ARBITRARY WAVEFORM EDITOR

INSTRUCTION MANUAL

NF Corporation

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ARBITRARY WAVEFORM EDITOR

INSTRUCTION MANUAL

- About registered trademarks

Preface

Thank you for purchasing the WF1967/WF1968 Multifunction Generator.
To ensure safe use of this product, please first read “Safety Precautions” on the following pages.

- This manual has the following chapter organization.

If you are reading this manual for the first time, start from “1. OVERVIEW.”

1. OVERVIEW

   Presents brief descriptions of the Arbitrary Waveform Editor functions.

2. INSTALLATION

   Describes environmental requirements for operation of the Arbitrary Waveform Editor as well as its installation.

3. FOR FIRST-TIME USERS

   Describes Arbitrary Waveform Editor operations, using simple examples of respective major features. Try to operate the software while reading this chapter.

4. OPERATIONS ON ARBITRARY WAVEFORM DISPLAY WINDOW

   Describes functions and how to use waveform display window.

5. OPERATIONS ON OTHER WINDOWS

   Describes functions and how to operate other windows.

6. ERROR MESSAGES

   Describes error specifications.

7. MAINTENANCE

   Describes management of the CD-ROM and actions to take when the device is damaged.

Safety Precautions

For safe use, ensure to obey the following warnings and cautions.
We are not responsible for damage resulting from failure to obey these warnings and cautions.

- Ensure you obey the instructions in this instruction manual.

This instruction manual contains instructions for safe operation and use of this product.
Before using the product, please read this manual first.
All the warning items contained in this instruction manual are intended for preventing risks that may lead to serious accidents. Ensure to obey them.

- If you notice anything strange

If the power system controlled by this product produces smoke, unusual odor, or strange sound, immediately stop using it.
Should you encounter any anomaly like above, make sure the system cannot be used until the repair is completed, and immediately contact us or our agent.

Disclaimer

“Arbitrary Waveform Editor” (hereinafter abbreviated as “this software”) is shipped after being tested and inspected sufficiently by NF Corporation.
Should you encounter any failure caused by a manufacturing defect or accident during transportation, contact us or our agent.
We have no responsibility for any damage caused by using this software. We also are not obligated to provide any modifications or support, if you have problems with this software. Use this software on your own responsibility.

About Copyrights

Contact Us

Should you find any fault or any questions, please contact us or our agent from whom you purchased the product.
When you contact us or our agent, tell us the model name (or product name), version number, and more detailed symptom/condition of use.

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1. OVERVIEW

1.1 General

The Arbitrary Waveform Editor is software that supports the arbitrary waveform function of WF1967/WF1968 Multifunction Generator.

The Arbitrary Waveform Editor operates on Windows on a personal computer (PC), transferring waveform and other data via USB.
The main functions of the Arbitrary Waveform Editor are listed below.

[Waveform generation function]
Generates standard waveforms in the specified range.
Generates arbitrary waveforms in the specified range using waveform function expressions.
Generates arbitrary waveforms by specifying control points, using linear interpolation and spline interpolation.
Generates arbitrary waveforms by using PWF (parameter-variable waveform).

[Transfer & read-out function]
Transfers waveform data and the main parameter settings of the signal generator via USB.
Reads out the arbitrary waveform data of the signal generator via USB.

[Display function]
Specifies a range with two markers and reads the values of waveforms.

[File operation function]
Saves to a file and reads out waveform data, signal generator settings, waveform function expressions, interpolation control points, etc.

1.2 Conventions

The following conventions are used in this manual.

- Menu names and button names displayed on the screen, and user-input text
  Block letters enclosed by square brackets ([ ]). Example: **[File(F)]**, **[OK]**
- Press one key while holding down another key
  Two keys are connected by a plus symbol (+). Example: Ctrl+O
- Press one key, release it and press another key
  Two keys are divided by a comma (,). Example: Alt, F

2. INSTALLATION

2.1 Hardware Requirements

Before installing the Arbitrary Waveform Editor, check that the system satisfies all the requirements below.

2.1.1 Personal computer

- CPU: 1 GHz or faster
- Memory: 1 GB for 32-bit or 2 GB for 64-bit
- Free hard disk space: 10 MB or more
- Display: 1024 × 768 pixels or higher and 256 colors or more.
- OS: Windows 7 32-bit / 64-bit (Microsoft) English
  Windows 8.1 32-bit / 64-bit (Microsoft) English
  Windows 10 or later (Microsoft) English
- Disk drive: CD-ROM drive

---- Notes ----------

The company and product names are trademarks or registered trademarks of their respective owners.
The CD-ROM drive is required only when the software is installed.

2.1.2 USB interface

- USB 1.1 Full Speed

2.2 Installation Procedure

To install or uninstall this software, log on to Windows as an administrator.

2.2.1 Installing the USB driver software

This software is confirmed to work on NI-VISA Version 2023Q3 provided by National Instruments Corporation. Please be aware that we do not provide support for problems that occur in the VISA environment provided by other vendor products.
For details of NI-VISA, contact National Instruments Corporation or visit the National Instruments Website.

---- Notes ----------

Please set the remote interface of the WF1967/WF1968 to “USB” and then follow the procedure described above. For details, see the “WF1967/WF1968 Instruction Manual (Remote Control).”

2.2.2 Installing Arbitrary Waveform Editor

1. Insert the WF1967/WF1968 Multifunction Generator's CD-ROM into the CD-ROM drive of your PC.
2. Execute the installer in the folder English\Application\ARB_EDIT in the CD-ROM.
3. Click the Next button, following the instructions of the install wizard to install the software.
4. After the installation finishes, remove the CD-ROM from the CD-ROM drive. Now you can use the software. (☞3.2)

2.2.3 Uninstalling Arbitrary Waveform Editor

Open Programs and Features from Control Panel. From the list of currently installed programs, select "ARB Edit for WF1967/WF1968" and click Uninstall.

The folder where the software is installed is not always removed. The files created in the folder remain. If the files and the folder are not needed, remove them after uninstallation.

3. FOR FIRST-TIME USERS

3.1 General

This chapter describes several examples so that you can understand basic operations and functions for the "Arbitrary Waveform Editor" (ARB Edit).

It will be easier to understand the description if you read it while actually operating the software.

The following conventions are used in this chapter.

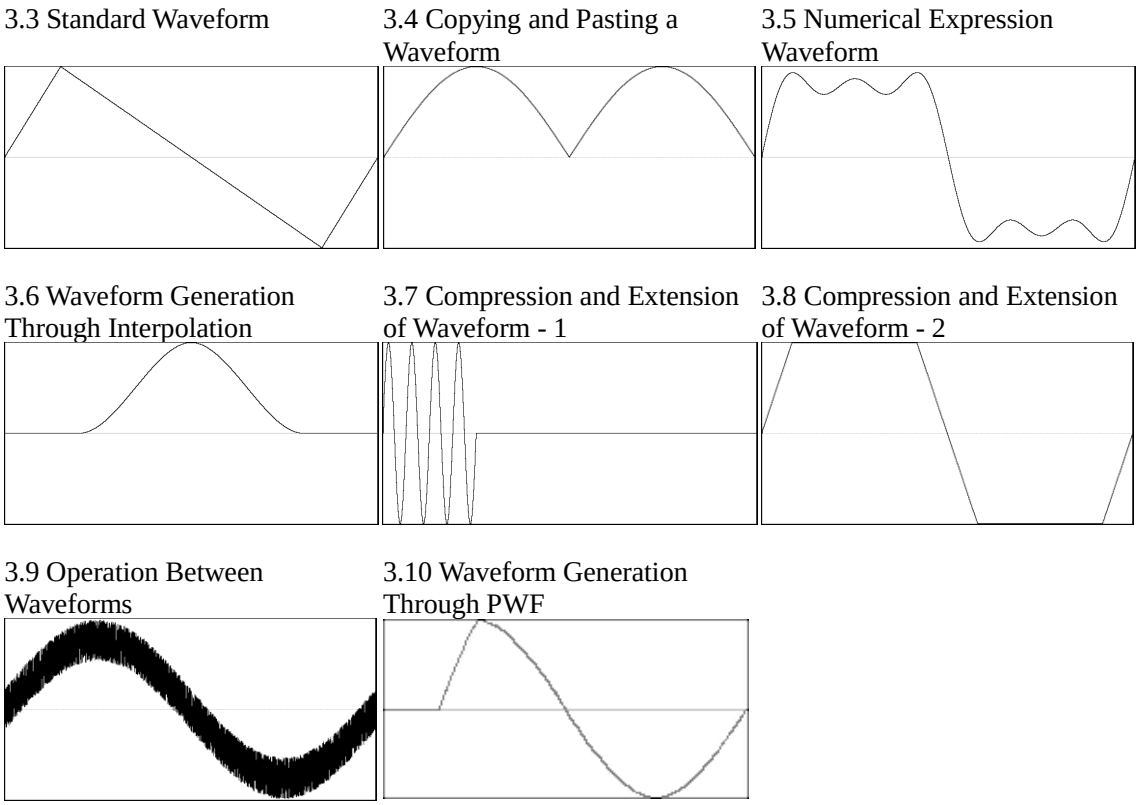


Figure 3-1 Examples of Waveforms Described in This Chapter

3.2 Start and Exit

To start the ARB Edit, click **[Start]-[Program]-[NFTool]-[ARB_Edit for WF1967_WF1968]-[ARB_Edit for WF1967_WF1968]**.

To exit the ARB Edit, click ☒ (close box) at the top right or select **[File] - [Exit]**. The confirmation message says **[Exit Program. Are you sure?]** in either case. Click the **[Yes]** button.

In the following examples, operations are explained from the default status when the ARB Edit is started. Before performing the operations in each example, exit the ARB Edit once and then restart it.

3.3 Standard Waveform

This section explains how to create a triangle wave with 30% symmetry, as a sample standard waveform.

Step 1:	Click  at the top left of the window. The same result can be obtained when **[Tools] - [Wave Create]** is selected. The waveform generation window appears.
Step 2:	Click the **[Function]** box and click **[Triangle]** from the list.
Step 3:	Change the numerical value from **[50]** to **[30]** in the number input section to the right of **[Symmetry]** and press the Enter key. This specifies a triangle wave with 30% symmetry.
Step 4:	Clicking **[All Page OK]** closes the waveform generation window and returns to the screen where the waveform is displayed.

Explanation 1: In this example, the waveform is generated across the memory size. In the ARB Edit, the waveform can be divided into multiple pages. For example, the fist quarter of a waveform can be allocated to the first page and the latter half of the waveform can be allocated to the second page, and so on. (☞5.1.1)

To execute the specified waveform across multiple active pages in batch, click the **[All Page OK]** button.

To execute the displayed page only, click the **[Page OK]** button. In this example, clicking either of the buttons leads to the same result because the first page alone is specified.

Explanation 2: In addition to the triangle wave, the sine wave, square wave (duty ratio variable), and waveform definitions (waveform functions) with the noise, DC, or numerical expression can be selected. (☞3.5)

3.4 Copying and Pasting a Waveform

This section explains how to create a full-wave rectification waveform, as a sample of copying and pasting waveforms.

Step 1: Click the button to the top left of the screen. The same result can be obtained when **[Tools] - [Waveform Create]** is selected.

Step 2: The sine wave is selected in the initial status, so click the **[All Page OK]** button without changing it and return to the waveform display window.

Step 3: Move marker B to the center of waveform. In the initialized state, **[1.000000]** is displayed to the bottom right of the screen. Set **[0.5]**, which is the half of the memory size, in the number area to the right of **[MrkB(X)]** and press the Enter key.

Step 4: Press the C key while holding down the Ctrl key. The same result can be obtained when **[Edit] - [Copy]** is selected. The area between markers A and B, that is, the first half data of waveform is copied to the clipboard.

Step 5: Select the **[tRack]** option button to set the markers to tracking mode. Set **[0.5]** in the **[MrkA(X)]** box and press the Enter key.

Step 6: Press the V key while holding down the Ctrl key. The same result can be obtained when **[Edit] - [Paste]** is selected. The waveform data on the clipboard is pasted to the latter half of waveform.

Explanation 1: If the axis setting is not in the initial state, the operation differs.
In this case, exit ARB Edit and then restart it and perform the operation.

Explanation 2: The operation of pressing the C key while holding down the Ctrl key is hereinafter expressed as Ctrl + C.
Ctrl + C (Copy) leaves the waveform in the copied area as is.
Ctrl + X (Cut) is the same in that the data in the selected area is saved onto the clipboard. The waveform in the selected area is deleted, however.
Ctrl + D (Delete) deletes the waveform in the selected area but the data on the clipboard does not change.

Explanation 3: Use markers A and B to select the range. For example, when the range specified with the markers is from 0 to 1.000, the actual selection range will be $0 \leq X < 1.000$.

Explanation 4: The clipboard (☞ 4.7.2)

3.5 Numerical Expression Waveform

This section explains how to create a waveform by superposing 3rd and 5th harmonics over the fundamental wave, as a sample of generating a waveform with a numerical expression.

Step 1:	Select **[Setup] - [Setup]**. The system setup window appears.
Step 2:	Click the **[Unit]** tab page.
Step 3:	Click the **[X-Axis Unit]** box and select **[User Unit]** from the displayed list. Leave the minimum value to the maximum value two lines below as their initial values, **[0.000000 - 1.000000]**.
Step 4:	Click the **[Y-Axis Unit]** box and select **[User Unit]** from the displayed list. Leave the minimum value to the maximum value in the last line as their initial values, **[-1.000 - 1.000]**.
Step 5:	Click the **[OK]** button to return to the waveform display window.
Step 6:	Click the f_x button at the left top of the window.
Step 7:	Click the **[Function]** box and select **[Waveform Function]** from the displayed list.
Step 8:	Input **[s=2*pi;]** in the **[Constant]** box. Input **[sin(x*s)+sin(x*s*3)/3+sin(x*s*5)/5]** in the **[Y=]** box.
Step 9:	Click the **[Compute]** button. The calculated waveform is displayed on the waveform generation window.
Step 10:	Click the **[All Page OK]** button to return to the waveform display window.

