RION

FFT Analysis Program
NX-43FT

Instruction Manual

Organization of This Manual

This manual describes functions and other operation methods of the FFT Analysis Program NX-43FT.
The manual consists of the chapters listed below. You should also consult the documentation for the Class 2 Sound Level Meter NL-43, Class 1 Sound Level Meter NL-53, and Class 1 Sound Level Meter (with low-frequency sound measurement function) NL-63.

- Overview of This Product
  Explains the functions of the NX-43FT.
- Preparation Before Use
  Explains how to install the NX-43FT and the settings before using it.
- Reading the Display
  Provides a basic explanation about the text displayed on the measurement screen when taking measurements.
- Setting Menu
  Describes how to configure the settings of the device.
- Measure
  Explains the basic procedures for measurement.
- Communication Commands
  Explains communication commands about functions of the NX-43FT.
- Specifications
  Lists the technical specifications of the NX-43FT.

Display	Meaning
Important	Failure to observe the precautions indicated by this may result in damage to the device.
Note	Denotes special information that is helpful in utilizing the capabilities of the device but that is not directly related to safety.

You can download the Instruction Manuals from our website:

https://rion-sv.com/nl-43_53_63/manual/

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1 Overview of This Product

The NX-43FT software is designed for installation on the Class 2 Sound Level Meter NL-43, Class 1 Sound Level Meter NL-53, and Class 1 Sound Level Meter (with low-frequency sound measurement function) NL-63 (hereinafter called “NL-43, NL-53, and NL-63” in this manual), allowing the unit to function as an FFT analyzer.
In addition to sound levels (up to four conditions), FFT analysis processing and calculation of the Partial Overall (POA) values for specified ranges are possible.

Measurement data can be displayed as a graph or in numerical format.
The graph display allows overlaying saved analysis results with the current analysis status.
Store data are stored in CSV format, which allows processing on a computer, using general software.

Measurement function

- Sound level
  Measures the sound level according to the selected frequency weighting and time weighting.
  [Instantaneous value]
  • Time-weighted sound pressure level L_p
  [Calculated values]
  • Time-weighted sound level L_{eq}
  • Maximum time-weighted sound level L_{max}

- FFT
  Performs analysis of each frame (400 ms) using the selected frequency weighting.
  Number of analysis points: 19,200 points (8,000 lines, frequency resolution 2.5 Hz)
  Frequency range: 20 kHz (sampling frequency 48 kHz)
  Overlap: None
  [Instantaneous value]
  • Spectrum for 1 frame INST
  [Calculated values]
  • Power average of spectrum LIN
  • Maximum of spectrum MAX

- Partial Overall (POA)
  Calculates the sum of power over a specified frequency range. This is done for each single frame of the FFT and each of the calculated values.

For details on the NL-43/NL-53/NL-63 main unit and operation keys, refer to the Instruction Manual of each sound level meter.

2 Preparation Before Use

2.1 Installing

Important

- Check that the power of the sound level meter is turned off before installing the program card.
- When installing, do so with sufficient battery power remaining, while charging via the USB cable, or with the AC adapter connected.
- Never remove the program card while installing the optional program. Doing so may result in a malfunction.
- Never format the program card with SD card formatting software (such as SD Formatter etc.). Otherwise, the program data on the card will be erased and can no longer be used. Restoration of the erased program is not guaranteed.
- Upgrade the firmware of the sound level meter to the latest version before installing the optional program. For the latest firmware version, check the download software section of the Support Room on the RION website (https://www.rion.co.jp/english/).

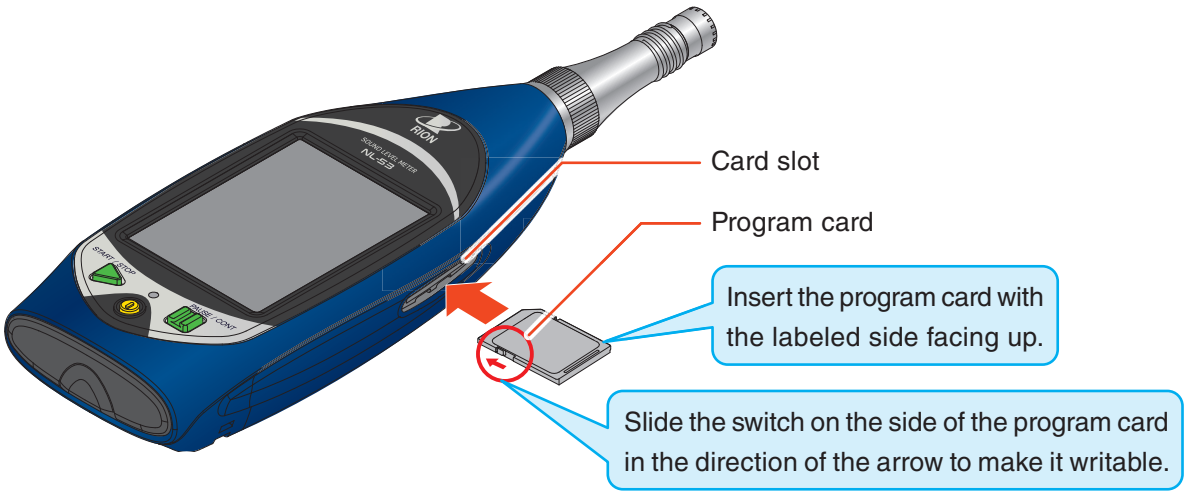
Note

- When installing the NX-43FT on the NL-43/53, function extension program NX-43EX must be installed first.
- The NX-43EX does not need to be installed for the NL-63.
- If you install the optional program on one sound level meter, you will not be able to install it on other sound level meters. To install the optional program for the other sound level meters, you will need to uninstall the optional program from the sound level meter where it is installed.
- After installation is complete, the program card from which the program was installed can be used as an SD card for storing data.

1 **Open the card slot cover on the right side of the sound level meter.**

2 **Insert the program card into the card slot.**

With the labeled side of the program card facing up, insert it into the card slot until a clicking sound is made.

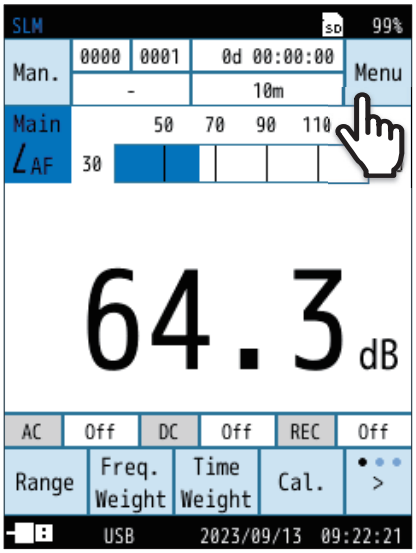


Note

- You will not be able to install the optional program if the write protection (read-only) of the program card is enabled. Make the program card writable.

3 Touch [Menu] on the measurement screen.

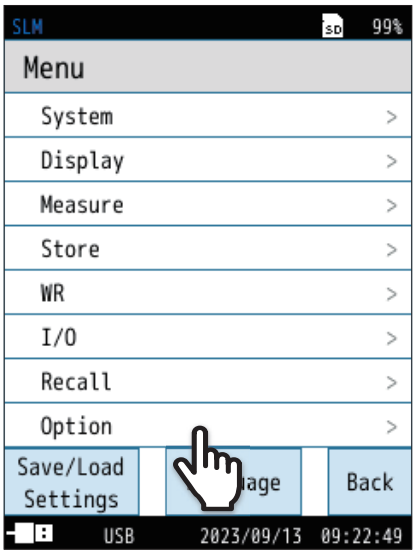
The [Menu] screen appears.



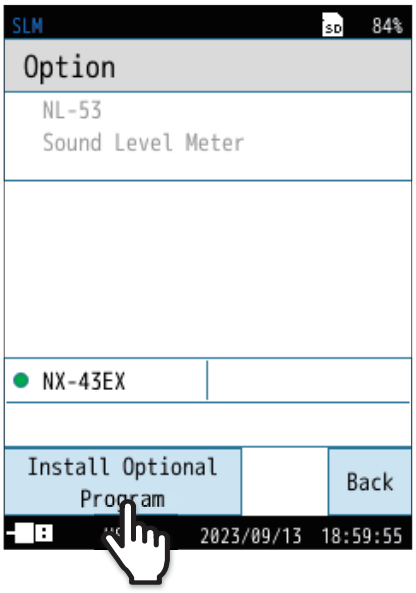
> **Note**
> - The program installation must be performed when the measurement mode is on [SLM]. Confirm that [SLM] is displayed in the upper left corner of the screen.
> - If other than [SLM], select [NL-53 Sound Level Meter (depending on the model of the unit)] on the [Menu] - [Option] screen and switch to [SLM].

4 Touch [Option] on the [Menu] screen.

The [Option] screen appears.



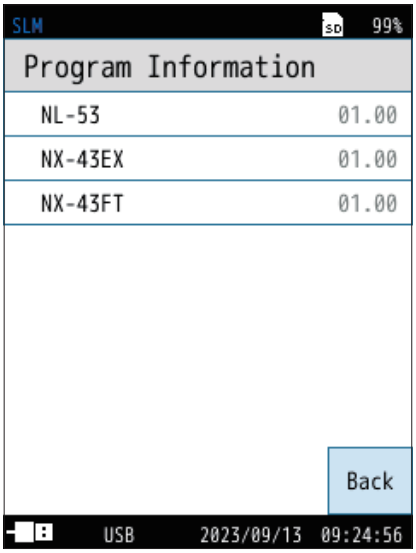
5 Touch [Install Optional Program] on the [Option] screen.



6 Touch [Install].

The program will now be installed.

- You can check the installed programs from [Menu] - [System] - [System Information] - [Program Information].



2.2 Uninstalling

Important

- Check that the power of the sound level meter is turned off before installing the program card.
- When uninstalling, do so with sufficient battery power remaining, while charging via the USB cable, or with the AC adapter connected.
- Never remove the program card while uninstalling. Doing so may result in a malfunction.

1 Open the card slot cover on the right side of the sound level meter.

2 Insert the program card used for installation into the card slot.

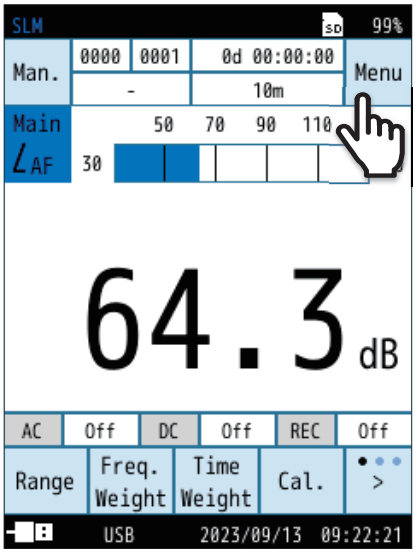
With the labeled side of the program card facing up, insert it into the card slot until a clicking sound is made (refer to Page 7).

Note

- You will not be able to uninstall the optional program if the write protection (read-only) of the program card is enabled. Make the program card writable.

3 Touch [Menu] on the measurement screen.

The [Menu] screen appears.

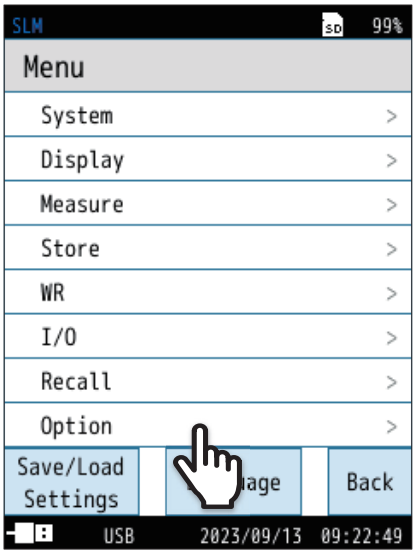


Note

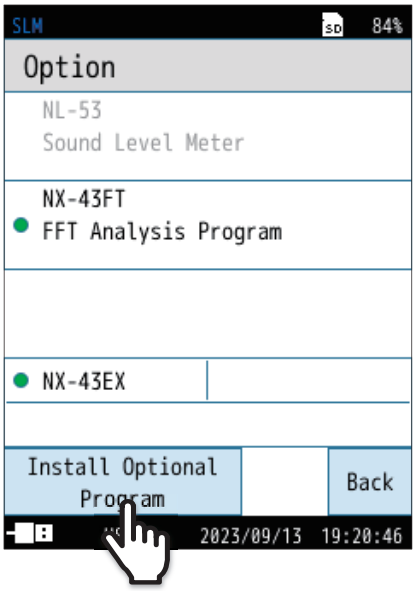
- The program uninstallation must be performed when the measurement mode is on [SLM]. Confirm that [SLM] is displayed in the upper left corner of the screen.
- If other than [SLM], select [NL-53 Sound Level Meter (depending on the model of the unit)] on the [Menu] - [Option] screen and switch to [SLM].

4 Touch [Option] on the [Menu] screen.

The [Option] screen appears.



