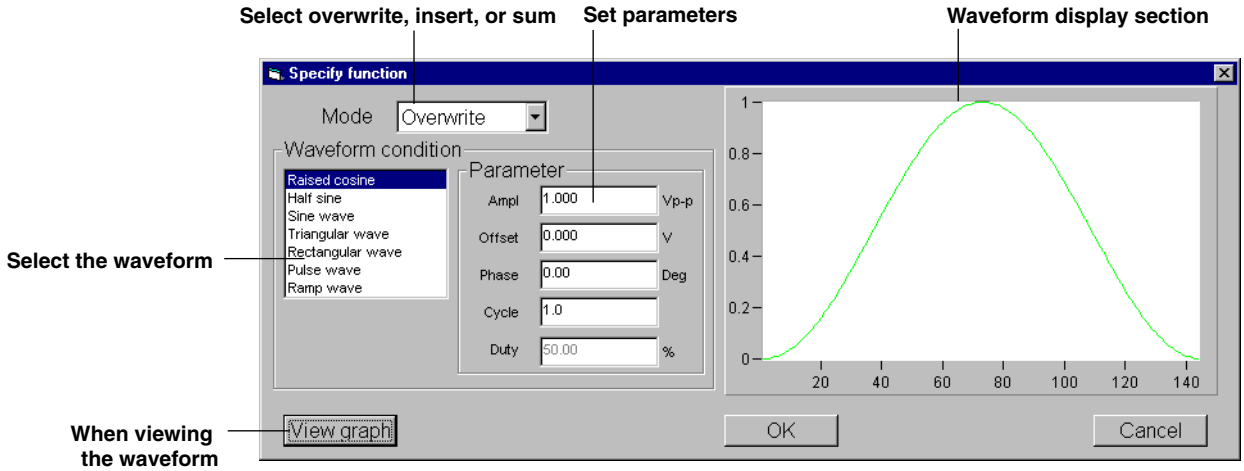
## Procedure

Carry out the following procedures when overwriting, inserting, or summing the specified waveform (wvf or CSV format) to the area specified by cursors 1 and 2 (see section 3.2) of the edit waveform display screen.

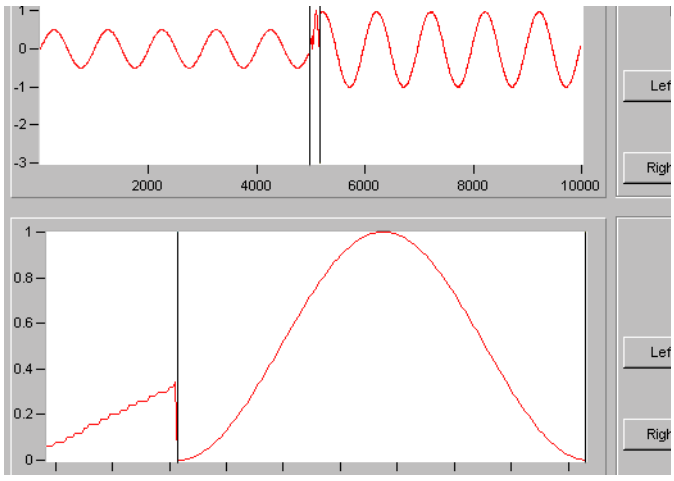
1. Click [Specify function] from the [Edit] menu.




2. In the dialog box shown below, select the waveform using the waveform (function) list box. Use the parameter setting boxes to the right of the waveform (function) list box to specify relevant parameters. The available parameters and their ranges are as follows.
   Ampl (amplitude): 0.001 to voltage range, Offset (off set voltage): Within the voltage range, Phase: 0.00 to 360.00 (0.01 resolution), Cycle (number of cycles): 0.01 to number of data points in the edit area/2 (0.01 resolution), Duty (for pulse wave only): 0.00 to 100.00 (0.01 resolution)
   Click the [View graph] button to display the specified waveform.




3. In the [Mode] list box, select Overwrite/Insert/Sum, and then the [OK] button.
4. In the confirmation dialog box, click the [OK] button.
   The waveform of the overwritten/inserted/summed data is displayed (the example below is when the waveform is inserted).



***Note***

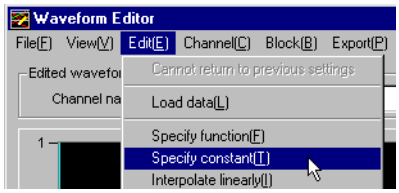
- The maximum and minimum values of the waveform data being loaded are used as the maximum and minimum values of the scale for the waveform that is displayed in the [Specify function] dialog box.
- The settings that are displayed when the [Specify function] dialog box is opened are those that were specified the previous time. However, [Mode] is always set to [Overwrite] as default.

# 3.5 Edit - Specify Constant

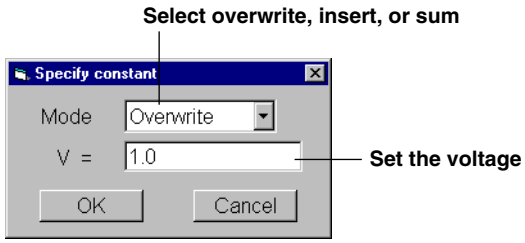
## Procedure

Carry out the following procedures when overwriting, inserting, or summing constant voltage data (wvf or CSV format) to the area specified by cursors 1 and 2 (see section 3.2) of the edit waveform display screen.

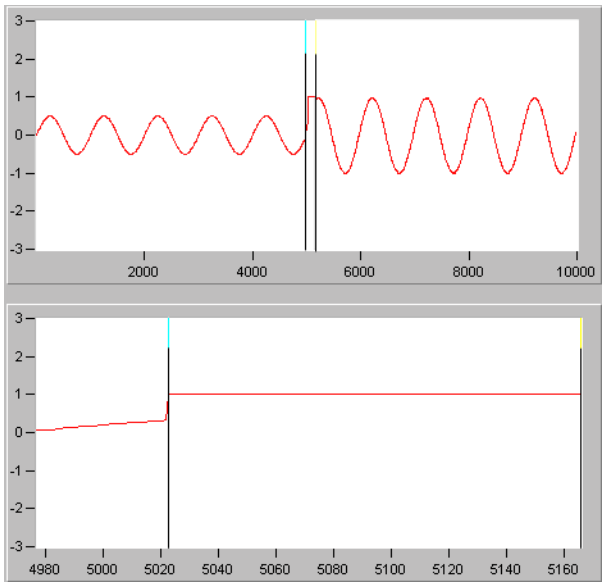
1. Click [Specify constant] from the [Edit] menu.