Explanation 1: In this example, the horizontal line (X) is treated as 0 to 1 by using the custom unit. Likewise, the vertical line (Y) is treated as ±1 as a whole. The expression of one cycle of the sine wave is made easier by defining s=2π as a constant so that **[x*s]** is expressed in a formula.

Explanation 2: If you set the X range for the custom unit to 0 to 6.283185 (2π) at step 3, the expression becomes simpler: **[sin(x)+sin(x*3)/3+sin(x*5)/5]**.

3.6 Waveform Generation Through Interpolation

This section explains how to create a smooth pulse waveform, as a sample of generating a waveform through interpolation.

Step 1:	Select **[Setup] - [Setup]** to display the system setup window. Next, click the **[Unit]** tab page.
Step 2:	Click the **[X-Axis Unit]** box and select **[User Unit]** from the displayed list. Leave the minimum value to the maximum value two lines below as their initial values, **[0.000000 - 1.000000]**. Click the **[Y-Axis Unit]** box and select **[User Unit]** from the displayed list. Leave the minimum value to the maximum value two lines below as their initial values, **[-1.000000 - 1.000000]**. Click the **[OK]** button to return to the waveform display window.
Step 3:	Set **[0.2]** in the **[MrkA(X)]** box and press the Enter key. Set **[0.8]** in the **[MrkB(X)]** box and press the Enter key.
Step 4:	Click the  button at the top left of the window. The same result can be obtained when **[Tools] - [Interpolate]** is selected. The interpolation editing window appears.
Step 5:	Click the cell for the Y value next to X which shows **[0.5]** on the list of the control points, enter **[1]**, and press the Enter key.
Step 6:	Click the **[Cont Spline]** button. The interpolated waveform is displayed on the waveform display window. If the waveform is hidden behind the interpolation editing window and difficult to see, move the screen.
Step 7:	Click the **[Exit]** button to return to the waveform display window.

Explanation 1: If the setting in step 1 and step 2 is already the default setting, no operation is required.

Explanation 2: The point set at step 5 is called “control point” in interpolation editing.

Explanation 3: In the case of linear interpolation, the waveform is created by interpolating spaces between control points with straight line. In the case of a spline, spaces between control points are smoothly interpolated with spline curve.

Explanation 4: In the case of a continuous spline, the selected range is interpolated so that it is smoothly connected to the previous and subsequent ranges as well. When all ranges are selected, the waveform is interpolated so that the head and tail of the waveform can be smoothly connected if the waveform is repeated.

3.7 Compression and Extension of Waveform - 1

This section explains how to create a burst waveform by contracting the sine wave to the first quarter of the waveform display window, as a sample of horizontally contracting/extending a waveform.

Step 1: Click the  button at the top left of the window. A sine wave is selected in the initial status. Change the value in the **[Period]** box from **[1]** to **[4]** to make a sine wave with four cycles. Click the **[All Page OK]** button to return to the waveform display window.

Step 2: Click the  button at the top left of the window. The same result can be obtained when **[Tools] - [Compress/Decompress]** is selected. The compress/decompress window appears.

Step 3: In the initial status, **[1.000000]** is displayed to the right bottom of the waveform display window. Leave the value in the **[Start X=]** box as **[0.0]**. Set **[0.25]**, the quarter of memory size, in the **[End X=]** box and press the Enter key.
The four sine waves displayed across the waveform are contracted to the first quarter on the waveform display window.
If the waveform is hidden behind the compress/decompress window and difficult to see, move the screen.

Step 4: Click the **[OK]** button to return to the waveform display window.

Explanation 1: **[Start X=]** is left as **[0]** in this example, so the original waveform is compressed to the first quarter of waveform on the waveform display window. For example, when **[Start X=]** is set to **[0.25]** and **[End X=]** is set to **[0.5]**, the original waveform is compressed to the second quarter on the waveform display window.

Explanation 2: It is also possible to specify the whole waveform. Select a part of waveform on the waveform display window with markers A and B in advance. If the **[Fit Length]** button is then clicked on the compress/decompress window, the selected range is expanded to the whole waveform.

3.8 Compression and Extension of Waveform - 2

This section explains how to create a trapezoidal wave by extending and clipping a triangle wave, as a sample of vertically contracting/extending a waveform.

Step 1:	Click the  button at the top left of the winow. A sine wave is selected in the initial status. Clck the **[Function]** box and select **[Triangle]** from the displayed list. Click the **[All Page OK]** button to return to the waveform display window.
Step 2:	Click the  button at the top left of the window. The same result can be obtained when **[Tools] - [Compress/Decompress]** is selected. The compress/decompress window appears.
Step 3:	Change the value in the **[Max]** box from **[1.0]** to **[3.0]** and press the Enter key. Change the value in the **[Min]** box from **[-1.0]** to **[-3.0]** and press the Enter key. The triangle wave is vertically extended, clipped and changed to a trapezoidal wave on the waveform display window. If the waveform is hidden behind the compress/decompress window and difficult to see, move the screen.
Step 4:	Click the **[OK]** button to return to the waveform display window.

Explanation 1: It is also possible to vertically contract or move the waveform by specifying the maximum and minimum numerical values at step 4. If the positive and negative full scales are exceeded as a result of extension or move, the waveform is clipped to the positive and negative full scales.

Explanation 2: It is possible to contract/extract part of a waveform by selecting the part on the waveform display window with Markers A and B in advance.

Explanation 3: If the waveform has not reached the positive and negative full scales, the waveform can be extended to the maximum amplitude by clicking the **[Fit Amplitude]** or **[Fit Peak-Peak]** button.

Explanation 4: The vertically reversed waveform can be obtained by setting **[–3.0]** as the maximum value and **[3.0]** as the maximum value at step 3.

Explanation 5: The compression/expansion ratio is specified with **[Max/Min]** in this example. **[Amp/Offs]** can also be used to specify this ratio. Select the **[Amp/Offs]** option button and set **[Amplitude]** to **[6.0]** and **[DC Offset]** to **[0]** to obtain the result same as in this example.

Explanation 6: The triangle wave is clipped to create a trapezoidal wave in this example. It is possible to generate the trapezoidal wave more easily by setting **[Transition]** on a square wave.

3.9 Operation Between Waveforms

This section explains how to create a waveform by superposing noise over a sine wave, as a sample of operation between waveforms.

Step 1: Click the button at the left top of the window. A sine wave is selected in the initial status. Change the value in the **[Amplitude]** box from **[2.0]** to **[1.5]** to reduce the amplitude a little bit. Click the **[All Page OK]** button to return to the waveform display window.

Step 2: Click the button at the top left of the window. The same result can be obtained when **[Tools] - [Operate]** is selected. The operation window appears.

Step 3: Click the **[Created Waveform]** button in the middle of the operation window. The waveform generation window appears as when the button is clicked.

Step 4: Click the **[Function]** box and select **[Noise]** from the displayed list. Change the value in the **[Amplitude]** box from **[2.0]** to **[0.4]**. Click the **[Page OK]** button to return to the operation window.

Step 5: When the **[=]** button is clicked, the waveform created as a result of addition of the sine wave and noise is displayed in the waveform display area to the right of the screen.

Step 6: Click the **[OK]** button to return to the waveform display window. The waveform superposing noise over the sine wave is now created.

Explanation 1: Besides the addition shown in this example, subtraction, multiplication, and division are possible.

Explanation 2: The operation can be executed targeting a part of the waveform by selecting the part on the waveform display window with markers A and B in advance.

Explanation 3: In this example, the waveform created on the waveform generation window is used for operation. The data on the "clipboard" (☞4.7.2) can be used by clicking the **[Clip Board]** button in step 3.

Explanation 4: It is convenient to set the vertical axis to ±1 of the custom as in the example in "3.5 Numerical Expression Waveform" when executing multiplication. Under this setting, the result of multiplying full scale values will also be a full scale value.

3.10 Waveform Generation Through PWF

An example using “On-Ph Ctrl Sine” is shown below as an example of waveform generation through PWF.

Step 1:	Click the button at the top left of the window. The same result can be obtained when **[Tools]-[PWF]** is selected. The PWF window appears.
Step 2:	Click the **[Function]** box, and then select **[On-Ph Ctrl Sine]** in the list.
Step 3:	Click the **[Var Prmtr]** box, and then select **[SlopeT]** in the list.
Step 4:	Either change the numerical value from **[10]** to **[20]** in the **[SlopeT]** box or move the slide bar to the right of **[Var Prmtr]** to change the waveform.
Step 5:	Click **[OK]** to close the PWF window and return to the waveform display window.

Explanation 1: In the PWF window, the waveform is generated across the entire memory size.

Explanation 2: Twenty-five different waveforms can be used with PWF. The number of parameters to be set depends on the waveform. (☞ 5.5)

4. OPERATIONS ON ARBITRARY WAVEFORM DISPLAY WINDOW

4.1 Organization and Functions

The display that appears when the ARB Edit is started is called the waveform display window.
This chapter describes the functions and operations on the waveform display window.

Figure 4-1 shows the names of each component on the waveform display window.

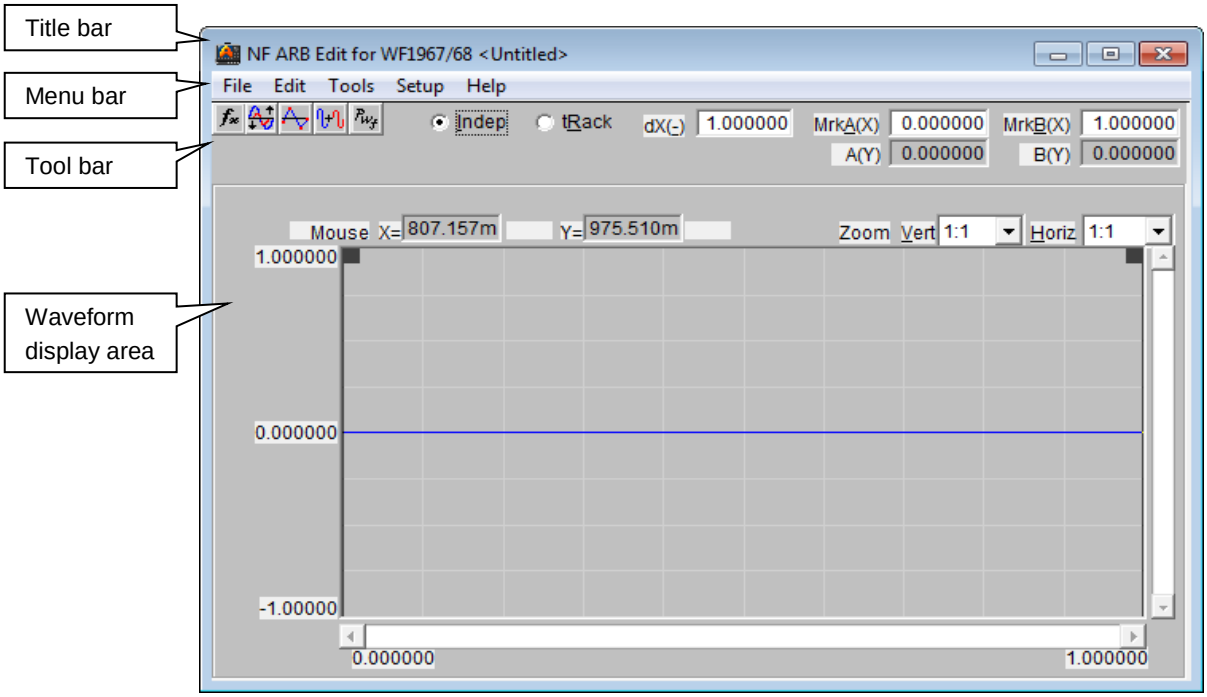


Figure 4-1 Waveform display window

The title bar displays the file name from/to which waveform data was read/written. If no file has been read or written, **[<Untitled>]** is displayed.

The menu bar has a pull-down menu. Clicking a menu name displays the menu options. Clicking an option executes that function.

The toolbar contains the frequently used function buttons and the marker setting/display section.

	: Waveform generation window	☞ 5.1
	: Compress/decompress window	☞ 5.2
	: Interpolate window	☞ 5.3
	: Operate window	☞ 5.4
	: PWF window	☞ 5.5

[○ Indep], **[○ tRack]**	Selects the marker operation mode.
[dX(-)]	Sets/displays the difference in the horizontal position of marker.
[MrkA(X)], **[MrkB(X)]**	Sets/displays the horizontal position of marker.
[A (Y)], [B (Y)]	Displays the vertical position of the waveform at the marker position.

The waveform display area contains the waveform display, display magnification (zoom) ratio selection, and the mouse pointer position display.

If an underlined alphabetic character is displayed to the right of the item name on the toolbar or in the waveform display area, pressing the underlined alphabetic character while holding down the Alt key selects the corresponding item.
For example, pressing Alt + H (pressing the H key while holding down the Alt key) selects **[Horiz Zoom]**. Note that pressing Alt, H (pressing the Alt key and then pressing the H key) displays the **[Help]** menu options on the menu bar.
Clicking the box to the right of the item name also selects that item.

4.2 Tool Menu

The tool menu options are shown below.

Tools	Wave Create	Opens the waveform generation window.	☞5.1
	Compress/Decompress	Opens the compress/decompress window.	☞5.2
	Interpolate	Opens the interpolate window.	☞5.3
	Operate	Opens the operate window.	☞5.4
	PWF	Opens the PWF window.	☞5.5

4.3 Setting Menu

The setting menu options are shown below.

Setup	Setup	Opens the system setting windoe.
	Show Grid	Turns on/off the grid display in the waveform display area.

Selecting **[Setup] - [Setup]** opens the system setup window. (☞5.6)
On the system setup window, it is possible to select the signal generator model, set or transfer main parameters, transfer waveform data, set the display unit, or perform other operations.

