INSTRUCTION MANUAL

Waveform Analysis Software

DA-20PA1

RION CO., LTD.

Organization of This Manual

This manual describes the features, operation and other aspects of the Waveform Analysis Software DA-20PA1. To ensure correct and safe operation, be sure to also consult the documentation of the computer on which the software is installed.

The following pages contain important information about safety. Be sure to read and observe these in full.

This manual contains the following sections.

Introduction

Provides an outline of the software and describes its features, operating environment, and the installation procedure.

Basic Operation

Explains names and functions of elements shown on the main screen, and describes the basic operation flow.

Advanced Operation

Explains how to select and save files, how to display information about different file types, and how to set data recording parameters for the 4-Channel Data Recorder DA-20.
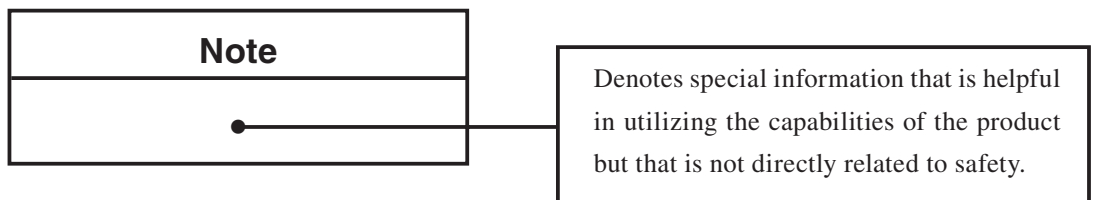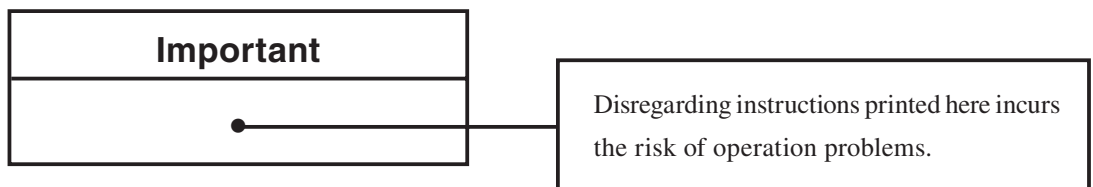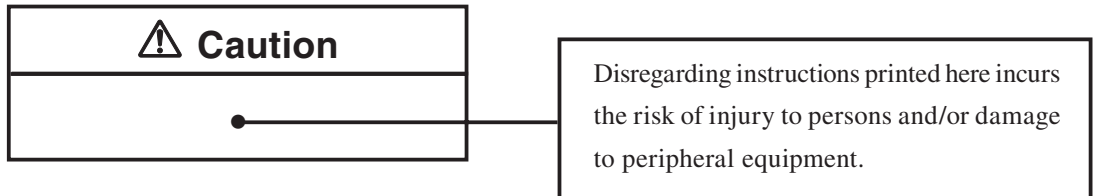
Other Information

Lists the specifications of the software and provides information about WAVE file content, calibration, troubleshooting, and related items.

* Company names and product names mentioned in this manual are usually trademarks or registered trademarks of their respective owners.

FOR SAFETY

In this manual, important safety instructions are specially marked as shown below. To prevent the risk of accidents and damage to the computer on which the software is installed, make sure that all instructions are fully understood and observed.

⚠ **Caution**
●

Disregarding instructions printed here incurs the risk of injury to persons and/or damage to peripheral equipment.

Important
●

Disregarding instructions printed here incurs the risk of operation problems.

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Note
●

Denotes special information that is helpful in utilizing the capabilities of the product but that is not directly related to safety.

About the Microsoft Windows operating system

This manual does not provide general information on how to use the Microsoft Windows operating system. For information about selecting commands and making settings in dialog boxes, refer to the documentation and online help of Microsoft Windows.

Examples for computer screens shown in this manual are for illustration purposes only. The actual appearance of screens may differ, depending on the version of the Microsoft Windows operating system and the computer environment.

⚠ Caution

Do not play the install CD-ROM in a CD player

The DA-20PA1 install disc is not a music CD. Inserting this disc in a CD player poses the risk of excessive volume levels that can cause hearing damage and damage to the CD player.

Important

Check the install CD-ROM

Before inserting the install disc in the CD-ROM drive of a computer, be sure to visually check the disc.

If there are any cracks or scratches or if the disc is deformed, do not insert the disc in the CD-ROM drive. Otherwise there is a risk of damage to the CD-ROM drive.

Precautions

- If a problem should occur while using this software, contact the supplier with a detailed description.

Supported file types

The types of files that can be handled by this software are listed below.

File format:	WAVE (extension "wav")
File size:	Max. 2 GB

Sampling frequency:

240 Hz, 256 Hz, 1.2 kHz, 1.28 kHz, 2.4 kHz, 2.56 kHz, 12 kHz, 12.8 kHz, 24 kHz, 25.6 kHz, 48 kHz, or 51.2 kHz

Files that do not meet the above specifications will not be handled correctly.

This software and the DA-20 support only WAVE files that employ the PCMWAVEFORMAT structure. WAVE files that employ the WAVEFORMATEX structure are not supported.

Some WAVE files not created on the DA-20 may not open correctly in this software, due to structure differences.

The sampling frequency of a WAVE file can be checked in the file properties. After importing a file, the information can also be checked on the [Wave File &Info] screen.

* WAVE files from the DA-20, SA-78WR, and NA-28 (NX-28WR) are supported. Regarding the NA-28, files with sampling frequencies other than listed above are not supported. Use a sampling frequency converter to change such files to one of the listed sampling frequencies.

WAVE file information

When you change the conversion unit set at the DA-20, the file will no longer be playable on the DA-20.

When performing an operation such as saving a range of data as a file with the intention of performing playback on the DA-20, do not change the conversion unit in the WAVE file information.

Sampling frequency related limitations

- Depending on the sampling frequency of the WAVE file, the available frequency range for FFT analysis and octave-band analysis and other items will change.

Sampling frequency	Playback	Filter where value becomes unstable *2	FFT analysis upper frequency limit *3	Octave-band analysis upper frequency limit (center frequency)	
				1/1oct	1/3oct
240 Hz	*1	-	93.75 Hz	63 Hz	80 Hz
256 Hz	*1	-	100 Hz	63 Hz	80 Hz
1.2 kHz	*1	G,Lvxy,Lvz	468.75 Hz	250 Hz	400 Hz
1.28 kHz	*1	G,Lvxy,Lvz	500 Hz	250 Hz	400 Hz
2.4 kHz	*1	G,Lvxy,Lvz	937.5 Hz	500 Hz	800 Hz
2.56 kHz	*1	G,Lvxy,Lvz	1 kHz	500 Hz	800 Hz
12 kHz	O	G,Lvxy,Lvz	4.688 kHz	2 kHz	4 kHz
12.8 kHz	*1	G,Lvxy,Lvz	5 kHz	2 kHz	4 kHz
24 kHz	O	G,Lvxy,Lvz	9.375 kHz	4 kHz	8 kHz
25.6 kHz	*1	G,Lvxy,Lvz	10 kHz	4 kHz	8 kHz
48 kHz	O	G,Lvxy,Lvz	18.75 kHz	8 kHz	16 kHz
51.2 kHz	*1	G,Lvxy,Lvz	20 kHz	8 kHz	16 kHz
Other than above	Not supported				

*1 Depending on the sound card, CPU speed, and operating system limitations, playback may not be possible, or pitch and sound quality may change in playback.
Sound dropouts may occur also in cases marked "O".

*2 Value after filter processing becomes unstable. The abbreviations in the table have the following meaning.

G: G characteristics,

Lvxy: Lv horizontal characteristics,   Lvz: Lv vertical characteristics

*3 1/2.56 of sampling frequency

- Depending on the sound card and CPU speed of the computer, noise or dropouts may occur during playback of a WAVE file.
- WAVE files with a sampling frequency under 12 kHz may not play. During playback of WAVE files with a sampling frequency of 12.8 kHz, 25.6 kHz, or 51.2 kHz, the pitch or sound quality may change.

DA20.INI file setting limitations

When using a DA20.INI file created by this software to save DA-20 settings, make sure that there are no conflicts between settings. Otherwise the settings will not become active in the DA-20. (For information about setting conditions, refer to the instruction manual of the DA-20.)

Install folder precautions

- Install this software directly on the computer where it is to be used. If the software is installed on another computer on a network, correct operation is not assured.
- Do not delete or change the names of files and folders in the installation folder of this software. Do not open any files in the folder with other applications. Otherwise correct operation of the software is not assured.

Usage License Agreement

I m p o r t a n t

Carefully read and observe the following agreement.

This is a legally binding software license agreement between you as the user and Rion Co., LTD. By installing, copying, or using the software, the user agrees to all conditions of the agreement. If the user does not agree to any of the conditions of the agreement, the software must be returned immediately without using it or any other product associated with it.

The software is protected by national and international copyright laws and regulations and intellectual property laws. Rion Co., LTD. only grants the right to use the software. The software itself is not sold to the user.

1. License Conditions

(1) Definition and Scope

The software covered by this agreement is the Waveform Analysis Software (DA-20 PA1) including the media on which the software is supplied, and documentation that is supplied with the software either in printed form or as an electronic file. This license agreement defines the right of the user to use the software.

(2) Usage

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(4) The user may not use the software to produce any products that imitate the software. Any imitation or simulation of the software is an infringement of copyright laws.

4. Duty of Agreement Propagation

The user must ensure that all persons using the software are fully aware of all conditions of this agreement. Any violation will be the responsibility of the user.

5. Warranty

(1) Rion Co., LTD. guarantees that the software is supplied on media that have no substantial defect, and that the software contains the functions that are explicitly listed in the specifications. If the software does not operate according to specifications or if any problems described above that are the responsibility of Rion Co., LTD. are detected and Rion Co., LTD. is informed of this fact within 90 days from the purchase date of the software, Rion Co., LTD. will undertake to remedy the problems free of charge.

(2) If the software does not operate according to specifications due to causes that are not the responsibility of Rion Co., LTD., Rion Co., LTD. will undertake to remedy the problems against charge.

6. Limitation of Warranty

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(2) Under no circumstances will the responsibility of Rion Co., LTD. as stated in "5. Warranty" exceed the equivalent of the price that the user paid for the software.

7. Duration

This agreement is valid until terminated. The user can terminate the agreement at any time by destroying the software and associated documentation and deleting all copies from the computer where the software was installed. The agreement also terminates when the user violates any of the conditions herein. In this case, the user also must destroy the software and associated documentation and delete all copies from the computer where the software was installed.

8. Jurisdiction

Any disputes or litigation arising from this agreement will be under the jurisdiction of the Tokyo District Court.

Contents

Introduction

Outline

The Waveform Analysis Software DA-20PA1 is designed to allow the use of a computer for display and playback of waveform data (WAVE format) recorded on a data recorder such as the DA-20.
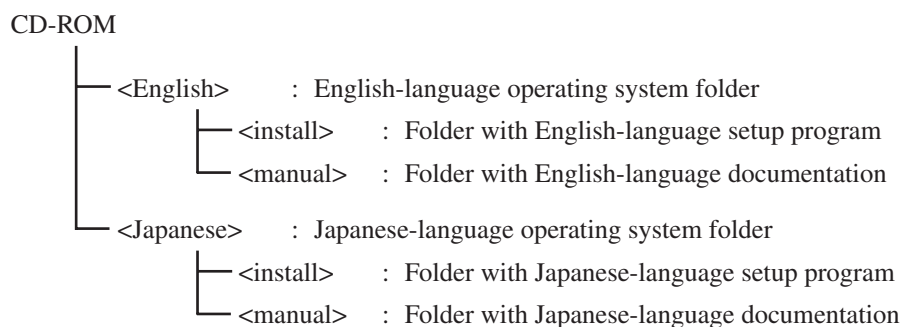
Features

The software has the following features.

- Display and monitor a waveform and perform analysis of a specified interval.
- Quickly jump to points where voice memo or marker information has been recorded.
- Apply various kinds of frequency weighting (FLAT, A, C, G characteristics) to sound level data.
- Apply JIS C1510 compliant frequency weighting to environmental and ground vibration data collected with a vibration level meter.
- Calculate rms values with various time weighting characteristics (time constant settings).
- Calculate sound exposure level L_E, equivalent continuous sound pressure level L_{eq}, and percentile sound pressure levels for noise evaluation.
- Calculate the same characteristic values for vibration level evaluation as for sound level evaluation.
- Process the recorded waveform with high-pass, low-pass, and bandpass filters using freely specified cutoff points.
- Perform FFT analysis with 25 to 12800 lines.
- Calculate 1st-order and 2nd-order differentiation and integration spectra from FFT analysis results. This function allows for example calculating the velocity or displacement spectrum from the acceleration spectrum.
- Calculate the 1/1 octave and 1/3 octave bandpass spectrum of the recorded waveform.
- Save analysis results as CSV files.
- Graph or window copy function facilitates the creation of reports.

All functions of this software become available when the access control key is inserted in a USB port of the computer. The key is supplied with the software. The use of hardware-based copy-protection is indicated by the "Hard Protect" label on the CD-ROM.

The folder structure on the supplied CD-ROM is as follows.

```
CD-ROM
    ├── <English>        : English-language operating system folder
    │       ├── <install>     : Folder with English-language setup program
    │       └── <manual>      : Folder with English-language documentation
    └── <Japanese>       : Japanese-language operating system folder
            ├── <install>     : Folder with Japanese-language setup program
            └── <manual>      : Folder with Japanese-language documentation
```

Operating Environment

This software has the following operating environment requirements.

Operating environment requirements

Computer	Intel Pentium IV 2 GHz or equivalent CPU, CD-ROM drive, IBM PC/AT compatible architecture
RAM	512 MB or more (when handling WAV files larger than 1 GB, installed RAM should be 2 GB or more)
Hard disk	10 GB or more of free space
Display	Suitable resolution for operating system (1024 × 768, XGA), or equivalent

Operating system (One of the following)

Microsoft Windows 2000 Professional

Microsoft Windows XP Professional

(Support for Japanese and English)

Other requirements

CompactFlash card slot, speakers, sound card

Software Installation

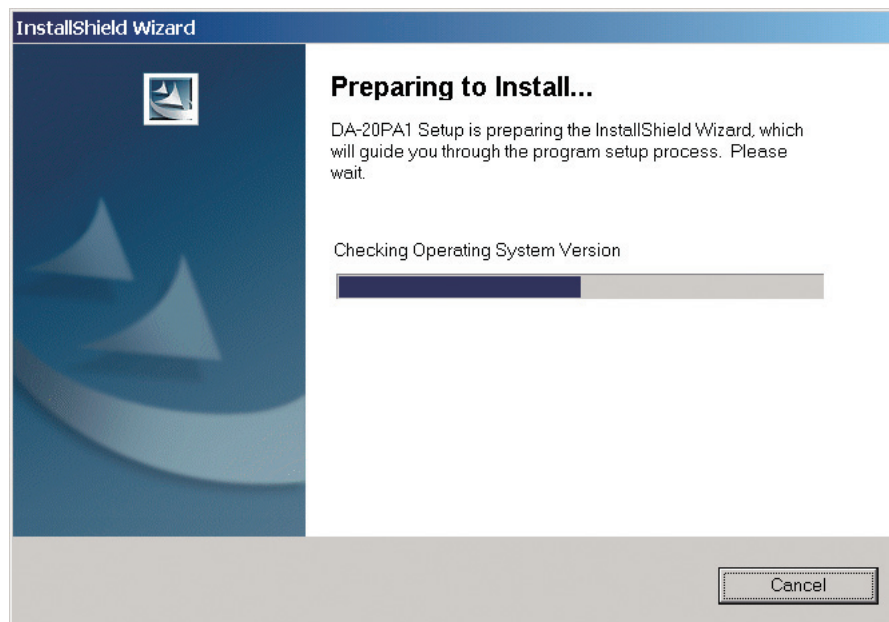| Important |
|---|
| To install this software, you must be logged on as Administrator or as a member of the Administrators group. |
| Install this software directly on the computer where it is to be used. If the software is installed on another computer on a network, correct operation is not assured. |

Installing and starting the software

Perform the installation of the software as follows. For details, see the separate "Installation Guide".

1. Insert the DA-20PA1 CD-ROM into the CD-ROM drive of the computer where the software is to be used. Locate the "install" folder under the "English" folder on the CD-ROM, and double-click the "setup.exe" icon.
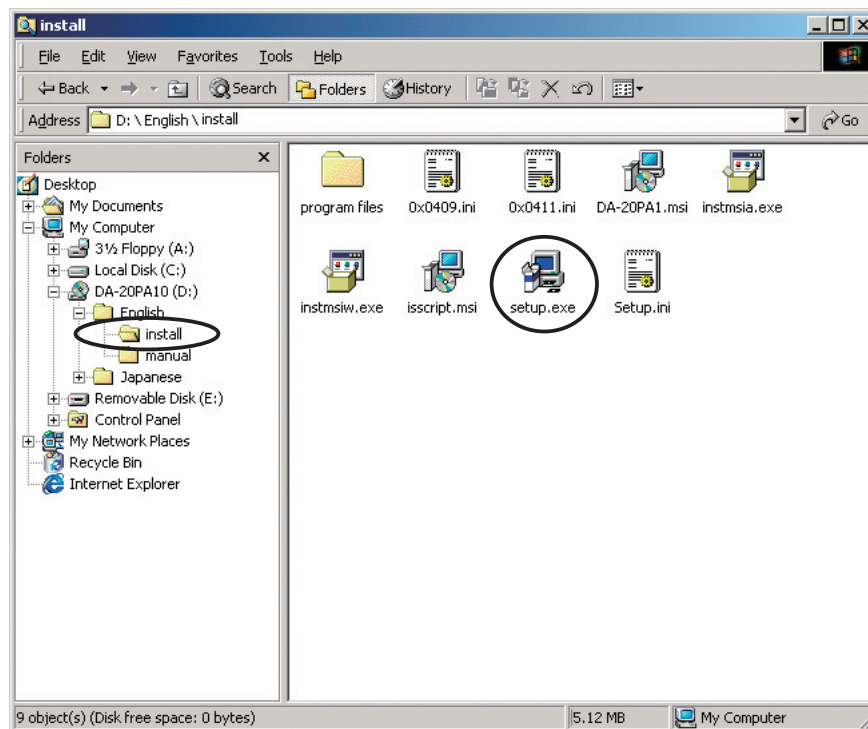
2. The "Preparing to Install..." screen appears and the installation starts. When installation of the DA-20PA1 software is completed, installation of the hardware-based protection driver begins.

Follow the instructions that appear on the screen. For details about the setup procedure, see the separate "Installation Guide".

3. Insert the supplied access control key into a USB port of the computer. Verify that the LED of the access control key is lit.

Important
Unless the supplied access control key is inserted into a USB port of the computer and the LED of the access control key is lit, the software will not work. If the key is not inserted or not inserted correctly (LED is not lit), an error message will appear when trying to start the software.

4. From the [Start] menu, select [RION] and [DA-20PA1]. The software starts up and the main screen appears.

| **Note** |
| --- |
| You can also start the software via a shortcut placed on the desktop, or by double-clicking "DA-20PA1.exe" located in the folder specified during installation. |
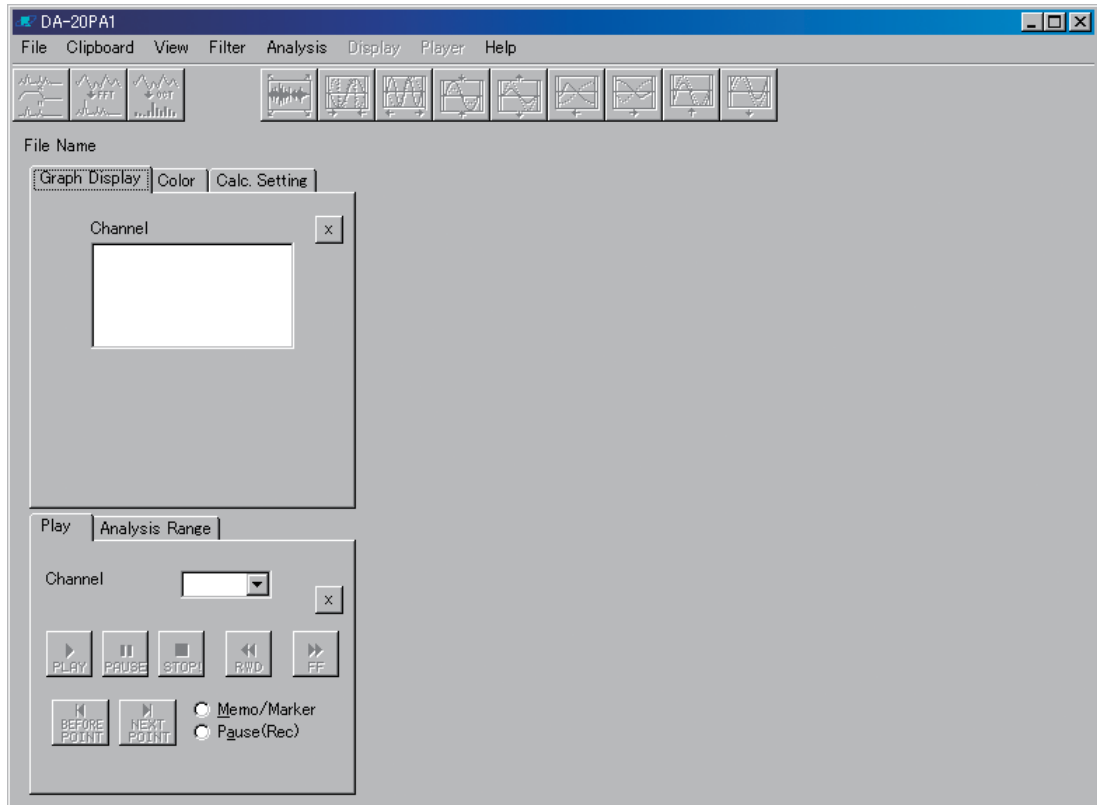
Note
Start this software from the computer where the software is installed. If started from another computer on a network, the software will not operate correctly, and error messages such as "Invalid file" will appear.

Troubleshooting

Software does not start properly.

Check the following points and retry the operation. If the software still does not start after checking all the points, or if a description of the problem is not found here, contact the supplier.