2. In the dialog box shown below, set the voltage value.
   The selectable range is equal to the voltage range.




3. In the [Mode] list box, select Overwrite/Insert/Sum, and then the [OK] button.
4. In the confirmation dialog box, click the [OK] button.
   The waveform of the overwritten/inserted/summed data is displayed (the example below is when the waveform is inserted).




***Note***

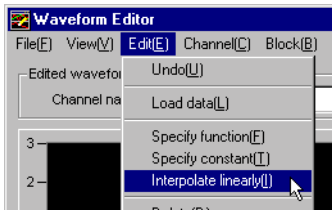
The settings that are displayed when the [Specify constant] dialog box is opened are those that were specified the previous time. However, [Mode] is always set to [Overwrite] as default.

# 3.6 Edit - Interpolate Linearly

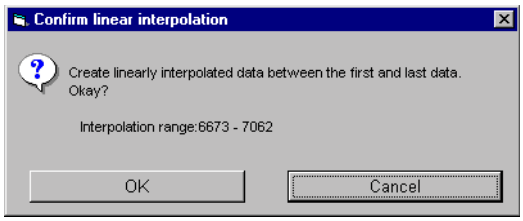
## Procedure

Carry out the following procedures when linearly interpolating values between the first and last values in the area specified by cursors 1 and 2 (see section 3.2) of the edit waveform display screen.

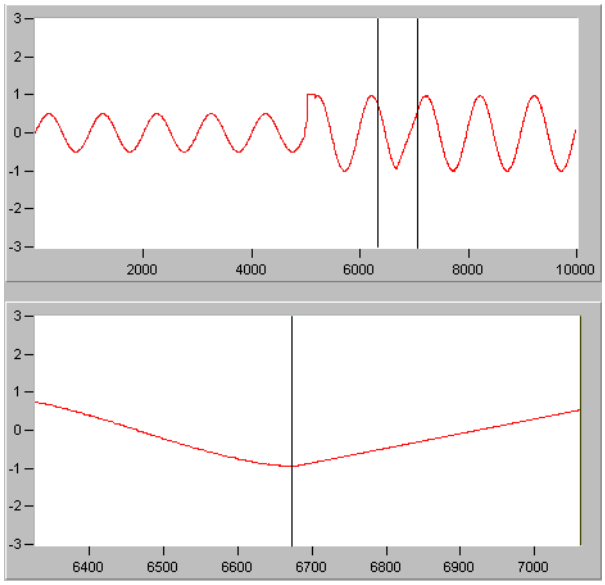
1. Click [Interpolate linearly] from the [Edit] menu.




2. In the confirmation dialog box, click the [OK] button.




As shown in the figure below, the specified area is linearly interpolated.

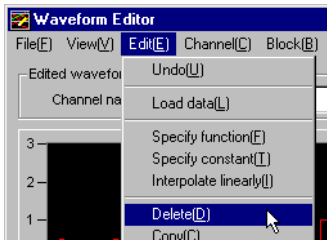


# 3.7 Edit - Delete

## Procedure

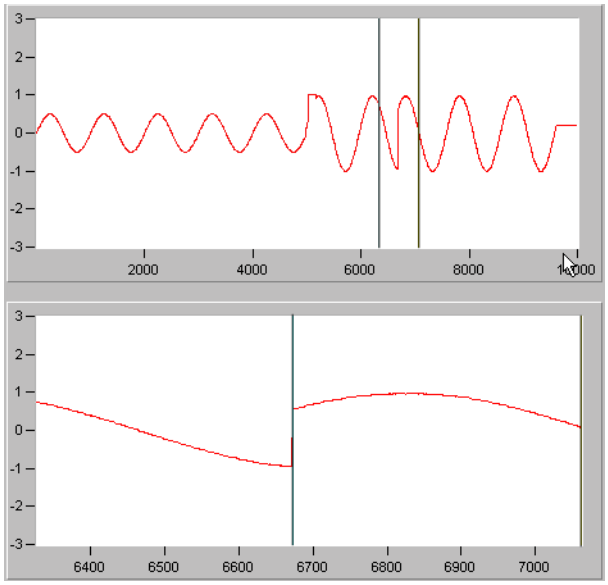
Carry out the following procedures when deleting the waveform in the area specified by cursors 1 and 2 (see section 3.2) of the edit waveform display screen.

1. Click [Delete] from the [Edit] menu.




2. In the confirmation dialog box, click the [OK] button.

As shown in the figure below, the specified area is deleted.

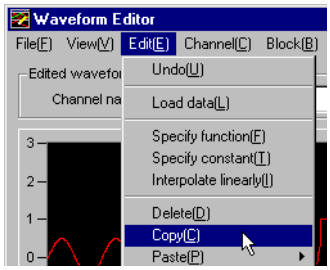


# 3.8 Edit - Copy/Paste

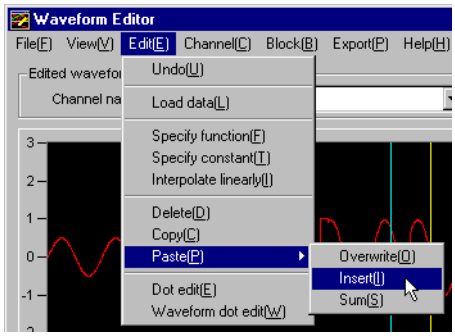
## Procedure

Carry out the following procedures when copying the waveform data in the area specified by cursors 1 and 2 (see section 3.2) of the edit waveform display screen to the position specified by cursor 1.

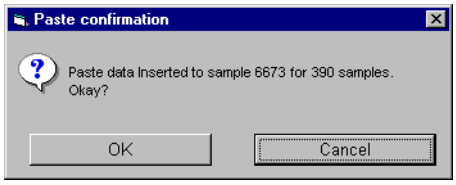
1. Click [Copy] from the [Edit] menu



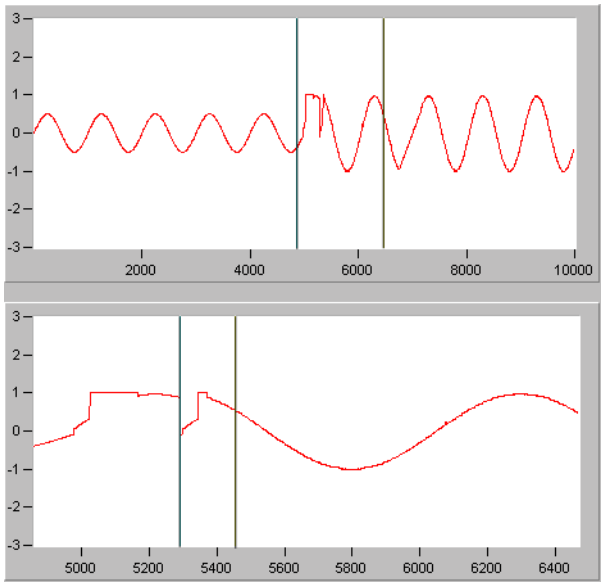

2. Move cursor 1 to the position at which you wish to paste the copied waveform.
3. Select [Paste] from the [Edit] menu, and click [Overwrite], [Insert], or [Sum] that are displayed to the right.