Each time **[Setup] - [Show Grid]** is selected, the grid display in the waveform display area is turned on or off. No grid is printed out when a waveform is printed out. (☞4.6.5)

4.4 Undo and Redo

In the ARB Edit, it is possible to revert the waveform creation or editing operation to the previous status (Undo). Selecting **[Edit] - [Undo]** or pressing Ctrl + U undoes the operation.
To cancel the Undo operation (Redo), select **[Edit] - [Redo]** or press Ctrl + U.

4.5 Zooming and Scrolling the Display

4.5.1 Vertical zoom

The waveform display can be independently zoomed vertically or horizontally.
The vertical magnification ratio can be [1:1] (display the whole waveform), [1:2] (display the half of waveform to the full screen), [1:4] up to [1:256].
Click the **[Zoom Vert]** box and select the desired item from the display magnification ratio list.
To increase the magnification ratio, press Alt + V to select the **[Zoom Vert]** box and then press the ↓ or → key.
To decrease the magnification ratio, press the ↑ or ← key.
The Home key cancels zooming and the End key zooms the waveform to maximum.

4.5.2 Horizontal zoom

The horizontal magnification ratio can be [1:1] (display the whole waveform), [1:2] (display the half of waveform to the full screen), [1:4] up to [1:128].
Click the **[Horiz]** box and select the desired item from the displayed magnification ratio list.
To increase the magnification ratio, press Alt + H to select the **[Horiz]** box and then press the ↓ or → key.
To decrease the magnification ratio, press the ↑ or ← key.
The Home key cancels zooming and the End key zooms the waveform to maximum.

4.5.3 Scrolling

When the vertical/horizontal ratio is [1:2] or greater, the scroll button appears on the scroll bar.
Drag the scroll button with the mouse to observe other parts of waveform.
The scroll button starts blinking when clicked. Pressing the ↓ or → key in this status moves the display position to the right or downward. Pressing the ↑ or ← key moves the display position to the left or upward.
Pressing the PageUp or PageDown key moves the display position by a larger step.
The Home key moves the display position to the leftmost or upmost position and the End key moves the display position to the rightmost or downmost position.

4.5.4 Marker and range selection

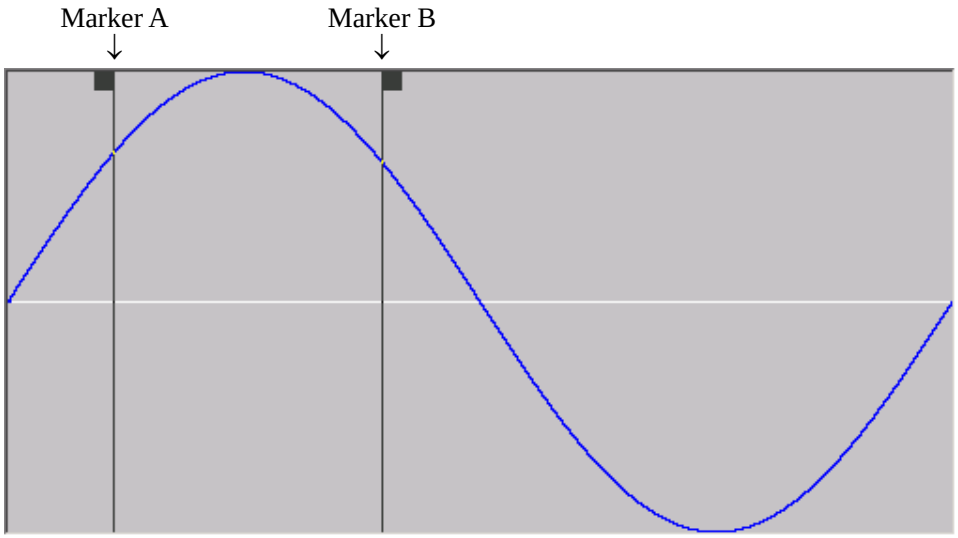
The markers are used to select the horizontal waveform range before editing or creating waveforms.
The markers are also used to specify the horizontal position to read the vertical value of the waveform.
The markers are displayed as vertical lines in the waveform display area.

4.5.5 Marker operations

a) Marker types

There are two markers used in the ARB Edit: marker A and marker B.

Marker A cannot be set to the right of marker B. marker A must be always to the left of or at the same position as marker B.



The position of each marker is displayed to the right of **[MrkA(X)]** and **[MrkB(X)]**.

The waveform value to the marker position is displayed to the right of **[A(Y)]** and **[B(Y)]**.

b) Moving the marker (mouse dragging)

The marker can be moved in two ways: mouse dragging and numerical value specification.

Moving the mouse cursor to the same horizontal position as the marker, the shape of the mouse cursor changes from to ↔. Dragging the mouse in this status moves the marker. Though the marker is difficult to see to the right or left edge, moving the mouse cursor to either edges makes the cursor to ↔.

When the marker is moved by mouse dragging, the waveform data address is used as the moving unit. When one dot on the display corresponds to multiple addresses due to the display magnification ratio, the address corresponding to one dot on the display is used as the moving step.

c) Marker moving (numerical value setting)

For marker position specification with a higher resolution, directly input the marker position with a numerical value.

Clicking the **[MrkA(X)]** box or pressing Alt + A selects the position display section of marker A. Inputting a numerical value followed by pressing the Enter key jump marker A to the specified position.

To specify the marker position in higher resolution, directly input a numeric value as the marker position.

Likewise, to jump marker B to the specified position, click the **[MrkB(X)]** box or press Alt + B and input a numerical value in the marker B position display section, and then press the Enter key.

By setting a numerical value, it is possible to freely specify the marker position within the setting/display resolution range without being restricted by the waveform data address.

d) Marker interlock mode

When the **[Indep]** option button on the toolbar is selected, markers A and B independently move.
When the **[tRack]** option button is selected, markers A and B move together. When either of the markers is moved, the other marker is also moved with the distance between them being kept.
The horizontal difference between marker A and marker B is displayed in the **[dX(-)]** box.
Click the**[dX(-)]** box or press Alt + - and input a numerical value, and then press the Enter key to jump marker B so that the distance between the markers becomes the specified value.

4.5.6 Range selection

The range selected with the marker is effective in the following operations:

- Copy/cut/paste range of waveform (☞ 4.7)
- Compression/expansion range (☞ 5.2)
- Range to generate the waveform through interpolation (☞ 5.3)
- Range to perform operaions (☞ 5.4)

To be exact, the marker exists just before the set/displayed horizontal axis position (the numerical value display to the right of **[MrkA(X)]** or **[MrkB(X)]**).
For example, when the horizontal axis position for marker A is 5 and that for marker B is 10, the selection range will be $5 \leq X < 10$. Marker A is located just before 5, so 5 is between marker A and marker B. Marker B is located just before 10, so 10 is not between marker A and marker B.

4.6 File Operations and Printing

The file menu options are shown below.

File				
	New	Ctrl+N	Starts a new ARB Edit.	☞4.6.2
	Open	Ctrl+O	Reads waveform data file.	
	Save	Ctrl+S	Saves waveform data file.	☞4.6.3
	Save As(WDB)	Ctrl+A	Saves waveform data file.	☞4.6.4
	Save As(TXT)	Ctrl+T	Saves waveform data file.	
	Print	Ctrl+P	Prints the displayed waveform.	☞4.6.5
	Exit		Exits the ARB Edit.	

The file name used for reading or saving is displayed on the title bar.

4.6.1 File types

ARB Edit can read/write the following types of files shown in Table 4-1.

Table 4-1 File Types

Window where the file is used	Description	Extension	Reference
Waveform display window	Specialized format file containing waveform data, signal generator settings, and display unit settings	.wdb	☞4.6.3
Waveform display window	Text file containing waveform data only	.txt	☞4.6.4
Waveform generation window	Specialized format text file containing standard waveform types as well as parameters, numerical expression waveform's constants and expressions	.wfn	☞5.1.5
Interpolation editing window	Text file containing control points only	.prn	☞5.3.3
PWF window	Original format text file of PWF parameter information	.pwf	☞5.5.4
System setup window	ARB Edit specialized format file containing signal generator settings, display unit settings and other data	.ocb	☞5.6.6

4.6.2 New

Selecting **[File] - [New]** or pressing Ctrl + N starts another ARB Edit. The new ARB Edit starts in the same position as where the first ARB Edit started.

It is possible to exchange data between ARB Edits via the clipboard. (☞4.7.2, 5.4.2)

4.6.3 Specialized format file

Almost all necessary information such as waveform data created using the ARB Edit, signal generator's settings, and display unit setting can be saved to a file in batch. This is an original format binary file with a smaller size than a text file (☞ 4.6.4).

To save a specialized format file:

1. Select **[File] - [Save As(WDB)]** or press Ctrl + A.
2. Select a saving location.
3. Enter a file name. The file extension is ".wdb", which can be omitted when entering a file name.
4. Click the **[Save]** button.

To read a specialized format file:

1. Select **[File] – [Open]** or press Ctrl + O.
2. Select a file location.
3. Set **[Files of type]** to **[Binary files (*.wdb)]**.
4. Enter a file name.
5. Click the **[Open]** button.

---- **Notes** ----------

The specialized format files created with the Arbitrary Waveform Editor for WF1973/WF1974 can be read in the same way.

4.6.4 Text file

Waveform data created with the ARB Edit can also be saved in a text file so that other applications can easily handle it.

A text file contains one data per line in address order. Data is represented in 16-bit two's complement.

To save the waveform data in a text file:

1. Select **[File] - [Save As(TXT)]** or press Ctrl + T.
2. Select a saving location.
3. Enter a file name. The file extension is ".txt", which can be omitted when entering a file name.
4. Click the **[Save]** button.

The ARB Edit can read the text file created with it or other applications. Data may be represented in the following 2 format:

- Integer number format text file
  Data is represented by 16-bit integer value. Negative number can be either represented in two's complement or written with minus sign in front. A file should contain one data per line.
  A text file created with the ARB Edit is in this format.
- Real number format text file
  Data is represented by real number. The largest absolute value in the data contained in the file is used as full scale. A file should contain one data per line.

The number of data in a text file should be 1048576 or smaller. If a file contains more than 1048576 data, the excess data is skipped during the read process.
If a file contains less than 1048576 data, the waveform datais expand to the entire waveform.

To read the integer number format text file:

1. Select **[File]-[Open]** or press Ctrl + O.
2. Select a file location.
3. Set **[Files of type]** to **[Text Integer data files (*.txt)]**.
4. Enter the file name.
5. Click the **[Open]** button.

To read the real number format text file:

1. Select **[File]-[Open]** or press Ctrl + O.
2. Select a file location.
3. Set **[Files of type]** to **[Text Real data files (*.txt)]**.
4. Enter the file name.
5. Click the **[Open]** button.

---- Notes ----------

The text files created with the Arbitrary Waveform Editor for WF1973/WF1974 can be read in the same way as the integer number format text file.

4.6.5 Print

Waveform data created with the ARB Edit can also be printed out as a waveform. Note that the grid is not printed out.

1. In the waveform display window, select **[File] - [Print]** or press Ctrl + P.
   The print window appears as shown Figure 4-2.
2. Make settings for the printer or font as needed.
   The upper, lower, and left margins cannot be set when printing the waveform.
3. Click the **[OK]** button.

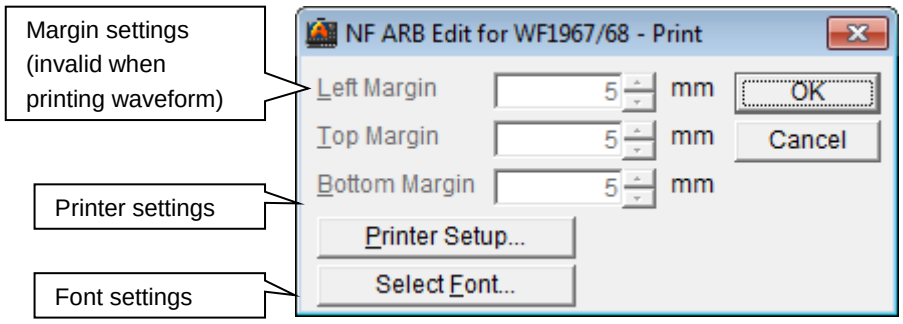


Figure 4-2 Print Window

4.7 Copy and Paste

In the ARB Edit, waveform data can be edited using the cut, copy, and paste functions.

Edit	Undo / Redo	Ctrl+U	Undoes or redoes the last operation. (☞4.4)
	Cut	Ctrl+X	Cuts the waveform data in the selected range to the clipboard.
	Copy	Ctrl+C	Copies the waveform data in the selected range to the clipboard.
	Paste	Ctrl+V	Replace the waveform data in the selected range with the data on the clipboard.
	Delete	Ctrl+D	Deletes the waveform data in the selected range.

4.7.1 Edit operation

- Cut → **[Edit] - [Cut]** (Alt, E, T or Ctrl + X)
- Copy → **[Edit] - [Copy]** (Alt, E, C or Ctrl + C)
- Paste → **[Edit] - [Paste]** (Alt, E, P or Ctrl + V)
- Delete→ **[Edit] - [Delete]** (Alt, E, D or Ctrl + D)

For details on each editing operation, see Figure 4-3.

4.7.2 Clipboard

Executing the cut or copy operation sends the waveform data in the selected range to the clipboard.
The clipboard is a temporary data storage area provided in Windows.
The waveform data in the selected range is sent to the clipboard. The data equivalent to 16 bits (–32768 to +32767) is regarded as one data unit contained in one numerical row.
Data on the clipboard can be pasted as is to the text editor, spreadsheet software, or other application or pasted within that ARB Edit or other ARB Edit when multiple ARB Edits are operating.

