

# **INSTRUCTION MANUAL**

FFT Analysis Card

## **NX-22FT**



3-20-41 Higashimotomachi, Kokubunji, Tokyo 185-8533, Japan



## **Organization of This Manual**

This manual describes functions and operation principles of the FFT analysis card NX-22FT. The manual consists of the chapters listed below. You should also consult the documentation for the Class2 Sound Level Meter NL-22 or Class1 Sound Level Meter NL-32.

### **Outline**

Gives basic information on the NX-22FT.

### **Inserting and Removing the Card**

Explains how to mount the NX-22FT card in the sound level meter and how to remove it.

### **Power On/Off**

Explains how to start the software and how to turn the unit on and off.

### **Menu Screens**

Explains general menu operations and setting procedures.

### **Calibration**

Explains calibration of the unit before measurement.

### **Measurement**

Explains general measurement screens and the procedure for measurement.

### **Memory Operations**

Explains how to store, recall, and delete data.

### **Convert Data Files**

Explains how to convert data files stored on the NX-22FT card to Microsoft Excel format.

### **Printing**

Explains how to print out results and shows print samples.

## Default Values

Lists the factory default settings for various parameters.

## Communication Commands

Explains the commands that become available when the NX-22FT is installed.

## Reference

Contains FFT spectrum graphs of inherent noise.

## Specifications

Lists the specifications of the NX-22FT.

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

# Usage License Agreement

<b>Important</b>
------------------

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 NX-22FT Analysis Software 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

The user may install and use the software on one computer that runs a licensed version of Microsoft Windows 95 / 98, or Microsoft Windows NT (Ver. 4.0). (Microsoft, Windows, Windows NT is a registered trademarks of Microsoft Corporation). For backup purposes only, the user may make one (1) copy of the software.

## **2. Intellectual Property Rights**

Rion Co., LTD. only grants the right to use the software. The software itself is not sold to the user.

Rion Co., LTD. holds the copyright to the software, and the rights to all copies revert to Rion Co., LTD. The user may not remove any copyright or trademark information attached to the software.

### **3. Limitations**

- (1) Based on this agreement, the user only acquires the right to use the software. Any other rights not covered in this agreement are not accorded to the user. The user may not copy or otherwise duplicate the software and the associated documentation by any means, in whole or in part, except for the case stated in "1. (2) Usage". The software and the associated documentation are protected by copyright laws.
- (2) The user does not have the right to give, sell, loan or otherwise make available the software and associated documentation to third parties, or to grant any usage rights to third parties.
- (3) The user does not have the right to alter, decompile, or reverse-engineer the software.
- (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**

- (1) Rion Co., LTD. does not guarantee that the software is fit for any particular purpose of the user, whether stated explicitly or implicitly, or that the software is free of errors. Rion Co., LTD. does not provide any other kind of warranty except as stated in this agreement. Rion Co., LTD. does not accept responsibility for any kind of damage, whether direct or indirect, tangible or intellectual, that may arise from the use of the software or the failure of the software to perform any function.
- (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**

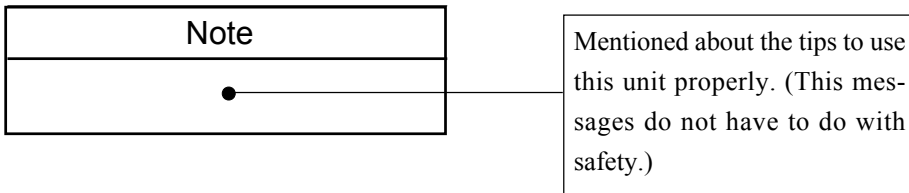
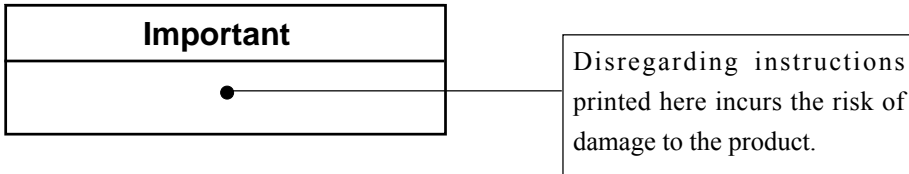
This agreement is valid until terminated. The user can terminate the agreement at any time by destroying the software and associated documentation and deleting all copies from the computer where the software was installed. The agreement also terminates when the user violates any of the conditions herein.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