- The hardware-based protection driver may not be installed or not be installed correctly. Delete the hardware-based protection driver and then install the driver once more by double-clicking on "HASPUserSetup.exe" located in the install folder on the CD-ROM.
- Check whether the access control key is inserted correctly into a USB port of the computer. When the key is inserted correctly, the LED of the key is lit.
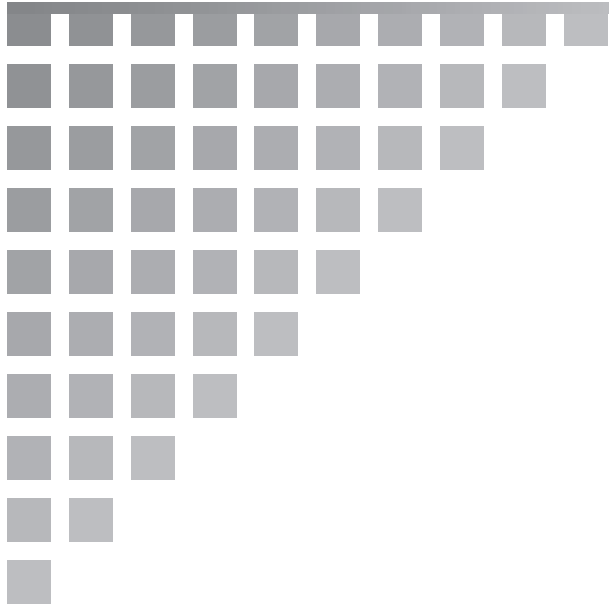
Basic Operation
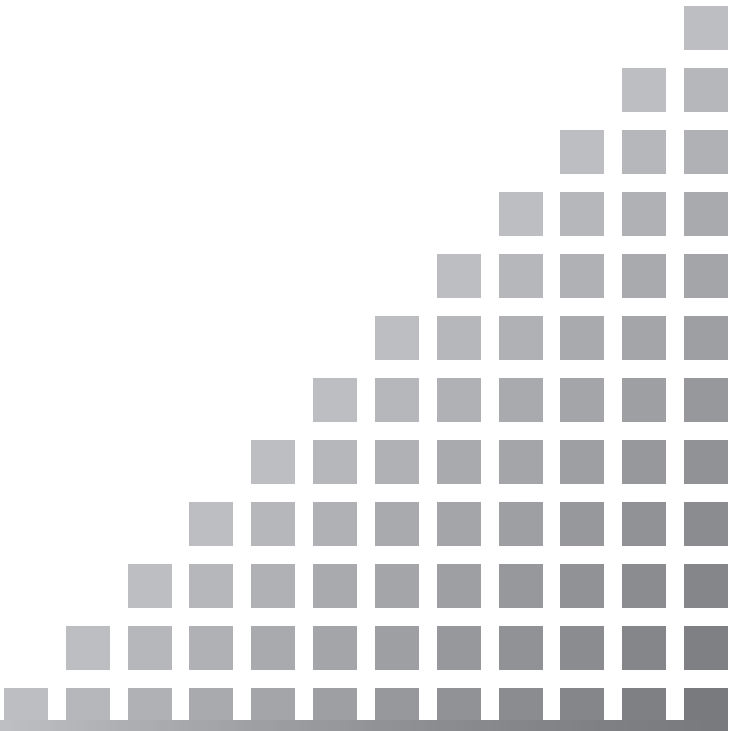
Main Screen Part Names and Functions

The various elements of the main screen and their function are briefly explained in this section.

When you start the software, the main screen appears.

In the example shown below, there are four graph windows for channels 1 to 4.

Menu bar
Tool bar
File name
Setting panel
Operation panel
Cursor
Graph
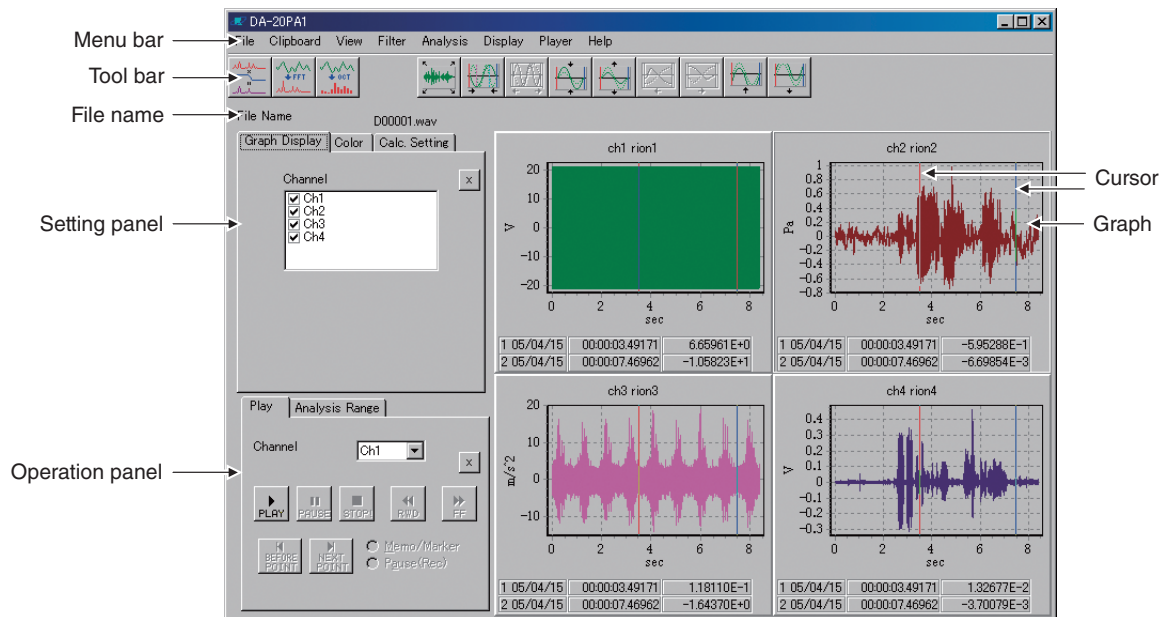
Menu bar

The menu bar gives access to a number of menus, as shown below. Each menu comprises a number of commands.

Commands that are grayed out in a menu have no effect when clicked.

[File] menu

This menu lets you select and save a WAVE file, create a DA20.INI file, and perform other functions. The menu also has commands for displaying property information for various files.
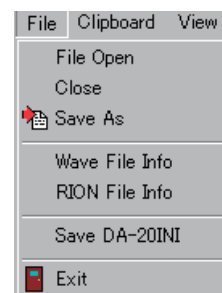
[File Open]

Selects the WAVE file to display.

For details on how to select files, see the section "Selecting a file" in "File Operations" (page 65).

[Close]

Closes only the currently displayed WAVE file. Does not close the software.

[Save As]

Saves the displayed data as a WAVE file.

For details on saving files, see the section "Saving a specified range" in "File Operations" (page 66).

[Wave File Info]

Shows information about the displayed WAVE file. In the displayed information, the conversion unit, dB reference, and Calib. (Unit/Volt) settings can be changed.

For details on the WAVE file information, see the section "WAVE file information" in "File Operations" (page 67).

[Rion File Info]

When the displayed WAVE file is a Rion file, this command shows information about the file. The memo field can be edited.

For details on the Rion file properties, see the section "Rion file information" in "File Operations" (page 69).

[Save DA20INI]

Creates the DA20.INI file that controls the data recording parameters of the DA-20.

For details on creating a DA20.INI file, see the section "Creating a DA20.INI file" in "File Operations" (page 70).

[Exit]

Shuts down the application. The same function can be performed by clicking the ⊠ button at the top right.

[Clipboard] menu

This menu lets you copy a graph or window (screen) to the clipboard.
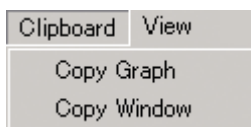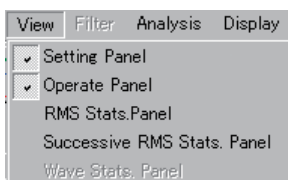

[Copy Graph]

Copies the selected graph to the clipboard.

[Copy Window]

Copies the entire screen to the clipboard.

[View] menu

This menu lets you display or hide the setting panel and operation panel, and control the display of statistical information. When all panels are deselected, the graph display fills the entire screen.

[Setting Panel]

Displays or hides the setting panel.

For details on setting panel operations, see the section "Setting panel" (page 21).

[Operate Panel]

Displays or hides the operation panel.

For details on operation panel operations, see the section "Operation panel" (page 24).

[RMS Stats. Panel]

Displays or hides the RMS stats. panel.

For details on RMS stats., see the section "RMS Stats." in "Statistical Processing" (page 31).

[Successive RMS Stats. Panel]

Displays or hides the Successive RMS stats. panel.

For details on the Successive RMS stats. panel, see "Successive RMS Stats." in the section "Statistical Processing" (page 32).
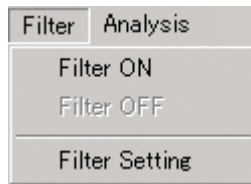
[Wave Stats Panel]

Displays or hides the waveform stats panel.

For details on waveform stats, see the section "Waveform Stats" in "Statistical Processing" (page 30).

[Filter] menu

This menu lets you make filter settings.

[Filter ON]

Applies the filter according to the settings made on the [Filter Setting] screen to the waveform.

For details on filter parameters, see the section "Filter settings" (page 42).

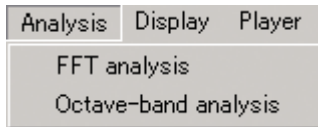## [Filter OFF]

No filter is applied to the waveform.

[Filter Setting]

Brings up the [Filter Setting] screen.

For details on the [Filter Setting] screen, see the section "Filter settings" (page 42).

[Analysis] menu

This menu contains commands for FFT analysis and octave analysis.

[FFT analysis]

Brings up the [FFT analysis] screen.

For details on the [FFT analysis] screen, see the section "FFT Analysis" (page 45).

[Octave-band analysis]

Brings up the [Octave-band analysis] screen.

For details on the [Octave-band analysis] screen, see the section "Octave-Band Analysis" (page 55).

[Graph display range] menu

This menu contains commands for controlling the graph display.

The menu items correspond to the tool bar items. For details on the tool bar, see the section "Tool bar" (page 18).

Note
You can directly specify the display range of the graph using the cursor, or you can use the [Analysis Range] tab on the operation panel. For details, see the section "Waveform graph" (page 27).

[Show All]

Show the entire data as a graph.

[X Zoom In]

Enlarge the range specified by the start point and end point on the X axis.

[X Zoom Undo]

Return the enlarged analysis range on the X axis to the previous condition.

[Y Zoom In]

Enlarge the display range on the Y axis by 25%.

[Y Zoom Out]

Reduce the display range on the Y axis by 25%.

[Move +X]

Move the specified display range on the X axis by one screen to the right (+ direction).

[Move -X]

Move the specified display range on the X axis by one screen to the left (- direction).

[Move +Y]

Move the specified display range on the Y axis by about 25% up (+ direction).
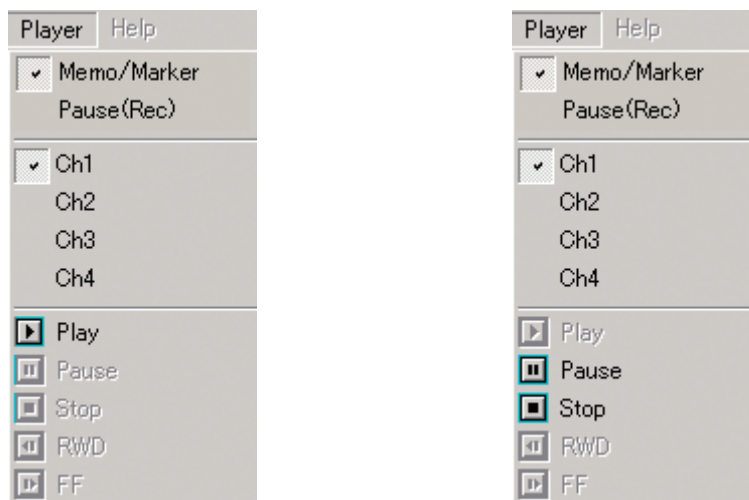
[Move -Y]

Move the specified display range on the Y axis by about 25% down (- direction).

[Player] menu

This menu contains commands for selecting the channel for playback and for controlling playback operations.

The menu items correspond to the items under the [Player] tab of the operation panel. For details on the operation panel, see the section "Operation panel" (page 24).

[Memo/Marker]

This item becomes available when voice memo or marker information is contained in the data.

[Pause (Rec)]

This item becomes available when pause information is contained in the data.

[Ch1] to [Ch4]

Lets you select one channel for playback. It is not possible to select multiple channels simultaneously.

[Play]

Starts data playback.

[Pause]

Pauses data playback. Selecting this command during pause cancels the pause condition and resumes playback.
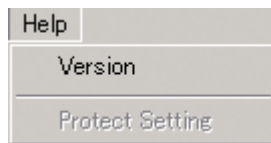
[Stop]

Stops data playback.

[RWD]

Moves the data playback position in the reverse direction (to past data). [Rewind]

[FF]

Moves the data playback position in the forward direction (to future data). [Fast-Forward]

[Help] menu

Provides information about the program version and about protect settings.
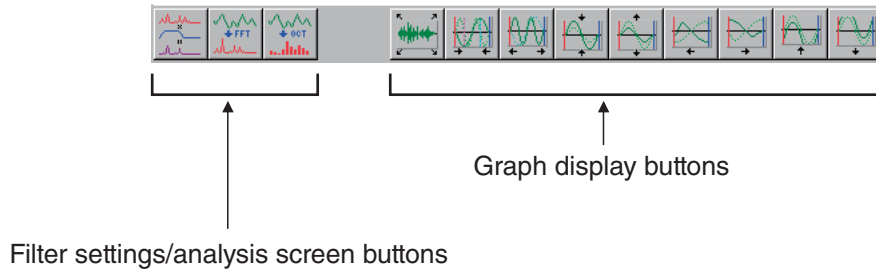

[Version]

Shows the software version.

Tool bar

Commands for making filter settings, starting the analysis screen, and controlling the graph display are shown as buttons on this bar. Clicking a button will execute the respective function.

Graph display buttons

Filter settings/analysis screen buttons

Note
The tool bar becomes available when a file is loaded.
The graph display setting applies to all channels.

Filter settings/analysis screen buttons

These buttons give access to the same functions as the [Filter] menu on the menu bar and the [FFT analysis] and [Octave-band analysis] commands on the [Analysis] menu.

 [Filter Setting] button

Brings up the Filter Setting screen.

(Same as [Filter] menu)

 [FFT analysis] button

Brings up the [FFT analysis] screen.

(Same as [FFT analysis] command on [Analysis] menu)

 [Octave-band] button

Brings up the Octave-band Analysis screen.

(Same as [Octave-band analysis] command on [Analysis] menu)

Graph display buttons

These buttons give access to the same functions as the [Graph display range] menu on the menu bar.

[Show All] button

Show the entire data as a graph.

(Same as [Graph display range] menu → [Show All] command)

[X Zoom In] button

Enlarge the range specified by the start point and end point on the X axis.

(Same as [Graph display range] menu → [X Zoom In] command)

[X Zoom Undo] button

Return the enlarged analysis range on the X axis to the previous condition.

(Same as [Graph display range] menu → [X Zoom Undo] command)

[Y Zoom In] button

Enlarge the display range on the Y axis by about 25%.

(Same as [Graph display range] menu → [Y Zoom In] command)

[Y Zoom Out] button

Reduce the display range on the Y axis by about 25%.

(Same as [Graph display range] menu → [Y Zoom Out] command)

[Move -X] button

Move the specified display range on the X axis by one screen to the left (- direction).

(Same as [Graph display range] menu → [Move -X] command)

[Move +X] button

Move the specified display range on the X axis by one screen to the right (+ direction).

(Same as [Graph display range] menu → [Move +X] command)

[Move +Y] button

Move the specified display range on the Y axis by about 25% up (+ direction).

(Same as [Graph display range] menu → [Move +Y] command)

[Move -Y] button

Move the specified display range on the Y axis by about 25% down (- direction).

(Same as [Graph display range] menu → [Move -Y] command)

Note
The [Show All] button applies only to the X axis. The Y axis may extend beyond the screen.

File name

Shows the file name of the displayed data.

Setting panel

Gives access to various settings including graph display, color, and other items.

There are three tabs labeled "Graph Display", "Color", and "Calc. Setting". Click on the tab to display the respective setting items.

To close the setting panel, click the ☒ (close) button.
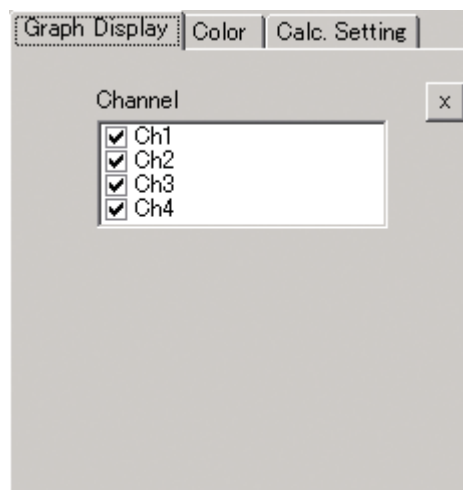
[Graph Display] tab

Lets you select the channel to display as a graph.

[Channel]

Click the channel that you want to display as a graph. The respective graph display appears.

[Color] tab

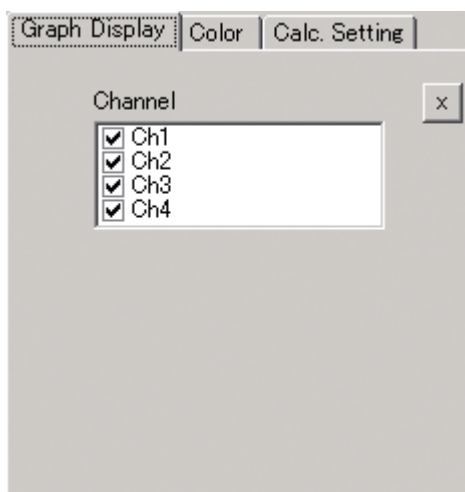Allows you to specify the color for the graph. The color can be specified separately for text, cursor 1 (playback start point), cursor 2 (playback end point), grid, and the lines representing the waveforms of channels 1 to 4.
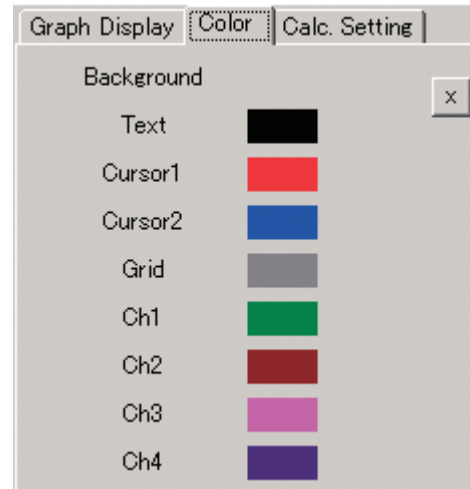
Changing the color

When you click on the item for which you want to change the color, the [Color] window appears. Select the desired color and click the [OK] button.
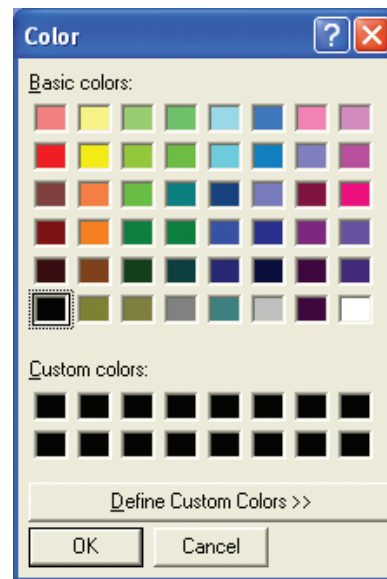
Note
By clicking [Define Custom Colors], you can create your own color shades.

[Calc. Setting] tab

Lets you set the time constant for root-mean-squared (rms) value calculation. The time rate for the effective value and other items can also be set.

[LN percentage set]

The percent figure for time percentile level calculation can be set from 1 to 99. Specify five figures in ascending order from left to right.

[Time Const.]

The time constant (time weighting) to be used for calculating the rms value can be set for each channel separately.

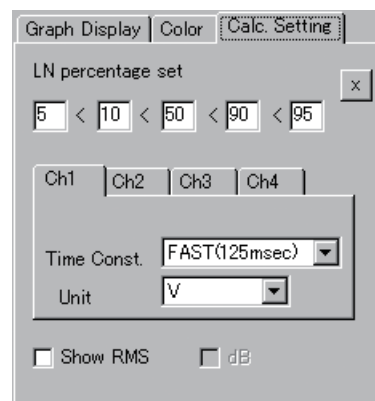Click the ▾ button to bring up a list from which to select the setting (1 msec, 10 msec, 35 msec, FAST (125 msec), 630 msec, SLOW (1 sec)).

Note
The time constant setting cannot be lower than 1/2 the sampling interval. This is relevant when the sampling frequency is low.

[Unit]

Lets you set the graph display Y axis unit for each channel separately. Click the ▾ button to bring up a list from which to select the setting.

Note
The "V (Volt)" value is calculated using the input range setting active when the waveform was recorded on the 4-Channel Data Recorder DA-20. Consequently, the value is invalid for WAVE format waveform data that were generated or recorded on equipment other than the DA-20.

[Show RMS]

When this check box is selected, the rms value graph will be shown. Clicking on the box will toggle the selection on and off.

[dB]

When this check box is selected, the rms value using the measurement quantity unit (EU, m/s^2, dB, etc.) will be shown on a logarithmic scale. Clicking on the box will toggle the selection on and off.

The check box becomes available when [Show RMS] is selected.