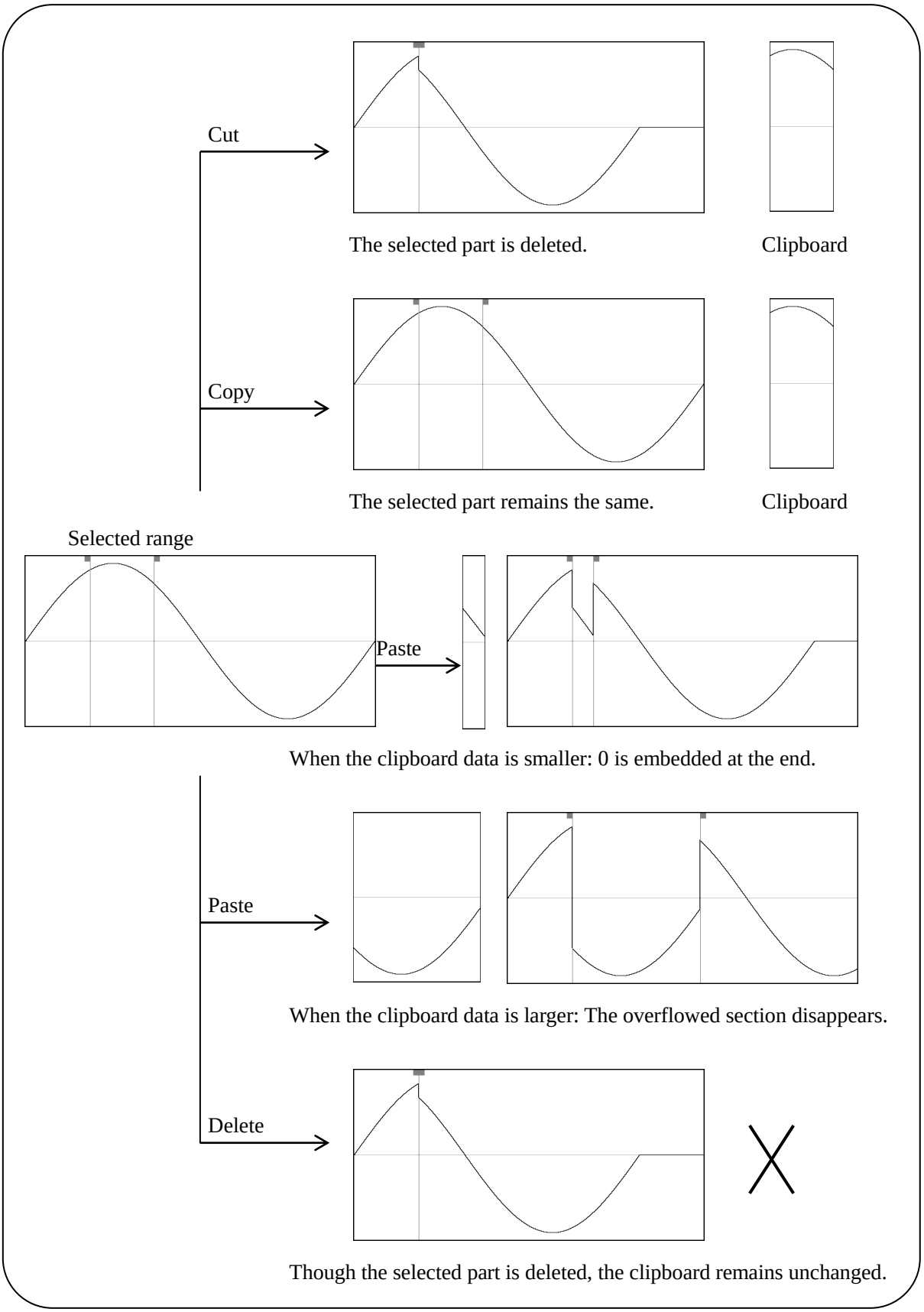


Figure 4-3 Waveform Editing Operation

5. OPERATIONS ON OTHER WINDOWS

5.1 Standard Waveform and Waveform Function

This chapter describes the functions and operations on each screen other than the waveform display window.

The waveform generation window is used to generate the standard waveform and numerical expression waveform.

Click the button on the toolbar or select **[Tool] - [Wave Create]** to open the waveform generation window.

Immediately after returning to the waveform display window after creating a waveform on the waveform generation window, the status before waveform creation can be recovered by selecting **[Edit] - [Undo]** or pressing Ctrl + U.

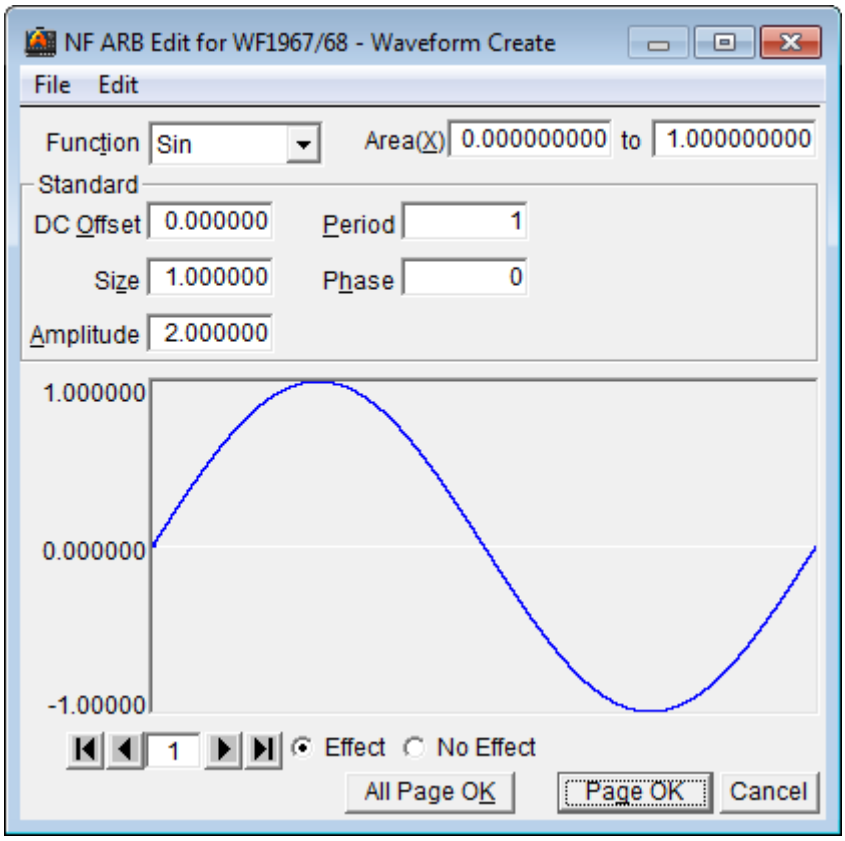


Figure 5-1 Waveform Generation Window

5.1.1 Range setting and page

On the waveform generation window, it is required to specify the independent “range” and “waveform definition” for each page to create a waveform. (Range specification with the markers on the waveform display window hardly affects the waveform generation window.)

Set the range for each page in the two numerical input areas to the right of **[Area(X)]**.

If there are duplicated ranges for multiple pages, the waveform definition for a larger page number (later one) takes effect. Using this characteristic, it is possible to change on the later page the part of the waveform

defined on one of the former pages.
Each page can be independently enabled or disabled. Select either the **[Effect]** or **[No Effect]** option button to the bottom of the window.
To move the page, use the ◀ and ▶ buttons at the bottom left of the waveform generation window. Clicking the ◀ button moves to the previous page and clicking the ▶ button moves to the next page.
Clicking the ⏮ button jumps to the first active page and clicking the ⏭ button jumps the last active page.
Directly input a number in the numerical value input area between the buttons and press the Enter key to jump to the specified page. The page numbers range from 1 to 200.

To return the settings on the displayed page to the default values, select **[Edit] - [Page Clear]** on the waveform generation window.
To return all pages to the default values at once, select **[Edit] - [All Page Clear]** on the waveform generation window.

To create the waveform on the displayed page only, click the **[Page OK]** button at the bottom of the screen.
To create waveforms on all pages, click the **[All Page OK]** button.
To return to the waveform display window without creating a waveform, click the **[Cancel]** button at the bottom of the screen or press the Esc key.
The maximum number of pages is 200.

5.1.2 Waveform selection

Clicking the **[Function]** box on the waveform generation window lists available waveforms. Select a waveform by clicking it.
The noise is generated based on the random number calculation, so different waveform data is created at each generation.
DC makes the specified range the same data.
The waveform function defines the waveform with a numerical expression. (☞ 5.1.4)

5.1.3 Parameter setting

The parameters in Table 5-1 can be set for sine waves, triangle waves, square waves, noise, and DC.

Table 5-1 Parameters for Standard Waveforms

	Sine	Triangle	Square	Noise	DC
DC Offset	○	○	○	○	○
Size	○	○	○	○	○
Amplitude	○	○	○	○	–
Period	○	○	○	–	–
Phase	○	○	○	–	–
Symmetry	–	○	–	–	–
Duty	–	–	○	–	–
Transition	–	–	○	–	–

The size can be calculated by subtracting (lower limit) from (upper limit) of the range specification (X) on the page. When the size is changed, the upper limit of range specification is changed.

The amplitude is the peak to peak value.

The cycle specifies how many cycles (waves) of the waveform in the range are to be created.

The phase unit is ° (degree).

For the triangle wave, the inclination (symmetry) can be set. The inclination unit is %.

For the square wave, the duty ratio and transition can be set. The duty ratio unit is %. The transition sets the time for the wave height value to go between 0% and 100% with the ratio to the cycle (%).

If the **[DC Offset]** or **[Amplitude]** setting exceeds the ± full scale value, the waveform is clipped at the ± full scale value.

When the mouse cursor is moved to the waveform display area on the waveform generation window, the shape of mouse cursor changes to ✥ or ⤡.

Dragging the mouse in the ✥ status vertically or horizontally moves the waveform. **[DC Offset]** is changed by vertical operations and **[Phase]** is changed by horizontal operations.

Dragging the mouse in the ⤡ status vertically or horizontally extends or compresses the waveform. **[Amplitude]** is changed by vertical extension/compression and **[Period]** is changed by vertical extension/compression.

Using ✥ or ⤡ enables you to intuitively set parameters while looking at the waveform. It is also possible to roughly make settings in this way and then set a more accurate value by inputting numerical values.

5.1.4 Waveform Function

Selecting **[Waveform Function]** in "5.1.2 Waveform selection" displays the constant input section **[Constant]** and numerical expression input section **[Y=]**.

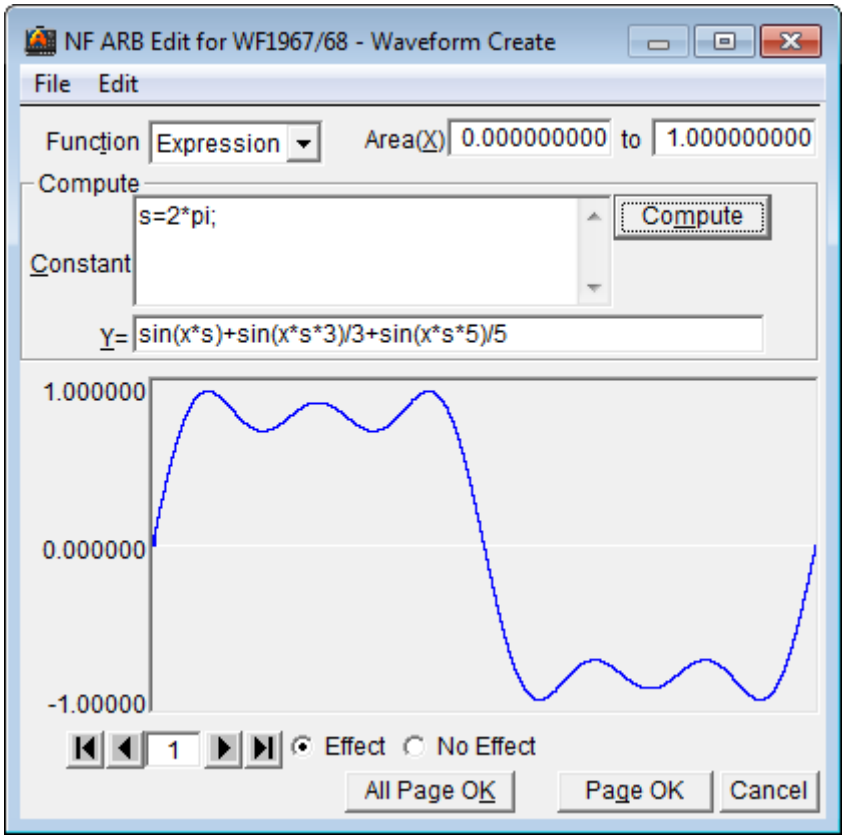


Figure 5-2 Waveform Generation Window - Waveform Function

Input the constant and expression and click the **[Compute]** button to check the calculated waveform in the waveform display on the waveform generation window.

To create the waveform on all pages in the batch, click the **[All Page OK]** button at the bottom of the screen.

To create the waveform on the displayed page only, click the **[Page OK]** button at the bottom of the screen.

To return to the waveform display window without creating a waveform, click the **[Cancel]** button at the bottom of the screen or press the Esc key.

a) Constants

Describe the constant in the [constant=value or expression] format such as **[fs=32767;]** and **[s=2*pi/1048576;]**. Be sure to suffix a constant definition or expression with **[;]**.

Use 1-byte characters for the constant or expression. Constants and expressions are not case sensitive.

The constant should begin with an alphabetic character and consist of alphanumeric characters.

Constants must be strings other than those shown in Table 5-4. It is recommended to use strings different from those in Table 5-2.

When the **[All Page OK]** button is clicked, the constant takes effect on the page where the constant is defined and subsequent pages.

For example, the constant defined on the first page affects all the pages. The constant defined on the third page affects the third and subsequent pages, but not the first and second pages.