## FOR SAFETY

In this manual, important safety instructions are specially marked as shown below. To prevent the severe damage to the unit or peripheral equipment, make sure that all instructions are fully understood and observed.





# Contents

Usage License Agreement .....	iii
Outline .....	1
Inserting and Removing the Card .....	2
Card Insertion/Removal .....	2
Power On/Off .....	3
Startup .....	3
Power-on .....	3
Power-off .....	4
Menu Screens .....	5
Calibration .....	11
Measurement .....	12
Measurement screen .....	12
Measurement Procedure .....	19
Measurement Modes .....	19
IST Mode .....	20
LIN Mode .....	22
MAX Mode .....	25
Menu Screen in Pause Mode .....	28
Memory Operations .....	29
Storing Data .....	29
Reading Stored Data .....	31
Erasing Data .....	33
Store Data Format .....	34
Convert Data Files .....	36
Printing .....	42
Default Values .....	45

Communication Commands .....	46
Command List .....	46
Command Format .....	49
Command Send Example .....	50
Command Description .....	51
Reference .....	66
Inherent noise FFT spectrum .....	66
Specifications .....	67

# Outline

The NX-22FT is a CompactFlash card (CF card) containing software that adds FFT analysis capability to the Class2 Sound Level Meter NL-22 or the Class1 Sound Level Meter NL-32.

The FFT analysis functions provided by the NX-22FT card are enabled simply by inserting the card into the sound level meter and turning the unit on. The unit can then calculate and display AP(A), AP, and 400-point FFT data.

The following parameters can be measured using FFT analysis:

- Instantaneous spectrum
- Averaged spectrum
- Maximum spectrum

The measurement data can be shown on the display as a graph.

The NX-22FT also functions as a memory card for storing measurement data. Because data are stored in CSV format, these can be read and processed by general-purpose software such as spreadsheet applications.

For detailed information on how to operate the controls on the NL-22/NL-32, please refer to the instruction manual of the NL-22/NL-32.

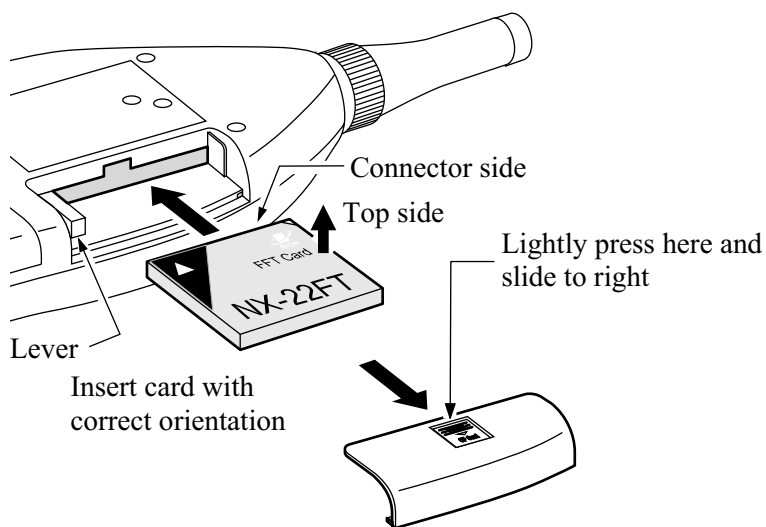
# Inserting and Removing the Card

## Card Insertion/Removal

### Important

Make sure that power to the sound level meter is turned off before inserting the card.