4. In the confirmation dialog box, click the [OK] button.




As shown in the figure below, the waveform is pasted starting from the cursor 1 position.



***Note***

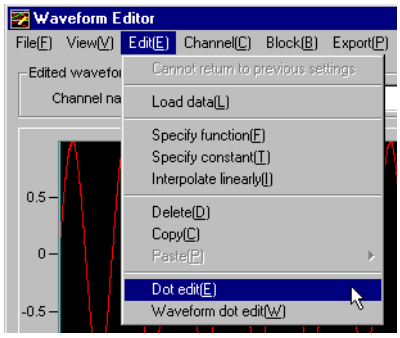
- If the number of data points of the waveform being pasted is greater than the number of points from the cursor 1 position to the last data point, the excess data are discarded.
- If the [Load data] operation is performed after the copy operation, the copied data are replaced by the loaded data. When the waveform is pasted, the loaded data are used.

# 3.9 Edit - Dot Edit

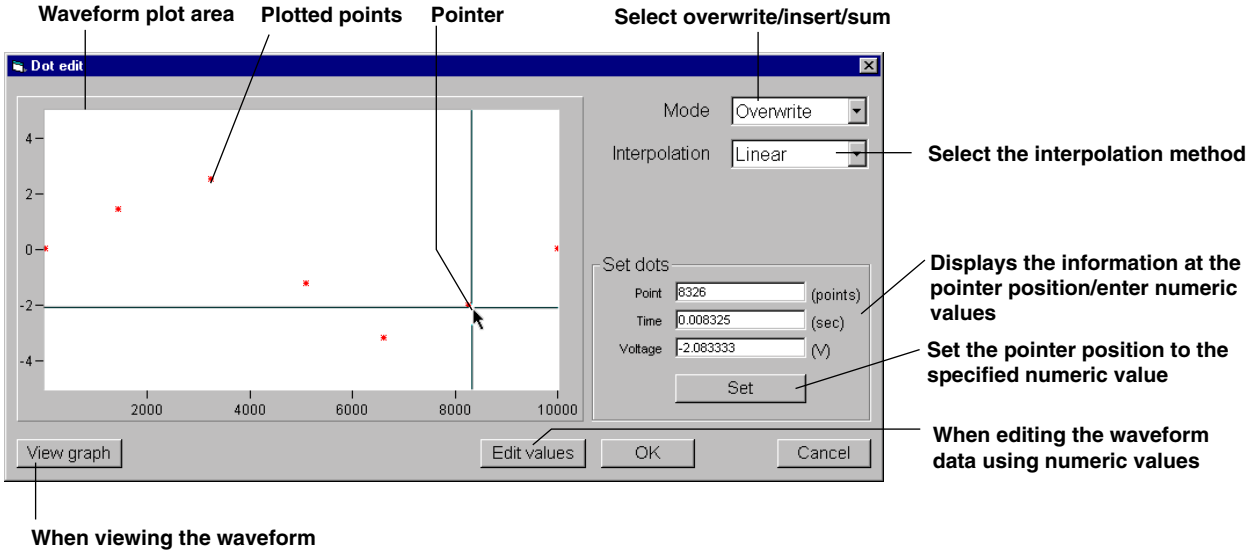
## Procedure

Carry out the following procedures when overwriting, inserting, or summing dot-edited waveform data to the area specified by cursors 1 and 2 (see section 3.2) of the edit waveform display screen.

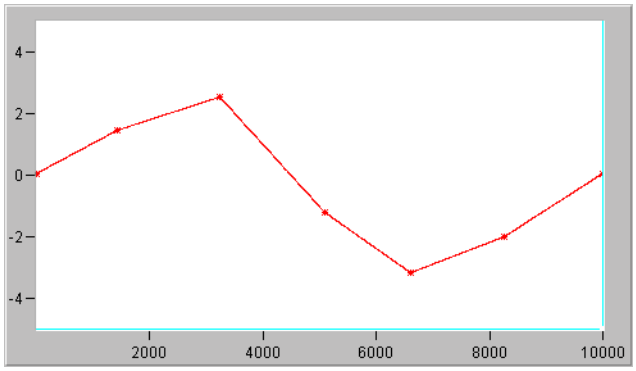
1. Click [Dot edit] from the [Edit] menu.



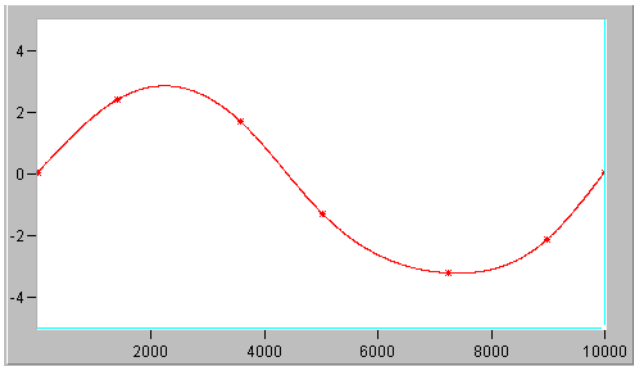

2. In the waveform plot area of the dialog box, move the pointer to the appropriate position and click the mouse.




The following figure is an example of a waveform that is displayed when [View graph] is clicked when [Linear] interpolation is specified.

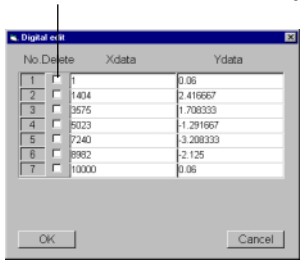


The following figure is an example of a waveform that is displayed when [View graph] is clicked when [Spline] interpolation is specified.

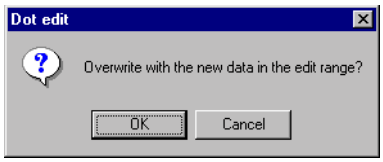



If the [Edit values] box is clicked, a dialog box appears for you to specify the waveform using numeric values. Change the data position (X value) or voltage (Y value) and click the [OK] button.