When the waveform on the displayed page is created with the **[Page OK]** button, the constant affects the displayed page only. For example, the constant defined on the second page does not affect the first and third pages.

To use the constant on other pages, click the **[Compute]** button to execute calculation on the page where the constant is defined in advance.

b) Built-in constants

The constants shown in Table 5-2 are embedded into the ARB Edit.

If the constant defined in "a) constant" has the same name as the built-in constant, the defined value or expression takes effect.

Table 5-2 Built-in Constants

Name	Meaning	Value
pi	Circle ratio	3.1415926535898
c	Light speed	2.99792458e8
h	Planck constant	6.6260755e-34
k	Boltzmann constant	1.380658e-23
r	Euler constant	0.57721566490153

c) Functions

Specify a numerical expression in the Y=f(X) format in the numerical expression input section **[Y=]**.

Here, "X" is a value that varies within the range of the page. For example, when the page range is 1000 to 2000, X in the expression changes between 1000 and 2000.

The X value in the expression is affected by the X axis unit of the system setup window settings. (☞5.6.2)

For example, consider the case where a sine wave is provided by an expression like **[Y=] [sin(x)]**. The argument for the sin() function is a radian expression.

Assume that the X axis unit is **[Address]** and the range is between 0 and 1,048,576. Because 1,048,576 = 2*π*166886.053..., the result of this expression is a sine wave with approximately 166,886 waves.

When the horizontal axis unit is **[Time]** and the cycle is 1 ms, the result of the expression will be 1e-3 = 2*π*0.0001591..., the result is a value that barely changes around the 0° of sine wave.

If the horizontal axis unit is **[User Unit]** and 0 to 1, the result of the expression will be 1 = 2*π*0.1591..., the result is a waveform of about one-sixth of the former half of sine wave.

To create the simplest expression to obtain one cycle of a sine wave, set the horizontal axis unit to **[User Unit]** and the range between 0 and 6.283185.

The **[Y=]** value in the expression is affected by the Y axis unit set on the system setup window. (☞5.6.2)

For example, consider the case where a sine wave is provided by an expression like **[Y=] [sin(x)]**. The value for the sin() function is ±1.

When the Y axis unit is **[Data]**, the range is between –32768 and +32767. Therefore, the result of this

expression is a waveform with very small amplitude close to 0.

When the vertical axis unit is **[Voltage]** and the amplitude is 20 Vp-p, the range is ±10, so the result of this expression is 1/10 of a full-scale sine wave.

When the vertical axis unit is **[User Unit]** and the range is between –1 and +1, the result of this expression is a full-scale sine wave.

If the calculation result exceeds the ± full-scale range, the waveform is clipped at the ±full-scale range.

d) Operators

The operators in Table 5-3 can be used in the constant input section **[Constant]** and numerical expression input section **[Y=]**.

The order of operator priority ranges from top (highest) to bottom (lowest).

The logical operator returns 1 when the condition is true and 0 when the condition is 1.

Table 5-3 Operators

Operator	Associativity	Remark
( ), function	→	
+ - !	←	Monadic operator, ! is a logical operator
^	→	Binary operator, exponential
* /	→	Binary operator, multiplication/division
+ -	→	Binary operator, addition/subtraction
< <= > >=	→	Logical operator, size comparison
== !=	→	Logical operator, Equivalence comparison
&&	→	Logical operator, AND
||	→	Logical operator, OR

e) Built-in functions

The functions shown in Table 5-4 can be used in the numerical expression input section **[Y=]** in the ARB Edit.

Table 5-4 Built-in Functions

Function Name	Number of Arguments	Description
sin (arg)	1	Sine. The argument is a phase in radian.
cos(arg)	1	Cosine. The argument is a phase in radian.
tan(arg)	1	Tangent. The argument is a phase in radian.
atn(arg)	1	Arctangent. The result is in radian between $-\pi/2$ and $\pi/2$.
sqr(arg)	1	$\sqrt{}$
exp(arg)	1	Index ex
log(arg)	1	Natural logarithm.
log10(arg)	1	Common logarithm.
power(arg1, arg2)	2	Absolute value of complex vector whose real part is the 1st argument and imaginary part is the 2nd argument.
phase(arg1, arg2)	2	Argument of complex vector whose real part is the 1st argument and imaginary part is the 2nd argument.
tri(arg1, arg2)	2	Triangular wave. The 1st argument is a phase in radian and the 2nd argument is a slope [0:100].
sqw(arg1, arg2, arg3)	3	Square wave. The 1st argument is a phase in radian, the 2nd argument is a duty ratio [0:100], and the 3rd argument is a transition [0:100].
rnd()	0	White noise whose magnitude is uniformly distributed within ±1.

f) Examples of waveform function

Some examples of waveform function are shown below.

In an example where there is only one page, the range is the whole horizontal axis range and description is omitted.

- One cycle of sine wave (X axis unit: addresses 0 to 1048576, Y axis unit: data ±32767)

```
Page 1      [Constant]  fs=32767;
                        s=2*pi/1048576;      ← Address 1048576 is regarded as 2π.
                [Y=]    fs*sin(x*s)
```

- One cycle of sine wave (X axis unit: time 0 to 1ms, Y axis unit: voltage ±10V)

```
Page 1      [Constant]  fs=10;
                        s=2*pi/1e-3;         ← 1ms is regarded as 2π.
                [Y=]    fs*sin(x*s)
```

- One cycle of sine wave (X axis unit: user unit 0 to 1, Y axis unit: user unit -1 to +1)

```
Page 1      [Constant]  s=2*pi;
                [Y=]    sin(x*s)
```

- One cycle of sine wave (X axis unit: user unit 0 to 6.283185, Y axis unit: user unit -1 to +1)
  Page 1 [Constant] (None)
  [Y=] sin(x)

- One cycle of square wave (X axis unit: user unit 0 to 6.283185, Y axis unit: user unit -1 to +1)
  Page 1 [Constant] (None)
  [Y=] ((sin(x)>=0)-0.5)*2
  (Obtain 0/+1 square wave using the logical operator ">=" and convert it to ±1.)

- DC sweep waveform (X axis unit: user unit 0 to 1, Y axis unit: user unit -1 to +1)
  Page 1 [Constant] s=2*pi;
  [Y=] (x-0.5)+sin(x*s*32)/2

- Damped wave (X axis unit: user unit 0 to 6.283185, Y axis unit: user unit -1 to +1)
  Page 1 [Constant] (None)
  [Y=] exp(-x)*sin(x*64)

- DSB waveform (X axis unit: user unit 0 to 6.283185, Y axis unit: user unit -1 to +1)
  Page 1 [Constant] a=19.5;
  b=20.5;
  [Y=] (sin(a*x)+sin(b*x))/2

- CR charge-discharge waveform (X axis unit: user unit 0 to 1, Y axis unit: user unit -1 to +1)
  Page 1 [Area(X)] 0 to 0.5
  [Constant] j=15;
  [Y=] 1-2*exp(-x*j)
  Page 2 [Area(X)] 0.5 to 1
  [Constant] j=15;
  [Y=] -1+2*exp(-(x-0.5)*j)

- Differentiation waveform (X axis unit: user unit 0 to 1, Y axis unit: user unit -1 to +1)
  Page 1 [Area(X)] 0 to 0.5
  [Constant] j=15;
  [Y=] exp(-x*j)
  Page 2 [Area(X)] 0.5 to 1
  [Constant] j=15;
  [Y=] -exp(-(x-0.5)*j)

- Differentiation waveform (X axis unit: user unit 0 to 1, Y axis unit: user unit -1 to +1)
  Page 1 [Area(X)] 0 to 0.5
  [Constant] j=15;
  [Y=] exp(-x*j)
  Page 2 [Area(X)] 0.5 to 1
  [Constant] j=15;
  [Y=] -exp(-(x-0.5)*j)

- Magnetic head waveform: Gaussian pulse (X axis unit: user unit -1 to 1, Y axis unit: user unit -1 to +1)

  Page 1 [Area(X)] -1 to 0
  [Constant] j=32;
  [Y=] exp(-((x+0.5)^2)*j)
  Page 2 [Area(X)] 0 to 1
  [Constant] j=32;
  [Y=] -exp(-((x-0.5)^2)*j)

- Magnetic head waveform: Lorentz waveform (X axis unit: user unit 0 to 6.283185, Y axis unit: user unit -1 to +1)

  Page 1 [Constant] (None)
  [Y=] (sin(x)-sin(x*3)/3+sin(x*5)/5)/1.533333333

- Waveform where surge is superimposed around 180° (X axis unit: user unit 0 to 1, Y axis unit: user unit -1 to +1)

  Page 1 [Area(X)] 0 to 1
  [Constant] s=2*pi;
  [Y=] sin(s*x)
  Page 2 [Area(X)] 0.49 to 0.51
  [Constant] j=50;
  [Y=] sin(s*x)+cos(s*j*x)/2+0.5

  (Create a sine wave across page 1 and overwrite the surge waveform on page 2.)

5.1.5 File operation

The settings on the waveform generation window can be saved in a text file.

To save the settings on the waveform generation window in a file:

1. Select **[File] - [Save]** or press Ctrl + S on the waveform generation window.
2. Select a saving location.
3. Enter a file name. The file extension is ".wfn", which can be omitted when entering a file name.
4. Click the **[Save]** button.

To read a file containing the waveform generation window settings:

1. Select **[File] - [Open]** or press Ctrl + O on the waveform generation window.
2. Select a file location.
3. Enter a file name.
4. Click the [**Open]** button.

Because the file containing the waveform generation window settings is a text file, the file can be edited using a text editor or other application, though this operation is not recommended.
As a result of editing, the file may be not able to be normally read. For example, the format may change to one that ARB Edit cannot read or the expression may become too long, exceeding the limit.

---- Notes ----------

The setting files created with the Arbitrary Waveform Editor for WF1973/WF1974 can be read in the same way.

5.1.6 Print

To print out the settings for the waveform generation window:

1. Select **[File] - [Print]** or press Ctrl + P on the waveform generation window.
2. Make settings for the upper, lower and left margins, the printer or font as needed.
3. Click the **[OK]** button.

5.2 Compression/Expansion

The compress/decompress window is used to vertically or horizontally compress or expand the waveform in the selected range.

Click the button on the tool menu or select **[Tools] - [Compress/Decompress]** to open the compress/decompress window.

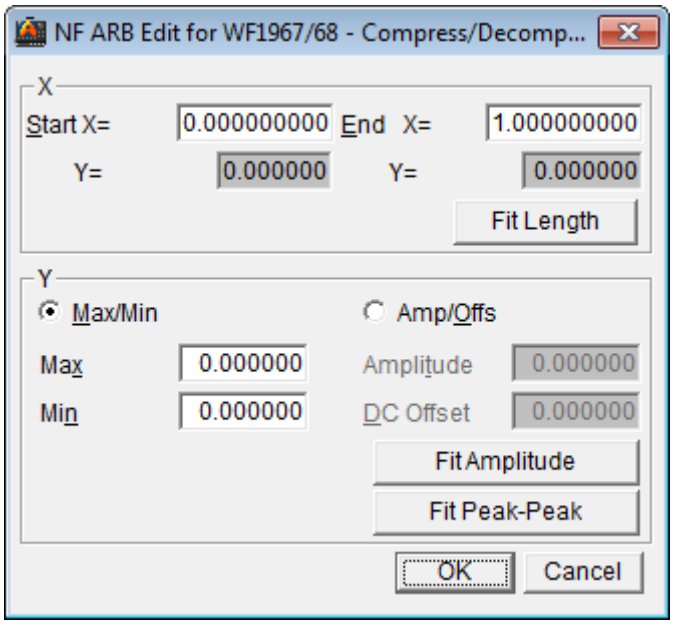


Figure 5-3 Compress/Decompress Window

Immediately after deforming a waveform on the compress/decompress window and returning to the waveform display window, the status before waveform deformation can be recovered by selecting **[Edit] - [Undo]** or pressing Ctrl + U.

5.2.1 Compression/Expansion along horizontal axis

Select the range with the markers on the waveform display window before compressing or expanding along the horizontal axis. (☞ 4.5.6)

To compress or expand along the horizontal axis, use the items in the **[X]** area on the compress/decompress window.

a) Using the selected range as the compression/expansion start/end points

The range selected with the markers in advance can be compressed, expanded, or moved to the range selected with the start/end points by entering values in the **[Start X=]** and **[End X=]** box.

The area where data is removed as a result of compression/expansion is filled with data immediately before or after the area.

b) Expanding the selected range to the full size

Click the **[Fit Length]** button to extend the range selected with the markers in advance to the whole waveform.

Most of actual data collected with the digital oscilloscope does not exactly consist of one cycle. In such a case, this function can clip one cycle.

c) Miscellaneous

Note that the waveform may be distorted when the compression/expansion rate is too high.

5.2.2 Compression/Expansion along vertical axis

The compression/expansion along the vertical axis vertical axis affects the selected range.

Select the range with the markers on the waveform display window before compressing or expanding along the vertical axis. (☞4.5.6)

To compress or expand along the vertical axis, use **[Y]** area on the compression/decompression window.

a) Performing compression/expansion by specifying the maximum/minimum values

When the **[Max/Min]** option button is selected, the maximum value of the range selected with the markers is displayed in the **[Max]** box and the minimum value is displayed in the **[Min]** box.

Input the maximum/minimum values of the target after compression/expansion in each box and press the Enter key to change the waveform on the waveform display window. If the waveform is hidden behind the compress/decompress window and difficult to see, move the window.

The waveform can be vertically inverted by setting a value smaller than the minimum value to the maximum value.

If the desired waveform is gained, click the **[OK]** button.

To return to the waveform display window without performing compression/expansion, click the **[Cancel]** button or press the Esc key.

b) Performing compression/expansion by specifying the amplitude/offset

When the **[Amp/Offs]** option button is selected, the amplitude value of the range selected with the markers is displayed in the **[Amplitude]** box and the offset value is displayed in the **[DC Offset]** box.