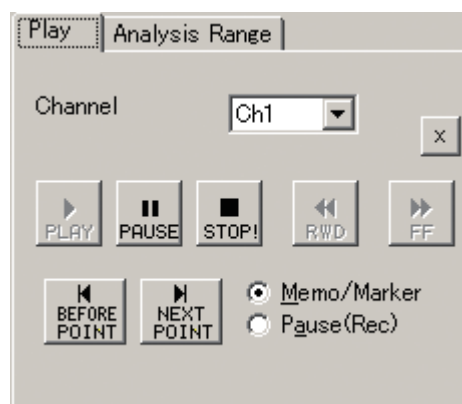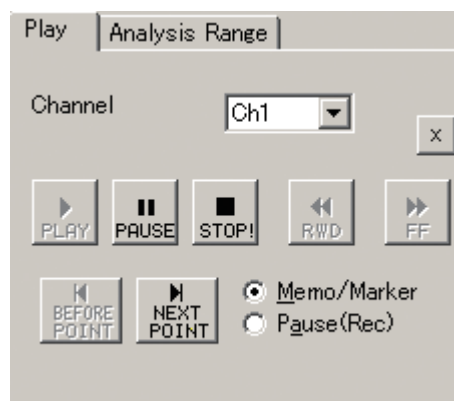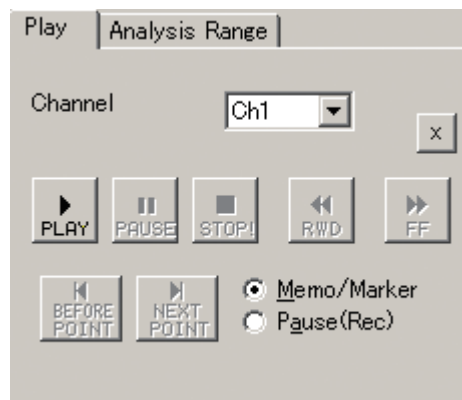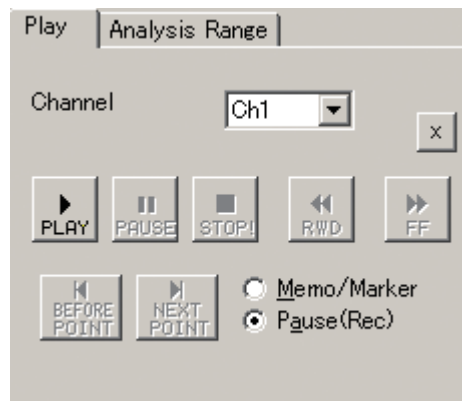| Note |
| --- |
| The [Unit] setting does not affect this operation. |

Operation panel

Lets you control data playback operations and specify the analysis range.

By clicking the ⊠ (close) button, the operation panel can be closed.

[Play] tab

Lets you control data playback operations.

The [Play] menu on the menu bar of the main screen gives access to the same functions.

[Play Channel]

Selects the channel for playback. Click the ⏷ button to bring up a list from which to select the setting.

[PLAY] button

Starts data playback.

[PAUSE] button

Pauses or resume data playback.

[STOP] button

Stops data playback.

[RWD] button

Moves the data playback position in the reverse direction (to past data). Because this resembles the rewind function on a VCR or similar, the function is called "Rewind".

[FF] button

Moves the data playback position in the forward direction (to future data). Because this resembles the fast-forward function on a VCR or similar, the function is called "Fast-Forward".

[BEFORE POINT] button

This button is available during playback and pause.

Clicking the button moves the playback position to any preceding voice memo/marker or pause point. If there are several such points, the playback position is moved to the closest point.

[NEXT POINT] button

This button is available during playback and pause.

Clicking the button moves the playback position to any following voice memo/marker or pause point. If there are several such points, the playback position is moved to the closest point.

[Memo/Marker]

Enabled when there is voice memo or marker information in the data.

[Pause (Rec)]

Enabled when there is pause information in the data.

[Analysis Range] tab

Lets you specify the data analysis range by setting the start position (Start Point) and end position (End Point).

Various data processing functions such as playback and FFT analysis are carried out within the range specified here. This is particularly useful when there is a large amount of waveform data.
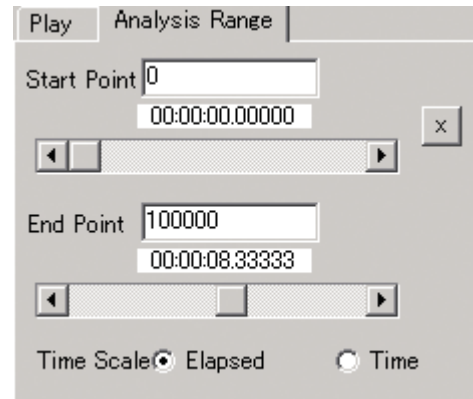
[Start Point]/[End Point]

The [Start Point] and [End Point] for the analysis range can be specified by any of the following methods.

- Enter a numeric value directly into the field at the right of [Start Point] and [End Point].
- Click the ◄ or ►| button at each end of the sliding bar to move the slider and change the value in the field at the right of [Start Point] or [End Point].
- Drag the slider to change the value in the input field at the right of [Start Point] or [End Point].

Note
The analysis range setting applies to all channels.
The analysis range can also be set by dragging the cursor on the waveform graph. The setting made by dragging the cursor and the setting made under the [Analysis Range] tab are linked. For information on the waveform graph, see page 27.

[Time Scale]

Selects how time is expressed. This selection affects the indication of the [Start Point] and [End Point], the cursor time, and the time axis of the graph.

[Elapsed]

Time is expressed as elapsed time measured from the start of the file.

[Time]

Time is expressed in terms of when the waveform was stored.

Waveform graph

The selected data are shown as a graph.

Above the graph, waveform and processing information is shown. Beneath the graph, the X axis and Y axis values for the respective cursors are shown. For information on display range and analysis range etc., see pages 28 and 29.

Waveform and processing information

Start point cursor (Cursor 1)

End point cursor (Cursor 2)

Cursor X axis value

Cursor Y axis value
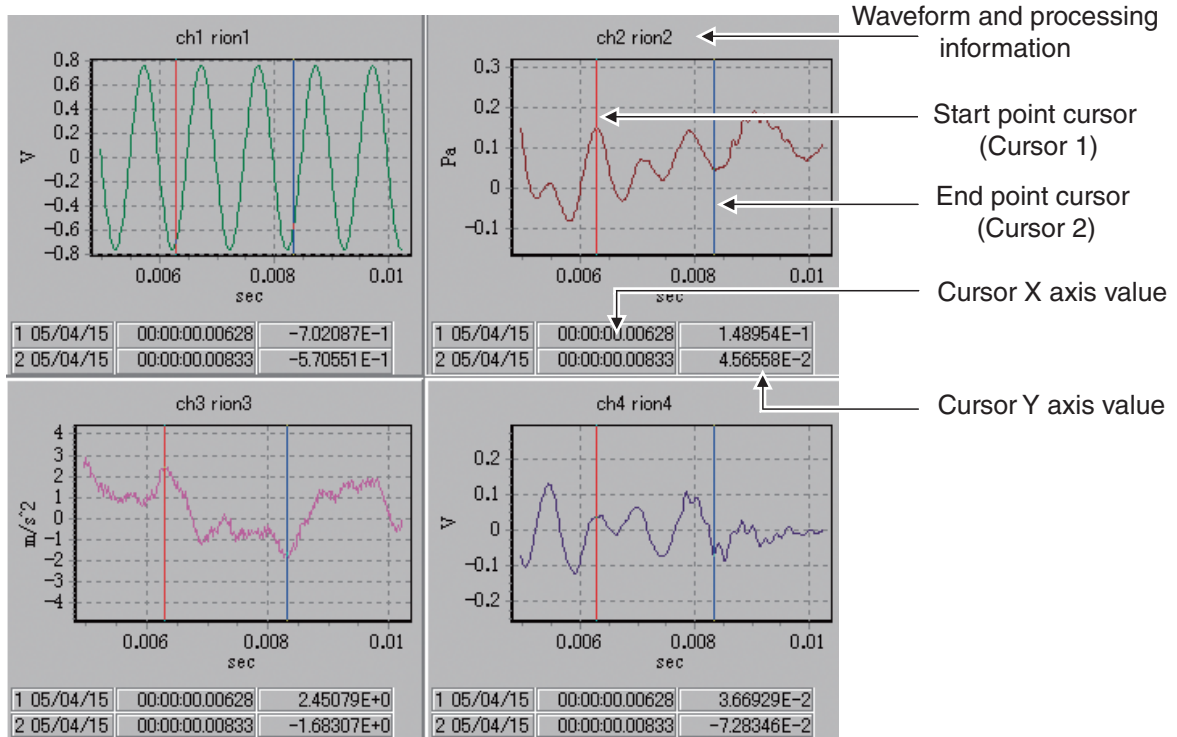
Specifying the analysis range

You can specify the analysis range by moving the cursors on the graph. The analysis range setting applies to all channels.

1. Drag the start point cursor (cursor 1) from the left edge of the graph towards the right, to the desired start point.

2. Drag the end point cursor (cursor 2) from the right edge of the graph towards the left, to the desired end point.

Note
The range can also be specified using the [Analysis Range] tab on the operation panel. For details, see the section "[Start Point]/[End Point]" (page 26).

Zooming the specified analysis range

The analysis range specified with the cursors on the graph can be zoomed.

1. Specify the analysis range with the cursors.

2. Perform zoom by one of the following two methods.

    *   Click the [X Zoom In] button on the tool bar.

    *   Use the [Graph display range] menu and select the [X Zoom In] command.
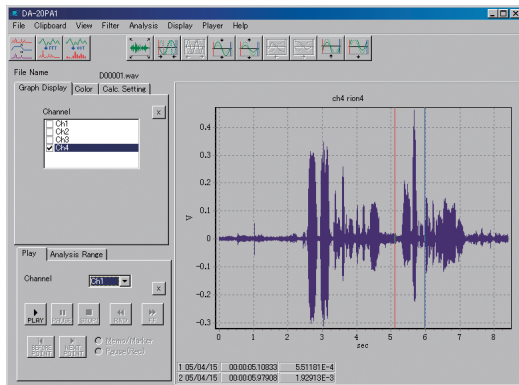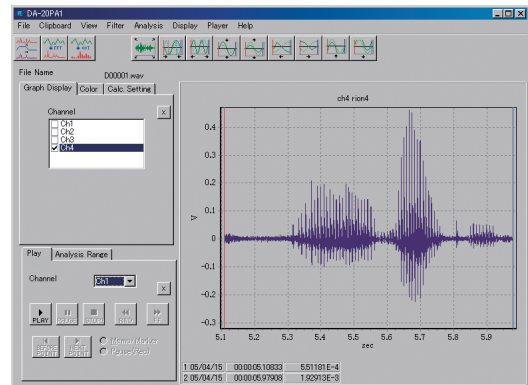
Before zoom   After zoom

Setting the Y axis display range

When you double-click on a displayed graph, the "Y-axis Scale Setting" screen appears.

Enter the maximum and minimum values in the respective fields and click the [OK] button. The Y axis display range will change accordingly. To automatically set the display range, select the "Auto Scale" check box.

To abandon the setting, click the [Cancel] button.

You can also change the Y axis display range by right-clicking on the graph and holding the mouse button while moving the mouse up or down.
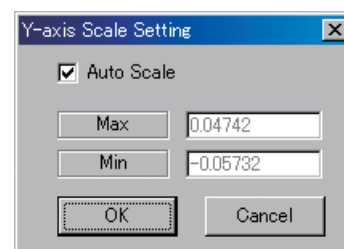
Other display range settings

Other display settings can be made by using the [Graph display range] menu or the various buttons on the tool bar.

For details, see the sections "[Graph display range] menu" (page 15) and "Graph display buttons" (page 19).

Statistical Processing

Various statistical values can be calculated from the data. The available statistical values depend on whether time waveform or RMS is selected for display.

[Waveform Stats]

The maximum, minimum, average, and variance values are calculated from the time waveform data.

Waveform stats processing

Processing of waveform statistical values occurs as follows.

1. Display the time waveform of the data.
   Under the [Calc. Setting] tab, deselect [Show RMS] so that the time waveform is shown.

2. Specify the processing range on the graph or by using the [Analysis Range] tab.
   The range should be between 1 and 1000 seconds. When the range is set outside of these limits, processing is not possible.

3. Using the [View] menu on the main screen, select [Wave Stats Panel].
   The waveform stats panel appears.

4. Select the channel for processing.
   The values are calculated and the results are shown.

   * The data used for processing are all sampling data from the analysis range. When the filter is set to ON, the data after filtering are used.
   * If the range is not between 1 and 1000 seconds, processing is not possible.
   * If you have changed the analysis range setting, click the [Calc] button.

[RMS Stats.]

The values for time percentile level L_N, equivalent level L_{eq}, single-event exposure level L_E, as well as the maximum level L_{max} and minimum level L_{min} in the selected range are calculated. If [Save As] is used to save the selected range as a CSV file, the processing results are output to the file.

RMS stats. processing

Processing of RMS statistical values occurs as follows.

1. Display the time waveform of the data.
   Under the [Calc. Setting] tab, select [Show RMS] so that the RMS indication is shown.

2. Specify the processing range on the graph or by using the [Analysis Range] tab.
   The range should be between 1 and 3600 seconds. When the range is set outside of these limits, processing is not possible.

3. Using the [View] menu on the main screen, select [RMS Stats. Panel].
   The RMS stats. panel such as shown at right appears.

4. Select the channel for processing.

5. The values are calculated and the results are shown.

> * The data used for processing are sampled every 10 milliseconds for RMS calculation. When the filter is set to ON, the data after filtering are used.
> * The range should be between 1 and 3600 seconds, and the number of data points should be no more than 1 million.
> * If RMS is not calculated, the indication "Disabled" is shown in the L_{max} and L_{min} fields.
> * Regardless of whether "dB" is selected or not, the values are always calculated as dB.
> * Precision at lower levels will be reduced.
>   For example, for a -60 dB signal, precision is approx. 1 dB.
> * If you have changed the analysis range setting, click the [Calc] button.
> * The [RMS Stats. Panel] command on the [View] menu of the main screen is only enabled when the "Show RMS" check box is selected.
> * In the processing result, L_{eq} may exceed L_{max} in a certain period. L_{max} is the maximum value of the sound pressure level for the time domain waveform with time weighting (Fast, Slow, etc.), calculated by exponential averaging. On the other hand, L_{eq} is determined from the time domain waveform in the specified period, but exponential averaging is not applied. Therefore L_{eq} may exceed L_{max} for periods where the level determined by exponential averaging is not yet sufficiently high.

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Saving the processing result

To save the processing result values, proceed as follows.

1. On the [File] menu of the main screen, select [Save As].

2. Specify "*.csv" as file type.

3. Specify the folder and file name and click the [OK] button.
   The statistical values for the selected range will be saved as a CSV file.

[Successive RMS Stats.]

RMS processed data are divided into multiple periods, and for each period the equivalent level L_{eq}, and maximum level L_{max} are calculated.

1. Enter the period duration and select the time unit (hours, minutes, seconds).

2. When you click the [Calc] button, a "Successive RMS Stats. Results" screen such as shown below appears.

Successive RMS Stats. Panel

Divided time setting

| 1 | sec |

Calc   Close

Successive RMS Stats. Results
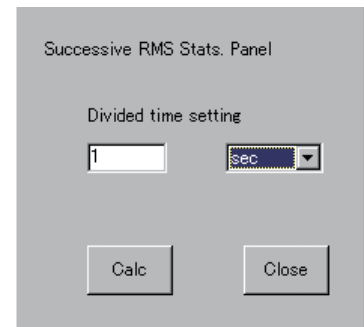
Time[sec]	Ch.1 Leq	Lmax	Ch.2 Leq	Lmax	Ch.3 Leq	Lmax	Ch.4 Leq	Lmax
1	-30.7	-30.7	-30.6	-30.6	-6.7	-6.2	47.1	49.2
2	-30.7	-30.7	-30.6	-30.6	-7.2	-6.7	48.1	50.5
3	-30.7	-30.7	-30.6	-30.6	-7.4	-6.8	43.4	49.1
4	-30.7	-30.7	-30.6	-30.6	-6.6	-5.8	30.1	35.8
5	-30.7	-30.7	-30.6	-30.6	-7.0	-5.9	49.3	58.2
6	-30.7	-30.7	-30.6	-30.6	-7.3	-6.4	46.4	57.5
7	-30.7	-30.7	-30.6	-30.6	-7.5	-7.1	46.6	49.1
8	-30.7	-30.7	-30.6	-30.6	-6.7	-5.7	39.0	46.7
9	-30.7	-30.7	-30.6	-30.6	-6.7	-5.2	51.2	58.5
10	-30.7	-30.7	-30.6	-30.6	-7.3	-6.8	47.5	50.5
11	-30.7	-30.7	-30.6	-30.6	-6.5	-5.2	44.2	49.0
12	-30.7	-30.7	-30.6	-30.6	-7.4	-6.7	29.6	36.6
13	-30.7	-30.7	-30.6	-30.6	-7.3	-6.8	49.6	56.6
14	-30.7	-30.7	-30.7	-30.6	-7.3	-6.7	45.8	47.4
15	-30.8	-30.7	-30.7	-30.7	-7.5	-7.1	45.5	47.3
16	-30.7	-30.7	-30.7	-30.7	-7.6	-6.9	45.2	48.7
17	-30.7	-30.7	-30.7	-30.7	-7.5	-7.1	45.9	48.9
18	-30.7	-30.7	-30.7	-30.7	-7.3	-6.3	46.9	49.1
19	-30.7	-30.7	-30.7	-30.7	-7.5	-7.1	45.7	48.6
20	-30.7	-30.7	-30.7	-30.6	-7.5	-7.2	46.1	48.7

Export   Close

* The [RMS Stats. Panel] command on the [View] menu of the main screen is only enabled when the "Show RMS" check box is selected.

Saving the processing result

To save the processing result values, proceed as follows.

1. Click [Export] on the "Successive RMS Stats. Results" screen.

2. Specify "*.csv" as file type.

3. Specify the folder and file name and click the [OK] button.
   The statistical values for the selected range will be saved as a CSV file.

Operation Flow

This software has two kinds of usage applications. The first usage is to check and display waveform data that were recorded with the DA-20 and to save such data on the computer as required, in a specific file format. The second usage is for checking and setting recording parameters used by the DA-20 and to write such parameter settings to a CompactFlash card for use in the DA-20.

This section provides a brief outline of each usage type. For detailed steps, refer to the respective sections on the pages indicated.

I. Checking and saving waveform data

1. Select the file whose data you want to check and save (see page 65).

   On the menu bar, access the [File] menu and select [File Open]. The "File Open" screen appears. Select the desired file.

   From this screen, you can also play back the selected file using the Player panel at the top right of the screen.
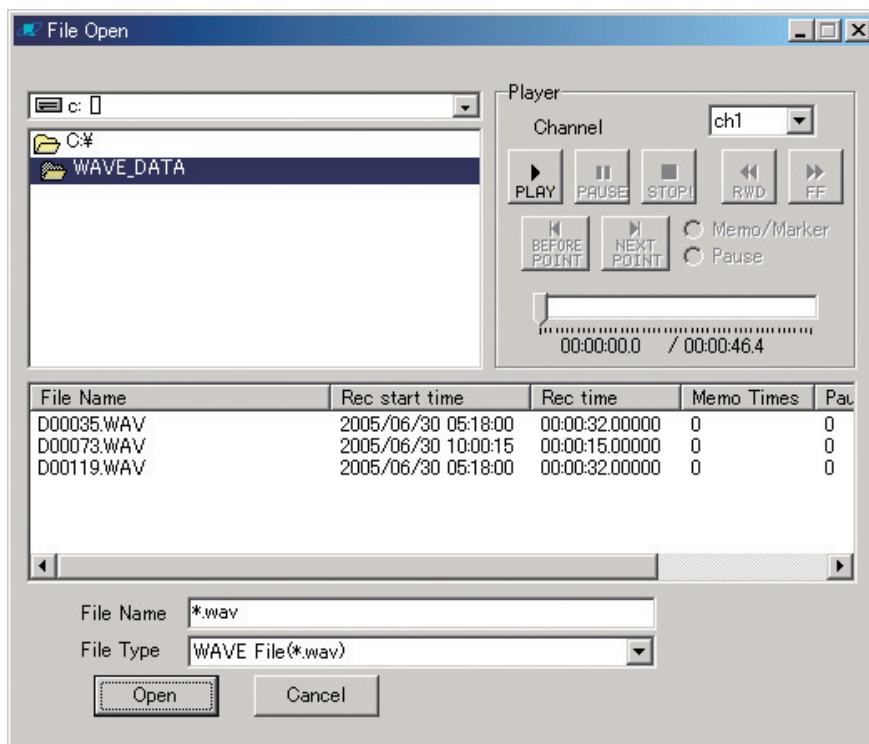
2. Use tool bar and the setting panel to display the waveform data and check the contents (see pages 18 to 19 and 21 to 23).
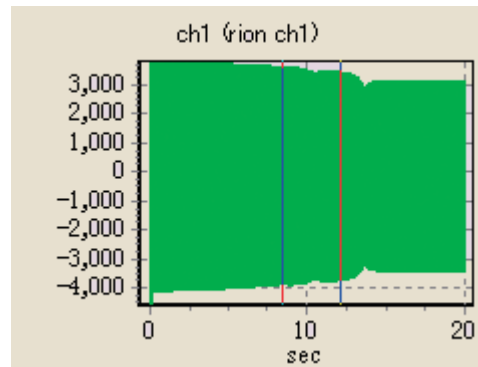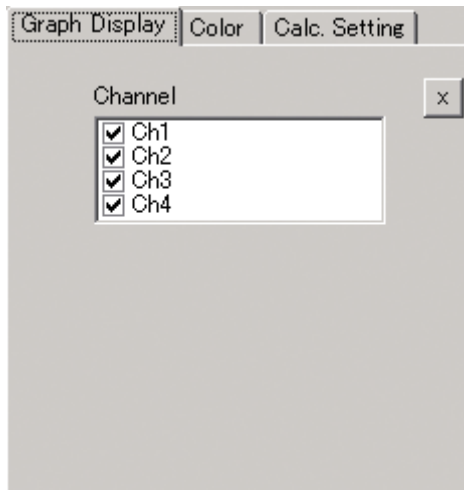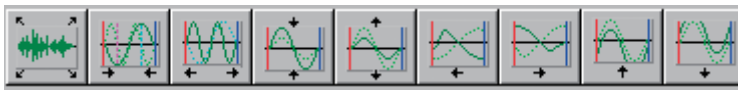
3. Save the data.

Using the original data, you can specify a range and save it as a new file (see page 66).

You can also copy the display contents into the clipboard, for saving as a bmp file or for pasting into a document or other application (see page 12).
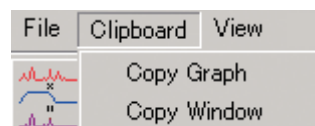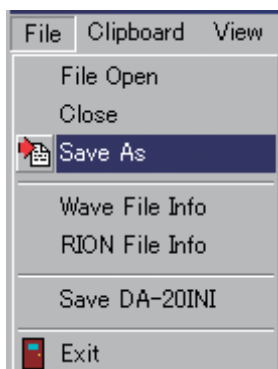
II. Writing a setting file to a CompactFlash card for use in the DA-20

You can set the recording conditions of the DA-20 using this software. The procedure is as follows.

Note
For details on recording conditions, refer to the documentation of the DA-20.