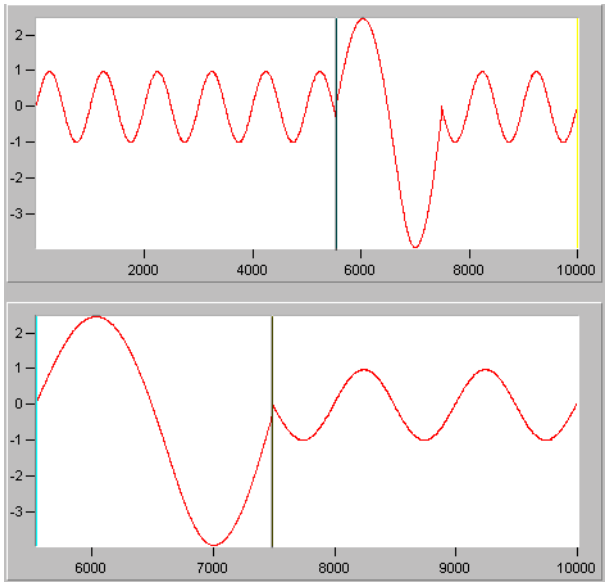
**Check to delete the data point**




3. When you are done editing, select [Overwrite], [Insert], or [Sum] in the [Mode] list box and click the [OK] button.
4. In the confirmation dialog box, click the [OK] button.




The waveform of the overwritten/inserted/summed data is displayed (the example below is when the waveform is inserted) in the specified area.

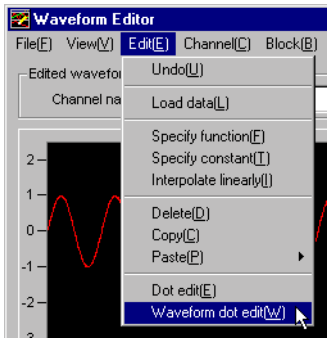


# 3.10 Edit - Waveform Dot Edit

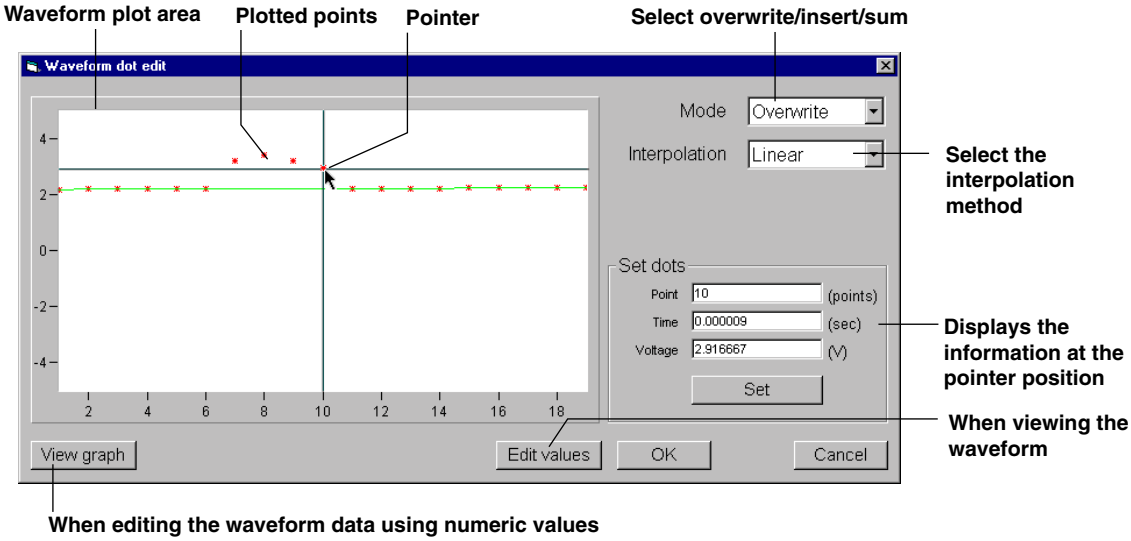
## Procedure

Carry out the following procedures when editing the waveform data (wvf or CSV format) in the area specified by cursors 1 and 2 (see section 3.2, area of 1000 points or less) of the edit waveform display screen and overwriting/inserting/summing the result to the specified area.

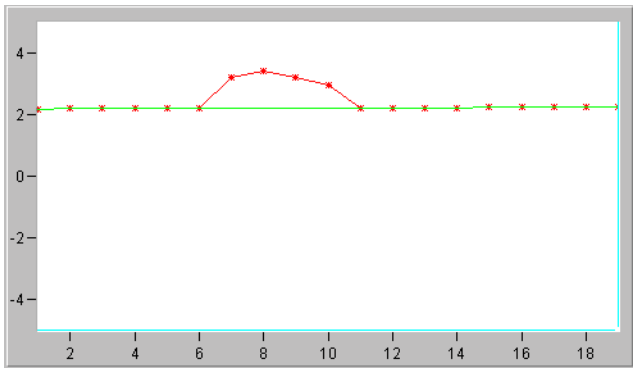
1. Click [Waveform dot edit] from the [Edit] menu.



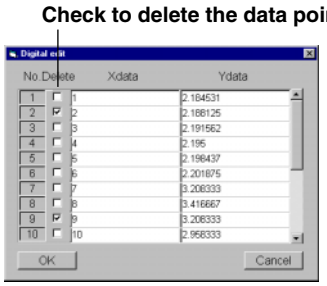

2. In the waveform plot area of the dialog box, move the pointer to the appropriate position and click the mouse.



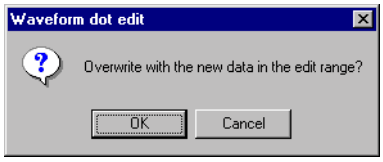

As shown in the figure below, if [View graph] is clicked when [Linear] interpolation is specified, the section of the waveform that has been changed is displayed in red.



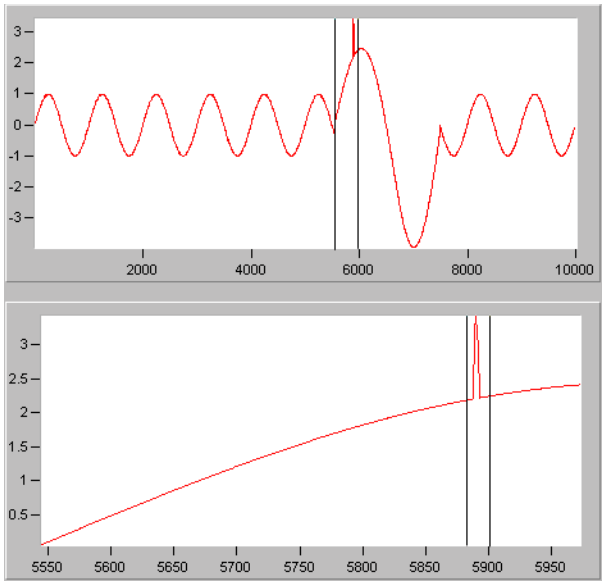
If the [Edit values] box is clicked, a dialog box appears for you to specify the waveform using numeric values. Change the data position or voltage and click the [OK] button.