1. Remove the card slot cover on the NL-22/NL-32.
2. Insert the NX-22FT card into the card slot.  
Insert card carefully and slowly with correct orientation until it stops.
3. To remove the card, press the lever on the left side. The card pops out of the card slot.



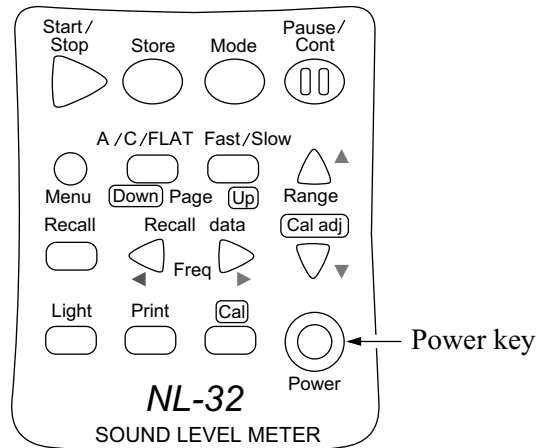
# Power On/Off

## Startup

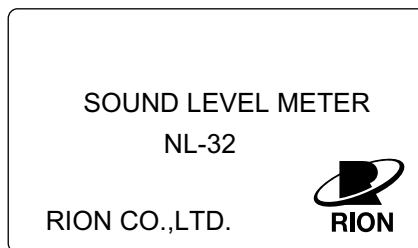
When power is turned on after the NX-22FT card was inserted in the NL-22/NL-32, the software from the card is automatically loaded into the NL-22/NL-32 and the unit starts to function as an FFT analyzer. To return to normal NL-22/NL-32 operation, turn power off, remove the NX-22FT card, and then turn power on again.

## Power-on

1. Turn the unit on by holding down the Power key for at least one second.

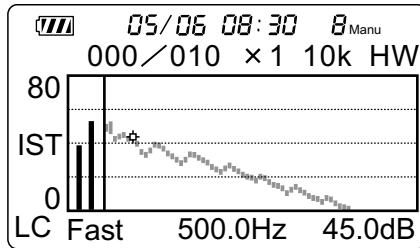


2. The initial screen as shown below appears.



Initial screen

3. After the initial screen was shown, the unit switches to the measurement screen as shown below.



Measurement screen

## Power-off

Turn the unit off by holding down the Power key for at least one second. The power-off screen as shown below appears and the unit is shut down.

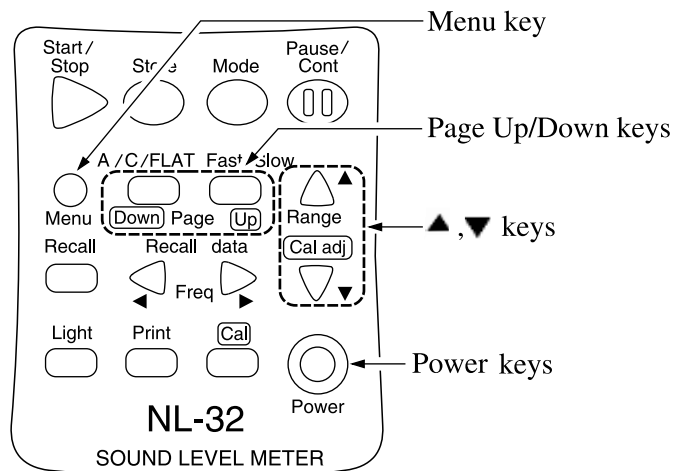


Power-off screen

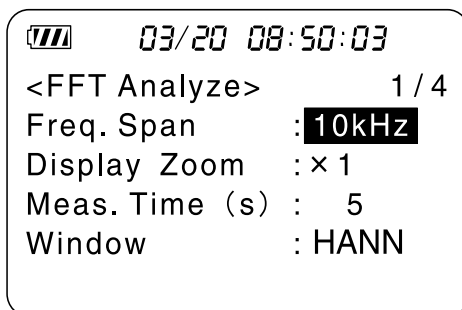
# Menu Screens

The menus serve to make various operation settings. There are four menu screens numbered 1/4 through 4/4.