1. In the formatting menu of the computer, select "FAT" as the file system.

Important
Do not select a file system other than FAT (such as FAT32 etc.). CompactFlash cards that have been formatted using a file system other than FAT (such as FAT32 etc.) cannot be used in the DA-20.

2. Format the CompactFlash card.

3. Open the [DA20INI Settings] screen.
   To open this screen, access the [File] menu on the menu bar and select [Save DA20INI].
   The [DA20INI Settings] screen opens.
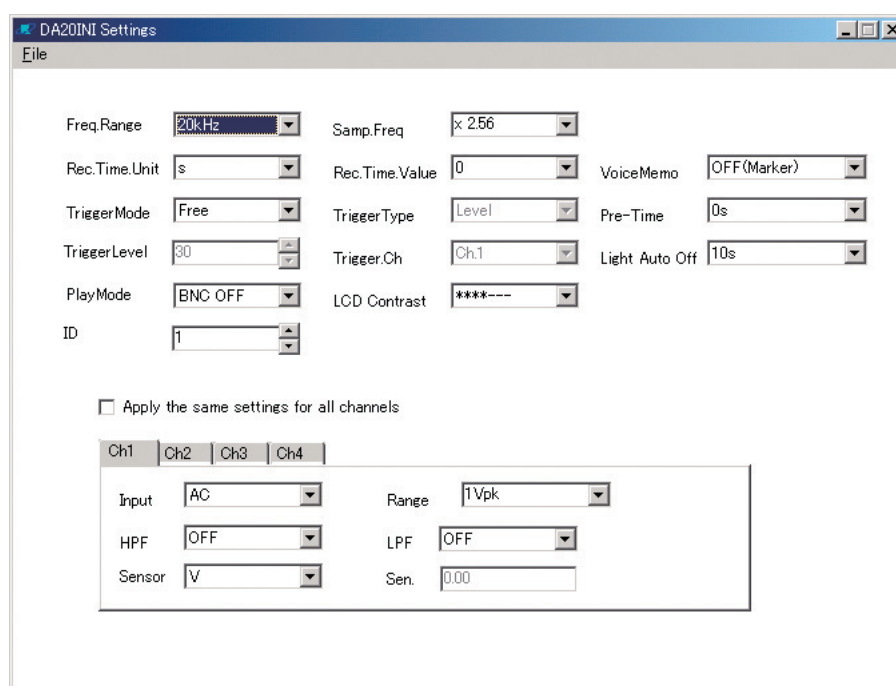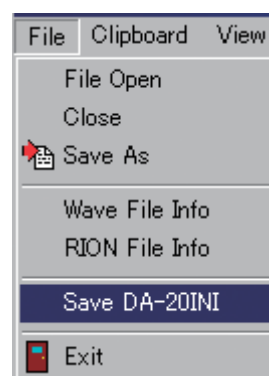
4. Change the settings as desired and write the result to the CompactFlash card for use in the DA-20. For information about the relationship between setting items and DA-20 operation, see page 70.

When the settings have been changed, save the DA20.INI file.

From the [DA20INI Settings] screen, select [Save As] and enter "DA20.INI" as the file name.

Important
Files with names other than "DA-20.INI" will not be recognized by the DA-20 and the unit will not operate.

Note
If WAVE files are also to be stored on the CompactFlash card, write the DA-20.INI file first as described above, and then follow the instructions in "Copying data to CompactFlash card for playback in DA-20" (page 38) from step 3 to write the WAVE files to the card.

Copying data to CompactFlash card for playback in DA-20

To copy data onto a CompactFlash card for playback with the DA-20, proceed as follows.

Note
The explanation assumes that there are data files on the computer that you want to play back with the DA-20.

1. In the formatting menu of the computer, select "FAT" as the file system.

Important
Do not select a file system other than FAT (such as FAT32 etc.). CompactFlash cards that have been formatted using a file system other than FAT (such as FAT32 etc.) cannot be used in the DA-20.

2. Format the CompactFlash card.

3. Create a folder named "WAVEFILE" on the hard disk of the computer, for example on the desktop.

4. Copy the data file(s) to be used for playback on the DA-20 into this folder. The file names must conform to the D*****.WAV format as specified for the DA-20.

Note
• The "*****" is an alphanumeric string of five characters.
• Copy files in sequence into the folder, starting with lower "*****" values.
• Use only data files that were recorded with the DA-20 or files that were created with the DA-20PA1 software by specifying and saving a range. Other kinds of WAVE files will not contain Rion file information and can therefore not be played on the DA-20.

5. Copy the entire "WAVEFILE" folder to the CompactFlash card in one operation, using a suitable tool of the operating system (such as Explorer).

Important
Any of the following actions will cause all data on the CompactFlash card to become unplayable by the DA-20. If such an action was carried out by mistake, back up the data from the CompactFlash card onto the computer and then perform the above procedure once more from the beginning.   • A data file on the CompactFlash card was deleted by a device other than the DA-20.   • A data file on the CompactFlash card was overwritten by a device other than the DA-20.   • Files from the "WAVEFILE" folder were copied onto the CompactFlash card individually (not as the entire folder).   • The "WAVEFILE" folder was copied onto the CompactFlash card without formatting the card first.   • A file of another application was written to the CompactFlash card. (Even deleting such a file will not solve the problem.)
When playback on the DA-20 is completed, be sure to either delete all contents of the CompactFlash card or format the card. If copied data remain on the CompactFlash card, later recording may not be performed properly.
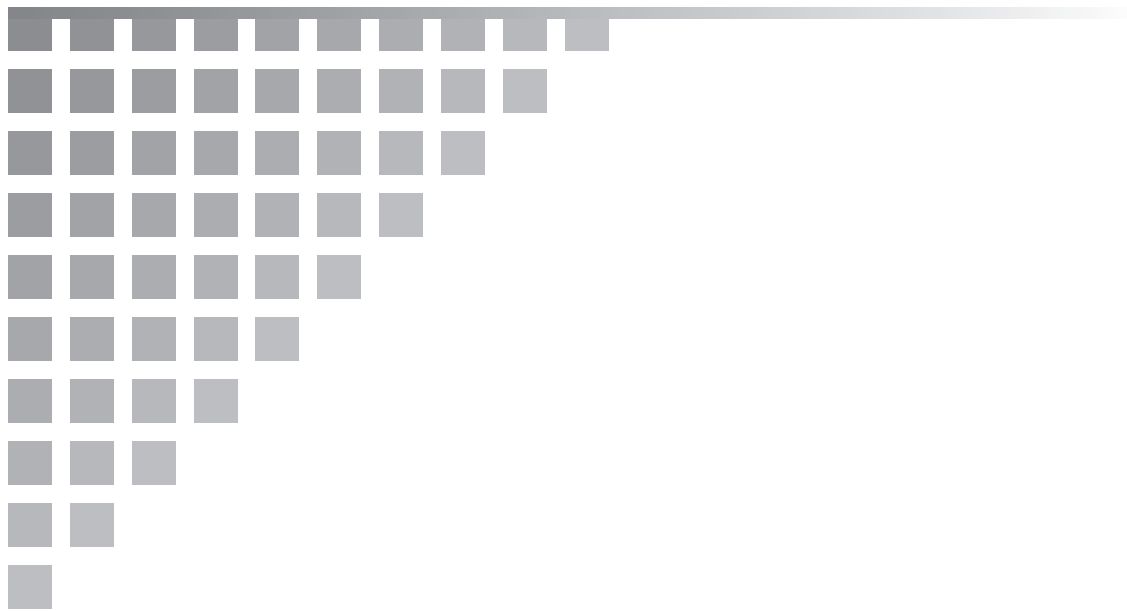
Advanced Operation
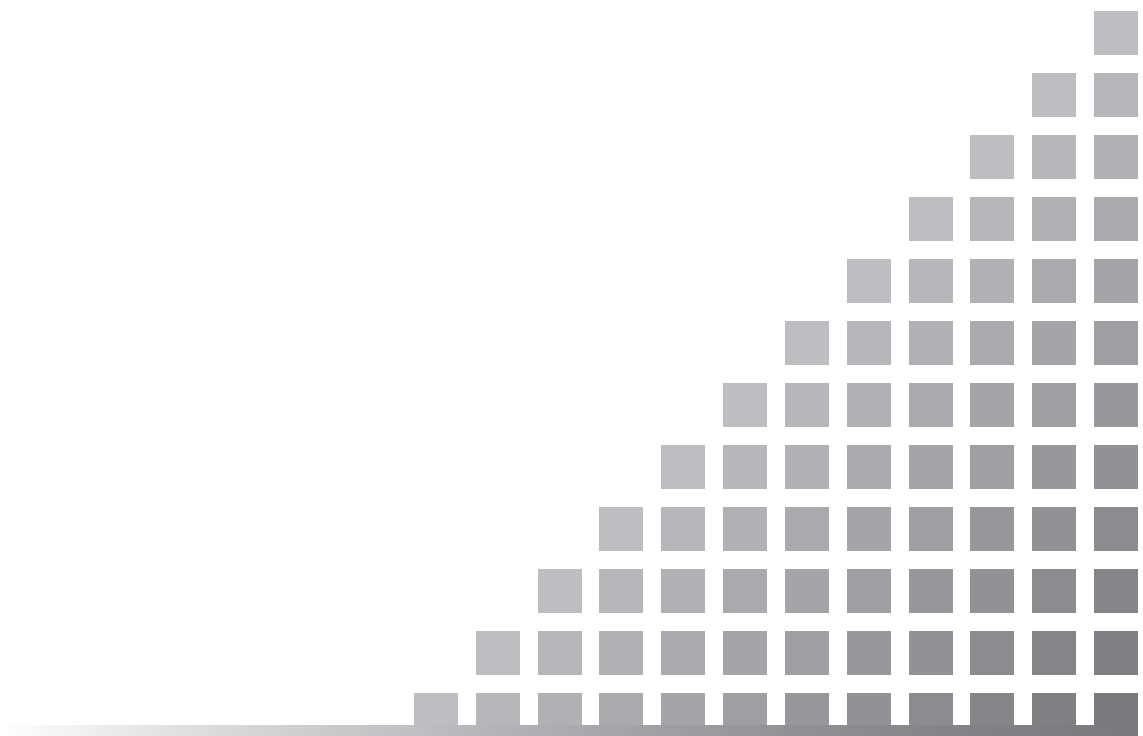
Filter Settings

The time waveform data can be processed by filters with various frequency weighting characteristics. In addition to filters with preset characteristics, an arbitrary filter with user-specified cut-off frequency settings can also be selected. The filter characteristics are shown on the screen as a graph.

Note
Certain limits apply to available arbitrary filter settings.

[Channel select] combo box

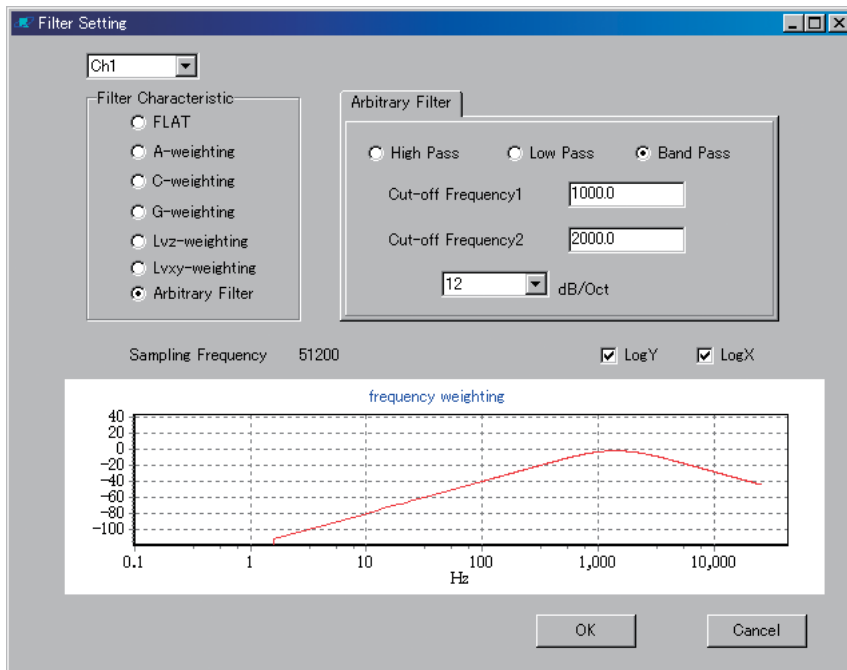Selects the channel to which the filter is applied. Each channel can have a different filter setting.

[Filter Characteristics] radio buttons

Seven filter selections are available via radio buttons: FLAT, A-weighting, C-weighting, G-weighting, Lvz-weighting, Lvxy-weighting, Arbitrary Filter.

[Arbitrary Filter] tab

The settings made under this tab become active when "Arbitrary Filter" is selected for [Filter Characteristics].

[Arbitrary filter type] radio buttons

Available selections are high-pass filter, low-pass filter, and bandpass filter. Then select the cut-off frequency (Hz).

[Cut-off Frequency] input fields

Cut-off Frequency 1: Low-side cut-off frequency
Cut-off Frequency 2: High-side cut-off frequency

[dB/Oct] combo box

Select the attenuation slope from 6, 12, 18, 24 dB/octave.

[LogY] check box

Causes the frequency characteristics graph Y axis to be shown in dB.

[LogX] check box

Causes the frequency characteristics graph X axis to be shown as a logarithmic indication.

[OK] button

Activates the current setting and closes the Filter Setting screen.

[Cancel] button

Closes the Filter Setting screen.

To set up the filter, proceed as follows.

1. Select the channel for which to make the filter setting.

2. Select the filter characteristics.
   The selected filter appears as a graph.
   When you have selected "Arbitrary Filter", make the following settings.

   (1) Select high-pass filter/low-pass filter/bandpass filter.
   (2) Enter the cut-off frequencies.
   (3) Select the attenuation slope (dB/octave).

3. To accept the settings, click the [OK] button.
   The settings become active, and the Filter Setting screen closes.
   To close the Filter Setting screen without accepting the settings, click the [Cancel] button.

4. Specify the range to which you want to apply the filter. The range can be specified directly on the graph or by using the [Analysis Range] tab.

5. Using the [Filter] menu on the main screen, set the filter to ON.
   Filter processing is carried out, and the range processed by the filter is automatically zoomed.
   To cancel filter processing, click the [Stop] button. In this case, the filter range extends to the point where the [Stop] button was clicked.

Note
If the [Show RMS] check box under the [Calc. Setting] tab on the main screen is selected, the filter cannot be selected.

* If you change the filter settings or display range, filter processing is carried out again.

* FFT analysis, octave-band analysis, and statistical value processing are carried out using the results of filter processing.

* To disable the filter, select [Filter OFF] from the [Filter] menu on the main screen. In this case, the results from FFT analysis, octave-band analysis, and statistical processing are discarded.

* If the cut-off frequency is set to a low value with regard to the sampling frequency and frequency range (for example, less than 10 Hz for a sampling frequency of 48 kHz), proper cut-off characteristics will not be achieved. Although the indication on the Filter Setting screen will show the cut-off, in actual operation correct attenuation does not apply.

FFT Analysis

The software enables FFT analysis of the range selected at the main screen. The amplitude spectrum will be displayed.

- The waveform range shown on the FFT analysis screen covers the analysis range set on the main screen, i.e. the range between the start point and end point.
- When the filter was applied to the waveform on the main screen, the [FFT analysis] screen will also show the result of filter processing.
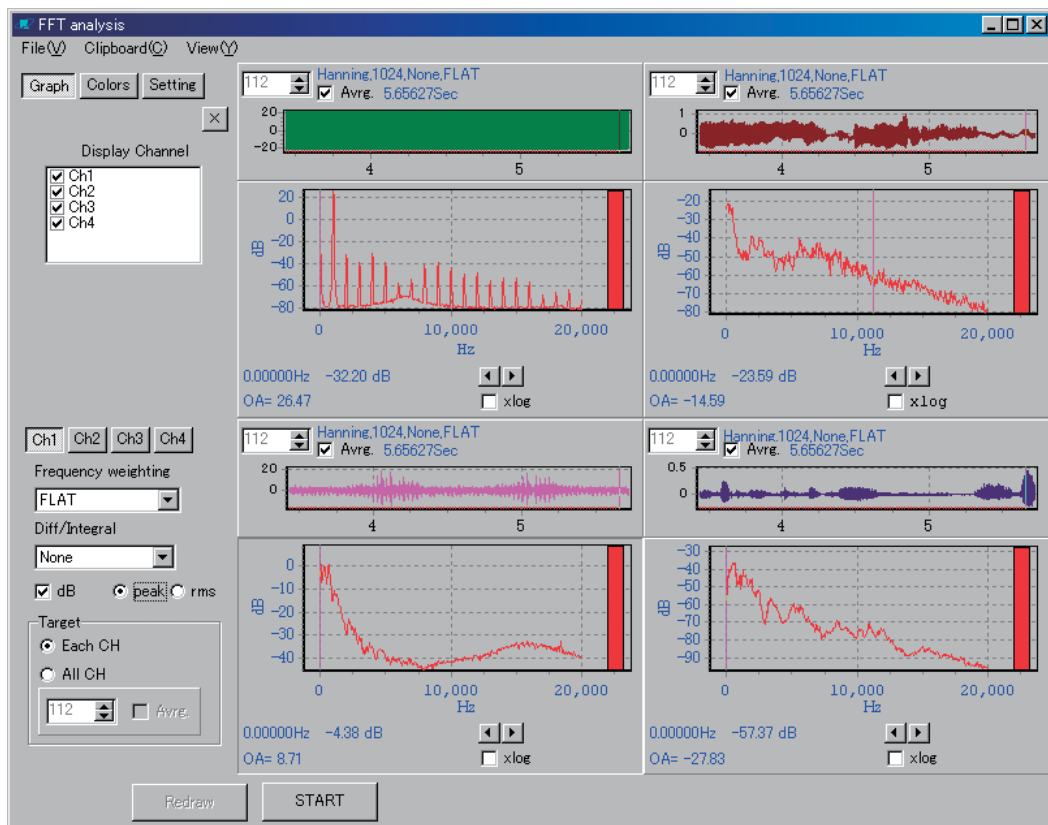
Menus

[File] menu

[File Save]

Saves the result of one FFT analysis shown on screen as a CSV file.

- Data for all channels are saved in a single file.
- Also if zoom or move was performed, the FFT analysis result from before the action will be saved.

[Close]

Closes the [FFT analysis] screen.

[Clipboard] menu

[Copy Graph]

Copies the FFT graph to the clipboard. Proceed as follows.

1. On the FFT graph, click within the area of the channel that you want to copy.

2. Click [Copy Graph] on the [Clipboard] menu.
   The graph is copied to the clipboard.

[Copy Window]

Copies the entire [FFT analysis] screen to the clipboard.

[View] menu

[Setting panel]

This menu lets you display or hide the setting panel.

- You can also turn off the setting panel with the ⊠ button in the panel.

Setting panel

Lets you make settings for analysis channel, analysis conditions, colors etc.

[Graph]

Lets you select the channels to show on screen. FFT analysis is performed for all channels for which a check mark is placed in the box.
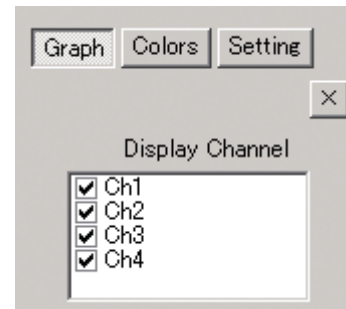
[Color]

- Lets you specify the colors for background, text, cursor, grid, and channels 1 to 4.
- Channels 1 to 4 are the colors that will be used for Ch1 to Ch4 on the FFT analysis graph.
- The time waveform color will be the same as set on the main screen. This specification cannot be made on the [FFT analysis] screen.
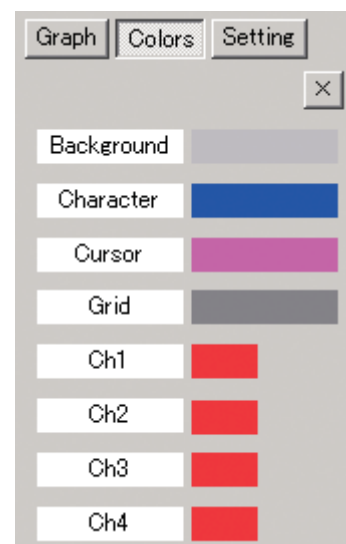
[Setting]

Lets you specify the parameters for FFT analysis.

Time Window:

Hanning, Flat-top, Rectangular

Sample N: 64/ 128/ 256/ 512/ 1024/ 2048/ 4096/ 8192
/ 16384/ 32768

Averages: 1 to 1024

Overlap Rate:

0%/ 25%/ 50%/ 75%

Overlap Samples:

Calculated as Sample N × Overlap Rate
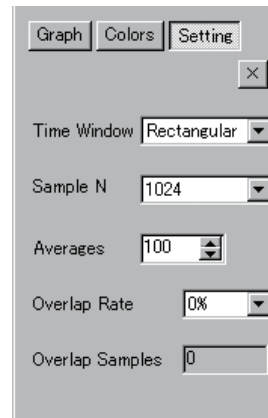
The following limitations apply for the FFT setting parameters.

If the specified analysis point number as determined by sample number, averaging count, and overlap rate (overlap samples) exceeds the displayed time waveform data range, click the [Start Point] button to automatically adjust the averaging count to the maximum value that fits the available analysis range.

Sample number

Available analysis range

Specified analysis point number (exceeds time waveform data)
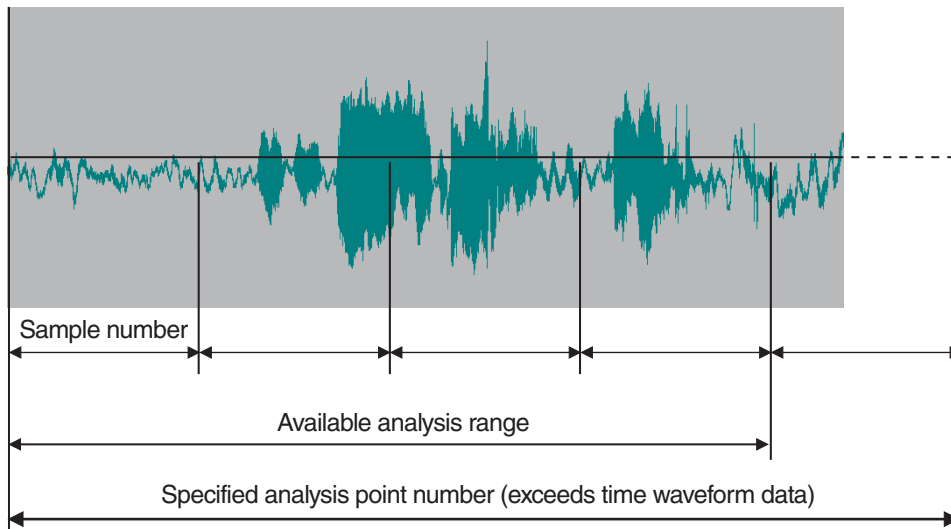
The maximum value for the averaging count is calculated according to the following formula.