The following relationship between the amplitude/offset and the maximum/minimum values exist.

$$\text{Amplitude} = (\text{maximum value} - \text{minimum value}),\ \text{Offset} = \frac{\text{Max. value} + \text{Min. value}}{2}$$

$$\text{Maximum value} = \text{offset} + (\text{amplitude}/2),\ \text{Minimum value} = \text{offset} - (\text{amplitude}/2)$$

Input the amplitude/offset value of the target after contraction/extension in each display section and click the **[OK]** button.

The waveform can be vertically inverted by setting a negative value to the amplitude.

c) Expanding the selected range to the maximum amplitude

Click the **[Fit Peak-Peak]** button to expand the range selected with the markers to the maximum amplitude. If the selected range offset is not 0 before expansion, it changes to 0 after expansion.

Click the **[Fit Amplitude]** button to expand the positive or negative peak to the maximum value without changing the offset.

d) Miscellaneous

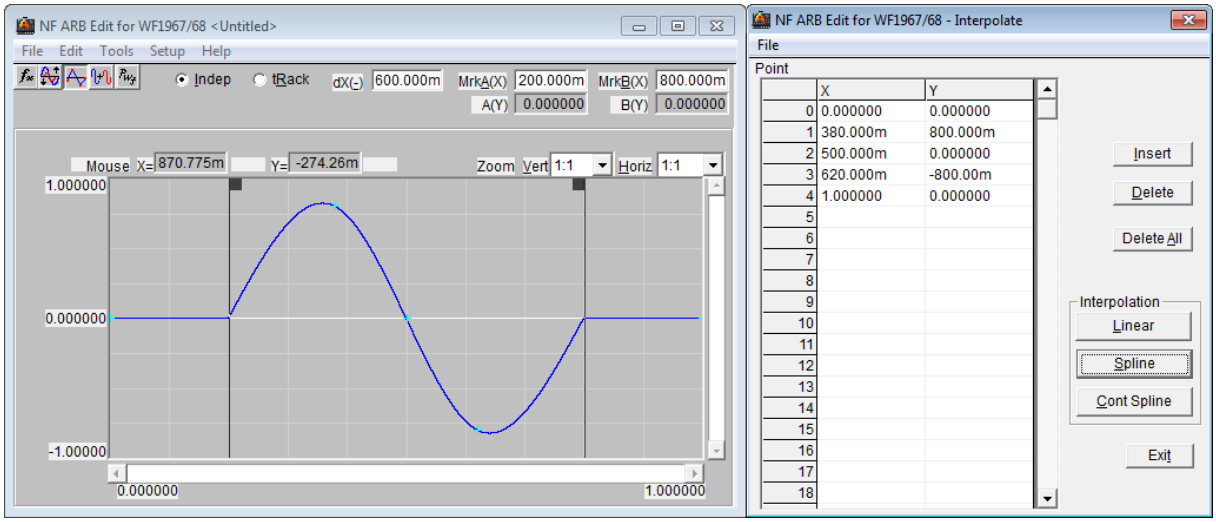
When the setting results in expansion that exceeds the ± full scale range, waveforms are clipped at the ±full scale range.

Note that the waveform may be distorted when the rate is too high.

5.3 Interpolation

The interpolation editing window is used to create waveforms with different types of interpolation. The point set for interpolation is called the “control point.”

Click the button on the tool menu or select **[Tools] - [Interpolate]** to open the interpolation editing window.



(Waveform display window) Interpolation editing window

Figure 5-4 Interpolation Editing Window

Interpolation editing is applied to the selected range. Select the range beforehand on the waveform display window with markers A and B.

5.3.1 Control point setting

Interpolation is applied to the range selected by markers on the waveform display window.

In the initial state, the following three control points are displayed.

[0.0, 0.0] [0.5, 0.0] [1.0, 0.0]

a) Specifying the control point with a numerical value

Click the index cell in the control point list on the interpolation editing window and then click the Insert button to insert and display a new data line. At this time, value X is the intermediate value of the previous and following values, and value Y is 0.0.

Click the X or Y cell and change their respective values. The value X that can be input must be within the range defined by the previous and following control points. Also, X cannot be changed if it is 0 or 1.

Value Y when X = 1 is the same as when X = 0.

Control points are displayed a [+] mark at the specified position in the waveform display area.

b) Specifying the control point with mouse

If any of control points' [+] marks are shown in red (selected), click an unmarked location of the waveform display area to change all marks to light blue (deselected).

c) Moving the control point with mouse

The control point can be moved by dragging the [+] mark on the waveform display window. If the screen magnification ratio is low, it might be difficult to capture the mark due to the display resolution.
When a control point is moved with the mouse, linear interpolation is performed and the waveform display area is overwritten.

d) Deleting the control point

Click the **[Delete]** button to delete the selected control point.
The selected control point cannot be restored. Take care when using this function.

e) Deleting all the control points

Click the **[Delete All]** button to delete all the set control points. All the set control points are deleted and the three control points of the initial state are displayed.
The selected control points cannot be restored. Take extra care when using this function.

5.3.2 Interpolation

When the range is selected and the control points are set, perform interpolation. The following three types of interpolation methods are possible.

- Linear interpolation where the spaces between control points are interpolated with a straight line
- Spline interpolation where the spaces between control points are interpolated with a smooth curve
- Continuous spline interpolation to use such a curve that the waveform is continued outside to the selected range for interpolation

For linear interpolation, click the **[Linear]** button or press Alt + L.
For spline interpolation, click the **[Spline]** button or press Alt + S.
For continuous spline interpolation, click the **[Cont Spline]** button or press Alt + C.
If part of the waveform is selected as the range, the control points at both edges of the range and those within the range are interpolated.
If the whole waveform is selected, continuous spline interpolates the waveform so that the head and tail of waveform will be smoothly connected if the waveform is repeated. The head and tail would have different values in the case of spline interpolation, so the waveform will not be smooth if repeated.
When the setting results in interpolation that exceeds the ± full scale range, waveforms are clipped at the ± full scale range.
After interpolation, click the **[OK]** button to return to the waveform display window.

Immediately after creating a waveform on the interpolation editing window and returning to the waveform display window, the status before waveform creation can be recovered by selecting **[Edit] - [Undo]** or pressing Ctrl + U.

5.3.3 File operation

The settings on the interpolation editing window can be saved in a text file.
To save the settings in a file:

1. Select **[File] - [Save]** or pressing Ctrl + S on the interpolation editing window.
2. Select a saving location.
3. Enter a file name. The file extension is ".prn", which can be omitted when entering a file name.
4. Click the **[Save]** button.

To read the file containing the interpolation editing window settings:

1. Select **[File] - [Open]** or pressing Ctrl + O on the interpolation editing window.
2. Select a file location.
3. Enter a file name.
4. Click the **[Open]** button.

This file can be read with any text editor or spreadsheet software.
Also, ARB Edit can read a text file created with any text editor or spreadsheet software.
When creating a text file, put the X data and Y data on one row and separate by space.

---- **Notes** ----------

Files saved by ARB Edit for WF1973/WF1974 can be read in the same way.
However, if you had set the unit of X-axis to "address" at the saving time, please be careful. The maximum address is 1048576 in this software, whereas it is 524288 in ARB Edit for WF1973/WF1974.
If such a file is read by using **[File] - [Open]**, the control points are prensent only in the address range of 0-524288 corresponding to the first half of the waveform. To extend control points over the entire waveform, please read the file by using **[File] - [Import]**. Then the value of X of each control point is doubled so that the control points spread in the address range of 0-1048576 corresponding to the entire waveform.

5.4 Operation

The operation window is used to create a waveform by performing arithmetical operations to the waveform in the selected range, standard waveform, numerical expression waveform, or the clipboard waveform.
Click the button on the tool menu or select **[Tools] - [Operation]** to open the operation window.

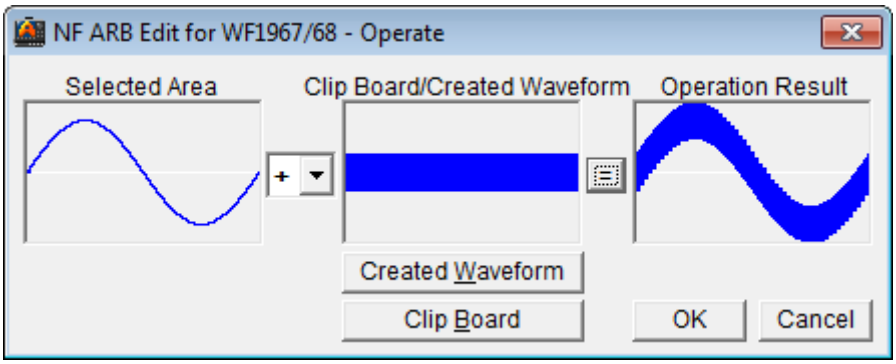


Figure 5-5 Operation Window

Immediately after creating a waveform on the operation window, the status before waveform creation can be recovered by selecting **[Edit] - [Undo]** or pressing Ctrl + U.
Operations are performed in the selected range. Select the range beforehand on the waveform display window with markers A and B.

5.4.1 Operation types

Clicking the operation box between **[Selected Area]** and **[Clip Board/Created Waveform]**, the basic arithmetical operations list is displayed. Select an operator in the list.
Note that **[*]** indicates multiplication (×) and **[/]** indicates division (÷).

5.4.2 Object of operation

a) Waveform generation

Clicking the **[Created Waveform]** button or pressing Alt + W displays the waveform generation window. Note the following restrictions.
- **[Area(X)]** and **[Size]** cannot be changed.
- The range cannot be divided into multiple pages.

Create a waveform referring to "5.1 Standard Waveform and Waveform" and click the **[Page OK]** button. The created waveform is displayed in the **[Clip Board/Created Waveform]** area.

b) Clipboard

Clicking the **[Clip Board]** button or pressing Alt + B displays the waveform stored on the clipboard in the **[Clip Board/Created Waveform]** area. (☞ 4.7.2)

If the selected range is longer than the clipboard, the overflowing part of the waveform is treated as zero data.
If the clipboard is longer than the selected range, the first part of the clipboard is used.
Though data on the clipboard are in 16-bit integers (–32768 to +32767), they are converted into the vertical axis unit in the operation. For example, when the vertical axis custom unit is –1 to +1, ±32767 on the clipboard is treated as ±1.

5.4.3 Operation execution

Clicking the **[=]** button displays the result of operation in **[Operation Result]**.
Click the **[OK]** button to return to the waveform display window and reflect the operation result.
Click the **[Cancel]** button or press the Esc key to return to the waveform display window without performing any operation.
It is recommended to set the vertical axis unit to the custom unit: –1 to +1, especially when executing multiplication. Under this setting, the result of multiplying ± full scale values can be a ± full scale value.
When the operation result exceeds the ± full scale value, waveforms are clipped at the ± full scale value.
Note that dividing a number by 0 results in infinity and an error usually occurs. To avoid such an error, the result of division by 0 is 0 as an exception in this operation.

5.5 PWF (Parameter-Variable Waveform)

In the case of parameter-variable waveforms (PWF), waveform data can easily be generated using 25 types of waveforms and setting up to 5 parameters.

Either click the button on the toolbar or select **[Tools] - [PWF]** to display the PWF window.

Once a waveform has been created on the PWF window and immediately after the waveform display window has been returned to, the state before the waveform was created can be returned to by selecting **[Edit]-[Undo]** or by pressing Ctrl + U.

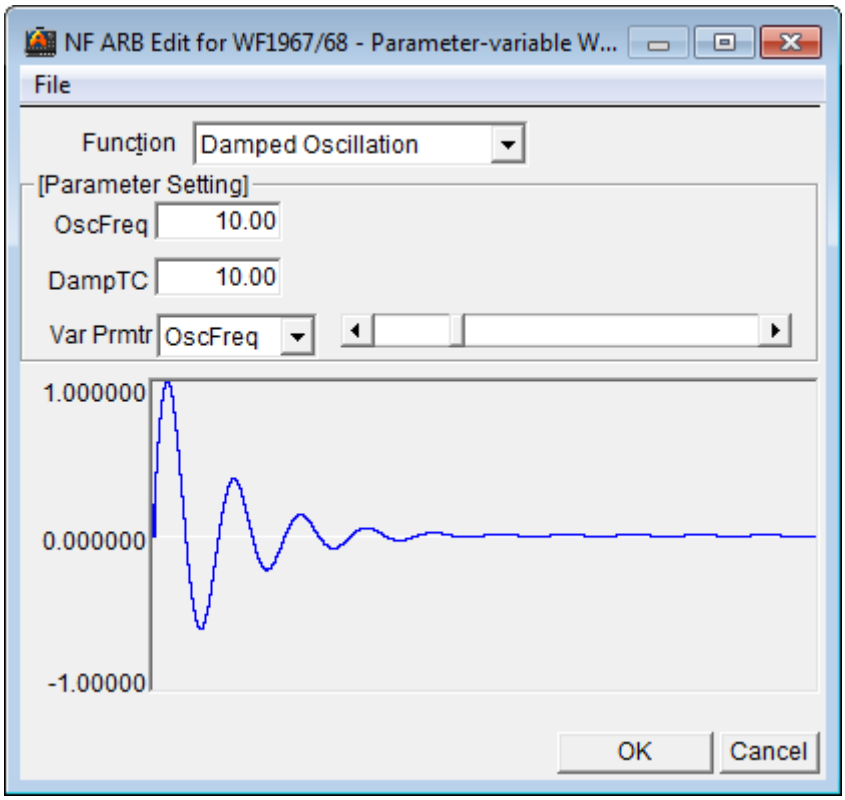


Figure 5-6 PWF window

For details on PWF waveforms, see "WF1967/WF1968 Instruction Manual (Operation)."