5 Touch [Install Optional Program] on the [Option] screen.

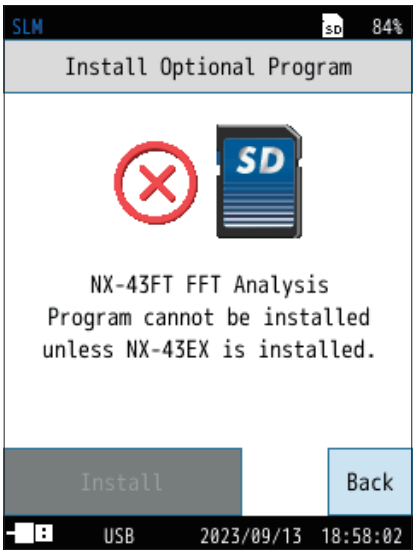


6 Touch [Uninstall].

The program will now be uninstalled.

2.3 If you cannot install

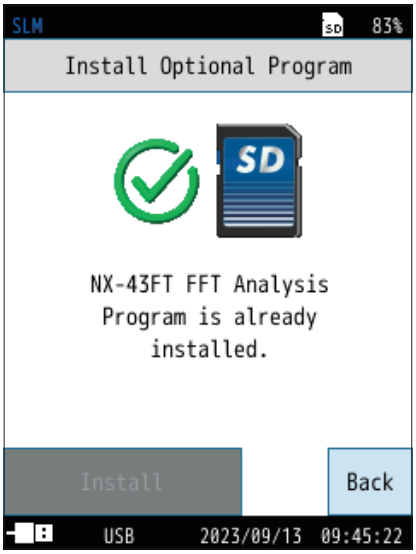
- You will not be able to install the NX-43FT if function extension program NX-43EX is not installed on the NL-43/NL-53.
  Touch [Back] or press the START/STOP key to return to the measurement screen.



Note

- The NX-43EX does not need to be installed for the NL-63.

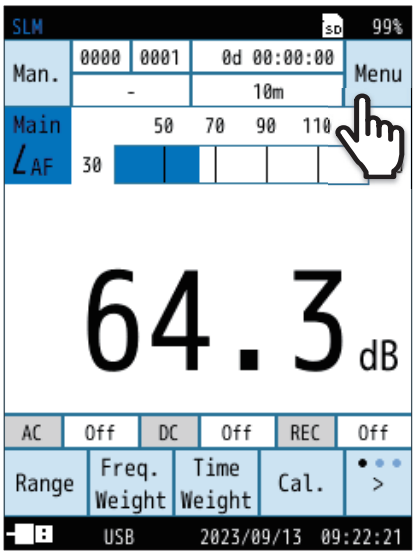
- If the NX-43FT is already installed on the main unit, it cannot be installed again.



2.4 Switching the function to this program

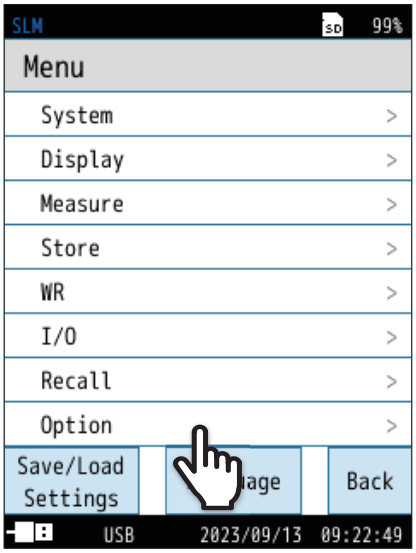
1 **Touch [Menu] on the measurement screen.**

The [Menu] screen appears.



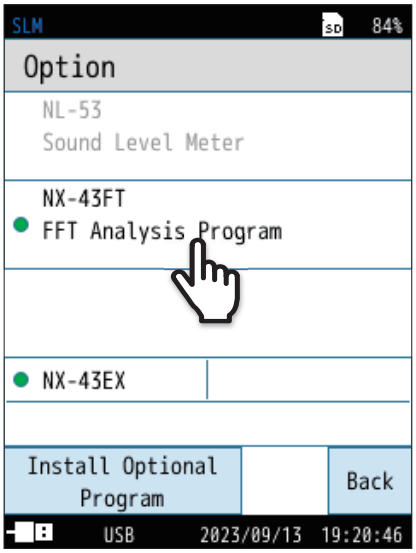
2 **Touch [Option] on the [Menu] screen.**

The [Option] screen appears.



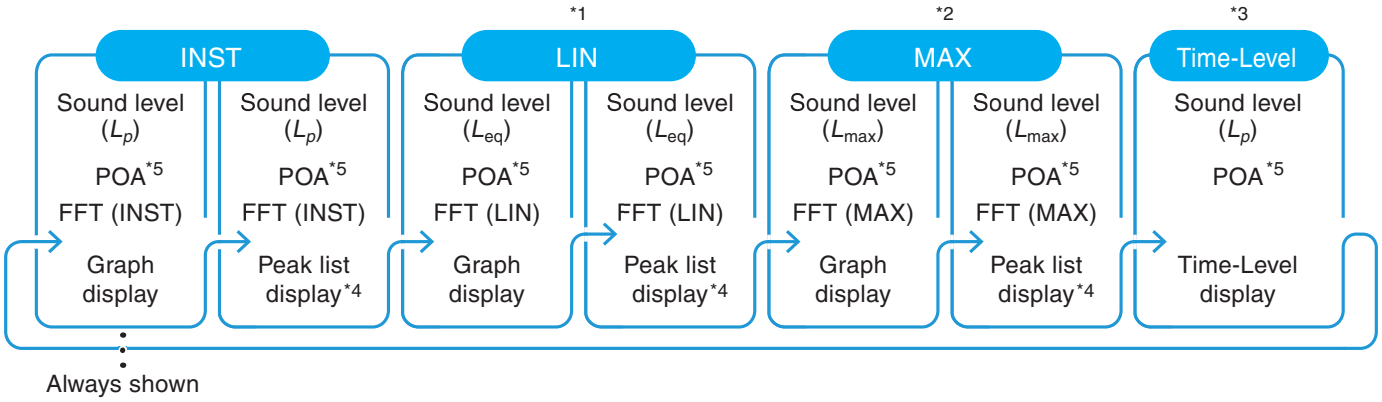
3 **Touch [NX-43FT FFT Analysis Program] on the [Option] screen.**

The unit will be restarted, the function will switch, and the NX-43FT measurement screen will appear.



3 Reading the Display

There are three types of measurement display screens: graph display, peak list display, and Time-Level display. Each time you touch Disp on the menu ring, the display switches in the following order (Page 17).

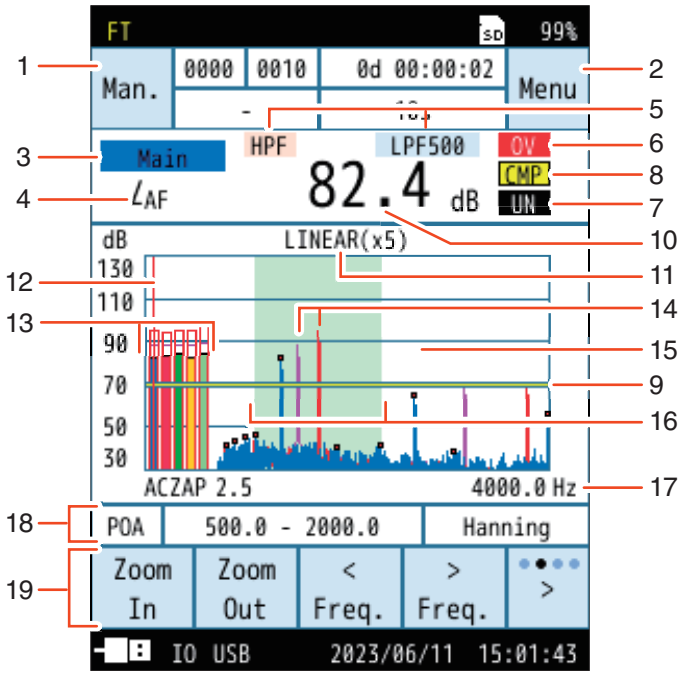


*1 Not displayed when [LIN] is set to [Off] on the [Menu] - [Display] screen (Page 22).
*2 Not displayed when [MAX] is set to [Off] on the [Menu] - [Display] screen (Page 22).
*3 Not displayed when [Time-Level] is set to [Off] on the [Menu] - [Display] screen (Page 23).
*4 Not displayed when [Peak List] is set to [Off] on the [Menu] - [Display] screen (Page 23).
*5 Not displayed when [Partial Overall (POA)] is set to [Off] on the [Menu] - [Measure] - [FFT Analysis] screen (Page 25).

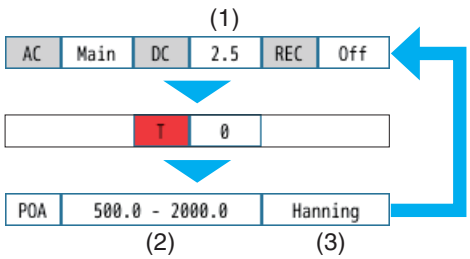
Note

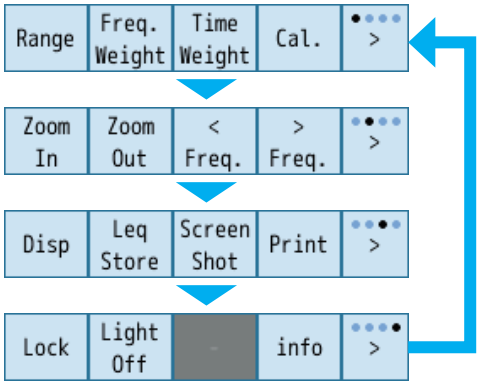
- While the actual display will not look like the one shown in the figures below, the explanation is based on the assumption that all the text are displayed.

3.1 Graph screen



<table>
<tr><th>No.</th><th>Name</th><th>Description</th></tr>
<tr><td>1</td><td>Store mode</td><td>Displays the store mode when saving to memory. Touch to go directly to the store settings screen. The store mode can be selected from [Manual] and [Auto].</td></tr>
<tr><td>2</td><td>Menu / measurement status</td><td>Touch to display the [Menu] screen. The following icons appear when measuring.
<table>
<tr><td>▶</td><td>Flashes during measurement.
In addition, the indicator LED flashes red.</td></tr>
<tr><td>■</td><td>Flashes while waiting for measurement in the [Delay Time] mode.
In addition, the indicator LED flashes blue.</td></tr>
<tr><td>II</td><td>When set to Manual store mode, if the PAUSE/CONT key is pressed while measuring, measurement will pause and this will flash.
In addition, the indicator LED flashes blue.
* This function cannot be used when the waveform recording function is set.</td></tr>
<tr><td>II</td><td>If the PAUSE/CONT key is pressed in the current state, measurement will pause and this will appear.
The sound level display at the time the key is pressed is fixed, and is released when the PAUSE/CONT key is pressed again.</td></tr>
<tr><td>Lock</td><td>Flashes when the operation is locked.
Touching the key lock on the menu ring locks all setting values. Operations other than turning off the screen and unlocking the key lock will not provoke a response.
To turn off the power, disable the operation lock and then press the POWER key.</td></tr>
</table></td></tr>
<tr><td>3</td><td>Channel name and frequency</td><td>Displays the channel name (Main, Sub1 to 3, POA) of the level bar selected with the cursor or the frequency of the spectrum at the cursor position.</td></tr>
<tr><td>4</td><td>Measurement amount</td><td>Displays the measurement amount of the graph selected with the cursor.
<table>
<tr><th>Sound level (Main, Sub1 to 3)</th><th>POA, FFT analysis</th></tr>
<tr><td>L_{AFmax}
max: when measurement amount is MAX
eq: when measurement amount is LIN
No display when the measurement value is INST
Time weighting
F, S, I, τ=10s*
No display when the measurement value is LIN
Frequency weighting
A, C, Z, G*</td><td>INST(A)
Frequency weighting
A, C, Z, G*
Measurement amount
INST, LIN, MAX</td></tr>
</table>
* NL-63 only.</td></tr>
<tr><td>5</td><td>Filter</td><td>Frequency weighting (Page 25) can be used to perform the low-pass filter and high-pass filter settings (NL-63 only). These settings can be made for the sound level and FFT respectively.</td></tr>
<tr><td>6</td><td>Overload indication</td><td>
<table>
<tr><td>OV
(White on red)</td><td>When an overload condition is detected for the sound level and FFT respectively, the indication is shown for at least one second.</td></tr>
<tr><td>OV</td><td>If the calculation contains signal overload data, this indication is shown. This indication remains on the calculation result screen until the next calculation measurement is started.</td></tr>
</table></td></tr>
<tr><td>7</td><td>Under-range indication</td><td>
<table>
<tr><td>UN
(White on black)</td><td>When a sound level under-range condition is detected, this indication is shown for at least one second. No indication is shown for FFT.</td></tr>
<tr><td>UN</td><td>If the calculation contains signal under-range data, this indication is shown. This indication remains on the calculation result screen until the next calculation measurement is started.</td></tr>
</table></td></tr>
</table>