3. When you are done editing, select [Overwrite], [Insert], or [Sum] in the [Mode] list box and click the [OK] button.
4. In the confirmation dialog box, click the [OK] button.




The edited waveform is overwritten/inserted/summed in the specified area (the example below is when the waveform is overwritten).

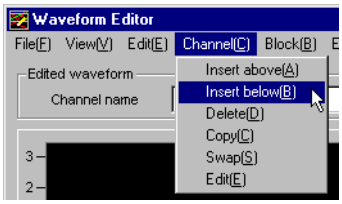


# 3.11 Channel - Insert Above/Insert Below

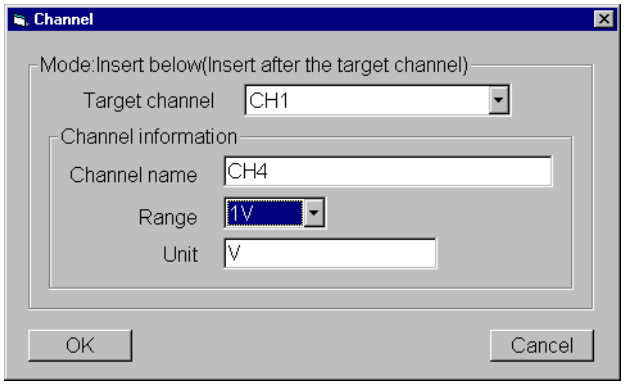
## Procedure

Carry out the following procedures when adding a new channel.

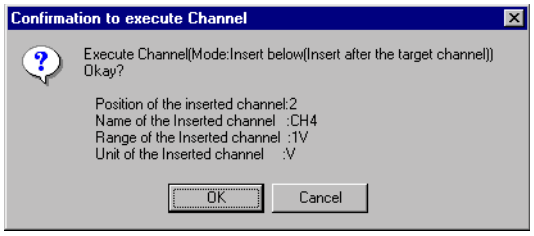
1. Click [Insert above] or [Insert below] in the [Channel] menu.
   To create a channel before the target channel, select [Insert above]. To create a channel after the target channel, select [Insert below].




2. In the dialog box shown below, select the [Target channel] from the list box. Select the name, voltage range, and unit for the new channel and click the [OK] button.
   In the example shown below, a new channel is created after [CH1]. The name, voltage range, and unit for the new channel are [CH4], [1 V], and [V], respectively.




3. In the confirmation dialog box, click the [OK] button.




***Note***

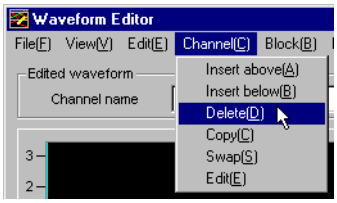
- Up to 80 channels can be created.
- Each channel name must be unique.
- Specify the channel name using up to 15 characters. The following characters can not be used: ["], [\], [/], [,], [.], [:], [;], [<], [>], [?], [*], [ | ], and [space].

# 3.12 Channel - Delete

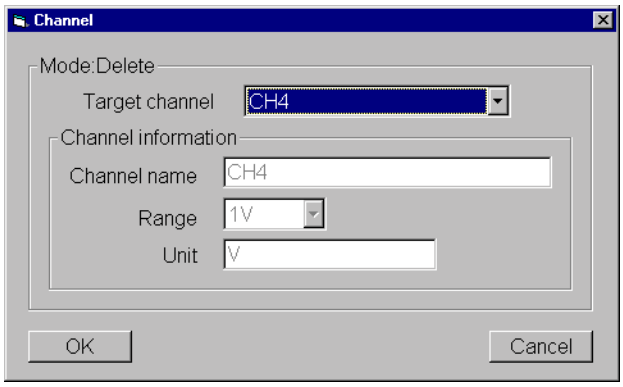
## Procedure

Carry out the following procedures to delete a channel.

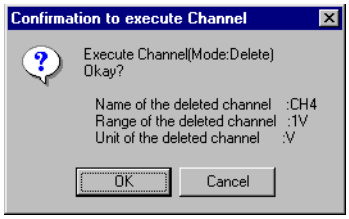
1. Click [Delete] from the [Channel] menu.




2. In the dialog box shown below, select the [Channel] from the list box, and click the [OK] button.
   In the example shown below, [CH4] is selected as the channel to be deleted.




3. In the confirmation dialog box, click the [OK] button.




***Note***

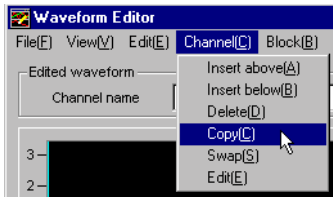
- If the channel being edited is deleted, the channel with the smallest number becomes the new channel that is edited.
- You cannot delete a channel if there is only one channel.

# 3.13 Channel - Copy

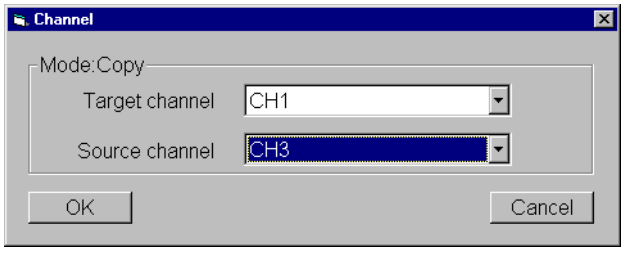
## Procedure

Carry out the following procedures to copy the waveform data of one channel to another channel.

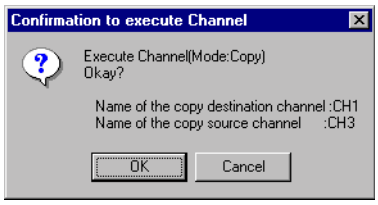
1. Click [Copy] from the [Channel] menu.




2. In the dialog box shown below, select the copy source and destination channels using the list boxes and click the [OK] button.
   In the example shown below, the waveform data of [CH3] are copied to [CH1].