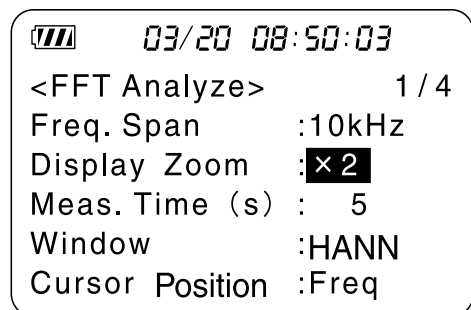
To switch from the measurement screen to the menu screen, press the Menu key. Use the Page Up/Down keys to switch between menu screens 1/4 to 4/4. Use the ▲ and ▼ keys to move the cursor to the various setting items.



## Menu screen (1/4)



Menu screen (1/4)  
(When display zoom is x1)



Menu screen (1/4)  
(When display zoom is x2 or x4)

## Freq. Span (frequency span for FFT)

Selects the frequency span for FFT analysis.

Pressing the ◀ and ▶ keys switches between the following settings:  
2 kHz ↔ 5 kHz ↔ 10 kHz ↔ 20 kHz (↔ 2 kHz ...)

## Display Zoom

Selects the display zoom factor.

Pressing the ◀ and ▶ keys switches between the following settings:

×1 ↔ ×2 ↔ ×4 (↔ ×1 ...)

## Meas. time (s) (measurement time)

Sets the measurement time in seconds. The number of measurements (FFT frames) is determined by the measurement time and the frequency span.

The measurement time can be set from 1 to 999 seconds in 1-second steps.

Pressing the ◀ and ▶ keys moves through the settings. After 999, the setting rolls over to 1. Keeping one of the keys depressed results in faster changes, as follows.

Hold key for about 0.5 seconds: 1-s increments

Hold key for about 1 second: 10-s increments

Hold key for about 1.5 seconds: 20-s increments

Hold key for about 2 seconds: 100-s increments

### Frequency span and sampling frequency

Frequency span	Sampling frequency	Sampling cycle	Frame time	Frequency resolution
20 kHz	48 kHz	20.8 μsec	20 msec	50 Hz
10 kHz	24 kHz	41.7 μsec	40 msec	25 Hz
5 kHz	12 kHz	83.3 μsec	80 msec	12.5 Hz
2 kHz	4.8 kHz	208 μsec	200 msec	5 Hz

### Note

A frame is a set of time series or frequency span data necessary for FFT processing. The duration of the frame depends on the selected analysis frequency span

## Window

Selects the type of window function for which Fast Fourier Transform is performed.

Pressing the ◀ and ▶ keys switches between the following settings:

RECT : Rectangular window

HANN : Hanning window

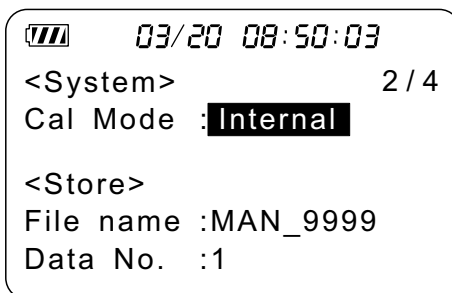


## Cursor Position

Selects whether the cursor is moved on AP(A), AP, or the spectrum. When display zoom is set to  $\times 1$ , this item does not appear.

When "Freq." is selected, the cursor can be moved to the AP(A) or AP position. When "AP" is selected the cursor moves onto AP or AP(A). Subsequent movement is possible on AP or AP(A) only, and the cursor cannot be moved to the spectrum. Select this setting when viewing the AP level value with zoomed high frequency display.

## Menu screen (2/4)



Menu screen (2/4)

### Cal Mode (calibration mode)

Pressing the ◀ and ▶ keys switches between the two available settings. To perform electrical calibration using only the internal circuitry, select the "Internal" setting. For calibration with an external pistonphone or acoustic calibrator, select the "External" setting. For details, refer to page 25 to 30 in the Instruction Manual of the NL-22/NL-32.