The waveform data that can be generated from the PWF window includes single-polarity waveforms. On the PWF window, waveform data can be generated in the ± full-scale range even for such waveforms. Change the settings of the amplitude range of the oscillator as necessary. Setting of the amplitude range can also be done in the oscillator settings on the system setup window. (☞5.6.4)

If, on the PWF window, the unit settings for the horizontal axis and vertical axis differ from the default values, the settings are forcibly changed to the units of the axes.

5.5.1 Waveform selection

Clicking the **[Function]** box on the PWF window, the list of available waveforms is displayed. Select a waveform in the list.

5.5.2 Parameter setting

When a waveform is selected on the PWF window, the parameters corresponding to the selected waveform are displayed in **[Parameter Setting]**. The number of parameters that can be set differs according to the waveform.

The parameter settings are done through direct numerical input in the text input field to the right of each parameter name. Each time a parameter value is changed, the waveform data is calculated and the display waveform is updated.

Besides numeric input, parameters can be changed via slider.

Click the **[Var Prmtr]** box to display the list of parameters. Select the desired parameter and move the slider in **[Parameter Setting]** to update the displayed waveform.

Moreover, the parameter setting value is also changed.

5.5.3 PWF parameters

The 25 types of waveforms that can be used on the PWF window, their parameters, and their setting ranges and resolutions are listed below.

Table 5-5 Steady Sine Group

Waveform	Parameter	Minimum Value	Maximum Value	Resolution
Unbalanced Sine	Amptd1	–100.00	100.00	0.01
	Amptd2	–100.00	100.00	0.01
Clipped Sine	Clip	0.00	99.99	0.01
CF Ctrl Sine	CF	1.41	10.00	0.01
Angle Ctrl Sine	Angle	–180.00	180.00	0.01
Staircase Sine	Steps	2	256	1
Multi-Cycle Sine	Cycles	0.01	50.00	0.01
	SPhase	–360.00	360.00	0.01

Table 5-6 Transient Sine Group

Waveform	Parameter	Minimum Value	Maximum Value	Resolution
On-Ph Ctrl Sine	OnPhase	0.00	360.00	0.01
	SlopeT	0.00	50.00	0.01
Off-Ph Ctrl Sine	OffPhase	0.00	360.00	0.01
	SlopeT	0.00	50.00	0.01
Chattering-On Sine	OnPhase	0.00	360.00	0.01
	ChatterN	0	20	1
	Ton	0.00	20.00	0.01
	Toff	0.00	20.00	0.01
Chattering-Off Sine	OffPhase	0.00	360.00	0.01
	ChatterN	0	20	1
	Ton	0.00	20.00	0.01
	Toff	0.00	20.00	0.01

Table 5-7 Pulse Group

Waveform	Parameter	Minimum Value	Maximum Value	Resolution
Gaussian Pulse	Sigma	0.01	100.00	0.01
Lorentz Pulse	Halfwidth	0.01	100.00	0.01
Haversine	Width	0.01	100.00	0.01
Half-Sine Pulse	Width	0.01	100.00	0.01
Trapezoid Pulse	RiseFall	0.01	50.00	0.01
	UpperBase	0.01	100.00	0.01
Sin(x)/x	ZeroCross	1	50	1

Table 5-8 Transient Response Group

Waveform	Parameter	Minimum Value	Maximum Value	Resolution
Exponential Rise	TC	0.01	100.00	0.01
Exponential Fall	TC	0.01	100.00	0.01
2nd Ord LPF Step	Fn	1.00	50.00	0.01
	Q	0.50	50.00	0.01
Damped Oscillation	OscFreq	0.01	50.00	0.01
	DampTC	–100.00	100.00	0.01

Table 5-9 Surge Group

Waveform	Parameter	Minimum Value	Maximum Value	Resolution
Oscillation Surge	OscFreq	0.01	50.00	0.01
	DampTC	0.01	100.00	0.01
	TrailTC	0.01	100.00	0.01
Pulse Surge	Tr	0.01	100.00	0.01
	Td	0.01	100.00	0.01

Table 5-10 Others Group

Waveform	Parameter	Minimum Value	Maximum Value	Resolution
Trapezoid with Offset	Delay	0.00	100.00	0.01
	Rise	0.00	100.00	0.01
	UpperBase	0.00	100.00	0.01
	Fall	0.00	100.00	0.01
	Offset	0.00	100.00	0.01
Half-Sine Edge Pulse	LE	0.00	100.00	0.01
	TE	0.00	100.00	0.01
	Duty	0.00	100.00	0.01
Bottom Referenced Ramp	Symm	0.00	100.00	0.01

5.5.4 File operation

The settings on the PWF window are saved in a text file.

To save the settings in a file:

1. Select **[File] - [Save]** or press Ctrl + S on the PWF window.
2. Select a saving location.
3. Enter a file name. The file extension is ".pwf", which can be omitted when entering a file name.
4. Click the **[Save]** button.

To read a file containing the PWF settings:

1. Select **[File] - [Open]** or press Ctrl + O on the PWF window.
2. Select a file location.
3. Enter a file name and
4. Click the **[Open]** button.

Because the PWF setting file is a text file, the file can be edited using a text editor or other applications, though this operation is not recommended.

As a result of editing, the file may be not able to be normally read.

---- Notes ----------

The PWF setting files created with the Arbitrary Waveform Editor for WF1973/WF1974 can be read in the same way.

5.5.5 Print

The setting conditions for the PWF window can be also printed out.

1. Selecting **[File] - [Print]** or press Ctrl + P on the PWF window.
2. Make settings for the upper, lower and left margins, the printer or font as needed
3. Click the **[OK]** button.

5.6 Transferring the Waveform and Settings

The system setup window is used to set the signal generator model, interface, and serial number.
This window is also used to transfer the signal generator settings or waveform data to the signal generator.
In addition, the vertical/horizontal axis unit displayed on the waveform display window can be set on this window.
Select **[Setup] - [Setup]** to open the system setup window.

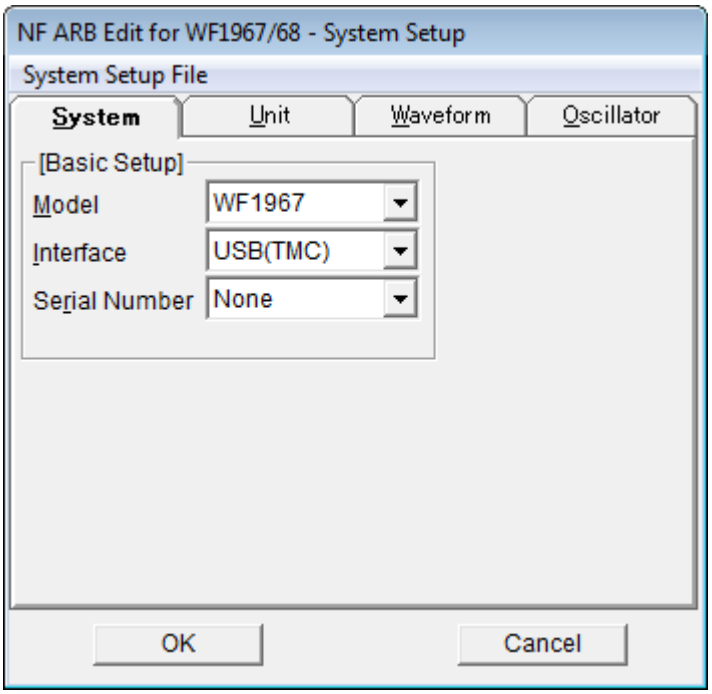


Figure 5-7 System Setup Window - System Setup

The system setup window consists of four tab pages: **[System]**, **[Unit]**, **[Waveform]**, and **[Oscillator]**.

5.6.1 Model setting

The **[Basic Setup]** frame on the **[System]** tab page is used select the signal generator model and the interface and set the serial number.

a) Selecting the target model

Click the **[Model]** box to display the list of supported signal generator models. Select one in the list.
The selected model is saved even after the ARB Edit is exited and the same setting applies at the next startup.

b) Interface selection

Click the **[Interface]** box to display the list of supported interfaces. Select one in the list.
The selected interface is saved even after the ARB Edit is exited and the same setting applies at the next startup.

---- Notes ----------

For WF1967/WF1968, the interface setting is fixed to **[USB(TMC)]**.

---

c) Serial number setting

Click the **[Serial Number]** box to display the list of the serial numbers of connected signal generators. Select one in the list.

If not a single unit is connected, “None” is displayed and no item other than “None” can be selected.

Check the signal generator to be connected for its serial number.

5.6.2 Axis unit setting

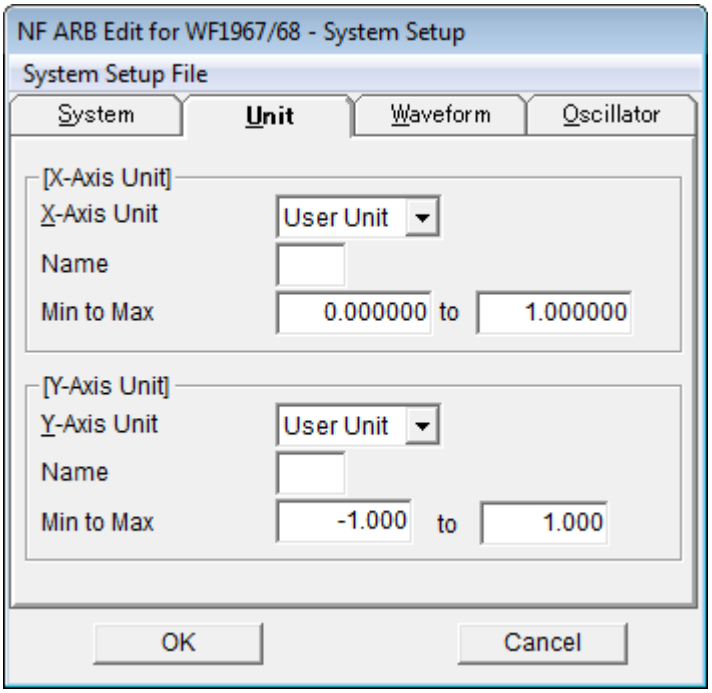


Figure 5-8 System Setup Window - Unit Setup

In the **[X-Axis Unit]** and **[Y-Axis Unit]** fields on the **[Unit]** tab page, perform the settings of the horizontal axis and vertical axis for waveform display.

a) Horizontal axis unit

The time and the user unit can be used as the display/setting unit of the horizontal axis in addition to the waveform data address.

The time is interlocked with **[Frequency]** and **[Period]** in **[Oscillator]** tab page.
From the head to the tail of waveform data, that is, one cycle corresponds to **[Period]** in **[Oscillator]** tab page.
For example, this function is useful when creating a waveform through interpolation by setting the voltage to the vertical axis and the time to the horizontal axis.
In the custom unit, any values can be set to the beginning and end of waveform data as well as the unit name.
Several examples in the custom unit of the horizontal axis are shown in Table 5-11.
When a numerical expression is used to generate a waveform, it is useful to use the 0 to 6.283185 radian units because trigonometrical functions such as sin() are in radian units.
Click the **[X-Axis Unit]** box to display the list of selectable horizontal axis units. Select one in the list.
When the custom unit is selected as a custom unit, **[Name]**, **[Min to Max]** can be set.
Input a string consisting of up to four characters as the name of the horizontal axis unit in the **[Name]** box.
Input numerical values for the minimum value (leftmost value of waveform) and maximum value (rightmost value of waveform) for the custom unit in the **[Min to Max]** box.

Table 5-11 Examples of Custom Units for the Horizontal Axis

Range	Name (Explanation)
0 to 1	cycle
–1 to 1	(Use this to align with the vertical axis range when the custom unit for the vertical axis is ±1.)
0 to 360	degrees (°)
0 to 400	grads
0 to 6.283185	radians

b) Vertical axis unit

The voltage and the custom unit can be used as the display/setting unit of vertical axis in addition to the waveform data (16 bits: –32768 to +32767).
The voltage is interlocked with **[Amplitude]** and **[DC Offset]** in **[Oscillator]** tab page. For example, this function is useful when creating a waveform through interpolation by setting the voltage to the vertical axis and the time to the horizontal axis.
In the custom unit, you can specify the bottom and top of waveform data as well as the unit name.
When a numerical expression is used to generate a waveform, it is useful to use –1 to +1 because the result of trigonometrical functions such as sin() is within ±1.
Click the **[Y-Axis Unit]** box to display the list of selectable vertical axis units. Select one in the list.
When the custom unit is selected, **[Name]**, **[Min to Max]** can be set.
Input a string consisting of up to four characters as the name of the vertical axis unit in the **[Name]** box.
Input numerical values for the minimum value (lowermost value of waveform) and maximum value (uppermost value of waveform) for the custom unit in the **[Min to Max]** box.

5.6.3 Waveform memory setting

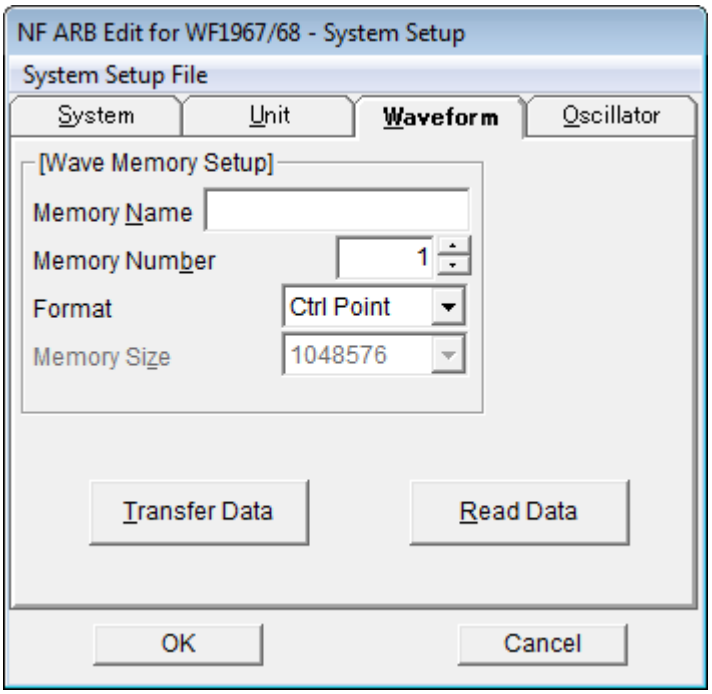


Figure 5-9 System Setup Window - Waveform memory Setup

The **[Wave Memory Setup]** frame on the **[Waveform]** tab page is used to set the waveform memory name, waveform memory number, and waveform format.

a) Waveform memory name

Input a waveform memory in the area to the right of **[Memory Name]**.