3. In the confirmation dialog box, click the [OK] button.




***Note***

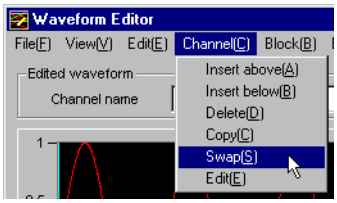
The channel name and unit are not copied. However, the voltage range is set to that of the copy destination channel.

# 3.14 Channel - Swap

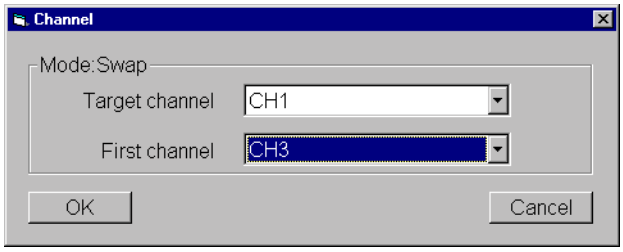
## Procedure

Carry out the following procedures to swap the data between two channels.

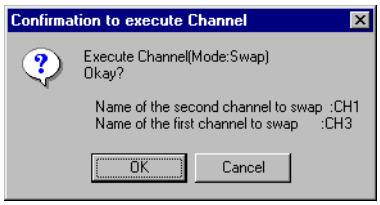
1. Click [Swap] from the [Channel] menu.




2. In the dialog box shown below, select the two channels in the list boxes and click the [OK] button.
   In the example shown below, [CH1] and [CH3] are swapped.




3. In the confirmation dialog box, click the [OK] button.




***Note***

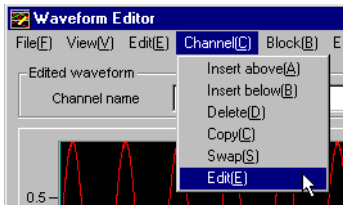
The channel name, voltage range, and unit are swapped, not just the waveform data.

# 3.15 Channel - Edit

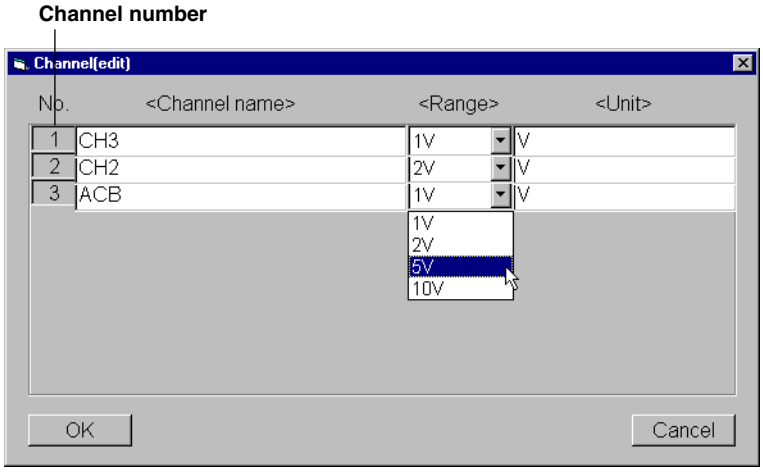
## Procedure

Carry out the following procedures to change the channel name, voltage range, and unit.

1. Click [Edit] from the [Channel] menu.




2. In the entry boxes and list boxes in the following dialog box, change the channel name, voltage range, and unit, and click the [OK] button.




***Note***

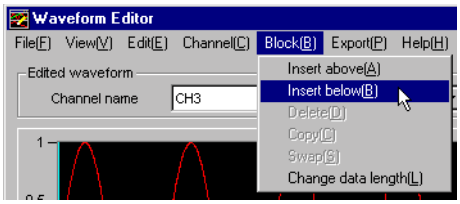
- When the voltage range is changed, the waveform data are scaled to the new voltage range. For example, a value that was “1 V” in the “1 V” range is scaled to “5 V,” if the range is changed to 5 V.
- If there are multiple blocks, the number of channels and the channel name, voltage range, and the unit of each channel are set to the same settings for all blocks.
- You cannot assign an identical channel name to another channel.
- Specify the channel name using up to 15 characters. The following characters can not be used: ["], [\], [/], [,], [.], [:], [;], [<], [>], [?], [*], [ | ], and [space].

# 3.16 Block - Insert Above/Insert Below

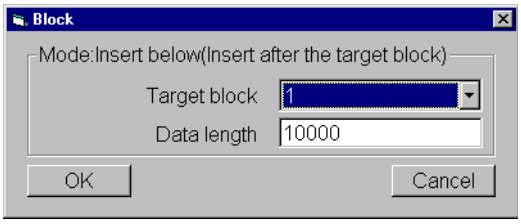
## Procedure

Carry out the following procedures when adding a new block.

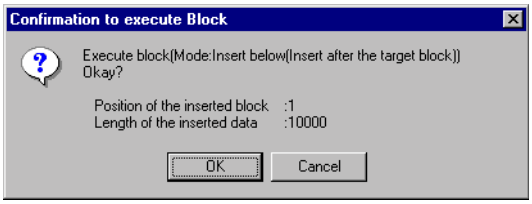
1. Click [Insert above] or [Insert below] in the [Block] menu.
   To create a block before the target block, select [Insert above]. To create a block after the target block, select [Insert below].




2. In the dialog box shown below, select the [Target block] from the list box. Set the data length of the block to be inserted and click the [OK] button.
   In the example shown below, block [2] with a data length of [1,000] is being inserted after block [1].




3. In the confirmation dialog box, click the [OK] button.




***Note***

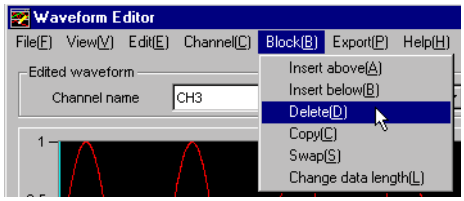
- Up to 256 blocks can be created.
- The data length range is 1 to 4,194,304 points.
- The newly added blocks will contain the same number of channels as the preexisting blocks.

# 3.17 Block - Delete

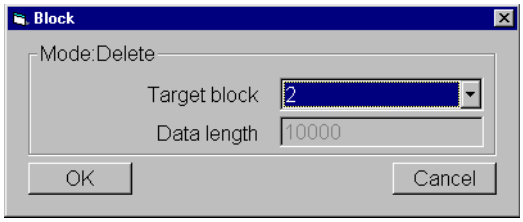
## Procedure

Carry out the following procedures to delete a block.