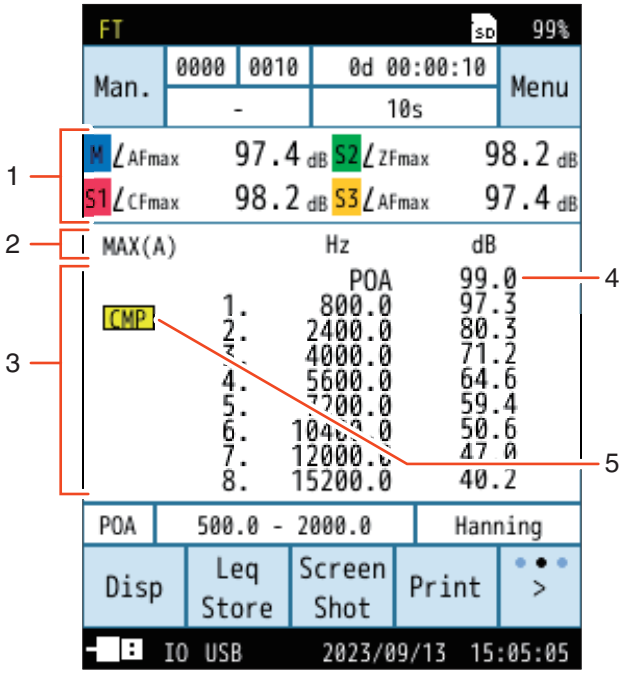
<table>
<tr><th>No.</th><th>Name</th><th>Description</th></tr>
<tr><td>8
9</td><td>Comparator
Comparator level line</td><td>
<table>
<tr><td> </td><td>Displayed when the comparator (open collector signal for external device control) is selected with the I/O Port (page 34) and the following two conditions are met.
• When the specified channel (selected from Main, Sub1 to 3, Spectrum) exceeds the set level (30dB to 130dB)
• When the cursor is placed on the specified channel or spectrum
The comparator level line is displayed on the graph screen.</td></tr>
</table>
</td></tr>
<tr><td>10</td><td>Level indication</td><td>Displays the level of the graph selected with the cursor.</td></tr>
<tr><td>11</td><td>X-axis setting, zoom rate</td><td>Displays the X-axis setting of the FFT graph with linear scale “LINEAR” or logarithmic scale “LOG”. The zoom rate is displayed in parentheses.</td></tr>
<tr><td>12</td><td>Cursor</td><td>Used to select either one of the level bars (Main, Sub1 to 3, POA) or one of the spectrum frequencies. To move the cursor, touch the screen, or touch < Freq. or > Freq. on the menu ring. Touch and hold for faster movement.</td></tr>
<tr><td>13</td><td>Level bar</td><td>
<table>
<tr><td> </td><td>Main</td><td>Sound level bar for the Main. This is always displayed.
The set frequency weighting is displayed below the bar.</td></tr>
<tr><td> </td><td>Sub1 to 3</td><td>Sound level bars for the Sub1 to 3 channels can be displayed.
The set frequency weighting is displayed below each bar.
These bars are displayed for any sub channel set to [On] on the [Menu] - [Measurement] - [Sub Channel Settings] screen.</td></tr>
<tr><td> </td><td>Partial Overall (POA)</td><td>A level bar for Partial Overall (POA) can be displayed.
The indication “P” is displayed below the bar.
This bar is displayed if [Partial Overall (POA)] is set to [On] on the [Menu] - [Measure] - [FFT Analysis] screen.</td></tr>
</table>
</td></tr>
<tr><td>14</td><td>Overlay graph</td><td>When [Display Overlay Data] is set to [On], graphs of the stored data are overlaid.
Overlay data 1 is displayed with red lines and Overlay data 2 with purple lines (Page 23).</td></tr>
<tr><td>15</td><td>FFT graph (spectrum)</td><td>Each spectrum level is displayed as a line graph. Depending on the zoom rate, a single pixel may contain multiple lines, with the largest and smallest of the levels connected to each other.
When [Peak List] is set to [On] on the [Menu] - [Display] screen, dots are displayed on the top few spectral peaks (Page 23).</td></tr>
<tr><td>16</td><td>Partial Overall (POA) frequency selection range</td><td>When [Partial Overall (POA)] is [On], the set frequency selection range is displayed on the graph in light green (Page 25).</td></tr>
<tr><td>17</td><td>Frequency display</td><td>Displays the upper and lower frequency limits of the FFT graph display range.</td></tr>
<tr><td>18</td><td>Information display bar</td><td>Each time you touch [info]* on the menu ring, the displayed information will switch.
(1) Not only the sound level (Main, Sub1 to 3, POA) but also POA and spectrum can be selected as DC output. The frequency information is displayed when a spectrum is selected.
(2) Displays the frequency setting range (frequency lower limit - upper limit) of the Partial Overall (POA).
(3) Displays the window function set on the [Menu] - [Measure] - [FFT Analysis] screen.
* [info] is displayed by touching ••• > on the far right of the menu ring.
  </td></tr>
</table>

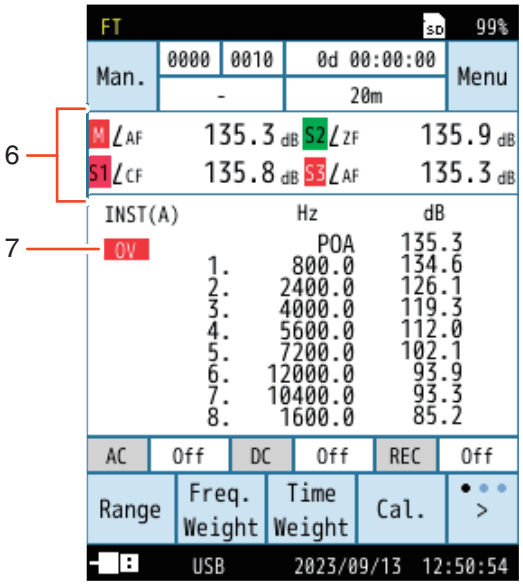
<table>
<tr><th>No.</th><th>Name</th><th>Description</th></tr>
<tr><td>19</td><td>Menu ring</td><td>
Each time you touch [>] on the far right of the menu ring, the displayed menu switches.


<table>
<tr><td>Range</td><td>Sets the upper and lower limits of the bar graph.</td></tr>
<tr><td>Freq. Weight</td><td>Sets the frequency weighting (Page 25).</td></tr>
<tr><td>Time Weight</td><td>Sets the time weighting (Page 26).</td></tr>
<tr><td>Cal.</td><td>Displays the [Calibration] screen (see “Operation Guide”).</td></tr>
<tr><td>Zoom In
Zoom Out</td><td>Changes the zoom rate for the frequency display.
Each time you touch [Zoom In], the zoom rate changes in the order of ×1 » ×2 » ×5 » ×10 » ×20 » ×40.
Each time you touch [Zoom Out], the zoom rate changes in the order of ×40 » ×20 » ×10 » ×5 » ×2 » ×1.</td></tr>
<tr><td>< Freq.
> Freq.</td><td>Used to select either one of the level bars (Main, Sub1 to 3, Partial Overall (POA)) or one of the spectrum frequencies. Move the cursor.</td></tr>
<tr><td>Disp</td><td>Switches the screen display (Page 14).</td></tr>
<tr><td>Leq Store
Lp Store
(Manual)</td><td>Displayed in Manual mode (see “Operation Guide”).
Even if you select [Cancel] when saving the data after measurement, you can save the data again. [Leq Store] appears on the menu ring. Touch it to save the L_{eq} store data (L_{eq}, L_{max}).
When paused, [Lp Store] appears. Touch it to save the L_p store data.</td></tr>
<tr><td>Screen Shot</td><td>Saves the screenshot of the displayed screen (see “Operation Guide”).</td></tr>
<tr><td>Print</td><td>Prints the screenshot of the displayed screen (see “Operation Guide”).</td></tr>
<tr><td>Lock</td><td>Turns on/off the key lock function.
Operations other than turning off the screen and unlocking the key lock will not provoke a response.
To turn the power off, disable the key lock and then press the POWER key (see “Operation Guide”).</td></tr>
<tr><td>Light Off</td><td>Turns off the backlight (see “Operation Guide”).</td></tr>
<tr><td>info</td><td>Switches the display of the information display bar.</td></tr>
</table>
</td></tr>
</table>

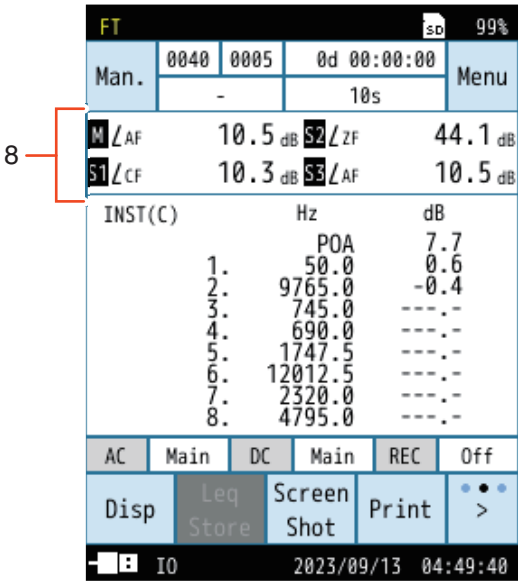
3.2 Peak list screen

When [Peak List] is set to [On] on the [Menu] - [Display] screen, the peak list screen can be displayed (Page 21). Each time you touch Disp on the menu ring, the display switches (Page 14).





Overload indication



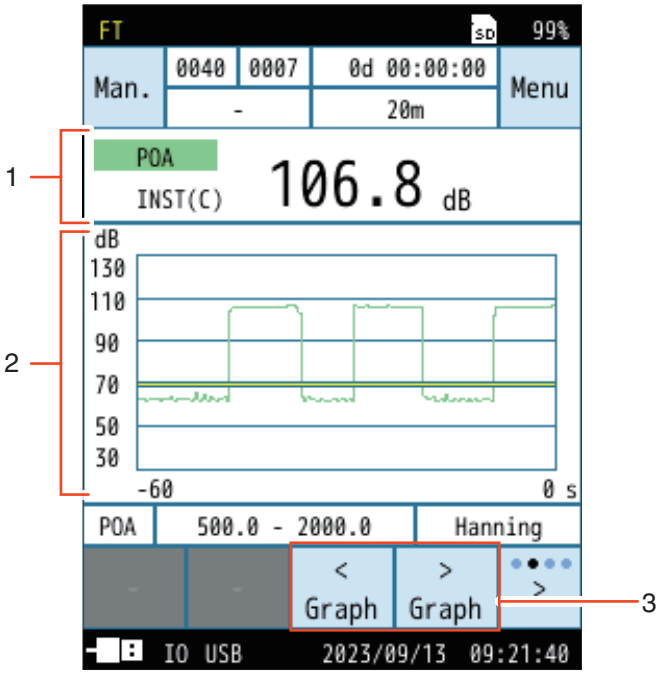
Under-range indication

No.	Name	Description
1	Sound level	Displays the measurement amount and sound level values for Main and Sub1 to 3 that are set to display.
2	Measurement amount	Displays the measurement amount of the FFT analysis.
3	Peak list	Lists the top eight lines of detected peaks in order of level, with their frequencies and level values. “--.-” is shown when the level value is -10 dB or lower.

<table>
<tr><th>No.</th><th>Name</th><th>Description</th></tr>
<tr><td>4</td><td>POA</td><td>Displayed when [Partial Overall (POA)] is set to [On] on the [Menu] - [Measure] - [FFT Analysis] screen.
The sum of the power values over the frequency range set by the partial overall upper and lower frequency limits is displayed (Page 25).</td></tr>
<tr><td>5</td><td>Comparator</td><td>Select [Comparator] on the [Menu] - [I/O] - [I/O Port] - [Function] screen.
If the channel to be judged by the comparator is set to [Spectrum], CMP will appear in the peak list area.
When the channel is selected either one of Main or Sub1 to 3, the sound level icon changes from the default color to yellow (e.g., Main, M » M).</td></tr>
<tr><td>6
7</td><td>Overload indication</td><td>
<table>
<tr><td>M
S1
S2
S3</td><td>When a signal overload condition is detected in the sound level, the corresponding Main or/and Sub1 to 3 icons will change from the default color to red for at least 1 second (e.g., Main, M » M).</td></tr>
<tr><td>M
S1
S2
S3</td><td>When a signal overload condition is detected during calculation measurement, the corresponding Main or/and Sub1 to 3 icons will change from the default color to red.
This indication remains until the next calculation measurement is started (e.g., Main, M » M).</td></tr>
<tr><td>OV</td><td>When an FFT overload condition is detected, the indication is shown for at least 1 second.</td></tr>
<tr><td>OV</td><td>This is displayed when there is a signal overload data during FFT calculation.
This indication remains on the calculation result screen until the next calculation measurement is started.</td></tr>
</table>
</td></tr>
<tr><td>8</td><td>Under-range indication</td><td>
<table>
<tr><td>M
S1
S2
S3</td><td>When a signal under-range condition is detected in the sound level, the corresponding Main or/and Sub1 to 3 icons will change from the default color to black (e.g., Main, M » M).</td></tr>
<tr><td>M
S1
S2
S3</td><td>When a signal under-range condition is detected during calculation measurement, the corresponding Main or/and Sub1 to 3 icons will change from the default color to black.
This indication remains until the next calculation measurement is started (e.g., Main, M » M).</td></tr>
</table>
</td></tr>
</table>

3.3 Time-Level screen

The time-level screen can be displayed if [Time-Level] is set to anything other than [Off] on the [Menu] - [Display] screen (Page 23).
Each time you touch [Disp] on the menu ring, the display switches (Page 14).