N=(St-S0)/(Sa-S0) (discard decimal points for the quotient)

N: Maximum averaging count

St: Sample number of time waveform data

Sa: Sample number

S0:   Overlap samples

Example 1

Sample number of time waveform data:

100000

Sample number: 512

Averaging count: 200

Overlap rate: 0%

(Overlap samples: 0)

In this case, the actually used averaging count becomes 195.

Example 2

Sample number of time waveform data: 100000

Sample number: 512

Averaging count: 300

Overlap rate: 25%

(Overlap samples: 128)

In this case, the actually used averaging count becomes 260.

- When the overlap rate is changed, the number of overlap samples is automatically calculated.

[Channel specific settings]

These items can be set individually for each channel. After clicking on the button for the desired channel, make the settings as required.

Frequency weighting

Clicking here lets you select from the following options:
A-weighting, C-weighting, G-weighting, Lvz-weighting, Lvxy-weighting, None.

This selection is available only when the filter setting on the main screen is OFF or when it is ON and "FLAT" has been selected. At other filter settings, the frequency weighting here is fixed to "None".
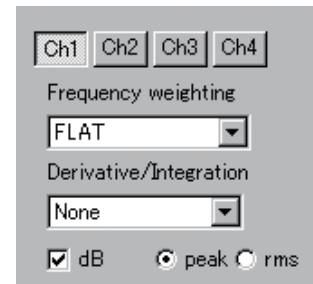
Derivative/Integration

Clicking here lets you select from the following options: None, differential of 1st-order, differential of 2nd-order, integral of 1st-order, integral of 2nd-order.

dB

When this check box is selected, the FFT analysis result is shown in dB.

peak

FFT analysis result is shown as peak values.

rms

FFT analysis result is shown as rms values.

Note
• About rms and peak values   When performing FFT analysis of $y(t) = A\sin 2\pi ft + B$ signal (where (single) amplitude A, offset B), the rms value is always 3 dB lower than the peak value, except at 0 Hz.
• rms setting   Value at 0 Hz:　B   Value at f Hz:　$A/\sqrt{2}$
• peak setting   Value at 0 Hz:　B   Value at f Hz:　A   Overall value (OA) in both cases does not comprise DC (0 Hz).

[Target]

Each CH

The display iteration count can be specified for each channel. The boxes for count and averaging on the graph become available.
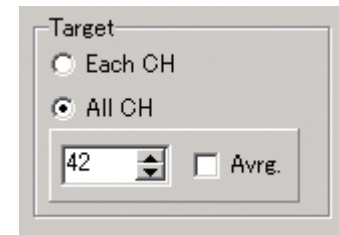
All CH

The display iteration count is the same for all channels. The boxes for specifying the count and averaging for all channels become available.

Count for all channels

Lets you specify the display iteration count for all channels.

Averaging check box

Lets you select average indication for all channels. This averaging count applies to the total number of all analysis iterations (not the average of the displayed count).

Redraw

Redraw

When the analysis range was changed on the main screen or a file was reopened, click the [Redraw] button on the [FFT analysis] screen to update the waveform indication on the [FFT analysis] screen.

When you redraw the screen, the previous analysis result will be cleared. Click the [Start] button to restart the analysis.

Analysis procedure

START

Clicking the [Start] button initiates FFT analysis processing.

When analysis up to the specified averaging count has been performed, the procedure stops automatically.

During analysis processing, the [START] button changes to [STOP]. By clicking the button, you can stop the process before completion.

When analysis processing is completed, the averaged results are shown.

[Analysis upper limit frequency]

With this software, the upper limit frequency for analysis is set to 1/2.56 of the sampling frequency of the waveform data. The table below shows the frequencies for various sampling frequencies.

Sampling frequency	Analysis upper limit
240 Hz	93.75 Hz
256 Hz	100 Hz
1.2 kHz	468.75 Hz
1.28 kHz	500 Hz
2.4 kHz	937.5 Hz
2.56 kHz	1 kHz
12 kHz	4.6875 kHz
12.8 kHz	5 kHz
24 kHz	9.375 kHz
25.6 kHz	10 kHz
48 kHz	18.75 kHz
51.2 kHz	20 kHz

Analysis result display
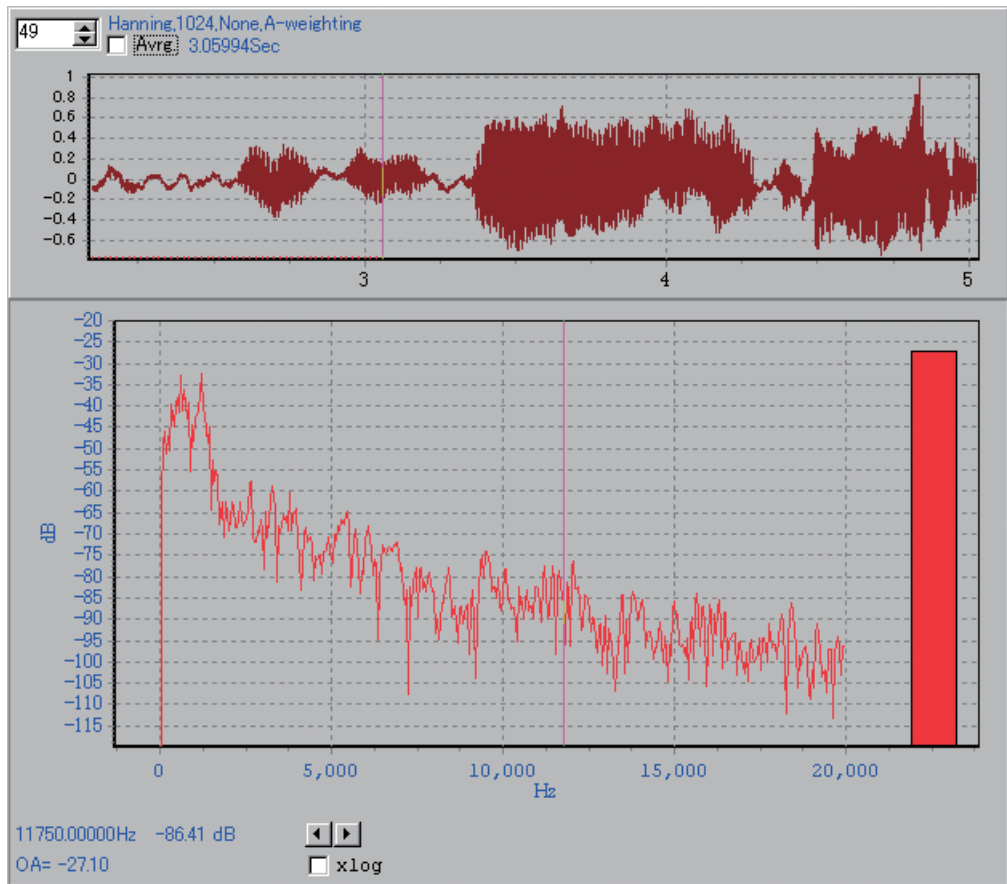
[Analysis count]

You can specify any count for display here, up to the actual number of analysis iterations that were performed.

When the [Avrg] check box is selected, the results for the total averaging count are averaged. (This is not the average for the counts currently displayed.)

This setting is not available when the [Target] item is set to "All CH".

[Analysis information]

Information about the window function, sample number, differential/integral setting, and frequency weighting characteristics is shown here.
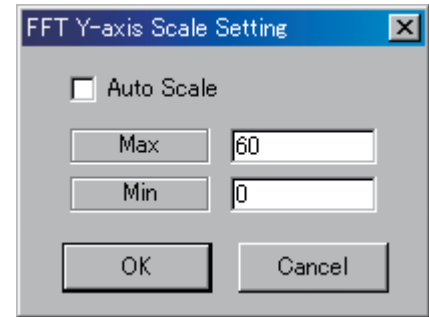
[Y-axis Scale Setting]

When you double-click on the FFT analysis graph for a channel, the dialog box for setting the Y axis scale appears, letting you set the maximum and minimum values.
When the FFT analysis function was started, the Y axis scale is normally resized automatically for each display. When the check box is deselected and Y axis scale settings are made, the Y axis scale becomes fixed.

[X-axis Scale Setting]

When you right-click on the FFT analysis graph for a channel, the dialog box for setting the X axis scale appears, letting you set the maximum and minimum values.
When the FFT analysis function was started, the scale is normally resized automatically for each display. When the "All" check box is deselected and X axis scale settings are made, the X axis scale becomes fixed. The bar graph (AP) at the right side of the graph also is no longer displayed.
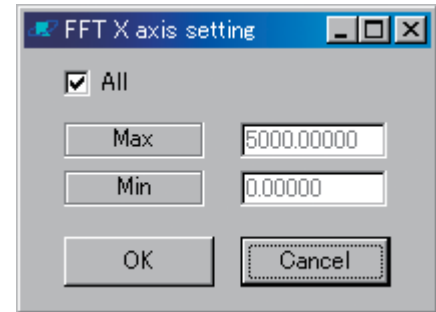
[Graph Zoom/Move/Return]

When you click the left mouse button somewhere on the FFT graph and then hold the button down while dragging the mouse from left to right, the dragged rectangular area will be displayed in enlarged view.
When you click the right mouse button somewhere on the FFT graph and then hold the button down while dragging the mouse, the graph will move in the same direction.
When you click the left mouse button somewhere on the FFT graph and then hold the button down while dragging the mouse from right to left, the zoomed or moved FFT graph will return to the original condition.

[Cursor]

A cursor is shown on the FFT graph, and the frequency at the cursor point is indicated.
The cursor can be moved on the FFT graph by using the move buttons (◀▶) on the screen.

[Link Time Waveform Graph and FFT Graph]

The cursor on the time waveform can be moved sideways by grasping it with the mouse. When you do this, the FFT graph also changes to show the result for the current time point.
Selecting the [xlog] check box switches the frequency axis to a logarithmic scale.

Saving the analysis result

You can store the FFT analysis result as a CSV file.
For details, see the section [File] - [File Save] (page 46).

Octave-Band Analysis

The software enables 1/1 octave-band and 1/3 octave-band analysis of the range selected at the main screen.

[Compatible sampling frequencies]

This software can only perform octave-band analysis on waveform data using the following sampling frequencies (the same as available on the DA-20).

240 Hz, 256 Hz, 1.2 kHz, 1.28 kHz, 2.4 kHz, 2.56 kHz, 12 kHz, 12.8 kHz, 24 kHz, 25.6 kHz, 48 kHz, 51.2 kHz

- For data with sampling frequencies other than the above, an error message will appear when you click the [Start] button on the [Octave-band Analysis] screen, but the time waveform can be displayed.
- When you open the [Octave-band Analysis] screen, the range will be the same as set on the main screen, i.e. the range between the start point and end point.
- When the filter was applied to the waveform on the main screen, the [Octave-band Analysis] screen will also show the result of filter processing.

Menus

[File] menu

[File Save]

Saves the result of the octave-band analysis as a CSV file.

The currently displayed octave-band data or all octave-band data can be saved.

To save a file, proceed as follows.

1. Access the [File] menu and select [Save]. The save dialog appears.

2. Select the data to save.

3. Click the [Save] button. The file dialog box appears.

4. Specify the folder and file name and click the [Save] button. The file is saved.

Note
Data for all channels are saved in a single file.

[Clipboard] menu

[Copy Graph]

Copies the octave-band graph to the clipboard. Proceed as follows.

1. Click on the octave-band graph for the channel that you want to copy. The area with the clicked channel is shown recessed.

2. Click [Copy Graph] on the [Clipboard] menu.
   The graph is copied to the clipboard.

[Copy Window]

Copies the entire [Octave-band Analysis] screen to the clipboard.

[View] menu

[Setting panel]

This menu lets you display or hide the setting panel.

You can also turn off the setting panel with the ⊠ button in the panel.

[Stats panel]

Displays or hides the statistics panel.

You can also turn off the statistics panel with the ⬜ Close button in the panel.

Setting panel

Lets you make settings for analysis parameters, graph display, colors etc.

[Graph]

Lets you select the channels to show on screen. Octave-band analysis is performed for all channels for which a check mark is placed in the box.
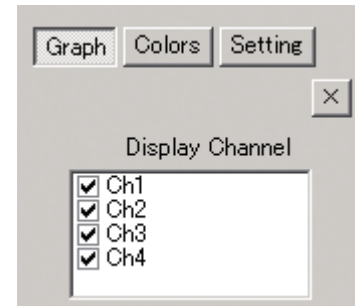
[Color]

Lets you specify the colors for background, text, cursor, grid, and channels 1 to 4.

Channels 1 to 4 are the colors that will be used for Ch1 to Ch4 on the octave-band analysis graph.

The time waveform color will be the same as set on the main screen. This specification cannot be made on the [Octave-band analysis] screen.

[Setting]

Lets you specify the parameters for octave-band analysis.

1/N octave: 1/1 octave, 1/3 octave
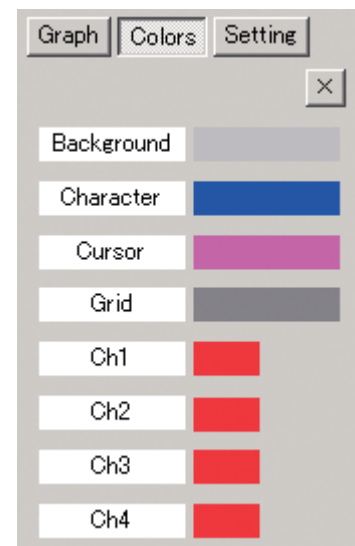
Based on the sampling frequency of the waveform data, the upper limit for the analysis
frequency band differs. The analysis graph will display data up to this frequency band.
See the following table for more information.
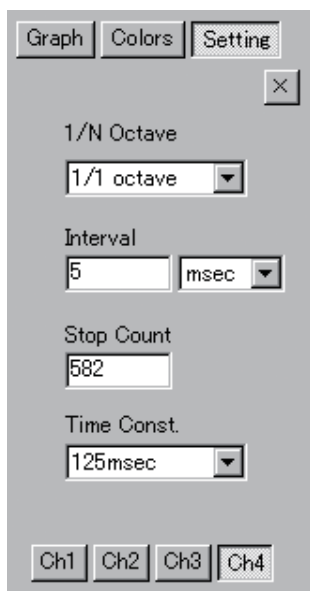
Sampling frequency	1/1 octave analysis upper frequency limit	1/3 octave analysis upper frequency limit
240 Hz	63 Hz	80 Hz
256 Hz	63 Hz	80 Hz
1.2 kHz	250 Hz	400 Hz
1.28 kHz	250 Hz	400 Hz
2.4 kHz	500 Hz	800 Hz
2.56 kHz	500 Hz	800 Hz
12 kHz	2 kHz	4 kHz
12.8 kHz	2 kHz	4 kHz
24 kHz	4 kHz	8 kHz
25.6 kHz	4 kHz	8 kHz
48 kHz	8 kHz	16 kHz
51.2 kHz	8 kHz	16 kHz

Interval: Specifies the waveform data update interval for analysis. The setting range is 5 milliseconds to 3600 seconds. The unit can be switched between seconds (sec) and milliseconds (msec).

Depending on the sampling frequency of the waveform data, the minimum setting value may be higher than 5 milliseconds. See the following table for more information.

Sampling frequency	Display interval minimum setting
240 Hz	25 msec
256 Hz	125 msec
1.2 kHz	5 msec
1.28 kHz	25 msec
2.4 kHz	5 msec
2.56 kHz	25 msec
12 kHz	5 msec
12.8 kHz	5 msec
24 kHz	5 msec
25.6 kHz	5 msec
48 kHz	5 msec
51.2 kHz	5 msec

The interval is always an integral multiple of the minimum setting. If another value is entered, it is automatically adjusted.

Example: minimum setting 5 msec

Available interval settings are 5, 10, 15 msec etc.

If "12 msec" is entered, the setting is automatically adjusted to "15 msec".

In actual analysis, the interval setting will not be applied rigidly. Rather, for each interval, the closest preceding sample will be used.

Stop Count:

> Sets the number of data used for analysis, from 1 to 1000. When the result of "interval x stop count" exceeds the number of waveform data, an error message will appear when you click the [Start] button. The message will indicate the possible setting range for the current interval setting. Change the setting accordingly.

Interval

Available analysis range

Interval × stop count (exceeds time waveform data)
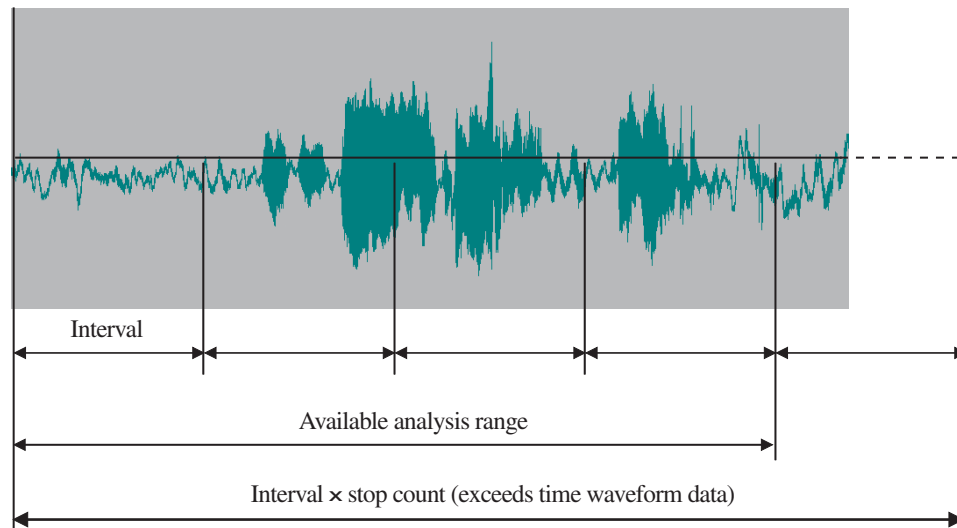
Time Const:

> 1 msec/10 msec/35 msec/125 msec/630 msec/1000 msec/10 sec
> The time constant can be set separately for each channel. Click the respective channel button and then make the setting.

[Channel specific settings]

These items can be set individually for each channel. After clicking on the button for the desired channel, make the settings as required.
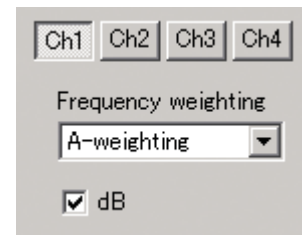
Frequency weighting

Clicking here lets you select from the following options:

A-weighting, C-weighting, G-weighting, Lvz-weighting, Lvxy-weighting, FLAT.

This selection is available only when the filter setting on the main screen is OFF or when it is ON and "FLAT" has been selected. At other filter settings, the frequency weighting here is fixed to "None".

The waveform data condition can be checked on the waveform graph and from the processing information.

dB

When this check box is selected, the octave-band analysis result is shown in dB.

[Target]

Each CH

The count can be specified for each channel. The boxes for count and averaging on the graph become available.
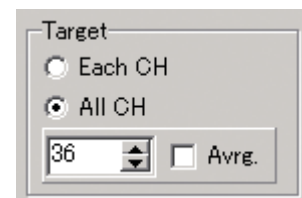
All CH

The count is the same for all channels. The boxes for specifying the count and averaging for all channels become available.

Count for all channels

Lets you specify the count for all channels.

Averaging check box

Lets you select average indication for all channels. This averaging count applies to the total number of all analysis iterations (not the average of the displayed count).

Redraw

When the analysis range was changed on the main screen, click the [Redraw] button on the [Octave-band analysis] screen to update the waveform indication.

Analysis procedure

Clicking the [Start] button initiates analysis processing.
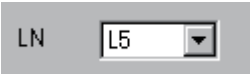
When analysis up to the specified averaging count has been performed, the procedure stops automatically.

During analysis processing, the [START] button changes to [STOP]. By clicking the button, you can stop the process before completion.

When analysis processing is completed, the averaged results are shown, using rms values.

   * When the statistics panel command on the [View] menu is checked, the setting panel becomes as follows.

LN   [L5 ▼] : Selects percentile level. Available settings are L5, L10, L50, L90, and L95.

Percentile level such as L5 and L95 can only be selected if the statistical quantity which is in bottom left of the graph is set to L_N.

export : Lets you export the processing result.

Close : Closes the statistics panel.

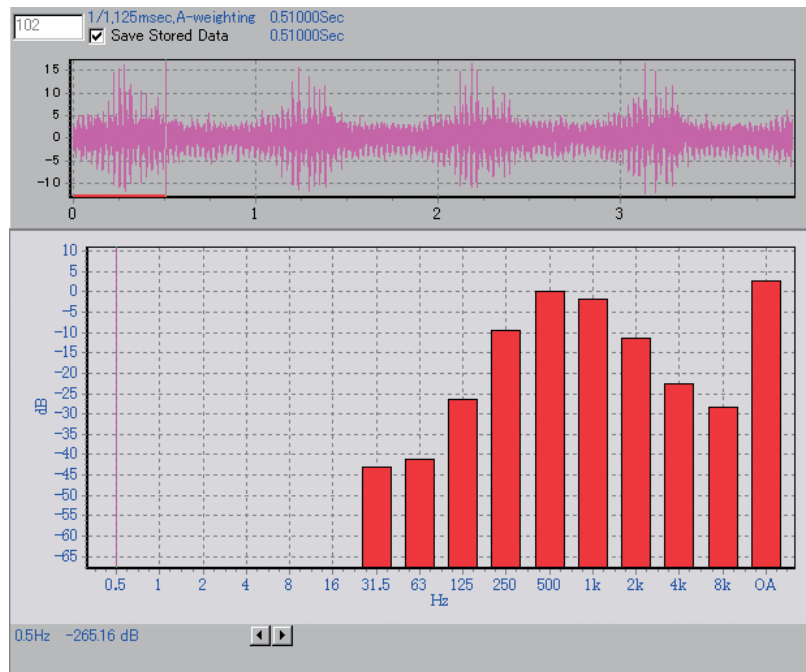# Analysis result display

[Analysis count]

You can specify any count for display here, up to the actual number of analysis iterations that were performed.