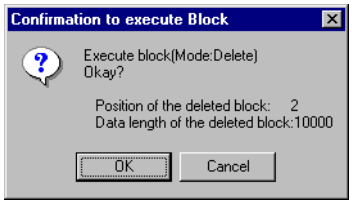
1. Click [Delete] from the [Block] menu.




2. In the dialog box shown below, select the [Target block] from the list box, and click the [OK] button.
   In the example shown below, block [2] is selected as the block to be deleted.




3. In the confirmation dialog box, click the [OK] button.




***Note***

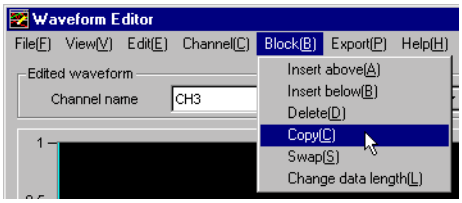
- If the block being edited is deleted, the block with the smallest number becomes the new block that is edited.
- You cannot delete a block if there is only one block.

# 3.18 Block - Copy

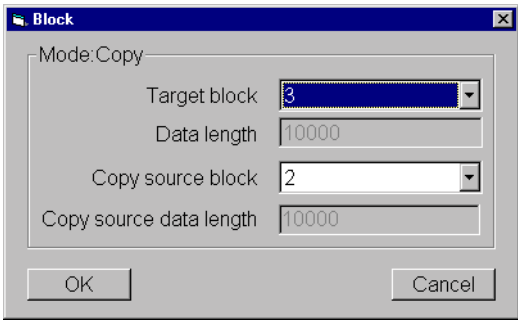
## Procedure

Carry out the following procedures to copy the waveform data of one block to another block.

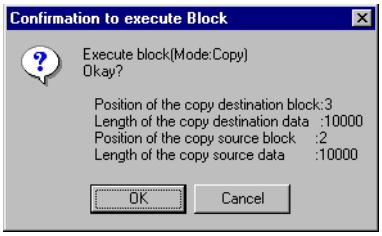
1. Click [Copy] from the [Block] menu.




2. In the dialog box shown below, select the copy source and destination blocks using the list boxes and click the [OK] button.
   In the example shown below, all the waveform data of block [2] are copied to block [3].




3. In the confirmation dialog box, click the [OK] button.




***Note***

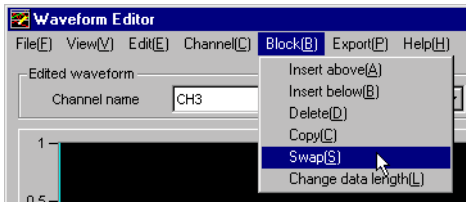
An exact copy of the source block is copied to the destination block. Therefore, even if the data lengths of the two blocks are different, the data length of the destination block is set to the data length of the source block.

# 3.19 Block - Swap

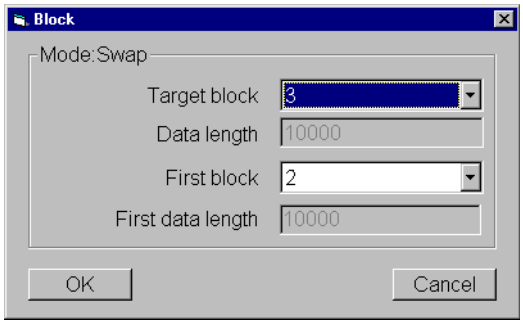
## Procedure

Carry out the following procedures to swap all the waveform data between two blocks.

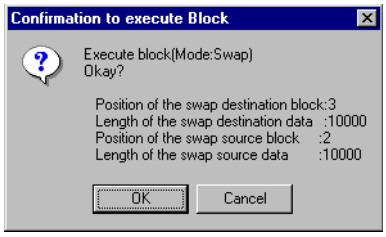
1. Click [Swap] from the [Block] menu.




2. In the dialog box shown below, select the two blocks in the list boxes and click the [OK] button.
   In the example shown below, block [2] and [3] are swapped.




3. In the confirmation dialog box, click the [OK] button.

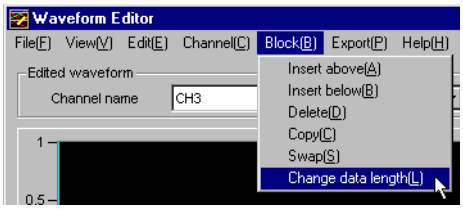


# 3.20 Block - Change Data Length

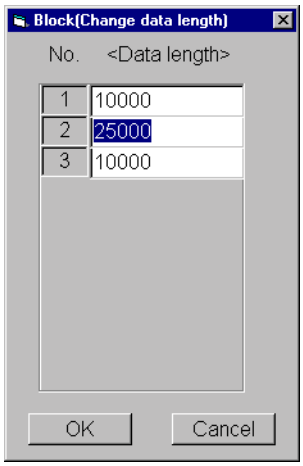
## Procedure

Carry out the following procedures to change the data length of each block.

1. Click [Change data length] from the [Block] menu.




2. In the following dialog box, change the data length and click the [OK] button.
   The selectable data length range is 1 to 4,194,304.



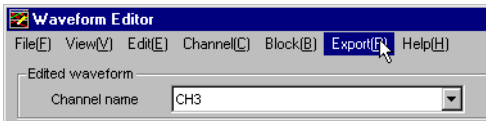

***Note***

If the specified data length is greater than the original data length, any data beyond the end of the preexisting waveform are set to 0 V.

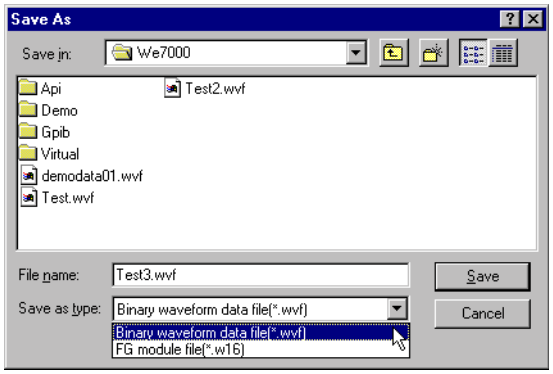
# 4.1 Exporting to Yokogawa's Proprietary File Format (Binary Waveform Data File)

## Procedure

1. Click [Export].

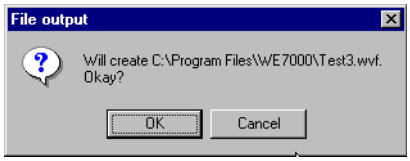



2. In the [Save as type] list box within the following dialog box, select [Binary waveform data file (*.wvf)].




3. Enter the file name and click the [Save] button.

4. In the confirmation dialog box, click the [OK] button.



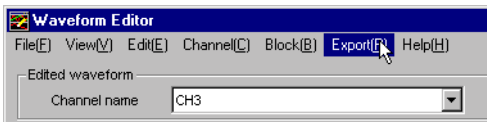

***Note***

- When waveform data are saved, a header file "XXXXXX.hdr" is created in addition to the waveform data file "XXXXXX.wvf." The header file is necessary when loading the waveform data file into the D/A module, for example. Therefore, make sure not to delete the header files. For details related to the header file, see section 1.4, "Output Waveform Data."
- If the waveform data in Yokogawa's proprietary file format (waveform format file) are loaded into the 4-CH, 100 ks/S D/A Module WE7281 for the generation of an arbitrary waveform in the FG mode, the data length is set to "65,536" regardless of the actual data length. If the data length of the loaded waveform is longer than this number, then the first "65,536" points are loaded. If it is shorter, any waveform data beyond the end of the loaded waveform are set to 0 V.