No.	Name	Description
1	Sound level / POA level	Displays the measurement amount and sound level values for Main or Sub1 to 3 that are set to display. POA displays the measurement amount and level value of the Partial Overall.
2	Time-Level waveform	Displays level variation with respect to time. The time scale of the X-axis is set in [Time - Level] on the [Menu] - [Display] screen, and the level scale of the Y-axis is set in [Bar Graph] on the [Menu] - [Display] screen.
3	Menu ring [< Graph] [> Graph]	[< Graph] and [> Graph] on the menu ring are displayed in the Time-Level screen. Each time you touch [>] on the far right of the menu ring, the displayed menu switches. Touch [< Graph] and [> Graph] to switch channels (Main, Sub1 to 3 that are set to display, and POA).

Note

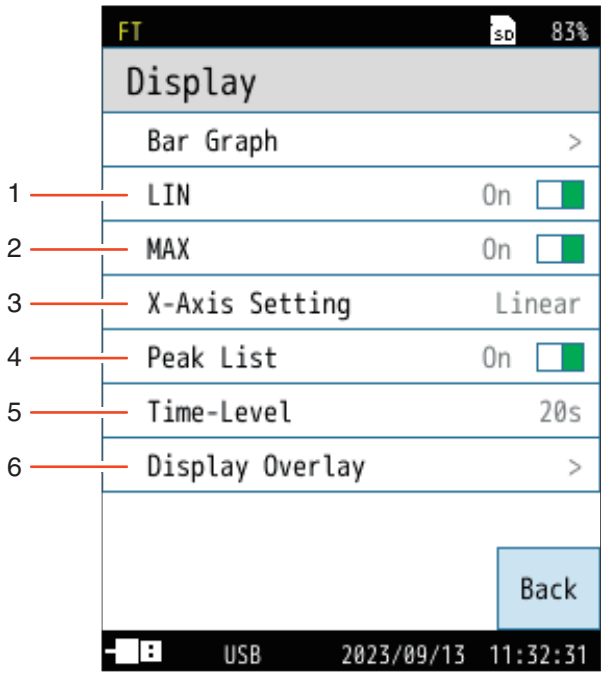
- The Time-Level display is for sound levels (Main, Sub1 to 3) and POA. The Time-Level screen for each spectrum is not displayed.

4 Setting Menu

This chapter describes only the menus related to the NX-43FT.
For the setting menus of the sound level meter unit, refer to “Operation Guide”.

4.1 Display

Sets the measurement amount and other items displayed on the measurement screen.



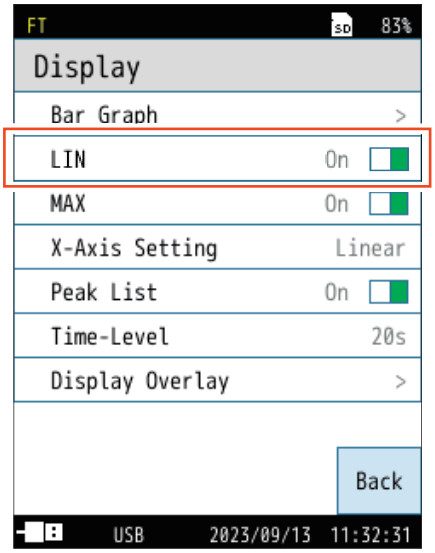
No.	Name	Description
1	LIN	Select whether to display the power average value of the spectrum (LIN) on the measurement screen (Page 22).
2	MAX	Select whether to display the maximum value of the spectrum (MAX) on the measurement screen (Page 22).
3	X-Axis Setting	Select the X-axis display from Linear and Logarithm (Page 22).
4	Peak List	Select whether to display the peak list on the measurement screen (Page 23).
5	Time-Level	Sets whether to display the Time-Level screen (Page 23).
6	Display Overlay	Select whether to overlay the graphs of the previous measurement data (Page 23).

4.1.1 LIN

Sets whether to enable the LIN display in the FFT analysis.
LIN: Power average of the spectrum during the measurement period

$$Y_n = 10 \log\left(\frac{1}{n}\sum_{i=1}^{n} 10^{\frac{X_i}{10}}\right)$$

Y_n: Average data (unit: dB)
X_i: Data per frame (unit: dB)
i: Frame numbers ($i = 1, 2, 3, \ldots, n$)
n: Power-averaged frame count

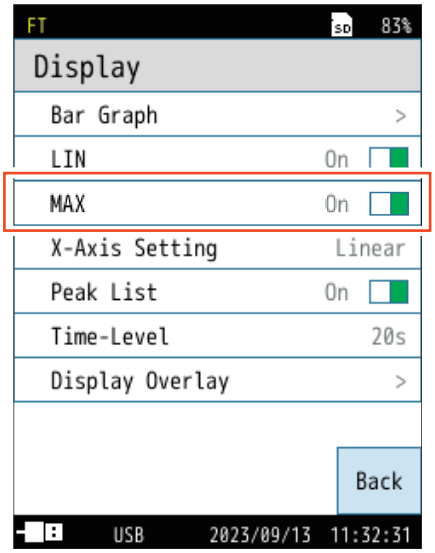


Note

- With Sound Level (Main, Sub1 to 3), the equivalent continuous sound level L_{eq} during the measurement time is calculated.

4.1.2 MAX

Sets whether to enable the MAX display in the FFT analysis.
MAX: Maximum of spectrum during the measurement period



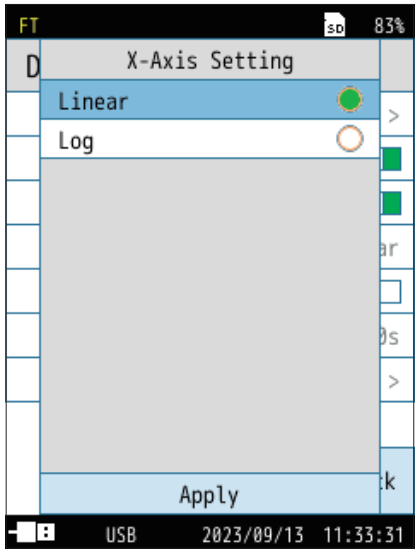
Note

- With Sound Level (Main, Sub1 to 3), the maximum time-weighted sound level L_{max} within the measurement time is calculated.

4.1.3 X-Axis Setting

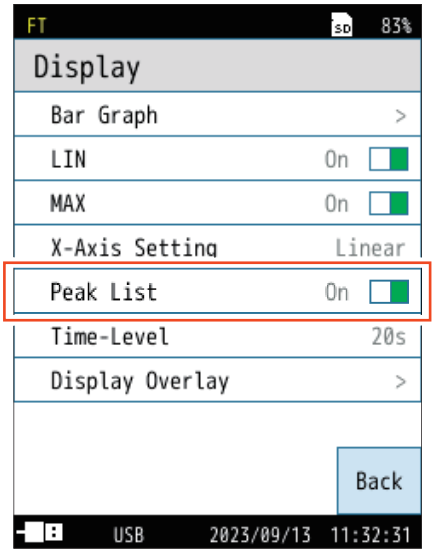
Switches the scale of the X-axis.

Item	Description
Linear	Sets the X-axis of the graph display to linear scale.
Log	Sets the X-axis of the graph display to logarithmic scale.



4.1.4 Peak List

Sets whether to enable the peak list display in the FFT analysis.
When [On] is selected, the peak list screen display (Page 18) is enabled, and the frequencies and level values of the top eight lines of detected peaks are displayed in a list in order of level.
In addition, the graph screen (Page 14) displays dots at the peaks of the spectrum.



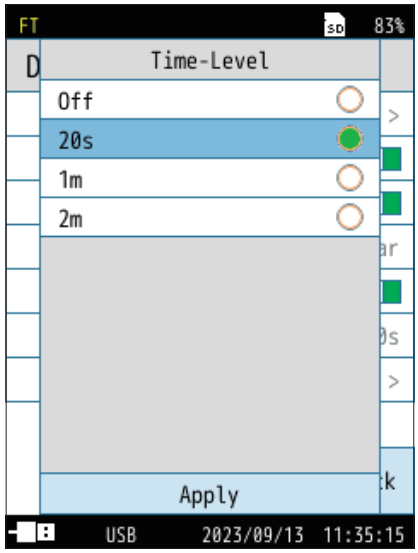
4.1.5 Time-Level

Sets whether to display Time-Level.
When set to anything other than [Off], the Time-Level display (Page 20) is enabled.

Item	Description
Off	Does not display the [Time-Level] screen.
20s	Displays the [Time-Level] screen. Select the screen horizontal axis (time).
1m	
2m	

Note

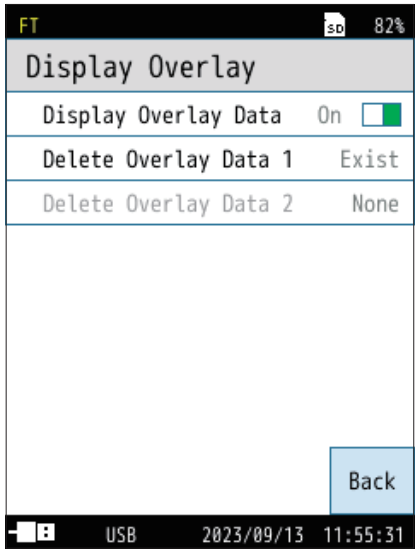
- The Time-Level display is for sound levels (Main, Sub1 to 3) and POA. The Time-Level screen for each spectrum is not displayed.



4.1.6 Display Overlay

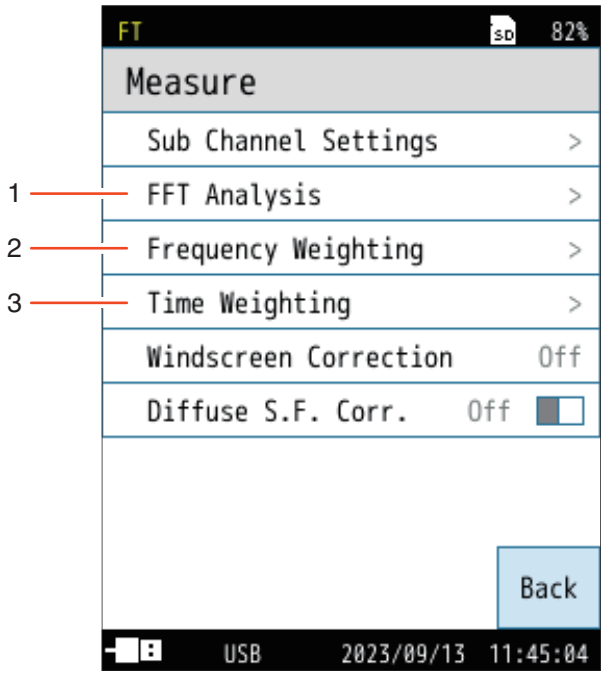
Sets whether to overlay (Page 44) the previously stored measurement data on the measurement screen.
Overlay data is registered from the [Recall] screen (Page 40).

Registered overlay data can be deleted.



4.2 Measure

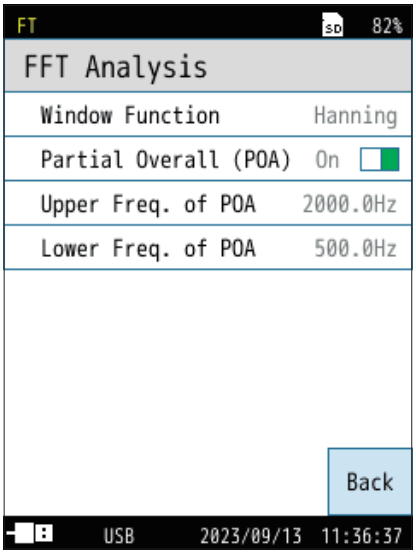
Sets the number of measurement channels, correction and other items.



No.	Name	Description
1	FFT Analysis	Sets the FFT analysis (Page 25).
2	Frequency Weighting	Sets the sound level and FFT frequency weighting (Page 25).
3	Time Weighting	Sets the time weighting of the sound level (Page 26).

4.2.1 FFT Analysis

Switches the mode of FFT analysis.



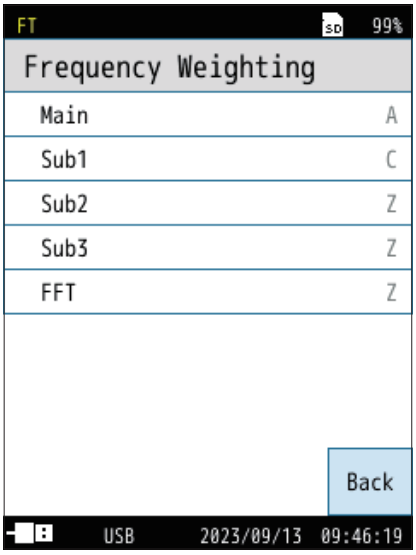
Item	Description
Window Function	Sets the window function to be applied to the time waveform of the FFT analysis. Select from [Hanning] and [Rectangular]. Hanning is generally used for continuous signals such as noise and vibration, while Rectangular is used for analysis of single-shot pulse signals.
Partial Overall (POA)	Turns on/off the Partial Overall (POA).
Upper Freq. of POA	These items are shown when [Partial Overall (POA)] is set to [On]. The partial overall upper and lower frequency limits can be set.
Lower Freq. of POA	

Note

- The Partial Overall (POA) is calculated for each single frame of the FFT and each of the calculated values.
- When in the graph screen, the range set by the partial overall upper and lower frequency limits is displayed in light green (Page 14).

4.2.2 Frequency Weighting

Sets the sound level and frequency weighting of the FFT analysis.