When the [Save Stored Data] check box is selected, the results for the total averaging count are averaged. (This is not the average for the counts currently displayed.)

This setting is not available when the [Target] item is set to "All CH".

[Analysis information]

Information about the analysis result time and frequency weighting characteristics are shown on the graph.

* When the statistics panel command on the [View] menu is checked, the indication on the bottom left of the graph becomes as follows.

Leq ▼ : Selects the statistical quantity. Available settings are L_{eq}, L_E, L_{max}, L_N, and instantaneous value.

[Scale Setting]

When you double-click on the analysis graph for a channel, the dialog box for setting the scale appears, letting you set the display range.

Freq. display range:

When this check box is selected, frequency bands under 20 Hz are not displayed.

Max/Min:

These boxes let you specify the maximum value and minimum value for the Y axis display scale.

When the analysis function was started, the Y axis scale is normally resized automatically for each display. When settings are made as described here, the Y axis scale becomes fixed.

When the Auto Scale check box is selected, the Y axis is scaled automatically.
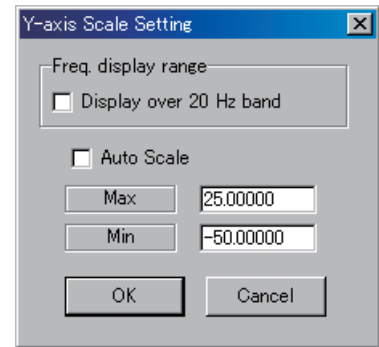
[Cursor]

A cursor is shown on the analysis graph, and the frequency at the cursor point is indicated. The cursor can be moved on the analysis graph by using the move buttons (◄►) on the screen.

[Link Time Waveform Graph and Analysis Graph]

The cursor on the time waveform can be moved sideways by seizing it with the mouse. When you do this, the analysis graph also changes to show the result for the current time point.

Saving the analysis result

You can store the analysis result as a CSV file.

For details, see the section [File] - [File Save] (page 56).

File Operations

This section describes how to select files for analysis, how to save a specified range, how to display information about various files, and how to set the data recording parameters for the 4-Channel Data Recorder DA-20.

Selecting a file

Select a WAVE file for display as follows.

1. From the [File] menu, select the [File Open] command.
    The [File Open] screen appears.
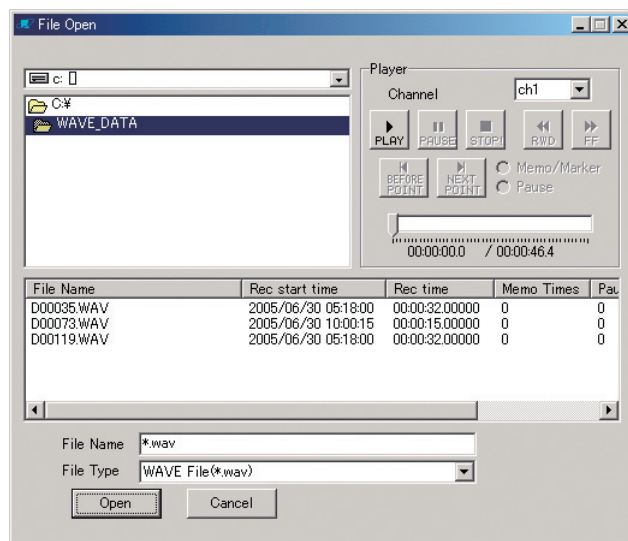
2. From the list of drives, select the drive where the file to be analyzed is located. Click the button to bring up a list from which to make the selection.
    A list of folders on the selected drive appears in the folders window.

3. From the list of folders, select the folder where the file to be analyzed is located.
    A list of files in the selected folder appears.

Note
When you move the pointer to a file and click on it, the waveform playback panel becomes active, allowing you to check the content of the file. For information on how to use the waveform playback panel, see the section "Operation panel" (page 24).
Files that are not in a format that can be opened by the DA-20 will not be displayed, even if they are WAVE files.

4. Click the [Open] button.
   The selected file is loaded.

Important
If you start the DA-20PA1 program and attempt to open a file, but no WAVE file is present in the directory, the indication "Selected file not found" appears.

Saving a specified range

The data of a specified range can be saved as a WAVE file or text (.CSV) file. "Specified range" refers to the area between the start point and end point cursors.

1. From the [File] menu, select the [Save As] command.
   The [Save As] screen appears.
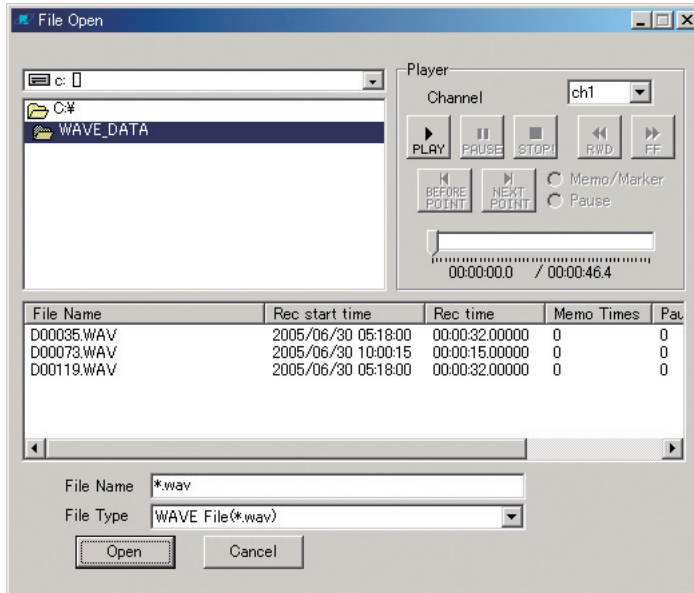
2. In the [Save in] field, select the target drive or folder. Click the ⊟ button to bring up a list from which to make the selection.
   The folders in the selected drive/folder are shown.

3. Select the target folder from the folder/file list.

4. Enter the name of the file to be created in the [File name] field. The [Save as type] field lets you select either ".WAV" or ".CSV".

5. Click the [Save] button.

Note
When the file has been saved correctly, a message to that effect is displayed.
When saving CSV files, voice memo/marker information and pause information (count, time, size) will not be saved.

WAVE file information

Information about the currently open WAVE file (number of channels, sampling frequency, etc.) can be displayed. On this display, the Conv. Unit, dB Reference, and Calib. (Unit/Volt) can be changed.

Important
When you change the Conv. Unit set at the DA-20, the file will no longer be playable on the DA-20. When saving a range of data as a file with the intention of performing playback on the DA-20, do not change the conversion unit in the WAVE file information.
The Calib. information is saved for multiple channels together. When applying to load Calib. information to a file with more channels than the original file for which the Calib. information was saved (for example, applying the Calib. information of a 1-channel WAVE file to a 4-channel WAVE file), an error message may appear. In such a case, note the Calib. setting and enter it again.

1. From the [File] menu, select the [Wave file Info] command.

   The [Wave file &Info] screen appears.
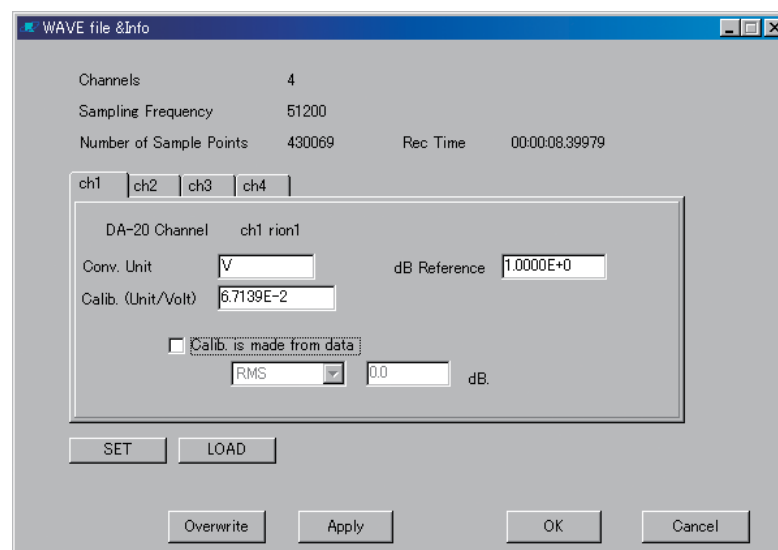
Note
Recorded data created with the 4-Channel Data Recorder DA-20 contain Rion specific information about Conv. Unit, dB Reference, Calib. (Unit/Volt), etc. When this information is not present, the default values are shown.
For details regarding settings, see "About the Calibration Function (Read-out Conversion)" on page 82.

2. Change the [Conv. Unit], [dB Reference], and [Calib. (Unit/Volt)] fields as required.

Note
By clicking the [Apply] button after changing a setting, you can make the change effective immediately.

3. Save the [Conv. Unit], [dB Reference], and [Calib. (Unit/Volt)] information for each channel, as required. When you press the [SET] button, a [Memory 1], [Memory 2], and [Memory 3] button will appear. You can save the settings by clicking one of these buttons. Saved settings can be called up by using the [LOAD] button.

4. To terminate the file information view/change procedure, click the [OK] button.

Rion file information

Recorded data created with the 4-Channel Data Recorder DA-20 contain Rion specific information about various items. Memo information can also be entered or edited.

1. From the [File] menu, select the [Rion File Info] command.

   The [Rion File Info] screen appears.

2. Enter or change the memo information as required (max. 32 characters).

3. To terminate the Rion file information view procedure, click the [OK] button.

Creating a DA20.INI file

The DA-20PA1 software allows you to control the data recording parameters of the DA-20. For information about parameter settings, consult the DA-20 Instruction Manual.

1. From the [File] menu, select the [Save DA20INI] command.
   The [DA20INI Settings] screen appears.
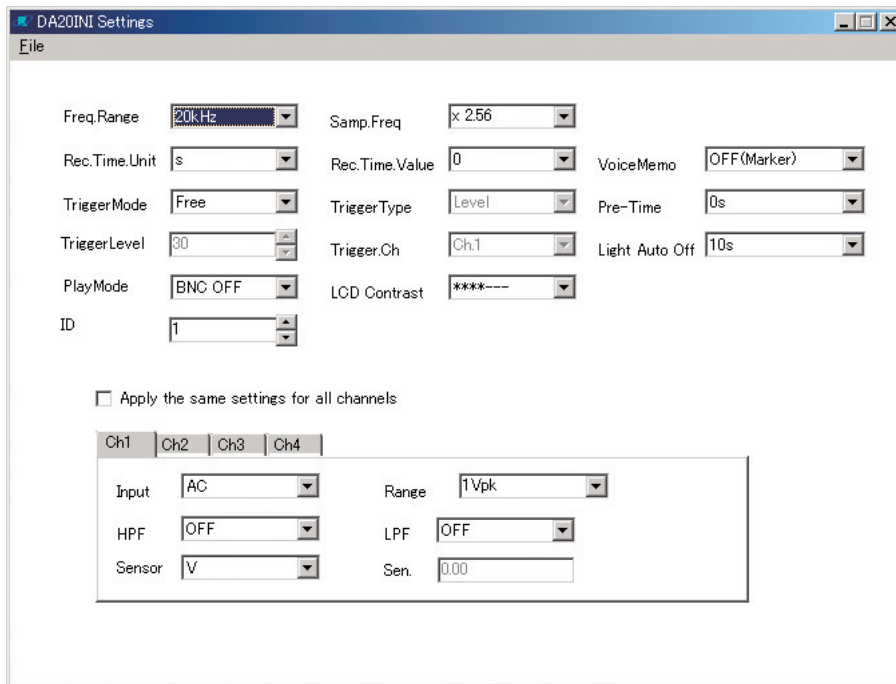
2. Change the various settings as required.
   The available setting items as they appear on this screen and the corresponding DA-20 parameter are listed below.

Freq.Range	Frequency range
Samp.Freq	Sampling frequency and frequency range ratio (sampling frequency/frequency range)
Rec.Time.Unit	Recording time unit (hours/minutes/seconds)
Rec.Time.Value	Recording time value
VoiceMemo	Voice memo function
TriggerMode	Trigger operation mode
TriggerType	Trigger signal type
Pre-Time	Pre-recording time
TriggerLevel	Trigger level
Trigger.Ch	Trigger channel
Light Auto Off	Backlight timer
PlayMode	Playback mode
LCD Contrast	Display contrast
ID	ID number

The following setting items can be set for each channel separately.

If the check box [Apply the same settings for all channels] is selected, all channels will use the settings made for channel 1. Note that simply deselecting this check box will not restore the original settings in the other channels.

Input	Sensor type
Range	Input range
HPF	High-pass filter
LPF	Low-pass filter
Sensor	Sensor type and unit
Sen.	Sensitivity and unit conversion

The following limitations apply to the respective setting items.
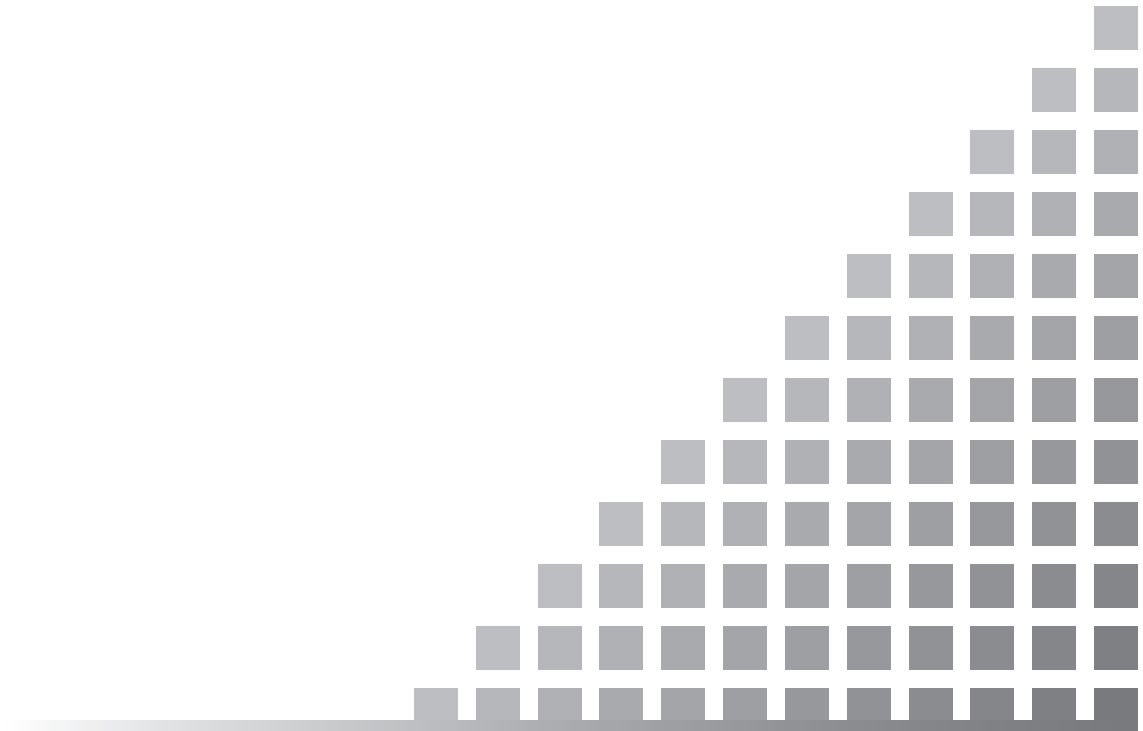
(1) When the sensor type is set to DC, the HPF setting for that channel must be OFF, and the input range of the DA-20 must be 1 V or higher.

(2) The LPF setting must be lower than the frequency range setting.

(3) When the trigger signal type is set to "Level", the trigger channel may not be set to OFF.

(4) When the frequency range setting is lower than 1 kHz, the Voice memo function must be OFF.

3. Write the settings to the CompactFlash card.

Access the menu bar on this screen, select [File] and [File Save].
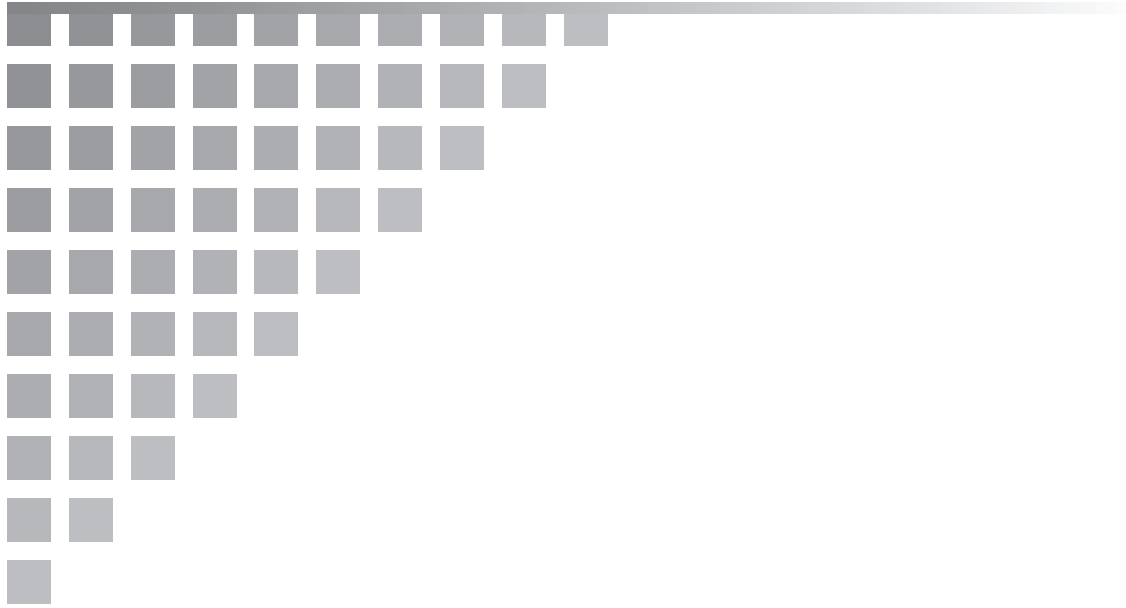
Other Information

Specifications

Operating environment requirements

Computer	Intel Pentium IV 2 GHz or equivalent CPU, CD-ROM drive, IBM PC/AT compatible architecture
RAM	512 MB or more (when handling WAV files 1 GB or larger, installed RAM should be 2 GB or more)
Hard disk	10 GB or more of free space
Display	Suitable resolution for operating system (1024 × 768, XGA), or equivalent

Operating system (One of the following)

Microsoft Windows 2000 Professional

Microsoft Windows XP Professional

(Support for Japanese and English)

Other requirements

CompactFlash card slot, speakers, sound card

Media type   CD-ROM install disc (1)

PCM Format WAVE Files

The WAVE file format represents a commonly used method developed for saving and playing music on Microsoft operating systems (such as Windows XP). WAVE files employ a format called RIFF which encodes information in multiple chunks that are linked and saved as a file.

The chunk configuration used by the DA-20 is as follows.

RIFF chunk:	This is always located at the beginning of the WAVE file and is called the RIFFHeader. Including DA-20 specific chunks, the following five sub chunk types are comprised in the RIFF chunk.
fmt sub chunk:	Data attributes (data format, sampling frequency, etc.)
rion sub chunk:	DA-20 specific information (recording conditions etc.)
memo sub chunk:	DA-20 specific information (voice memo/marker data added during recording)
paus sub chunk:	DA-20 specific information (pause data added during recording)
data sub chunk:	Waveform data

The configuration of each (sub) chunk is explained below.
The variable types used in the table are as follows.

WORD:	16-bit unsigned integer
DWORD:	32-bit unsigned integer
double:	IEEE double precision floating
char:	Character string

The little-endian principle is used when storing multi-byte values in memory.

RIFF chunk

Number of bytes	Type	Description
4	char	"RIFF"
4	DWORD	Chunk size (in bytes)
4	char	"WAVE"

fmt sub chunk

Number of bytes	Type	Description
4	char	"fmt"
4	DWORD	Chunk size (in bytes): 16
2	WORD	Data format: 1 (PCM)
2	WORD	Channel number: 1 to 4
4	DWORD	Sampling frequency
4	DWORD	Number of data bytes per second (all channels)
2	WORD	Number of bytes per data: channel number × 2
2	WORD	Number of bits/data channel: 16

rion sub chunk (DA-20 specific)

Number of bytes	Type	Description
4	char	"rion"
4	DWORD	Chunk size (in bytes): 460
460	STRUCTURE	Recording parameters and other information of DA-20

memo sub chunk (fixed to 40 kB, DA-20 specific)

Number of bytes	Type	Description
4	char	"memo"
4	DWORD	Chunk size (in bytes): 1024 × 40 - 8 = 40952
40944	STRUCTURE	Recording voice memo or marker information MEMORECTIMEFORMAT × 3412 = 40944
8	BYTE	For adjusting overall sub chunk size to 40 kB

paus sub chunk (fixed to 40 kB, DA-20 specific)

Number of bytes	Type	Description
4	char	"paus"
4	DWORD	Chunk size (in bytes): 1024 × 40 - 8 = 40952
40944	STRUCTURE	Recording pause information MEMORECTIMEFORMAT × 3412 = 40944
8	BYTE	For adjusting overall sub chunk size to 40 kB

data sub chunk

Number of bytes	Type	Description
4	char	"data"
4	DWORD	Waveform data size (in bytes)
n	STRUCTURE	Waveform data

Even if no voice memo/marker information and pause information is recorded in the memo sub chunk and paus sub chunk, the size will be 40 kB respectively. The TIMEDATA will consist of voice memo/marker or pause information units (MEMORECTIMEFORMAT and PAUSETIMEFORMAT).

MEMORECTIMEFORMAT and PAUSETIMEFORMAT are defined as follows.

MEMORECTIMEFORMAT (DA-20 specific)

Number of bytes	Type	Description
4	DWORD	Voice memo/marker position. Indicates the position in bytes from the start of DATA.
4	DWORD	Voice memo size (in bytes). For marker, this is zero.
4	DWORD	Voice memo/marker start time/time D31 to D26 Adding 2000 gives the year D25 to D22 Month D21 to D17 Day D16 to D12 Hours D11 to D6 Minutes D5 to D0 Seconds

Dxx such as D31 to D0 denotes position of bit.