### File name

Allows you to specify a 4-digit number to be used as file name. Because this unit allows only manual storing, the first part of the file name is fixed to "MAN\_".

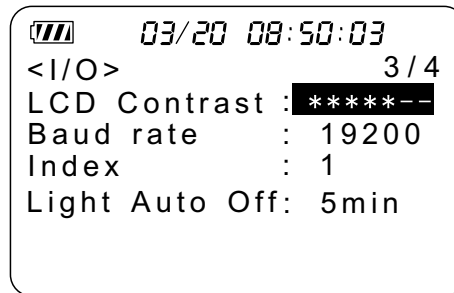
The 4-digit number is specified in blocks of 2 digits. Use the ▲ and ▼ keys to move the cursor and use the ◀ and ▶ keys to increase or decrease the number. The setting range is 00 to 99, in single-step increments. After 99, the setting reverts to 00.

### Data No. (address)

Allows you to specify the address for storing data. Up to 100 sets of data can be stored in each file.

Use the ◀ and ▶ keys to increase or decrease the number. The setting range is 1 to 100, in single-step increments. After 100, the setting reverts to 1.

## Menu screen (3/4)



Menu screen (3/4)

### LCD Contrast

The number of \* symbols corresponds to the contrast setting. It can be changed with the ◀ and ▶ keys in seven steps.

### Baud rate (I/O transfer speed)

Selects the transfer speed for serial communication via the RS-232C interface and for data output to a printer.

Pressing the ◀ and ▶ keys switches between the following settings:  
4800 ↔ 9600 ↔ 19200 (↔ 4800 ...) (Unit: bps)

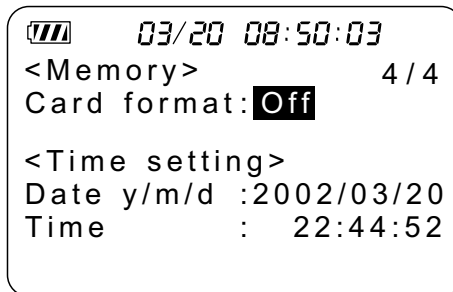
### Index

This is a number for identifying the unit during communication with a computer when multiple units (up to 255) are used. The setting range is 1 to 255. Use the ◀ and ▶ keys to increase or decrease the number.

### Light Auto Off

Sets the automatic backlight turn-off function of the LCD to 5 minutes or "Cont.". Use the ◀ and ▶ keys to switch between the following settings.  
5 min: Backlight is automatically turned off after 5 minutes  
Cont.: Backlight on/off is controlled only by the Light key.

## Menu screen (4/4)



Menu screen (4/4)

### Card format

The default setting is "Off".

To delete all data stored on the NX-22FT card, use the ◀ and ▶ keys to set the item to "On".

For more information on deleting data, refer to page 33.

### Date y/m/d

#### Time

Serves for setting the current date and time.

Use the ▲ and ▼ keys to move the cursor to the desired item, and use the ◀ and ▶ keys to set the numbers.

The indication "Set ready? → Start" flashes at the bottom of the display.

When you press the Start key, the internal clock of the unit is set to the selected date and time.

# Calibration

Before starting measurement, you should calibrate the sound level meter. For details, see the instruction manual for the Sound Level Meter NL-22/NL-32, section "Calibration", page 25 to 30.

To make Cal Mode settings, press the Menu key and access menu screen 2/4. When you press the Cal key at the measurement screen, the calibration screen appears. Note that the level range indication will be different on the calibration screen and the measurement screen, as shown in the table below.