Item	Description
A	Sets A-weighting.
C	Sets C-weighting.
Z	Sets Z-weighting.
G	Sets G-weighting.
Z(HPF)	Sets Z-weighting and high-pass filter to limit the lower limit of the measurement frequency range to 10 Hz.
Z(LPF 100Hz)	Sets Z-weighting and low-pass filter (cutoff frequency 100 Hz) to limit the upper limit of the measurement frequency to 100 Hz.
Z(LPF 500Hz)	Sets Z-weighting and low-pass filter (cutoff frequency 500 Hz) to limit the upper limit of the measurement frequency to 500 Hz.

* For details, refer to “Operation Guide” - “Frequency Weighting” in the Instruction Manual of each sound level meter.

Note

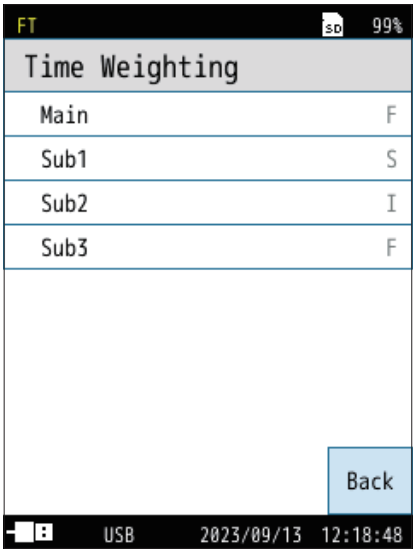
- G, Z(HPF), Z(LPF 100Hz), and Z(LPF 500Hz) weighting are functions of the NL-63 only.

4.2.3 Time Weighting

Sets the time weighting for each channel.

Item	Description
F	Sets F (fast).
S	Sets S (slow).
I	Sets I (impulse).
τ=10s	Sets 10s.

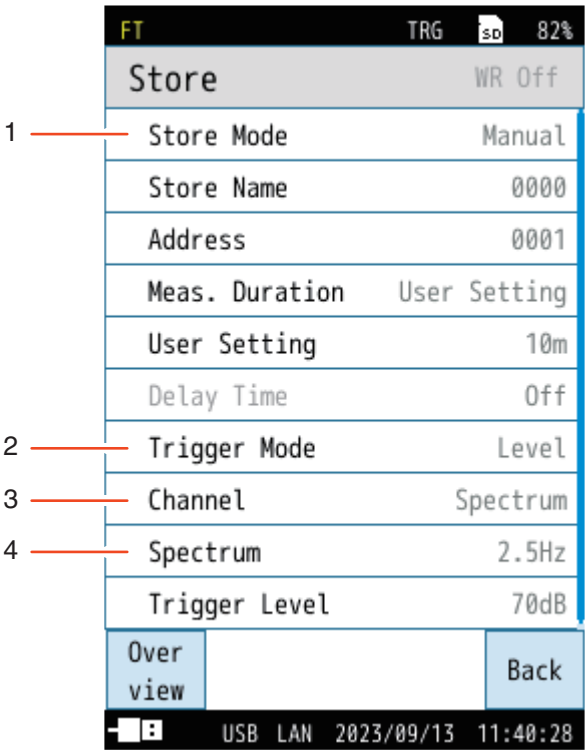
* For details, refer to “Operation Guide” - “Time Weighting” in the Instruction Manual of each sound level meter.



Note

- The time weighting applies only to the sound level.
- τ=10s is a feature available only with the NL-63.

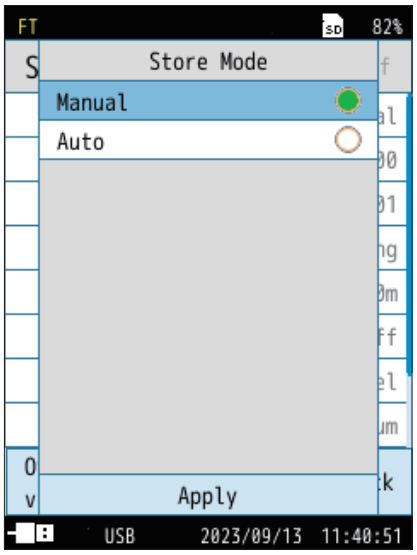
4.3 Store



No.	Name	Description
1	Store Mode	There are two store modes: Manual and Auto.
2	Trigger Mode	Select the trigger for starting measurement from [Level] and [External] (Page 28).
3	Channel	Displayed when [Trigger Mode] is set to [Level]. Select the channel where the trigger mode is to be applied (Page 29).
4	Spectrum	Displayed when [Trigger Mode] is set to [Level], and [Channel] is set to [Spectrum]. The spectrum can be set from 2.5Hz to 20kHz in 2.5Hz intervals (Page 29).

4.3.1 Store Mode

Sets the store mode. Select the [Manual] or [Auto] mode.
(Timer Auto is not available)

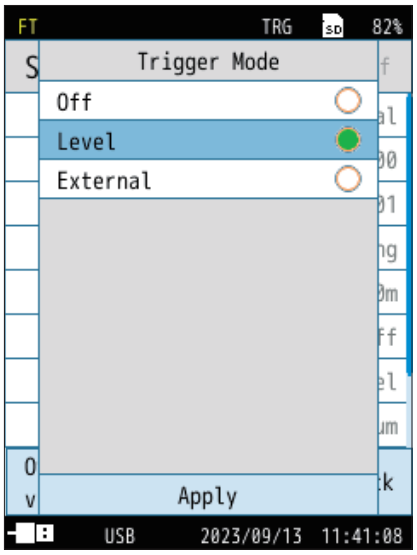


4.3.2 Trigger Mode

Select the trigger for starting measurement from [Level] and [External].
For [Level] and [External], refer to “Operation Guide” - “When [Comparator] is selected” in the Instruction Manual of each sound level meter.

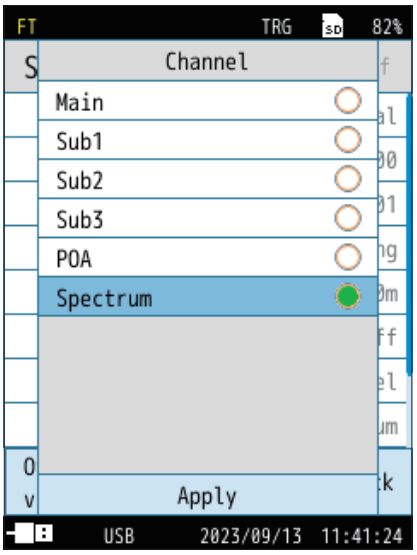
Note

- Level trigger starts measurement when the specified channel exceeds the specified level.
- External trigger starts measurement when the BNC terminals of the comparator output / trigger input cable CC-43CT connected to the I/O port are shorted.
- [Trigger Mode] cannot be used together with the following functions:
  - Delay Time
  - Level recording (NX-43WR function)
  - I/O port (when external trigger is set)



4.3.3 Channel

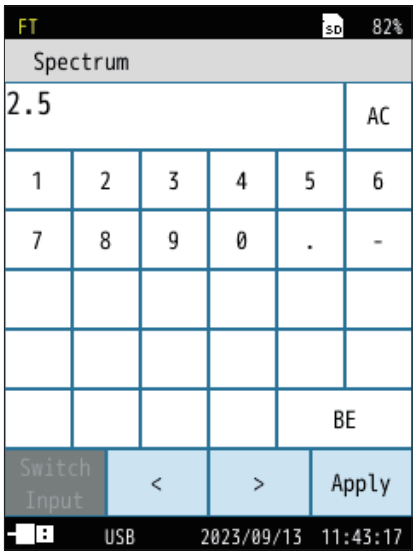
Displayed when [Trigger Mode] is set to [Level] on the [Store] screen.
Select the channel where the trigger mode is to be applied.



Note
Each sub channel (Sub1 to 3) is displayed and selectable only when set to display.

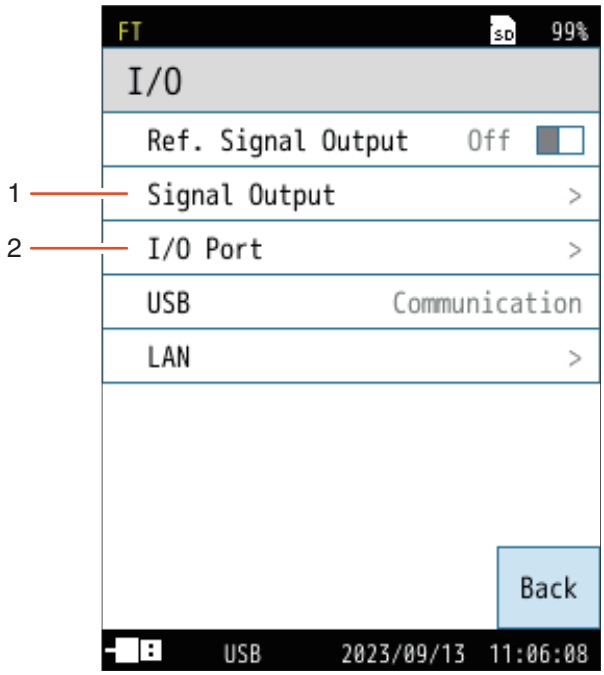
4.3.4 Spectrum

Displayed when [Trigger Mode] is set to [Level], and [Channel] is set to [Spectrum].
The spectrum can be set from 2.5Hz to 20kHz in 2.5Hz intervals.



4.4 I/O

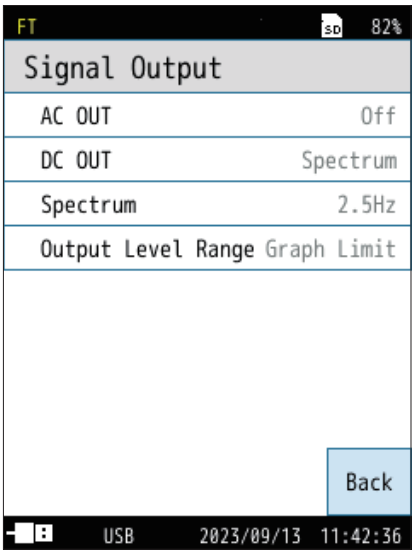
This screen is used to set the types of signals to be input and output externally.



No.	Name	Description
1	Signal Output	Sets the AC output and DC output (Page 31).
2	I/O Port	Sets the I/O port on the bottom of the device (Page 34).

4.4.1 Signal Output

Sets the AC output and DC output.



Item	Description
AC OUT*	Sets the AC signal output from the AC/DC terminal on the bottom of the device.
DC OUT*	Sets the DC signal output from the AC/DC terminal on the bottom of the device.
Output Level Range	Sets the upper limit of the output level range.

* For details, refer to “Operation Guide” - “Connecting the AC/DC output ports” in the Instruction Manual of each sound level meter.

Important

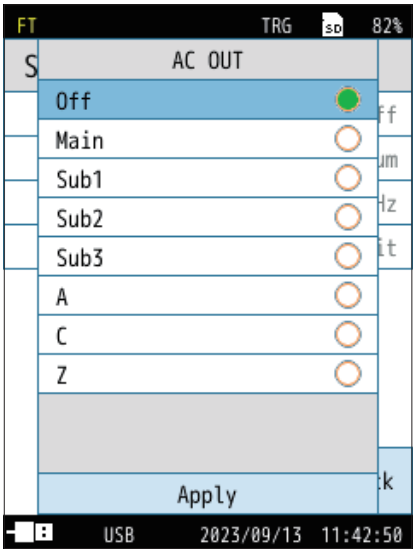
- Make sure that the dedicated cable and stereo output adapter CC-43S are properly connected. Connecting them in an incorrect combination may damage the main unit.

Note

- Simultaneous output of AC output and DC output is possible. To output either AC output or DC output, use CC-24. To output them simultaneously, use CC-43S.
- If either [AC OUT] or [DC OUT] is set to [On] with stereo output cable CC-43S connected, the output will be made from channel 1. If both are set to [On], the AC output will be made from channel 1. If either [AC OUT] or [DC OUT] is set to [On] with the stereo output cable connected, the output will always be made from channel 1. If both are set to [On], the AC output will be made from channel 1 and the DC output from channel 2.

AC OUT

Item	Description
Off	No AC signal is output.
Main	The frequency weighting set for the selected channel is applied and the AC signal corresponding to the sound pressure waveform is output.
Sub1	
Sub2	
Sub3	
A	The selected frequency weighting is applied and the AC signal corresponding to the sound pressure waveform is output.
C	
Z	
G	
Z(HPF)	
Z(LPF 100Hz)	
Z(LPF 500Hz)	

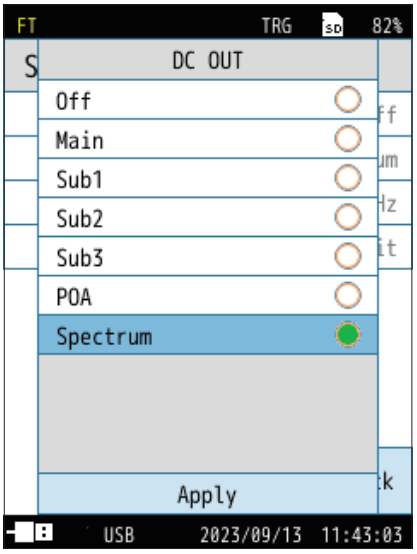


Note

- G, Z(HPF), Z(LPF 100Hz), and Z(LPF 500Hz) weighting are functions of the NL-63 only.
- POA is not available for AC output.