The waveform memory name can be set with up to 20 one-byte alphanumerical characters.

Half-width kana and double quotation marks cannot be used.

b) Waveform memory number

Click the ▲▼ button to the right of **[Memory Number]** to select a waveform memory number.

Click ▼ to increase the memory number and click ▲ to decrease the memory number.

It is also possible to directly input a numerical value in the numerical value display area.

---- Notes ----------

WF1967/WF1968 waveform memory

- Waveform data cannot be transferred to memory No. 0.
- Memories No. 1 to 128 are non-volatile memories. The transferred waveform data in these memories are saved even after the power is switched off.

---

c) Format

Click the **[Format]** box to display the list of format that can be selected.

Depending on the waveform data, transfer in the **[Control Point]** format may not be possible. In this case, the control point format cannot be selected and only **[Array]** format can be selected.

The control point format is waveform data for generating waveforms through linear interpolation inside the signal generator.

Control point data is created from the waveform data displayed on the waveform display window when the system setup window is displayed.

For example, in the case of waveform data that involves complex changes such as noise, the number of valid data points may not suffice. In such a case, the generation of control point format data is stopped and the data is generated in the array format only.

The control point format has the advantage of a smaller amount of data compared to the array format, which fits in the waveform memory of the main unit. Therefore, when using arbitrary waveforms during sequence oscillation of the WF1967/WF1968, a larger number of waveform types can be used.

Note that the control point format data of this transfer method does not necessarily match the control points on the interpolation editing window.

The array format consists of data strings corresponding to waveform memory addresses. The data of the control point format described previously is created from data in this array format.

d) Waveform memory size

If **[Array]** format is selected as the transfer format, **[Memory Size]** becomes selectable. In the case of **[Control Point Format]**, manipulation is not possible.

Click the **[Memory Size]** box to display the list of waveform memory sizes that can be selected.

Select one in the list.

When wishing to simply output an arbitrary waveform, a larger size is more convenient, but if wishing to use arbitrary waveform data for sequence oscillation, a larger size limits the number of arbitrary waveforms that can be used.

e) Transfer execution

Click the **[Transfer Data]** button or press Alt + T to transfer the generated waveform data to the signal generator and output that waveform.

---- Notes ----------

To output different arbitrary waveforms from CH1 and CH2 on the WF1968, transfer the waveform data to the waveform memory of the different numbers, because the waveform memory is shared between CH1 and CH2.

---

f) Read execution

Click the **[Read Data]** button or press Alt + R to read waveform data from the signal generator. The read waveform data is displayed on the waveform display window.

If the waveform data that was read from the signal generator was control point format data, the control points can be changed on the interpolation editing window.

5.6.4 Oscillator Setup

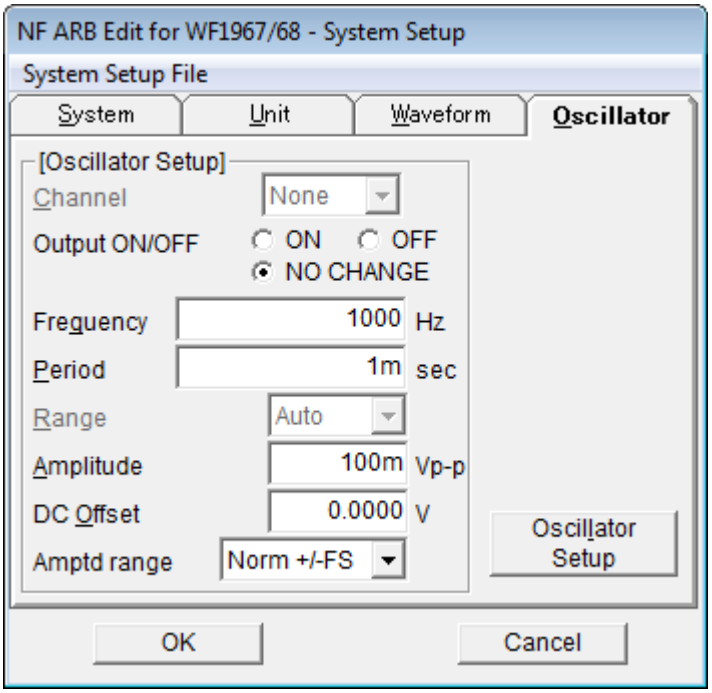


Figure 5-10 System Setup Window - Oscillator Setup

The **[Oscillator Setup]** frame in the **[Oscillator]** tab page is used to set the signal generator channel, output on/off, frequency (cycle), output range, amplitude, DC offset, and amplitude range.

The relationship between the signal generator models and settable items is shown in Table 5-12.

Table 5-12 Signal Generator Setting

	WF1967	WF1968
Channel	–	○
Output on/off	○	○
Frequency	○	○
Period	○	○
Output range	○	○
Amplitude	○	○
DC offset	○	○
Amplitude range	○	○

In the frequency, period, amplitude, and DC offset, T (10^{+12}), G (10^{+9}), M (10^{+6}), k (10^{+3}), m (10^{-3}), u (10^{-6}: μ), n (10^{-9}), p (10^{-12}), f (10^{-15}), and a (10^{-18}) can be added after the number.
The oscillator setting is initialized after the next startup after the ARB Edit is exited or an additional ARB Edit is started. (☞5.6.8)

a) Channel

Click the **[Channel]** box to display the list of selectable modes. Select one in the list.

b) Output on/off

Select **[ON]** or **[OFF]** to switch the output on or off. Select **[NO CHANGE]** not to switch the output state.

c) Frequency

Enter the frequency setting value in the **[Frequency]** box.
Changing the frequency setting also updates the period setting (inverse number of frequency.)

d) Period

Enter the period setting value in the **[Period]** box.
Changing the cycle setting also updates the frequency setting.

e) Range

Click the **[Range]** box to display the list of selectable output ranges. Select an output range in the list.

---- **Notes** ----------

For WF1967/WF1968, the range setting is fixed to **[Auto]**.

---

f) Amplitude

Enter the amplitude setting value in the **[Amplitude]** box.
The amplitude and DC offset settings put restrictions on each other. The setting range also differs according to the amplitude range setting.

g) DC offset

Enter the DC offset setting value in the **[DC Offset]** box.
The amplitude and DC offset settings put restrictions on each other. The setting range also differs according to the amplitude range setting.

h) Amplitude range

Click the **[Amplitude range]** box to display the list of amplitude ranges that can be selected. Select the output range in the list.

If **[Norm ±FS]** or **[Inv ±FS]** is selected as the **[Amplitude range]**, the **[Amplitude]** setting unit is **[Vp-p]**. In all other cases, the **[Amplitude]** setting unit is **[Vpk]**.

i) Transferring data

Clicking the **[Oscillator Setup]** button or pressing Alt + L transfers the settings in the **[Oscillator Setup]** frame to the signal generator.

---- **Notes** ----------

When oscillation parameter settings for the WF1967 or WF1968 are performed with the ARB Edit, the following items are forcibly changed.

- Oscillation mode: changed to continuous oscillation mode only if it is sequence oscillation mode
- Load impedance setting: Open (High-Z)

5.6.5 Cautions during transfer and reading

When performing waveform data transfer, read, or oscillator settings of the main parameters among the oscillator settings, observe the following cautions.

- Data cannot be transferred unless the driver software is installed normally. (☞2.2.1)
- Do not perform any operation using the ARB Edit during data transfer.
- It is not possible to transfer data from multiple ARB Edits at the same time.

5.6.6 File operations

The settings for the system setup window are saved to a file or read from a file.

The system setting file for the ARB Edit is a binary file in the unique format and cannot be used in other applications.

To save a system setting file:

1. Select **[System Setup File] - [Save]** or press Ctrl + S on the system setup window.
2. Select a saving location.
3. Enter a file name. The file extension is ".ocb", which can be omitted when entering a file name.
4. Click the **[Save]** button.

To read the system setting file:

1. Select **[System Setup File] - [Open]** or press Ctrl + O on the system setup window.
2. Select a file location.
3. Enter a file name.
4. Click the **[Open]** button.

---- **Notes** ----------

The system setting files created with the Arbitrary Waveform Editor for WF1973/WF1974 can be read in the same way. Note that the model setting in the file to be read is changed from "WF1973" to "WF1967" or from "WF1974" to "WF1968."

5.6.7 Print

The setting conditions for the system setup window can also be printed out.

1. Select **[System Setup File] - [Print]** or press Ctrl + P on the system setup window.
2. Make settings for the upper, lower and left margins, the printer or font as needed.
3. Click the **[OK]** button.

5.6.8 Initial values

The parameters set on the system screen and initialized when the ARB Edit is started are shown in Table 5-13.

Table 5-13 Initialized Values

	WF1967	WF1968
Waveform memory name	(No specification)	
Waveform memory number	0	
Channel	–	1
Output on/off	OFF	
Frequency [Hz]	1000	
Period [sec]	1m	
Output range	Auto	
Amplitude [Vp-p]	0.1	
DC offset [V]	0.0	
Amplitude range	Norm +/–FS	
X axis unit	Custom	
X axis name	(No specification)	
X axis minimum value	0.000000	
X axis maximum value	1.000000	
Y axis unit	Custom	
Y axis name	(No specification)	
Y axis minimum value	–1.000	
Y axis maximum value	1.000	

6. ERROR MESSAGES

6.1 Arbitrary Waveform Editor Error

The following table summarizes the error specifications of the ARB Edit.

Table 6-1 Error Messages

Message	Description
Memory Allocation Failed.	Memory for OS operation could not be secured at startup.
No Spline point.	During waveform generation using interpolation, the interpolation was performed without any control points specified.
Cannot create two spline point on same X. Do you want continue?	Displayed when the leftmost and rightmost values of the Y axis are different when generating a waveform using interpolation.
File Write error.	An error occurred while a file was being saved in the ARB Edit. If this error persists, restart the ARB Edit.
File Read error	An error occurred while a file was being read in the ARB Edit. Do not use this file.
Read in is interrupted because the data file contains data of a model that is not supported.	An error occurred because a data file containing the information of a model other than the WF1967/WF1968 was read. Do not use this file.
Clip Board Open error.	An error occurred during an operation executed for the clipboard. If this error persists, restart the ARB Edit.
Clip Board Read error.	
Clip Board Write error.	
Clip Board error.	
Constant format error.	An arbitrary function expression for waveform generation contains an error. Modify the error cause according to the message.
Syntax error in equation.	
Lack of parenthesis.	
Unbalance of parenthesis.	
Divided by 0.	
Compile error.	
The unit of the axis was changed.	Indicates that the axis setting is other than the initial state, when the PWF window is displayed.
The axis range was set to X[0.0 - 1.0], Y[−1.0 - 1.0].	
Illegal Font Size.	Modify the specified font size in the printing dialog box.
No Listeners on the INTERFACE.	This error occurs when waveform data transfer, read, or oscillator settings are performed with no signal generator connected via USB.
The Sequence Edit Software is running. Terminate the Sequence Edit Software and restart.	After terminating the Sequence Edit Software, start the ARB Edit.
Transfer is interrupted because an error occurred.	If the “-225, ‘Out of memory’” message is displayed immediately before this message, check the total size of the WF1967/WF1968 arbitrary waveform data and delete any unnecessary data. If such a message is not displayed, switch off the power of the WF1967/WF1968 once before operating again.

7. MAINTENANCE

7.1 Handling CD-ROM

CD-ROM should be handled carefully paying attention to the followings.

- Store the CD-ROM in a place without direct sunlight, high temperature, and high humidity.
- Use and store the CD-ROM in a place without dust.
- Do not touch the recording surface directly. It may cause damage or errors.
- If it is dirty, wipe it with a soft dry cloth. Do not use any solvent such as benzene.
- Store the CD-ROM in a vertical or horizontal position so that it would not be deformed.
- When writing on the label surface of the CD-ROM, use a felt-tipped pen (Do not use anything with a hard point such as a ball point pen or pencil.)

7.2 Replacement of Damaged CD-ROM

If your CD-ROM has been damaged, contact NF Corporation or our agent.
For a fee, we will replace it with new one.

7.3 Check Version

The version of this software is displayed in the Version Information dialog which appears when you click **[Help] - [About]**.

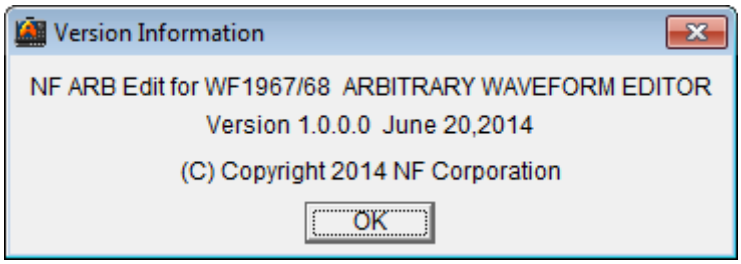


Figure 7-1 Version Information Dialog

WABUN: (DA00046805-003)

NOTES

- Reproduction of the contents of this manual is forbidden by applicable laws.
- The contents of this manual may be revised without notice.
- Information provided in this manual is intended to be accurate and reliable. However, we assume no responsibility for any damage regarding the contents of this manual.
- We assume no responsibility for influences resulting from the operations in this manual.

ARBITRARY WAVEFORM EDITOR Instruction Manual

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