Measurement screen	Calibration screen
0 to 80 dB	10 to 70 dB
10 to 90 dB	20 to 80 dB
20 to 100 dB	20 to 90 dB
30 to 110 dB	20 to 100 dB
40 to 120 dB	20 to 110 dB
50 to 130 dB	30 to 120 dB
60 to 140 dB	40 to 130 dB

## Note

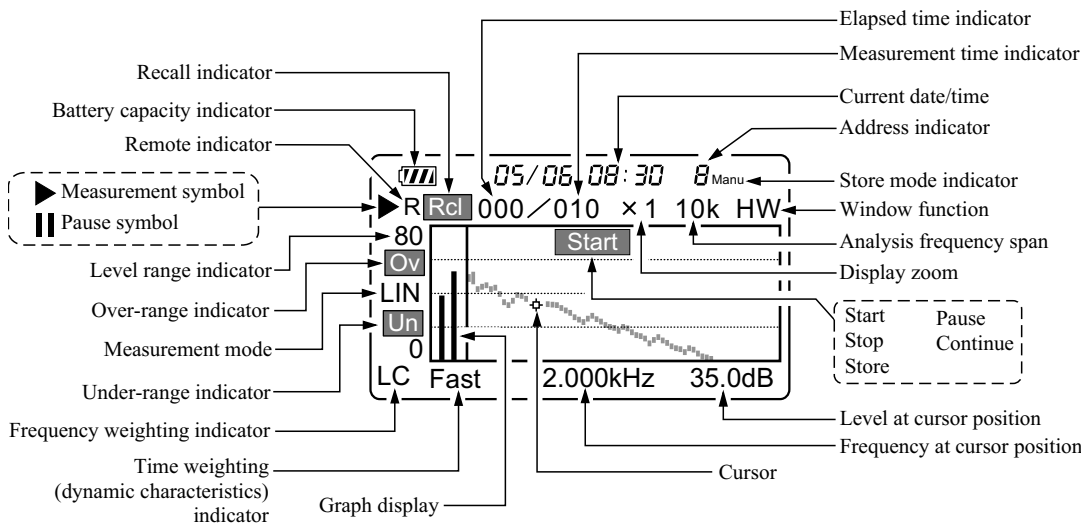
AC output voltage

At the measurement screen, AC output voltage is 1 Vrms at the full-scale -10 dB point. At the calibration screen, AC output voltage is 1 Vrms at the full-scale point.

# Measurement

## Measurement screen

A screen such as shown below will not appear in actual operation. The illustration is intended to show all display elements.



(Size and font of the actual display may differ.)

### Elapsed time indicator

During processing, this indicator shows the elapsed time in seconds.

### Measurement time indicator

Shows the measurement time set with menu screen 1/4 in seconds.

### Current date/time

Shows the current date and time as month/day, hour:minute.

### Address indicator

Shows the Data No. set with menu screen 2/4.

The display range is 1 to 100, and the display is automatically incremented by 1 every time a set of data is stored. After Data No. 100 has been stored, the indication "100" flashes. If an attempt is made to store more data in this condition, an error message is shown and the store operation is not performed.

## Store mode indicator

Shows the data store mode. Because this unit allows only manual storing, the indication is fixed to "Manu".

## Window function

Shows the window function set with menu screen 1/4.

HW: Hanning window

RW: Rectangular window

## Analysis frequency span

Shows the frequency span set with menu screen 1/4 (2 kHz, 5 kHz, 10 kHz, 20 kHz).

## Display zoom

Shows the display zoom factor set with menu screen 1/4 ( $\times 1$ ,  $\times 2$ ,  $\times 4$ ).

## Processing indicator

Start: Shown for 1 second at start of processing.

Stop: Shown for 1 second at end of processing.

Store: Shown for 1 second when storing data.

Pause: Shown for 1 second when processing is paused.

Continue: Shown for 1 second when processing is resumed.

## Level at cursor position

Shows the level at the cursor position, updated every second.

## Frequency at cursor position

Shows the frequency at the cursor position. You can move the cursor with the ◀ and ▶ keys. The cursor movement step width is determined by the selected frequency span.