DC OUT

Item	Description
Off	No DC signal is output.
Main	The frequency weighting and time weighting set for the selected channel are applied and the DC signal corresponding to the sound level (L_p) is output.
Sub1	
Sub2	
Sub3	
POA	The frequency weighting is applied and the DC signal corresponding to INST is output.
Spectrum	The frequency weighting is applied and the DC signal corresponding to INST is output.



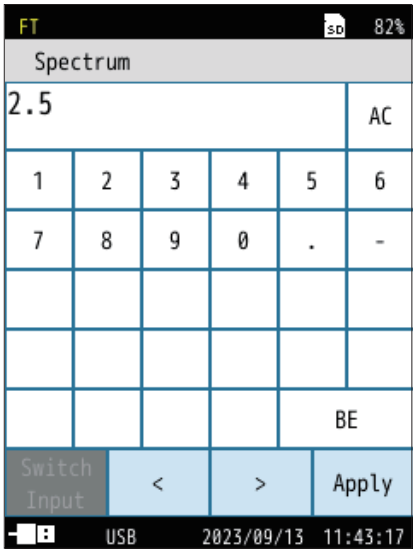
Note

Each sub channel (Sub1 to 3) is displayed and selectable only when set to display.
[POA] is displayed and can be selected only with the following settings:

- Partial Overall (POA): On

• Spectrum

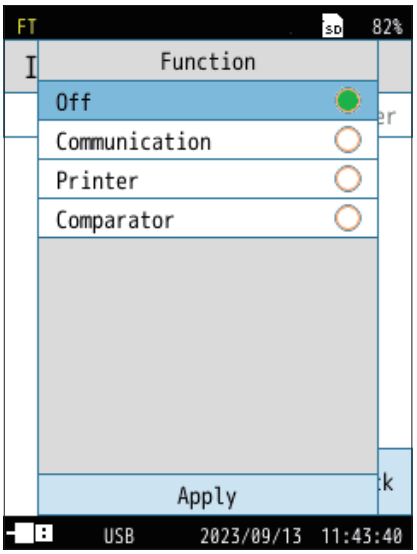
The spectrum can be set from 2.5Hz to 20kHz in 2.5Hz intervals.
If a spectrum is selected on the [Menu] - [I/O] - [Signal Output] - [DC OUT] screen, the frequency can be set on the [Spectrum] screen. Once this is set, the frequency information is displayed in the information display bar (Page 16).



4.4.2 I/O Port

Sets the I/O port on the bottom of the device.

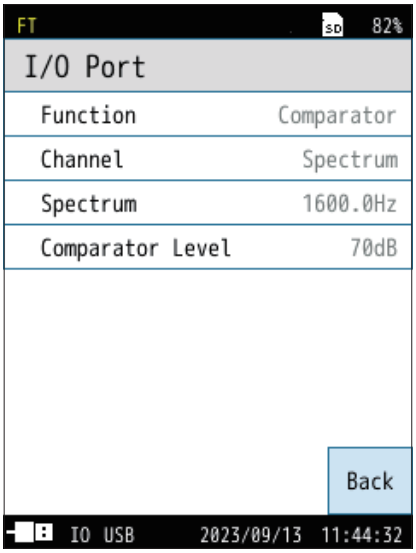
Item	Description
Off	Turns off the I/O setting of the I/O port.
Communication	Measurement values can be acquired and settings can be changed by using communication commands.
Printer	The contents on the screen can be printed using the dedicated printer DPU-414 or BL2-58. * DPU-414 and BL2-58 are no longer manufactured and sold.
Comparator	Outputs the comparator signal (open collector signal for external device control). Select the channel for comparator judgment (select from Main, Sub1 to 3, Band) and level (30dB to 130dB) can be set. Set the frequency when selecting the spectrum.



When [Spectrum] is selected for the channel with [Comparator]

The comparator output turns on when the specified channel exceeds the set level.

Item	Description
Channel	Select the channel for comparator judgment from Main, Sub1 to 3, and Spectrum.
Spectrum	Displayed when [Spectrum] is selected for the channel with [Comparator]. The spectrum can be set from 2.5Hz to 20kHz in 2.5Hz intervals.
Comparator Level	Sets the level at which the comparator output is turned on.



Note

- [POA] is not available for [Comparator].

Factory default settings

The factory default settings for the main setting items are listed below.

Item			Default settings
Display	LIN		On
	MAX		On
	X-Axis Setting		Linear
	Peak List		Off
	Time-Level		20s
	Display Overlay		Off
Measure	FFT Analysis	Window Function	Hanning
		Partial Overall (POA)	Off
		Upper Freq. of POA	20000.0Hz
		Lower Freq. of POA	2.5Hz
	Frequency Weighting	Main, Sub1 to 3	A
		FFT	Z
	Time Weighting	Main, Sub1 to 3	F
Store	Store Mode		Manual
	Store Name		0000
	Address		0001
	Meas. Duration		20m
	Delay Time		Off
	Trigger Mode		Off
I/O	Ref. Signal Output		Off
	Signal Output	AC OUT	Off
		DC OUT	Off

5 Measure

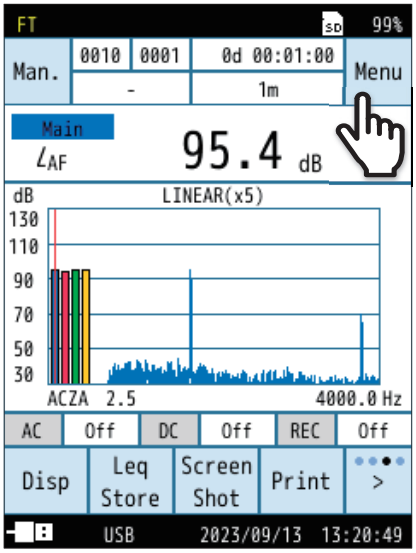
5.1 Measure

Note

- After installation is complete, the program card for this program can be used as an SD card for storing data.
- Prior to measurement, first format the SD card for storing data with the device.

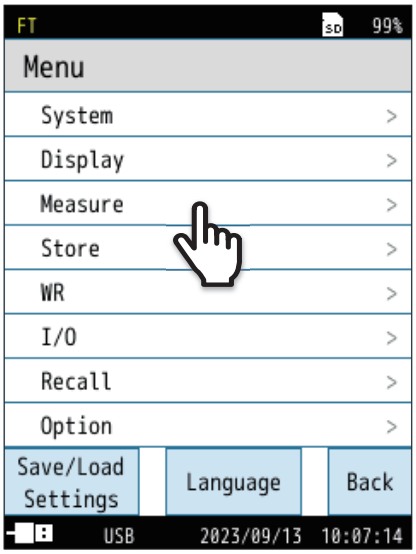
1 Touch [Menu] on the measurement screen.

The [Menu] screen appears.



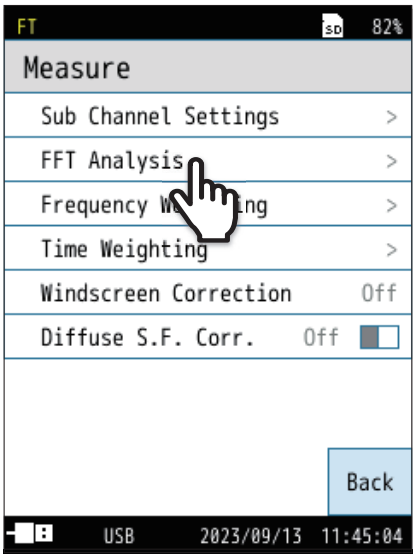
2 Touch [Measure] on the [Menu] screen.

The [Measure] screen appears.



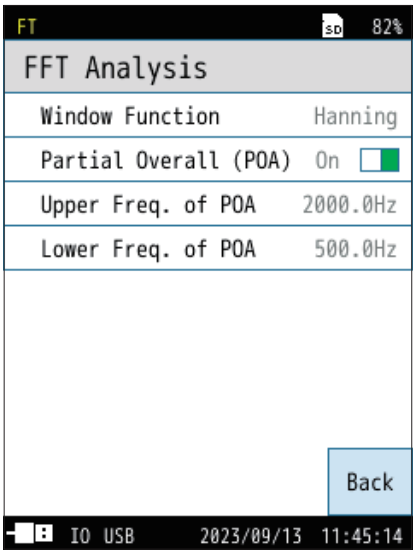
3 Touch [FFT Analysis] on the [Measure] screen.

The [FFT Analysis] screen appears.

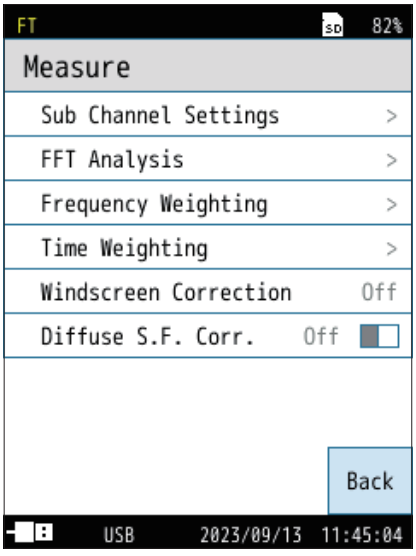


4 Set [Window Function] and, if necessary, [Partial Overall (POA)].

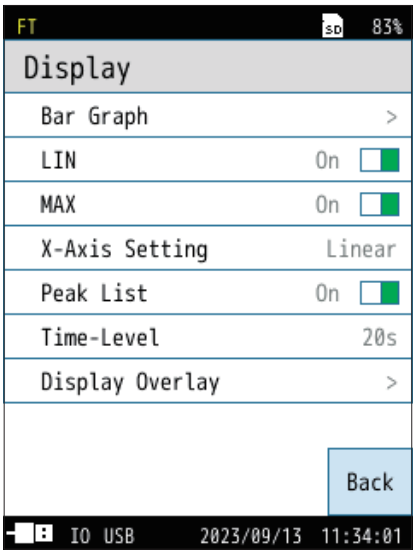
Item	Description
Window Function	Select from [Hanning] and [Rectangular].
Partial Overall (POA)	Turns on/off the Partial Overall (POA). When [On] is selected, the partial overall upper and lower frequency limits can be set.



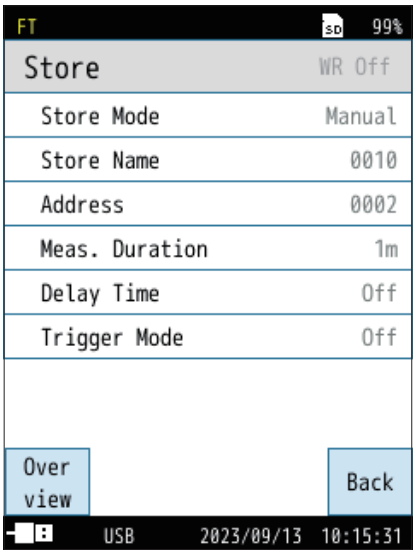
5 Return to the [Measure] screen and set the required items such as frequency weighting and time weighting.



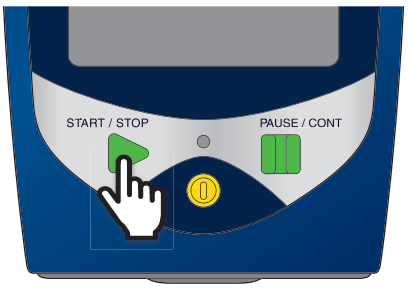
6 **Return to the [Menu] screen, and touch [Display] to set the necessary items.**



7 **Return to the [Menu] screen, and touch [Store] to set [Store Mode] and the measurement conditions.**



8 **Touch [Back] or press the START/STOP key to return to the measurement screen.**



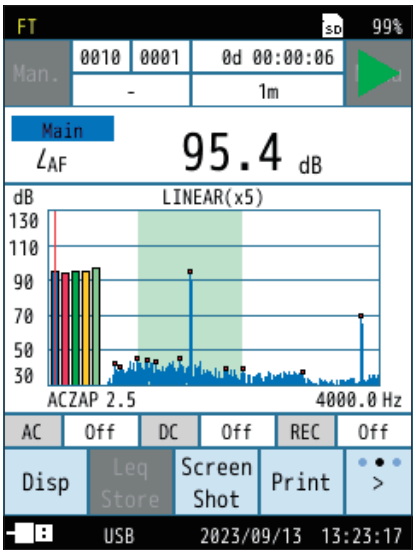
9 Press the START/STOP key to start measuring.

- On the measurement screen, touch [Disp] to switch the screens in the following order:

INST (Graph) » INST (Peak list) » LIN (Graph) » LIN (Peak list) » MAX (Graph) » MAX (Peak list) » Time-Level

* The items that are set to [Off] in the [Menu] - [Display] screen are skipped (Page 14).

- To move the cursor, touch the screen or touch [< Freq.] [> Freq.] on the menu ring. Touch and hold for faster movement.
- During measurement, the PAUSE/CONT key can be used to pause and resume the measurement (only when the store mode is set to Manual, and waveform recording is off). When paused, [PAUSE] and [II] are displayed flashing on the screen. Touch [Lp Store] on the menu ring to save the sound level (L_p).
- While no measurement is in progress, pressing the PAUSE/CONT key will display [PAUSE] and [II] on the screen, and pause the sound level displayed at that point. Press the PAUSE/CONT key again to cancel the pause.