PAUSETIMEFORMAT (DA-20 specific)

Number of bytes	Type	Description
4	DWORD	Pause position. Indicates the position in bytes from the start of DATA.
4	DWORD	Pause start time D31 to D26 Adding 2000 gives the year D25 to D22 Month D21 to D17 Day D16 to D12 Hours D11 to D6 Minutes D5 to D0 Seconds

WAVE file data in the DA-20 are fixed to 16 bit. The data sequence according to the number of channels is as follows.

For 1 channel (same as 16-bit monaural)

sample1	sample2	sample3	sample4	· · ·
ch-n1 data	ch-n1 data	ch-n1 data	ch-n1 data	· · ·

For 2 channels (same as 16-bit stereo)

sample1		sample2		· · ·
ch-n1 data	ch-n2 data	ch-n1 data	ch-n2 data	· · ·

For 3 channels

sample1			· · ·	
ch-n1 data	ch-n2 data	ch-n3 data	· · ·	· · ·

For 4 channels

sample1				· · ·
ch-n1 data	ch-n2 data	ch-n3 data	ch-n4 data	· · ·

RIONFORMAT (fixed to 460 bytes, DA-20 specific)

Order	Number of bytes	Type	Description
000	4	DWORD	Maker name: "RION"
004	8	char	Product type: spaces if empty
012	4	DWORD	Device ID: Integer value
016	4	DWORD	File version: 1 to
020	8	char	CPU version: *.*.***
028	8	char	DSP version: *.*.***
036	8	double	Channel unit A/D conversion measurement amount (the product of this value and the A/D conversion value is the measurement amount) (DATA of data chunk is the A/D conversion value) When OFF, the value is zero. 036: Ch.1, 044: Ch.2, 052: Ch.3, 060: Ch.4
044	8	double	
052	8	double	
060	8	double	
068	8	double	$1V_{pk}$ measurement amount of each channel (corresponds to EU value, sensor sensitivity, etc.) When OFF, the value is zero, 1 without calibration 068: Ch.1, 076: Ch.2, 084: Ch.3, 092: Ch.4
076	8	double	
084	8	double	
092	8	double	
100	8	char	Left-aligned measurement amount Blanks are padded with spaces. "m/s^2", "EU", "dB", "V" OFF settings are all " "(space) 100: Ch.1, 108: Ch.2, 116: Ch.3, 124: Ch.4
108	8	char	
116	8	char	
124	8	char	
132	8	char	Left-aligned input range (before $1V_{pk}$ calibration) Blanks are padded with spaces. "1V", "0.01V" etc. 132: Ch.1, 140: Ch.2, 148: Ch.3, 156: Ch.4
140	8	char	
148	8	char	
156	8	char	

Order	Number of bytes	Type	Description
164	4	DWORD	Low-pass filter of each channel
168	4	DWORD	0: OFF,
172	4	DWORD	6: 100 Hz, 7: 500 Hz, 10: 1 kHz
176	4	DWORD	164: Ch.1, 168: Ch.2, 172: Ch.3, 176: Ch.4
180	4	DWORD	High-pass filter of each channel
184	4	DWORD	0: OFF, 10: 0.3 Hz, 15: 10 Hz
188	4	DWORD	180: Ch.1, 184: Ch.2, 181: Ch.3, 188: Ch.4
192	4	DWORD	
196	4	DWORD	Trigger type 10: Level, 40: External, 50: External Gate
200	4	DWORD	Trigger mode 10: Free, 20: Single, 30: Repeat
204	4	DWORD	Always 0
208	4	DWORD	Trigger channel: 1 to 4
212	8	double	Trigger level: unit is %
220	4	DWORD	Pre-trigger: Seconds unit (equals pre-time)
224	4	DWORD	Always 0
228	16	char	Recording start time: YyyyMmDd HhMmSs0 (space between d and H) Example: 2005/06/28, 8:30 is "20050628 0830000"
244	2	WORD	Overload incidence during recording in each channel
246	2	WORD	
248	2	WORD	0: no, 1: yes
250	2	WORD	
252	32	char	Comment string for each channel
284	32	char	
316	32	char	Used by Waveform Analysis Software DA-20PA1
348	32	char	
380	4	DWORD	Number of pause incidences during recording: 0 to
384	4	DWORD	Always 0
388	2	WORD	CCLD information for each channel
390	2	WORD	0: DC/AC
392	2	WORD	1: CCLD
394	2	WORD	2: CHG (using VP-80)

Order	Number of bytes	Type	Description
396	8	double	
404	8	double	EU value for 0 dB in each channel
412	8	double	Zero when no dB conversion is carried out
420	8	double	
428	2	WORD	Voice memo setting 0: OFF (Marker), 1: Voice Only, 2: Voice/Input Zero when no voice memo data are present with Voice/Input setting
430	4	DWORD	Input setting information 0: OFF, 1: AC, 2: DC, 3: CCLD, 4: reserved, 5: CHARGE D15 to D12 Using above code for channel 4 D11 to D8 Using above code for channel 3 D7 to D4 Using above code for channel 2 D3 to D0 Using above code for channel 1
434	4	DWORD	Serial number
438	2	WORD	Number of trigger incidences Repeat trigger sequential number (0 to)
440	2	WORD	No. of voice memo or marker recordings
442	18	Indeterminate	----

About the Calibration Function
(Read-out Conversion)

Basic relationship between physical quantity of measurement object and recorded data

A sensor produces a voltage (electrical signal) in response to a change in the physical quantity acting upon it. However, when the sensor is changed to one with a different sensitivity, the output voltage will also change significantly, even if the physical quantity remains the same. Therefore sensors usually come with individual documentation stating the sensitivity of the sensor in response to a given physical quantity. Some examples are given below.

Examples

Accelerometer with built-in preamplifier   6.42 mV/(m/s^2)

When the normal acceleration unit of 1 m/s^2 is applied to this sensor, it will produce a voltage of 6.42 mV.

Microphone   -28 dBV/Pa

When the normal sound pressure unit of 1 Pa is applied to this sensor, it will produce a voltage of -28 dBV = 0.04 V.

When the sensor sensitivity is known, the sensor output can be used to calculate the physical quantity acting on the sensor according to the following equation:

Physical quantity = (1/sensor sensitivity) × voltage

Instead of sensor sensitivity, this software uses a coefficient called "Calib. (Unit/Volt)" which is the reciprocal expression of sensor sensitivity. The above equation therefore can be restated as follows.

Physical quantity = (1/sensor sensitivity) × voltage = "Calib. (Unit/Volt)" × voltage

Physical quantity = (1/sensor sensitivity) x Voltage
= "Calib. (Unit/Volt)" x Voltage
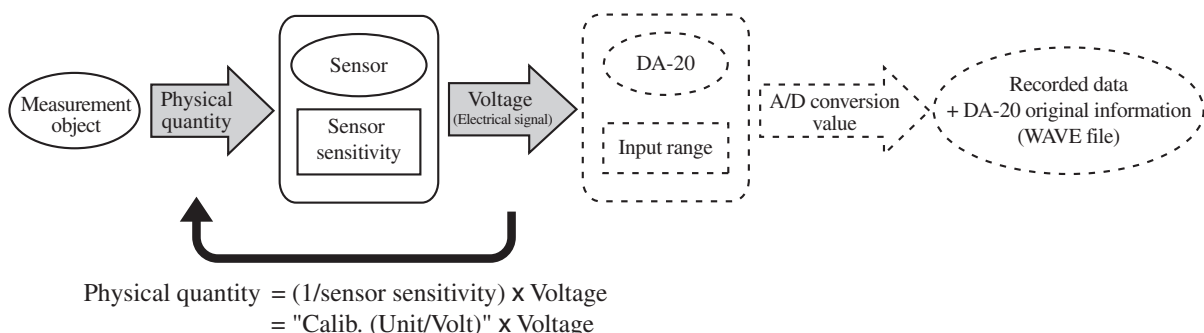
The voltage output by the sensor is then input to the DA-20. The DA-20 performs A/D conversion using the "input range/25400" voltage as 1 unit. The voltage output by the sensor can be calculated according to the following equation.
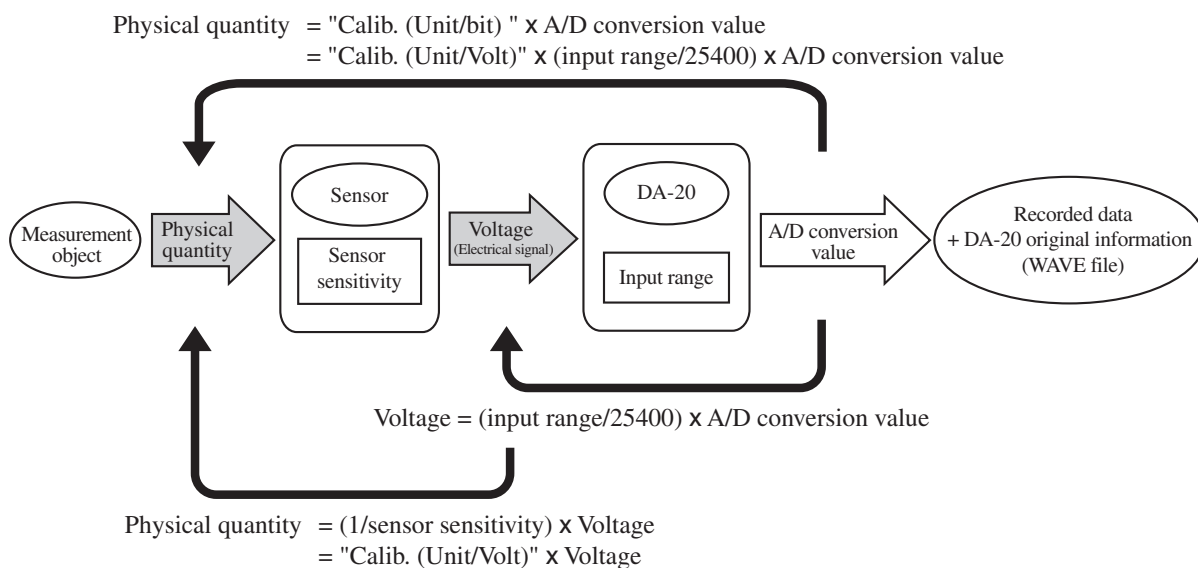
Voltage = (input range/25400) × A/D conversion value

Voltage = (input range/25400) x A/D conversion value
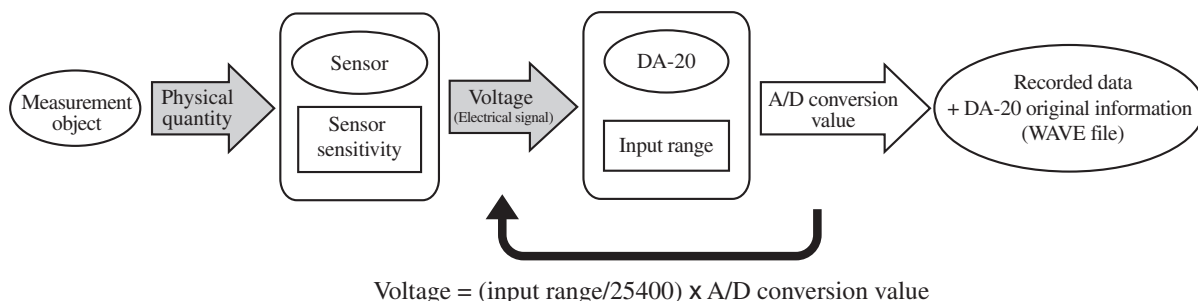
The physical quantity can be calculated from the conversion value stored in the file as follows.

Physical quantity = "Calib. (Unit/Volt)" × voltage

= {"Calib. (Unit/Volt)" × (input range/25400)} × A/D conversion value

In this software, the {"Calib. (Unit/Volt)" × (input range/25400)} part is called "Calib. (Unit/bit)". Using this, the above equation becomes

Physical quantity = "Calib. (Unit/Volt)" × voltage

= "Calib. (Unit/bit)" × A/D conversion value

The "Calib. (Unit/bit)" is a useful value for converting the WAVE file data (A/D conversion values) into the corresponding physical quantity.

Physical quantity = "Calib. (Unit/bit) " x A/D conversion value
= "Calib. (Unit/Volt)" x (input range/25400) x A/D conversion value

Voltage = (input range/25400) x A/D conversion value

Physical quantity = (1/sensor sensitivity) x Voltage
= "Calib. (Unit/Volt)" x Voltage

WAVE files recorded with the DA-20 contain the original information (sensor sensitivity, input range, A/D conversion 1 unit voltage (= input range/25400). Therefore the measurement data can be read as A/D values or as voltage or as the physical quantity that was the measurement object.

WAVE files not recorded with the DA-20 do not have information about input range, A/D conversion 1 unit voltage etc. Therefore the measurement data can only be read as A/D values.

| Measurement object | Physical quantity | Sensor / Sensor sensitivity ? | Voltage (Electrical signal) | A/D converter board or similar / Input range ? | A/D conversion value | Recorded data (WAVE file) |
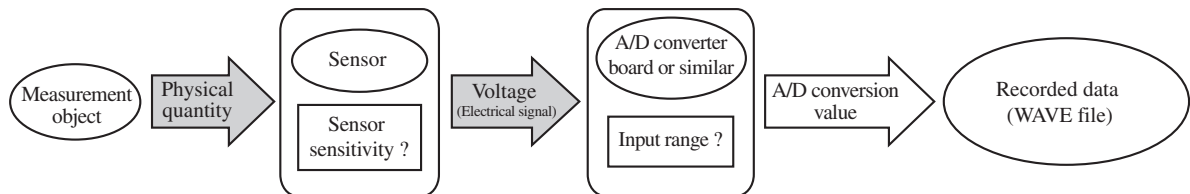
Readout change of recorded data

I. Changing the way data are displayed

Selecting the cursor value unit

After A/D conversion, data recorded with the DA-20 can be read as voltage or as the physical quantity that was the measurement object.

The [Unit] selection menu on the [Calc. Setting] tab of the setting panel gives access to settings for the cursor value reading. This setting can be made separately for each channel. The following selections are available.

None: The A/D conversion value is shown.

V (Volt): The voltage value is shown.

Pa, m/s^2, V, EU etc.:

The physical quantity is shown.

The DA-20 supports only the following four physical quantities as unit names for the third selection: Pa, m/s2, EU, V. Due to this limitation, the software allows converting the V and EU values into the original unit names.

However, the maximum length of a unit name is 7 characters.

The unit name change is available on the [Wave File &Info] screen.

For details, see the section "Changing the unit name" in "II. Measurement value readout conversion" on page 90. Because the unit name change also involves the Calib. (Unit/Volt), you should also read the other explanations in "II. Measurement value readout conversion".
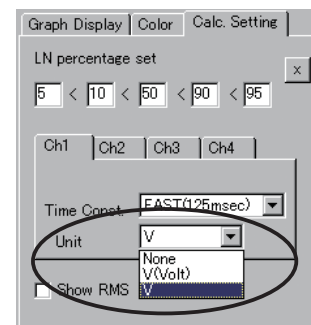
Important
For files that are to be played back on the DA-20, do not change the unit name. Otherwise correct playback will not be possible.

Displaying a waveform as RMS

RMS is calculated from the waveform and displayed according to the time constant setting. The RMS display can be activated by selecting the [Show RMS] check box in the [Calc. Setting] tab.
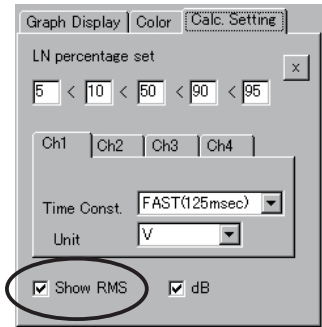
When switching to RMS display, the dB waveform derived from RMS is shown. To show the RMS value as a waveform, deselect the [dB] check box.

The dB value is calculated as follows.

dB value = 20 log (RMS value (physical quantity value)/dB Reference)

The default setting for the dB Reference is "1", but this can be changed on the [Wave File &Info] screen. For details about the dB Reference, see "Changing the dB Reference" (page 89) in "II. Measurement value readout conversion".

The time constant can be selected from 1 msec, 10 msec, 35 msec, FAST (125 msec), 630 msec, and SLOW (1 sec).
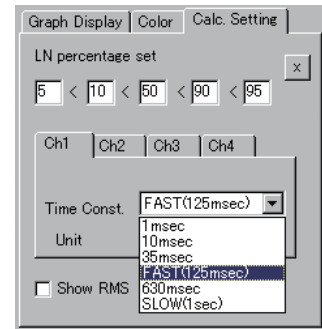
However, the time constant cannot be shorter than 1/2 of the sampling interval (reciprocal expression of sampling frequency). When the time constant is changed during RMS display, RMS recalculation is performed.

Original waveform

RMS check box

dB waveform derived from RMS

dB check box
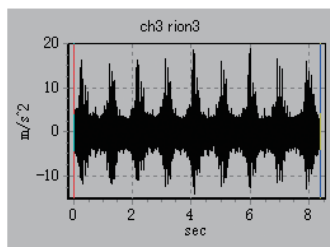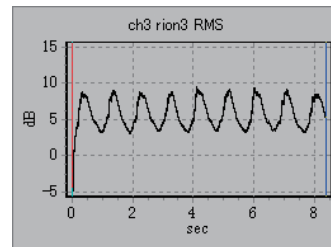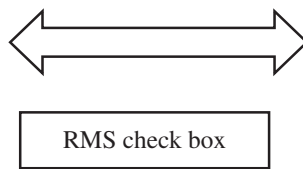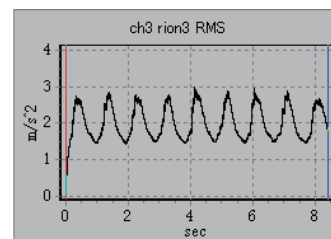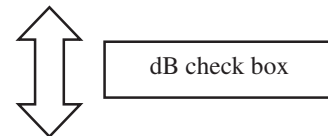
RMS waveform display

II. Measurement value readout conversion

If data were recorded on the DA-20 without correct sensor sensitivity and EU settings, the correct physical quantity can normally not be displayed from the resulting WAVE file.

To solve this problem, the DA-20PA1 offers a function for changing the Calib. (Unit/Volt). The calib. (Unit/Volt) is the reciprocal expression of sensor sensitivity. For reasons of simplicity, the 0 dB reference value required for dB calculation is fixed to 2E-5 Pa (sound pressure 0 dB) at the DA-20. Physical units other than sound pressure or acceleration are expressed as EU or V.

To augment the control flexibility of the DA-20, the software offers the capability for expressing physical quantities using the original unit names, with a 0 dB reference value as required.

Changing the "Calib. (Unit/Volt)"

The "Calib. (Unit/Volt)" is the reciprocal expression of sensor sensitivity. By multiplying it with the voltage value derived from the data, the physical quantity is obtained.

Physical quantity = Calib. (Unit/Volt) × voltage

When the Conv. Unit on the [Calc. Setting] tab of the setting panel is set to "V" (Volt), the cursor readout value (voltage) multiplied with the Calib. (Unit/Volt) matches the cursor readout when the unit is set to the physical quantity.

The Calib. (Unit/Volt) can be changed on the [Wave File &Info] screen. There are two methods (method A and method B) for achieving this. The Calib. (Unit/Volt) setting can be made separately for each channel.

Method A   "Calib. (Unit/Volt)" text box

Method B   Calib. (Unit/Volt) is made from data: XX.X [dB] from waveform data RMS/maximum value
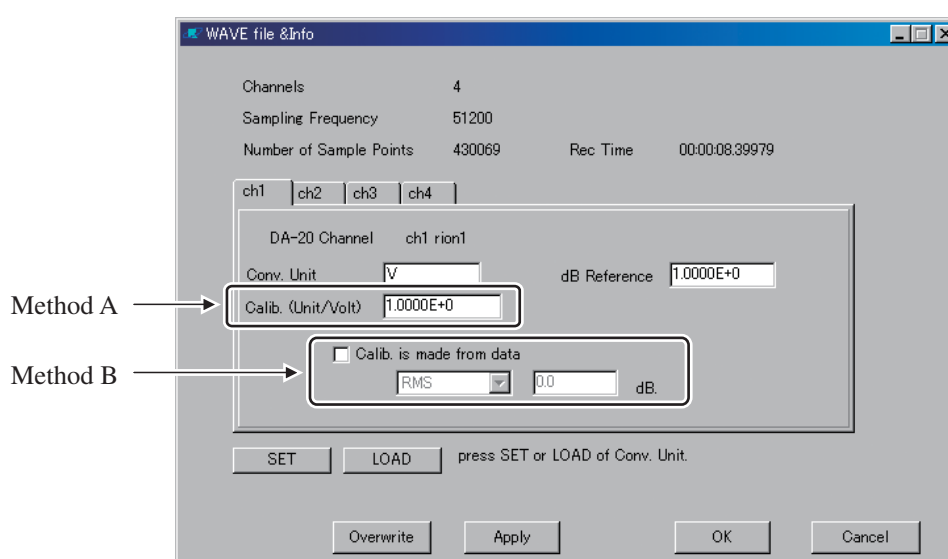
Method A is suitable when sensor sensitivity is known. Enter the Calib. (Unit/Volt) into the respective text box.

Method B is suitable when the calibration signal is included in the recorded data. Also when sensor sensitivity is known, it is recommended to include a calibration signal in the recorded data, for later use. Use the calibration signal waveform range as analysis range and enter the RMS value or maximum value of that waveform in dB. If the calibration signal value is known only as RMS, use this as Y and enter 20logY as XX.X dB. The result of calibration using this method will be shown in the "Calib. (Unit/Volt)" text box of method A.

Finally, click [Overwrite] and [Apply] or [OK] to accept the Calib. (Unit/Volt) change. To abandon the change, click the [Cancel] button. (If the button is grayed out and cannot be clicked, move the mouse cursor to a position outside of the input field and click.)

The button functions are as follows.