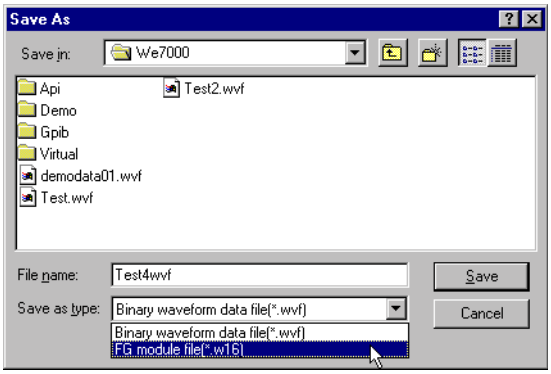
# 4.2 Exporting to Waveform Data File (FG Module File) for the WE7121

## Procedure

1. Click [Export].

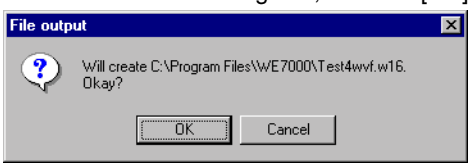



2. In the [Save as type] list box within the following dialog box, select [FG module file (*.w16)].




3. Enter the file name and click the [Save] button.

4. In the confirmation dialog box, click the [OK] button.




***Note***

- Since the file contains only one channel of waveform data, the waveform data of the specified block and channel are exported.
- The waveform data file is exported according to the following specifications so that it can be used in the function generator.

  Amplitude direction: Data points are assigned values by taking the minimum value of the edited waveform to be “1” (negative side of Vp-p) and the maximum value to be 4095 (positive side of Vp-p).

  Time axis direction: Exports 16384 points from the beginning of the edited waveform.

  Number of data points: If the number of data points is less than 16384, the remaining section is filled with “2048” (0 V). If the number of data points exceeds 16384, all points beyond the 16384th point are discarded.

# Specifications

## Files that can be loaded

One file from either of the two formats below

- Waveform data in Yokogawa's proprietary file format (extension: wvf, header file (extension: hdr) is also necessary)
  The specified channel of the specified block can be edited.
- ASCII data in CSV format
  Only the data in the first row can be edited.

## Output File Format

Saved to the following two types of files

- **Waveform data in Yokogawa's proprietary file format**
  Binary waveform data file, extension: wvf, a header file in ASCII format (extension: hdr) is also created.
  Number of bits: 16 bits
  Number of channels: In the range 1 to 80
  Number of blocks: In the range 1 to 256
  Data length: In the range 1 to 4,194,304 (per channel)
- **Waveform data for the WE7121**
  Binary file format dedicated to the WE7121 (extension: w16)
  Number of bits: 16 bits (Little Endian. The lower 12 bits are used. The upper 4 bits are ignored.)
  Value assignment: Using the maximum and minimum values of the data, scale the values in the range 1 to 4095.
  Data length: 16,384 points (If the number of data points is less than 16,384, the remaining section is filled with the value 2048.)

## Edit Functions

**Specify a function**
Change the waveform data in the specified area to the waveform created using the following functions.
Raised Cosine, Half Sine, square wave, triangular wave, rectangular wave, pulse wave, and ramp wave

**Specify a constant value**
Change the waveform data in the specified area to a constant value.

**Interpolate linearly**
Change the waveform data in the specified area to linearly interpolated values between the first and last values in the specified area.

**Delete**
Delete the waveform data in the specified area and shift the waveform data succeeding the area forward.

**Copy/Paste**
Copy the waveform data in the specified area and paste it to another specified area.

**Dot edit**
Create a waveform by numerically entering or plotting the passing points and interpolating the points using a line or a 3rd order spline and paste the waveform to the specified area.

**Waveform dot edit**
Change the waveform data by numerically entering or plotting each point (interpolation using a line or 3rd order spline is also possible).

**Channel Management**

Add/delete channels. Copy waveform data between channels. Swap waveform data between two channels. Change the channel condition (channel name, voltage range, and unit).

**Block Management**

Add/delete blocks. Copy waveform data between blocks. Swap waveform data between two blocks. Change the data length.

**Waveform Display**

- Main screen
  Displays all points of the specified block. Superimpose multiple channels.
- Edit screen
  Displays the waveform in the specified area (expanded display)
- Y-axis scale setting
  Auto scale or manual scale

**Cursor Functions**

- Specify the edit area using two cursors.
  Specify the cursor position (X value) using the mouse or by entering a value.
- Display the X value (number of points, time) and the Y value (Voltage).
- Cursor link
  Fix the distance between the two cursors.

**Channel name**

Up to 15 characters (checks for duplicate file names). Symbols that cannot be used: ["], [\], [/], [,], [.], [:], [;], [<], [>], [?], [*], [ | ], and [space].

**Selectable voltage range**

Because data are edited as voltage values, select the voltage range from the following.
±1 V, ±2 V, ±5 V, ±10 V

**Unit**

Up to 10 characters. Symbols that cannot be used: ["], [\], [/], [,], [.], [:], [;], [<], [>], [?], [*], [ | ], and [space]

## PC System Requirements

**Hardware**

- PC
  PC on which Windows 95/98 or Windows NT 4.0 runs.
  CPU: Pentium 133 MHz or higher
- Hard Disk
  Minimum free space of 20 MB. (However, this depends on the data size of the waveform being edited.)
- Drive
  One CD-ROM drive. This drive is used to install this software.
- Mouse
  Mouse supported by Windows95/98 or Windows NT 4.0
- Display
  Display supported by Windows 95/98 or Windows NT 4.0. A minimum of 256 colors (analog RGB) recommended.

**OS**

Microsoft Windows 95/98 or Windows NT 4.0

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