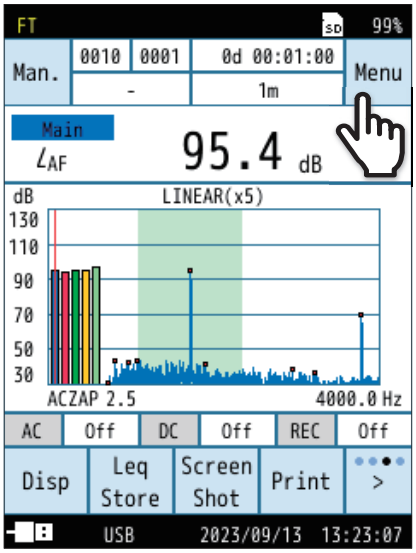


5.2 Displaying the overlay data

Register the recall data as overlay data, and display it overlaid on the current measurement on the measurement screen.

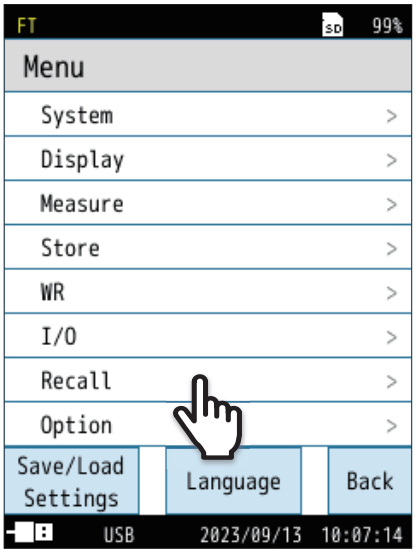
1 Touch [Menu] on the measurement screen.

The [Menu] screen appears.

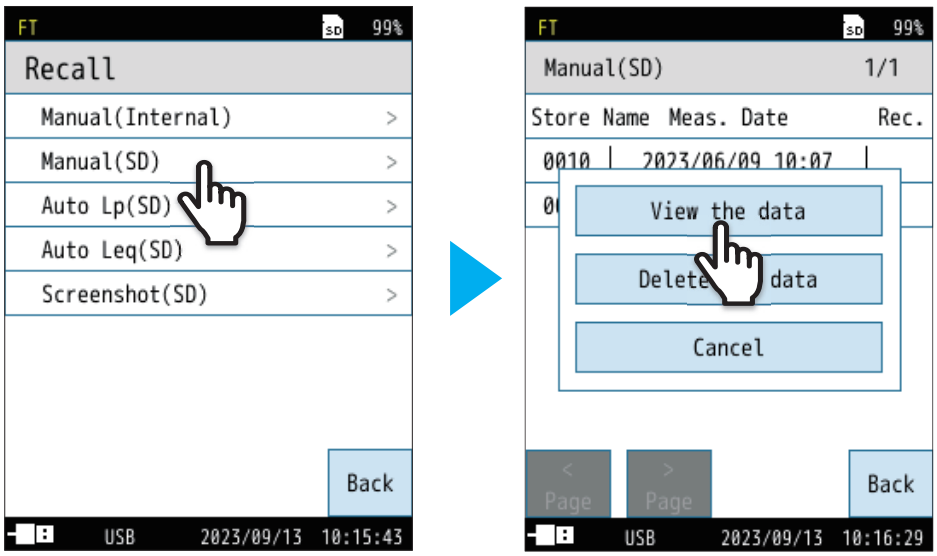


2 Touch [Recall] on the [Menu] screen.

The [Recall] screen appears.

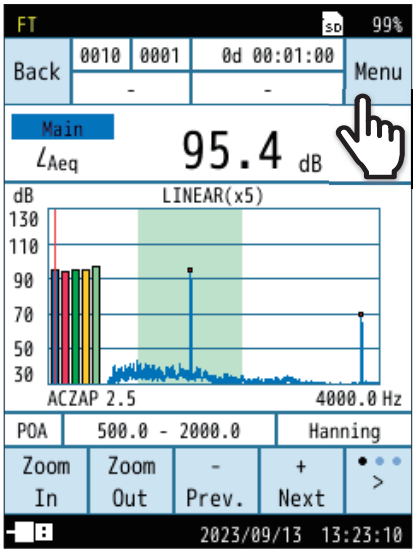


3 Read the recall data from the [Recall] screen.



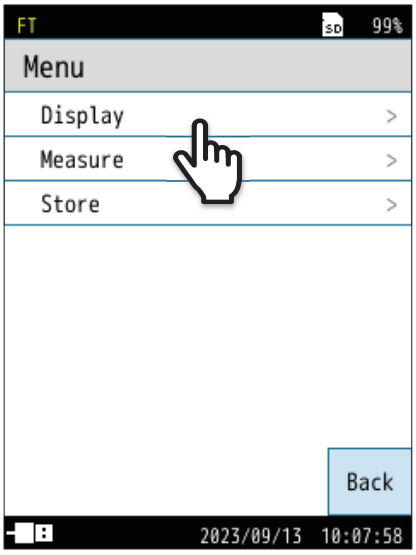
4 Touch [Menu].

The [Menu] screen appears.



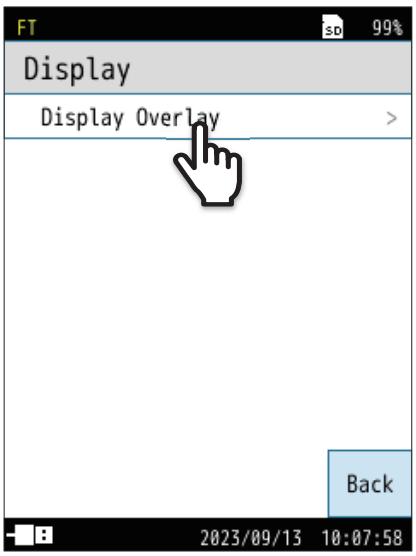
5 Touch [Display] on the [Menu] screen.

The [Display] screen appears.



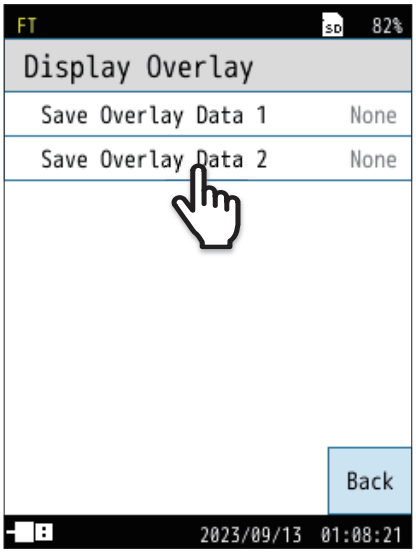
6 Touch [Display Overlay].

The [Display Overlay] screen appears.



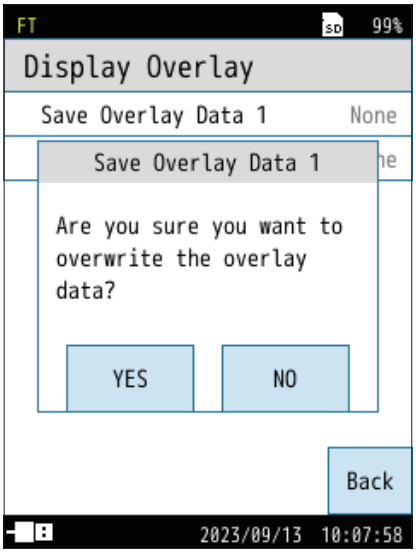
7 Touch [Save Overlay Data 1] or [Save Overlay Data 2].

The overlay data will be saved.
Up to two overlay data can be registered.

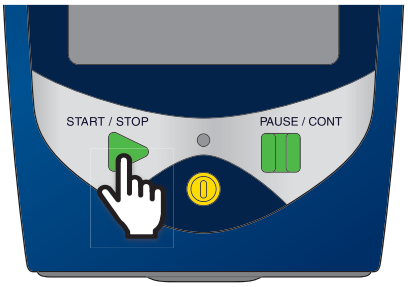


If saved data already exists, the screen shown to the right appears.

For details on how to delete the registered overlay data, refer to Page 23.

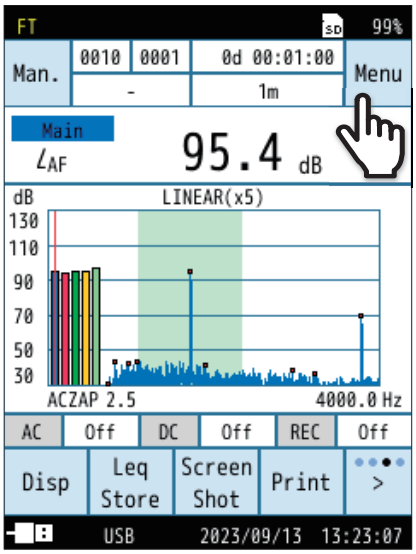


8 Touch [Back] or press the START/STOP key to return to the measurement screen.



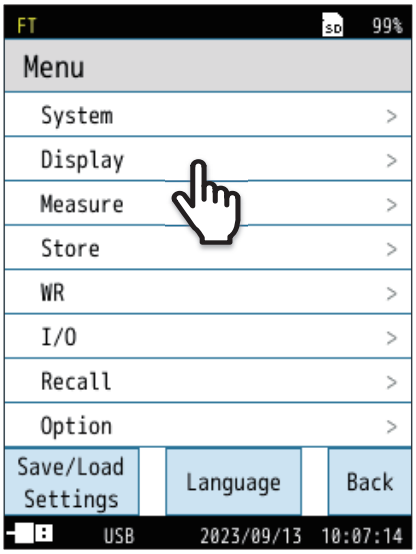
9 Touch [Menu] on the measurement screen.

The [Menu] screen appears.



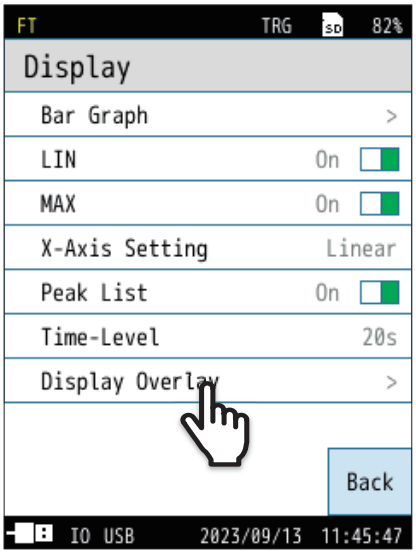
10 Touch [Display] on the [Menu] screen.

The [Display] screen appears.



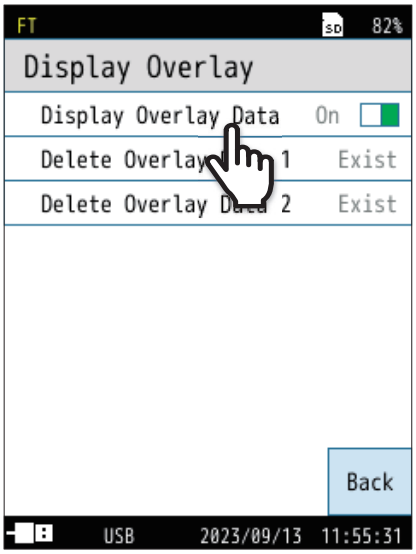
11 Touch [Display Overlay].

The [Display Overlay] screen appears.

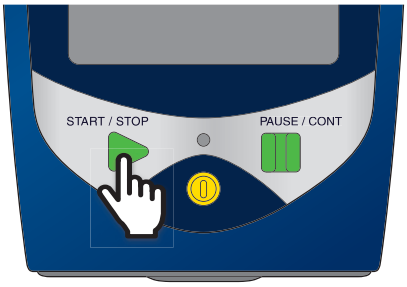


12 Set [Display Overlay Data] to [On].

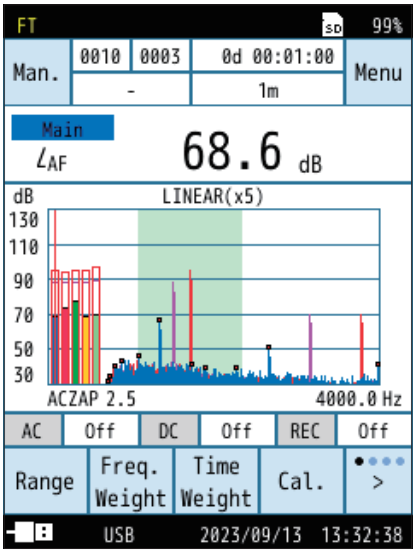
For details on how to delete the registered overlay data, refer to Page 23.