2 kHz: 5 Hz steps

AP(A) ↔ AP ↔ 5.000 Hz ↔ 10.00 Hz ↔ ... ↔ 995.0 Hz  
↔ 1.000 kHz ... 1.995 kHz ↔ 2.000 kHz

5 kHz: 12.5 Hz steps

Above 1.000 kHz, the step width alternates between 12 Hz and 13 Hz.

AP(A) ↔ AP ↔ 12.50 Hz ↔ 25.00 Hz ↔ ... ↔ 987.5 Hz  
↔ 1.000 kHz ↔ ... ↔ 4.987 kHz ↔ 5.000 kHz

10 kHz: 25 Hz steps

AP(A) ↔ AP ↔ 25.00 Hz ↔ 50.00 Hz ↔ ... ↔ 975.0 Hz  
 ↔ 1.000 kHz ↔ ... ↔ 9.975 kHz ↔ 10.00 kHz

20 kHz: 50 Hz steps

AP(A) ↔ AP ↔ 50.00 Hz ↔ 100.0 Hz ↔ ... ↔ 950.0 Hz  
 ↔ 1.000 kHz ↔ ... ↔ 19.95 kHz ↔ 20.00 kHz

## Graph display

See details on page 16.

## Time weighting (dynamic characteristics) indicator

Shows the time weighting (dynamic characteristics) setting. You can switch the setting with the Fast/Slow key. This setting only has an effect on AP and AP(A).

## Frequency weighting indicator

Shows the frequency weighting setting. You can switch the setting with the A/C/FLAT key. This setting only has an effect on AP, AP(A), and spectrum display.

LA : A weighting  
 LC : C weighting  
 Lp : FLAT

## Under-range indicator (Un)

**Un** is shown for at least 1 second when the sound pressure level has fallen below +7.4 dB from the level range lower limit.

## Under-range indicator (Un)

If the measurement value has fallen below +7.4 dB from the level range lower limit at least once during processing, the indicator shows **Un**. This indication is maintained until the start of the next processing operation.

## Measurement mode

Shows the selected measurement mode. You can switch the setting with the Mode key.

IST : Instantaneous mode  
 LIN : Linear averaging mode  
 MAX : Maximum value processing mode



### Over-range indicator (Ov)

**Ov** is shown for at least 1 second when the sound pressure level has exceeded the upper limit, causing overload.

### Over-range indicator (Ov)

If the sound pressure level has caused overload at least once during processing, the indicator shows **Ov**. This indication is maintained until the start of the next processing operation. If overload occurs again in this condition, the indication changes to **Ov**, and again to **Ov** when overload terminates.

During data recall, the indicator shows that overload information was stored together with the data.

### Level range indicator

Shows which setting applies as the upper and lower limit of the graph. The following seven settings are available: 0 to 80 dB, 10 to 90 dB, 20 to 100 dB, 30 to 110 dB, 40 to 120 dB, 50 to 130 dB, 60 to 140 dB. You can switch the setting with the Level Range keys.

During data recall, the indicator shows the range setting at which the data were stored.

### Status indicator

#### ► Measurement in progress symbol

Flashes during processing.

#### || Pause symbol

Shown while measurement is paused. During pause, the measurement value is not updated.

During data recall, the indicator is shown if the stored data comprise pause information.

Note
Pause information is stored when processing resumes after a pause.

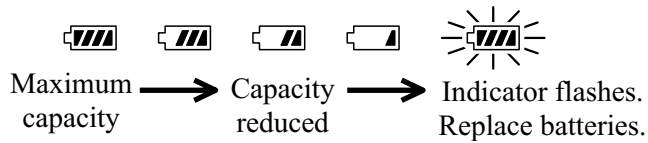
### Remote indicator

Appears when the unit is operating in remote mode.

## Battery capacity indicator

When using the unit on batteries, check the status of this indicator. The indicator changes as shown below, according to the remaining battery capacity. When the indicator flashes, correct measurement is not possible. Replace the batteries by new ones.