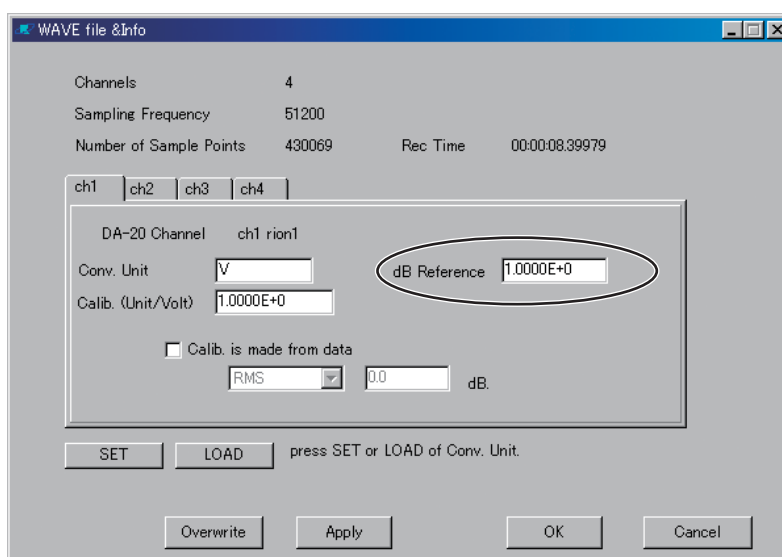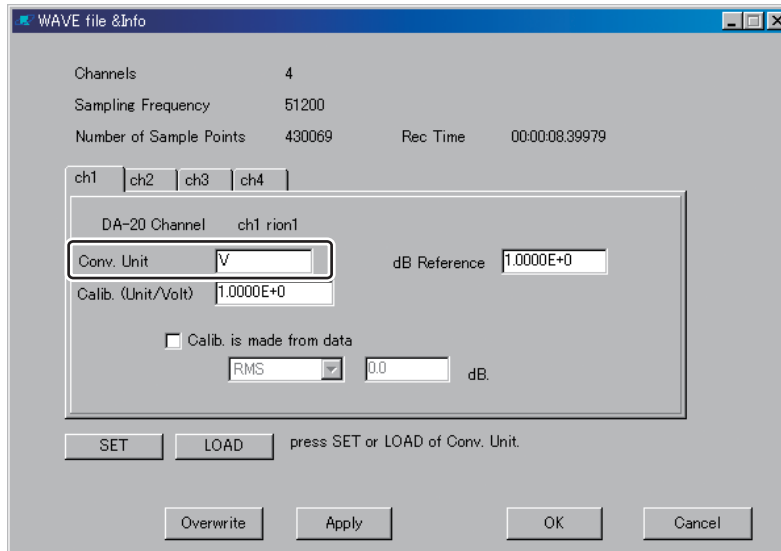|	
[Overwrite]	Enable the change and update the WAVE file.
[Apply]	Enable the change.
[OK]	Enable the change and close the screen.
[Cancel]	Abandon any steps taken since the last overwrite or apply action, and close the screen.

Changing the dB Reference

The RMS waveform display, FFT analysis result display, and octave-band analysis result display can be switched to dB. The dB value is calculated from the original data as follows.

$$dB \text{ value} = 20\log (\text{data value}/0 \text{ dB reference value})$$

The dB value can be calculated with any 0 dB reference value, but for certain kinds of measurement, standards and industry conventions may require a particular value. For example, sound pressure level requires a 0 dB reference value of 2E-5 [Pa].

The 0 dB reference value can be set by entering the value into the [dB Reference] text box on the [Wave File &Info] screen. The setting can be made separately for each channel.

After making the entry, click [Overwrite] and [Apply] or [OK] to accept the change. To abandon the change, click the [Cancel] button. (If the button is grayed out and cannot be clicked, move the mouse cursor to a position outside of the input field and click.)

The button functions are as follows.

[Overwrite]   Enable the change and update the WAVE file.

[Apply]   Enable the change.

[OK]   Enable the change and close the screen.

[Cancel]   Abandon any steps taken since the last overwrite or apply action, and close the screen.

Changing the unit name

Data that were recorded as EU or V due to restrictions imposed by the DA-20 can be changed into the units such as for temperature (deg.), rotation speed (rpm), or wind speed (m/sec).

The change in unit name is immediately reflected in the waveform display Y axis.

To change the unit name, enter the name into the [Conv. Unit] text box on the [Wave File &Info] screen. The setting can be made separately for each channel. The maximum length is 7 characters.

After making the entry, click [Overwrite] and [Apply] or [OK] to accept the change.

To abandon the change, click the [Cancel] button. (If the button is grayed out and cannot be clicked, move the mouse cursor to a position outside of the input field and click.)

The button functions are as follows.

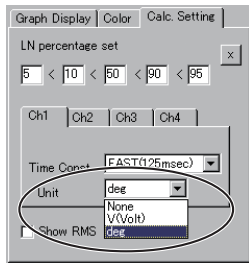|	
[Overwrite]	Enable the change and update the WAVE file.
[Apply]	Enable the change.
[OK]	Enable the change and close the screen.
[Cancel]	Abandon any steps taken since the last overwrite or apply action, and close the screen.

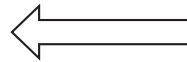An example for a change in Conv. Unit is shown below.
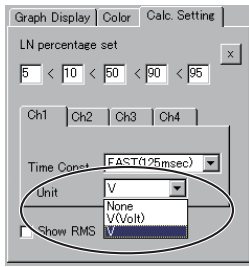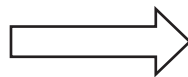

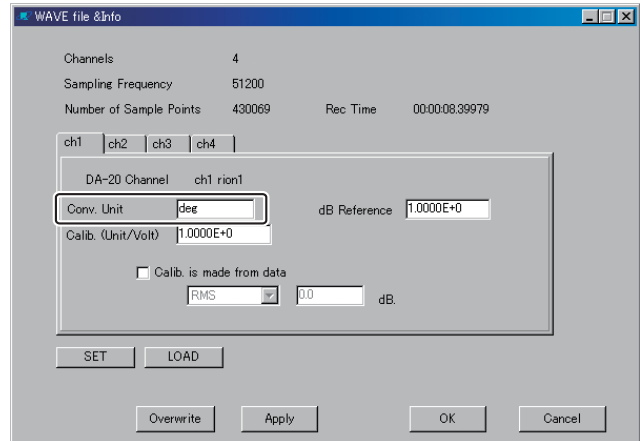
[Unit] menu:
physical quantity unit name is "V"
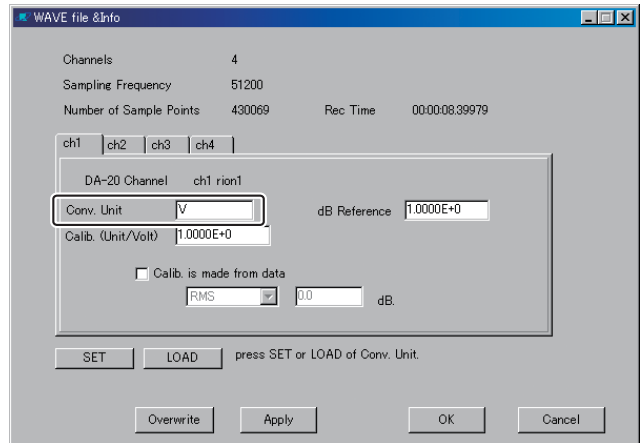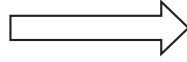
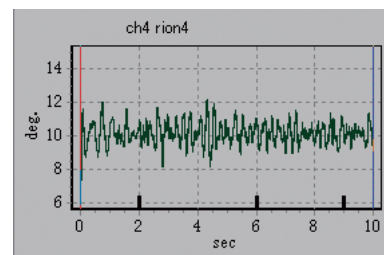Physical quantity unit display is changed from V to deg.

[Overwrite], [Apply] or [OK] is clicked

[Unit] menu:
physical quantity unit name has changed from "V" to deg.
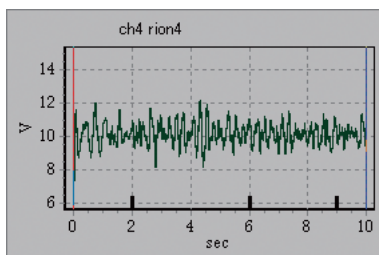
Unit name change
V ⇨ deg.

Reference information for changing the "Calib. (Unit/Volt)"

Relation between DA-20 setting, Calib. (Unit/Volt), and unit name

The relation between the "Sensor" and "Sensitivity" settings on the <Calibration> menu of the DA-20 and the Calib. (Unit/Volt) and unit name used by this software is as follows.

EU

Calib. (Unit/Volt) = X   X is value entered as "Sensitivity"

Unit name = EU

MIC

Calib. (Unit/Volt) = $10^{(-S/20)}$ S is microphone sensitivity entered as "Sensitivity"

Example: UC-53A

Calib. (Unit/Volt) = 2.7542E+01

S = -28.8 dBV/Pa (incl. preamplifier NH-22 pass-through loss)

Unit name = Pa

PICK or CHG

Calib. (Unit/Volt) = 1000/X   X is value entered as "Sensitivity"

Examples

PV-90I   Calib. (Unit/Volt) = 2.2727E+03   X = 0.44 mV/(m/s^2)

PV-85 + VP-80 Calib. (Unit/Volt) = 1.5576E+02   X = 6.42 pC/(m/s^2)

Unit name = m/s^2

V

Calib. (Unit/Volt) = 1   Sensitivity = "--" (no input)

Unit name = V

Practical examples for changing Calib. (Unit/Volt)

Recording AC output signal of sound level meter on DA-20

In this example, not only the microphone but the entire sound level meter is treated as a sensor.

Rion sound level meters are designed to output a voltage of 1 [Vrms] at the full-scale point of the respective level range. This means that the sensor (sound level meter) sensitivity is 1 [Vrms]/level range [dBPa (rms)].

Note that the sensor sensitivity changes according to the level range setting of the sound level meter.

A sound pressure level of 0 dB equals 2×10^{-5} [Pa (rms)], therefore X [dBPa (rms)] corresponding to the level range [dBPa (rms)] can be calculated according to the following equation.

$$\text{Level range [dBPa (rms)]} = 20\log (X \text{ [Pa (rms)]}/2 \times 10^{-5} \text{ [Pa (rms)]})$$
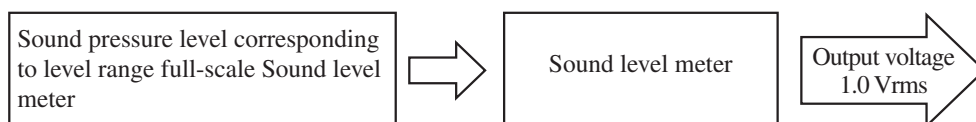$$= 20\log (X \text{ [Pa (rms)]}) + 94.0^* \text{ [dBPa (rms)]}$$

$$X \text{ [Pa (rms)]} = 10^{\wedge}((\text{level range} - 94.0^*)/20) \text{ [Pa (rms)]}$$

From the above, the sound level meter sensitivity is as follows.

$$\text{Sensor sensitivity} = 1/10^{\wedge}((\text{level range} - 94.0^*)/20) \text{ [Vrms/Pa (rms)]}$$
$$= 1/10^{\wedge}((\text{level range} - 94.0^*)/20) \text{ [V/Pa]}$$
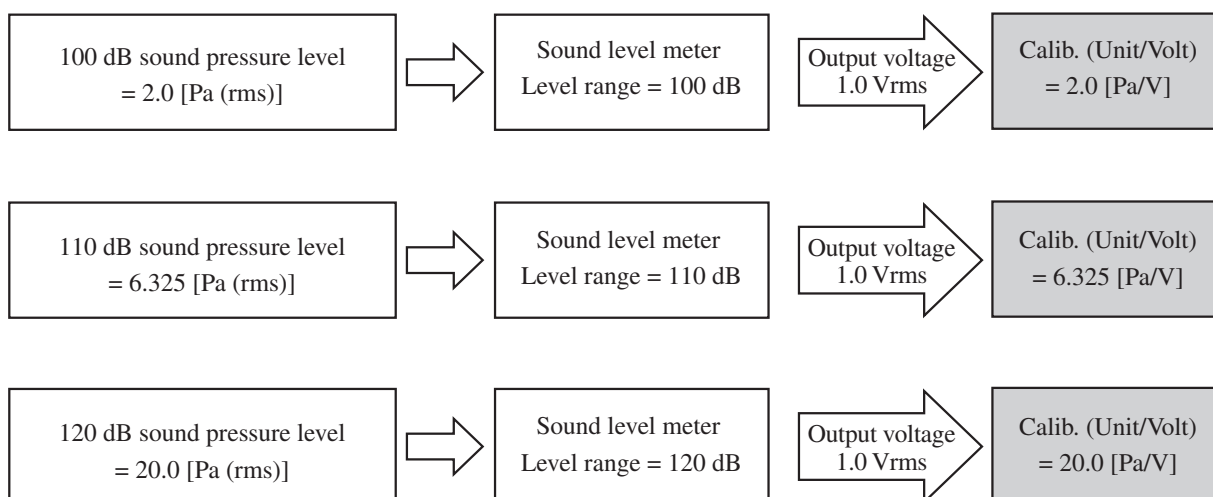
Therefore, the Calib. (Unit/Volt) is as follows.

$$\text{Calib. (Unit/Volt)} = 10^{\wedge}((\text{level range} - 94.0^*)/20) \text{ [Pa/V]}$$

Sound pressure level corresponding to level range full-scale Sound level meter	⇒	Sound level meter	⇒ Output voltage 1.0 Vrms

For example, when the sound level meter is set to a 100 dB range, the Calib. (Unit/Volt) for measured sound pressure level data is as follows.

Calib. (Unit/Volt): 100 dB range = $10^{\wedge}((100 - 94.0^*)/20)$ [Pa/V] = 2.0 [Pa/V]

* Note: The "94.0" value is actually 93.9794... (= $20\log(2 \times 10^{-5})$)

100 dB sound pressure level = 2.0 [Pa (rms)]	⇒	Sound level meter Level range = 100 dB	⇒ Output voltage 1.0 Vrms	Calib. (Unit/Volt) = 2.0 [Pa/V]
110 dB sound pressure level = 6.325 [Pa (rms)]	⇒	Sound level meter Level range = 110 dB	⇒ Output voltage 1.0 Vrms	Calib. (Unit/Volt) = 6.325 [Pa/V]
120 dB sound pressure level = 20.0 [Pa (rms)]	⇒	Sound level meter Level range = 120 dB	⇒ Output voltage 1.0 Vrms	Calib. (Unit/Volt) = 20.0 [Pa/V]

Example for recording AC output signal of sound level meter on DA-20
(calibration signal output added to actual data)

Using the calibration signal output of the sound level meter for calibration of externally connected equipment, the Calib. (Unit/Volt) can be determined.

At the level range setting to be used for recording, output the calibration signal for a few seconds, and then start the actual data recording. The voltage of the calibration signal is always 0.5 Vrms at any level range setting. On the other hand, the AC output level at sound pressure corresponding to the full-scale point is 1 Vrms. Therefore the calibration signal can be said to be the equal of measuring sound with one half the energy of the full-scale sound pressure level (level range - 6.0 dB).
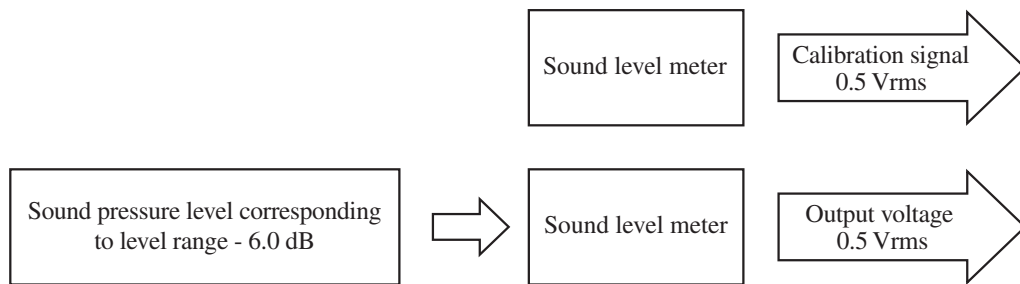
In the example described above, the Calib. (Unit/Volt) should be set so that the RMS value during the calibration signal interval is "level range - 6.0 dB".

The easiest way to achieve this is to use method B described in the section "Changing the "Calib. (Unit/Volt)"" of "II. Measurement value readout conversion" (page 87).

Sound pressure level corresponding to level range - 6.0 dB

Calibration signal   Recorded data

Select the check box and select RMS

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Display of data measured with NA-28 (NX-28WR)

Data measured with the NA-28 (NX-28WR) can be loaded and displayed using the DA-20PA1 software. The file information for such data has the following special characteristics.
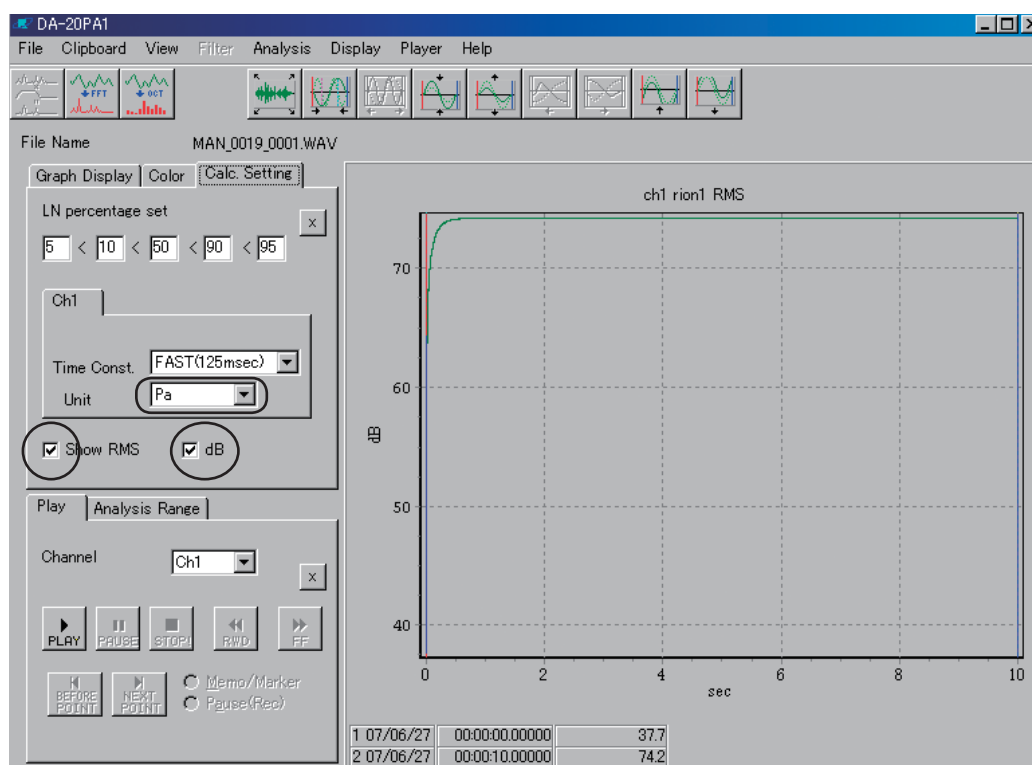
Conversion unit information for level range is recorded.
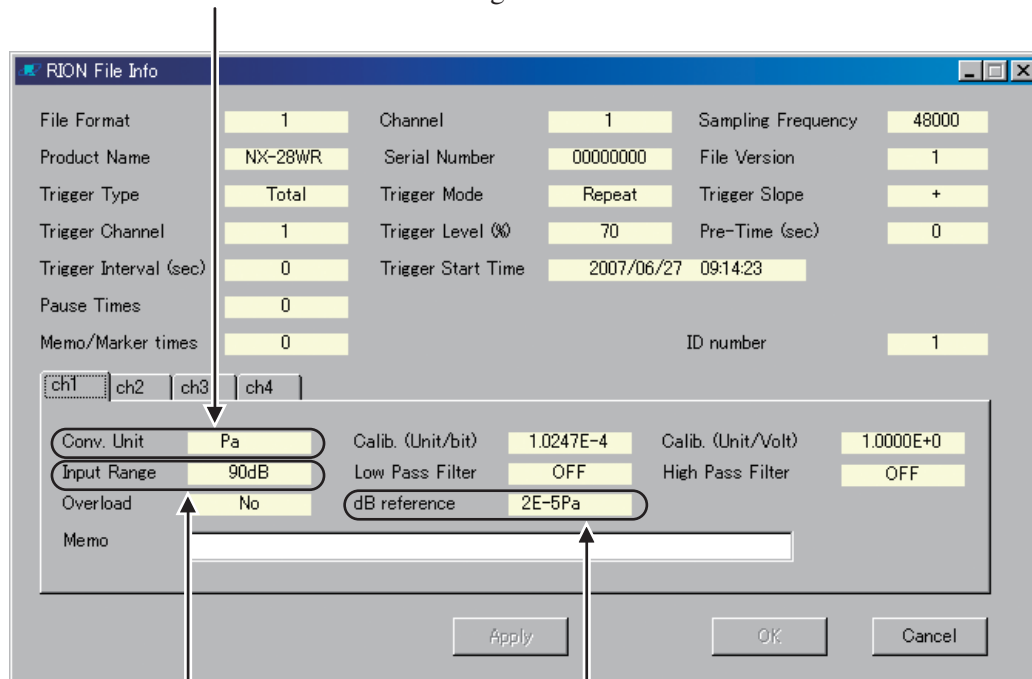
Level range of NA-28 (NX-28WR) is shown.

Due to the sound pressure level definition, this is always 2E-5.

When displaying level information for such data, set the graph display unit to Pa, and select the check boxes for Show RMS and dB.

Troubleshooting

This section lists possible problems that may occur when using the software, as well as steps to take in such a case. When you encounter a similar problem, try the countermeasures described here.

If the problem persists also after taking the described steps, or if a problem not described here occurs, contact the supplier.

Symptom   Screen layout is corrupted. Controls cannot be selected without scrolling.

Countermeasure   This condition may occur when "Large Font" is specified as system font. Specify "Small Font".

(For information on how to set the system font, refer to the documentation of the operating system.)

Symptom   On the FFT analysis screen, after moving the FFT analysis graph, the cursor can no longer be moved.

Countermeasure   When the range where data exist is moved out of the graph, the cursor cannot be moved. In such a case, hold down the left mouse button and drag the graph from right to left to reset the zoom/move condition.

Symptom   Octave-band analysis was attempted, but the message "Cannot perform octave-band analysis for this file (Invalid Sampling Frequency)" appears.

Countermeasure 1   Check whether the sampling frequency of the WAVE file is outside the range supported by this software. For information on limitations, see the section "Precautions" (page vi).

Countermeasure 2   Check whether the files "filecoef1.csv" and "filecoef3.csv" are located in the install folder (default: "C:\Program Files\RION\DA-20PA1"). If these files are not present, uninstall the software and then install it again.

Symptom   When trying to start the software, the normal screen does not appear, and the message "Invalid file..." is shown.

Countermeasure   Check whether the software was installed on the computer where you are starting it. A message such as "Invalid file..." will appear if attempting to start the software from another computer on a network, and the software will not operate correctly. Be sure to install the software on the computer from which it will be used.