13 Touch [Back] or press the START/STOP key to return to the measurement screen.



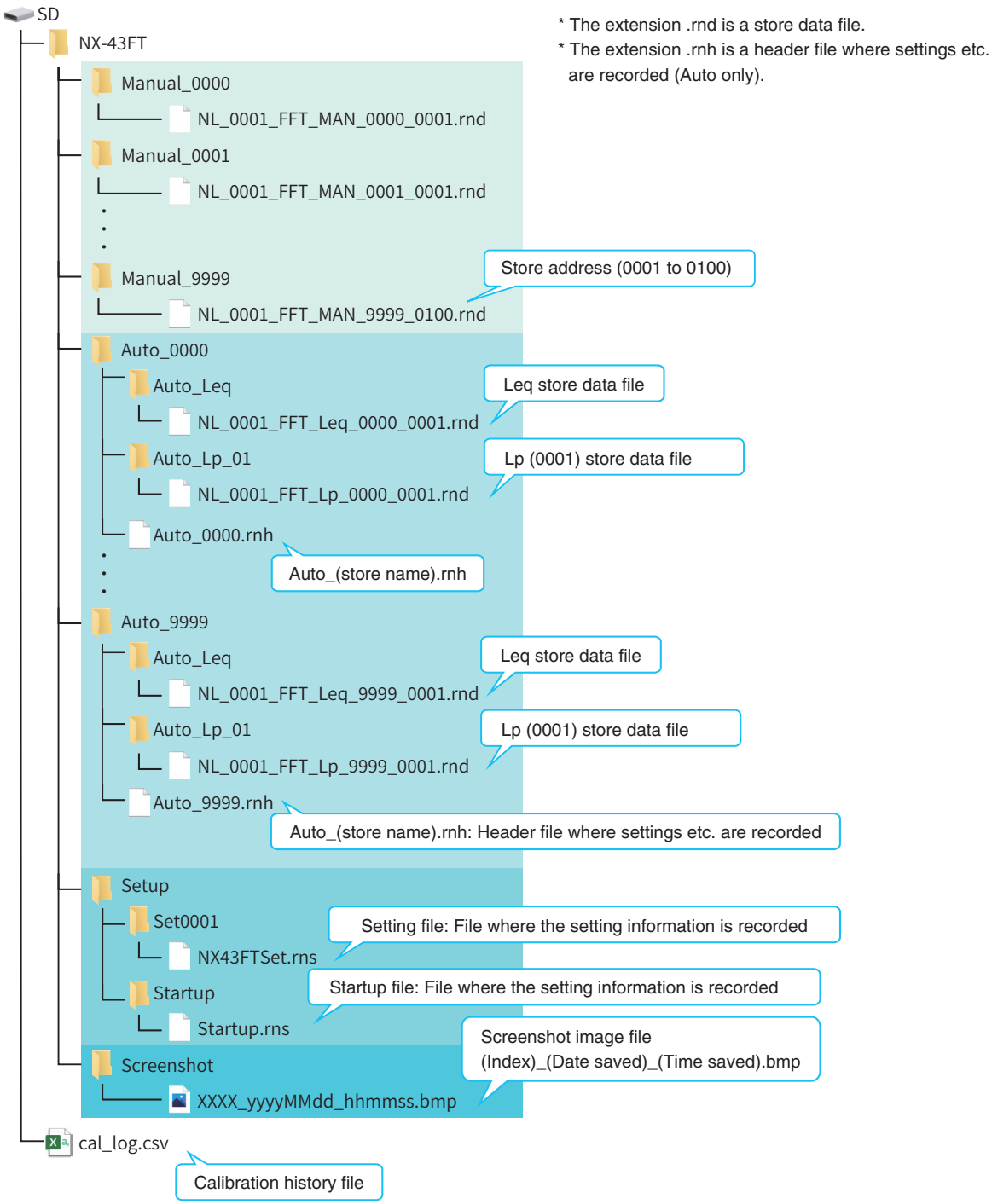
The registered overlay data is displayed on the measurement screen. Overlay data 1 is displayed with red lines and Overlay data 2 with purple lines.



5.3 Store data format and file structure

Folder and file names that are used for saving data differ, depending on the selected store mode.

File organization

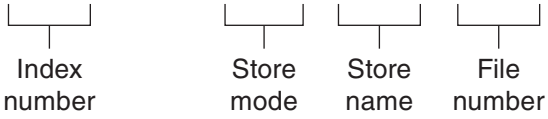


* The extension .rnd is a store data file.
* The extension .rnh is a header file where settings etc. are recorded (Auto only).

Data file name

Data files are named as shown below.

NL_0001_FFT_MAN_0000_0001.rnd



- Index number
  The number set in [Menu] – [System] – [System Information] – [Index number].
- Store mode
  The file name varies depending on the store mode.
  Manual store: MAN
  Auto store: Leq or Lp␣ (one single-byte space)
- Store name
  0000 to 9999
- File number
  For the Manual store, the store address (0001-0100) is shown here.

5.4 SD card

Important

- Use SD cards provided by Rion. The performance of other cards is not guaranteed.
- Note that we assume no responsibility for any damage or loss of stored measurement data.

Measurable time

The measurable time depends on the SD card capacity.
The measurable time to an SD card is as follows:

L_p store interval	SD card capacity		
	512 MB	2 GB	32 GB
400 ms	1 h	4 h	71 h

* SD card capacity may be less than indicated, depending on the type of SD card.

When performing Auto store

When one of the following conditions occurs, the store is stopped and data is saved.

- When the total measurement time reached the set value
- When the remaining capacity of the SD card became 1 MB or less
  (Waveform recording stops when the remaining capacity of the SD card becomes 10 MB or less.)

6

Communication Commands

For a list of additional commands for the Class 2 Sound Level Meter NL-43, Class 1 Sound Level Meter NL-53, and Class 1 Sound Level Meter (with low-frequency sound measurement function) NL-63 with NX-43FT installed, refer to the Communication Guide of the respective sound level meter.

7

Specifications

<table>
<tr><td>Model</td><td>Class 2 Sound Level Meter NL-43
Class 1 Sound Level Meter NL-53
Class 1 Sound Level Meter (with low-frequency sound measurement function) NL-63</td></tr>
<tr><td>Media</td><td>512 MB SD card</td></tr>
<tr><td>Measurement function</td><td>In addition to sound levels (up to four conditions), FFT analysis processing and calculation of Partial Overall (POA) for specified ranges are possible.
Sound level (Main, Sub 1 to 3)
<table>
<tr><td>Instantaneous value</td><td>Time-weighted sound level</td><td>L_p</td></tr>
<tr><td>Calculated values</td><td>Time-weighted sound level
Maximum time-weighted sound level</td><td>L_{eq}
L_{max}</td></tr>
</table>
FFT analysis
<table>
<tr><td>Instantaneous value</td><td>Spectrum of 1 frame</td><td>INST</td></tr>
<tr><td>Calculated values</td><td>Power average of spectrum
Maximum of spectrum</td><td>LIN
MAX</td></tr>
</table></td></tr>
<tr><td>Linear operating range</td><td>113 dB (A-weighting, 1 kHz)</td></tr>
<tr><td>FFT analysis</td><td>
<table>
<tr><td>Number of analysis points</td><td>19,200 points (8,000 lines, frequency resolution 2.5 Hz)</td></tr>
<tr><td>Frequency range</td><td>20 kHz (sampling frequency 48 kHz)</td></tr>
<tr><td>Overlap</td><td>0%</td></tr>
<tr><td>Window function</td><td>Hanning, Rectangular</td></tr>
</table></td></tr>
<tr><td>Frequency weighting</td><td>Sound level (Main, Sub 1 to 3): A-weighting, C-weighting, Z-weighting, G-weighting*
FFT analysis: A-weighting, C-weighting, Z-weighting, G-weighting*
* G-weighting is only available with the NL-63.</td></tr>
<tr><td>Time weighting</td><td>Sound Level (Main, Sub 1 to 3): F (fast), S (slow), I (impulse), 10 s*
* 10 s is only available with the NL-63.</td></tr>
<tr><td>Level range switching</td><td>
<table>
<tr><td>Level range</td><td>One range</td></tr>
<tr><td>Bar graph display</td><td>Upper limit: 70 dB to 130 dB can be set in 10 dB increments
Lower limit: -10 dB to 60 dB can be set in 10 dB increments</td></tr>
<tr><td>Signal output range</td><td>Can be linked to the bar graph upper limit, or set from 70 dB to 130 dB in 10 dB increments.</td></tr>
</table></td></tr>
<tr><td>Effective value detection</td><td>Digital calculation method</td></tr>
<tr><td>Sampling interval</td><td>Sound level (Main, Sub 1 to 3)
<table>
<tr><td>L_p, L_{eq}, L_{max}</td><td>20.8 µs (sampling frequency 48 kHz)</td></tr>
</table>
FFT analysis
<table>
<tr><td>INST, LIN, MAX</td><td>400 ms</td></tr>
</table></td></tr>
<tr><td>Reference signal output to external devices</td><td>
<table>
<tr><td>Frequency</td><td>1 kHz</td></tr>
<tr><td>Output level</td><td>Bar graph upper limit – 6 dB</td></tr>
</table></td></tr>
</table>

Trigger mode

Starts measurement upon the following trigger.

Level trigger	Measurement starts when the specified channel exceeds the specified level. Channel: Select from Main, Sub 1 to 3, POA, and Spectrum
External trigger	Measurement starts when the BNC terminals of the comparator output / trigger input cable CC-43CT connected to the I/O port are shorted.

Display

Level graphs and Time-Level graphs that correspond to various measurement values can be displayed.

Graph update cycle	Sound level: 100 ms, FFT: 400 ms
Numeric value update cycle	Sound level: 1 s, FFT: 400 ms
Measurement value display method	Graph or number list
Peak list	Displays the top eight peak frequencies and level values
Zoom rate	1x, 2x, 5x, 10x, 20x, 40x
X axis	Linear or logarithmic

Overload / under-range indication

The following notifications are sent for the sound level and FFT analysis respectively.

- OVER is displayed for a signal input that is larger than the upper measurement limit.
- UNDER is displayed for a signal input that is smaller than the lower measurement limit (excluding FFT analysis).
- OUTPUT OVER is displayed for a signal output that is larger than the output level range.

Manual store

Records instantaneous values or calculated values throughout a measurement to a file for one address at a time.

Measurement time	1 s to 59 s, 1 min to 20 min
Data storage capacity	SD card: Data can be saved with store names from 0000 to 9999 (up to 100 addresses for each store).

Auto store

Repeatedly records instantaneous values (Auto L_p store) and calculated values (Auto L_{eq} store) throughout a measurement to a file.

Total measurement time	20 min (fixed)
Lp store interval	400 ms
Leq calculation interval	20 min (fixed)
Data storage capacity	SD card: Data can be saved with store names from 0000 to 9999.

Waveform recording

The waveform recording function can be used in parallel with store (total recording only).
* Waveform Recording Program NX-43WR (optional) function

Overlay of measurement values

Select up to two recall data measurement results and display them overlaid.

Output

AC output	Output characteristics: Sound level (Main, Sub 1 to 3) link (channel can be selected) A-weighting, C-weighting, Z-weighting, G-weighting (NL-63 only) Output voltage: 1 Vrms at the output level range Output resistance: 50 Ω Load impedance: 10 kΩ or more
DC output	Channel: Selectable from Sound level (Main, Sub 1 to 3), POA, and Spectrum Output voltage: 2.5 V, 25 mV/dB at the output level range upper limit Output resistance: 50 Ω Load impedance: 10 kΩ or more
DC/AC simultaneous output	Enables simultaneous output of DC output and AC output.

<table>
<tr><td>Comparator</td><td>The comparator output turns on when the specified channel exceeds the set level.
<table>
<tr><td>Channel</td><td>Selectable from Main, Sub1 to 3, POA, and Spectrum</td></tr>
<tr><td>Level</td><td>30 dB to 130 dB can be set in 1 dB increments</td></tr>
</table></td></tr>
<tr><td>Communication/
RS-232C</td><td>
<table>
<tr><td>Communication</td><td>Measurement values can be acquired and settings can be changed by using communication commands.</td></tr>
<tr><td>Print</td><td>Printing is possible using the dedicated printer DPU-414 or BL2-58.
Prints the measurement screen or saved data screen.</td></tr>
<tr><td>Baud rate</td><td>9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps</td></tr>
</table></td></tr>
<tr><td>USB</td><td>
<table>
<tr><td>Communication</td><td>Measurement values can be acquired and settings can be changed by using communication commands.</td></tr>
<tr><td>Data transfer</td><td>Enables the transferring of data by making the computer recognize the SD card as a removable disk.</td></tr>
</table></td></tr>
<tr><td>LAN</td><td>
<table>
<tr><td>Communication</td><td>Measurement values can be acquired and settings can be changed by using communication commands.</td></tr>
<tr><td>Data transfer</td><td>Data on an SD card can be transferred to a computer.</td></tr>
</table></td></tr>
<tr><td>Power</td><td>4 × AA batteries, power supply to DC jack and USB port
<table>
<tr><td>Operating time
on NL-43/NL-53/NL-63
(at 23°C with ECO setting)</td><td>Alkaline battery LR6: Approx. 8 hours
Ni-MH rechargeable battery HR6: Approx. 8 hours
Mobile battery: Approx. 16 hours at 5000 mAh
* The operating time varies depending on the device settings and the battery manufacturer.</td></tr>
<tr><td>AC adapter</td><td>NE-21P
(Input: 100 V to 240 V AC, 50/60 Hz, Output: 12 V DC)</td></tr>
<tr><td>External power supply voltage</td><td>5.7 V to 15 V (rated voltage 12 V)
USB port: 5 V</td></tr>
<tr><td>Primary side
(100 V side)
power consumption</td><td>Approx. 4 W</td></tr>
</table></td></tr>
<tr><td>Dimensions</td><td>32 mm (H) × 24 mm (W) × 2.1 mm (D)</td></tr>
<tr><td>Weight</td><td>Approx. 5 g</td></tr>
<tr><td>Accessories</td><td>Supplied Accessories & Inspection Certificate</td></tr>
</table>

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