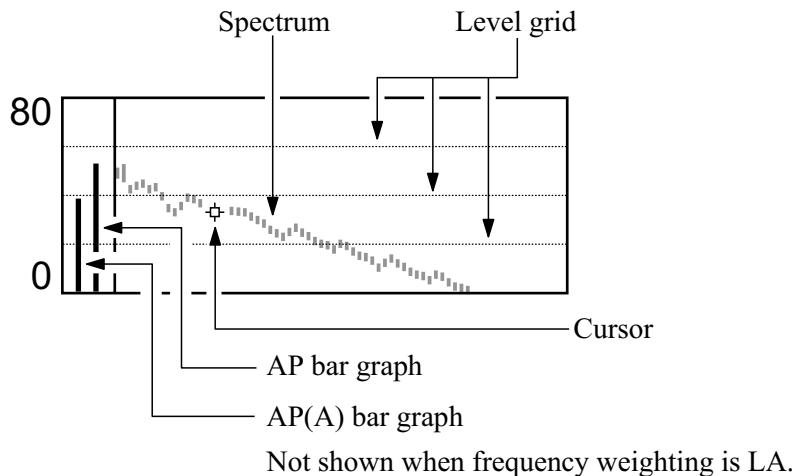
When the unit is powered from the AC adapter, the indicator always shows maximum capacity.



## Recall indicator

While recalling data that were stored in memory, this indicator is shown.

## Graph display



## Level grid

A line is shown for every 20 dB.

## Cursor position

Shows the level position for the frequency where the cursor is located. Can be moved with the Freq. ◀ and ▶ keys.

<b>Note</b>
The linearity range in which linear operation is assured for every level range setting is -2 to -72 dB.

## Graph display

All level values are updated every 100 ms.

AP(A) : Shows the A-weighted all-pass level. If "A" is selected for frequency weighting, this graph is not shown.

AP : Shows the all-pass level with the selected frequency weighting.

<b>Note</b>
Regardless of the frequency span setting, the AP(A) and AP values are always derived from the entire frequency range of the sound level meter.

Spectrum: Shows the level for each frequency.

The coordinate position for the respective data is determined, according to the display zoom setting.

### Display zoom ×1

For spectrum display, the horizontal axis zoom factor is 1, and all 400 data are shown.

### Display zoom ×2

For spectrum display, the horizontal axis zoom factor is 2, and 200 data are shown.

If the "Cursor Position" item on menu screen 1/4 has been set to "Freq.", the ◀, ▶ keys can be used to move the display area. When the cursor reaches the right or left edge, the graph display is scrolled.

### Display zoom ×4

For spectrum display, the horizontal axis zoom factor is 4, and 100 data are shown.

If the "Cursor Position" item on menu screen 1/4 has been set to "Freq.", the ◀, ▶ keys can be used to move the display area. When the cursor reaches the right or left edge, the graph display is scrolled.

**Note**

Regardless of the display zoom setting, the AP(A) and AP bar graph starts always at the bottom of the graph.

If the level is lower than 0.0 dB, the indication shows "0.0 dB". This also applies to stored data.

## Measurement Procedure

<b>Note</b>
At power-on, the unit reverts to the settings that were active when it was last turned off. Therefore the display will not always be the same.

### Measurement Modes

The unit has three measurement modes: IST, LIN, and MAX. You can switch between these with the Mode key.

IST mode: FFT analysis result for one frame is shown.

<b>Note</b>
A frame is one set of time series or frequency span data necessary for FFT processing. The duration of the frame depends on the selected analysis frequency span (see page 6).

LIN mode: The summed average of FFT analysis results is shown.

$Y_n$  : Averaged data

$$Y_n = \frac{1}{n} \sum_{i=1}^n X_i$$

$X_i$  : Data for each frame

$i$  : 1, 2, 3, ..... n

$n$  : Number of summed frames

MAX mode: The maximum FFT analysis result value for each frequency within the measurement time is shown.

## IST Mode

This mode is established by default when power is turned on.

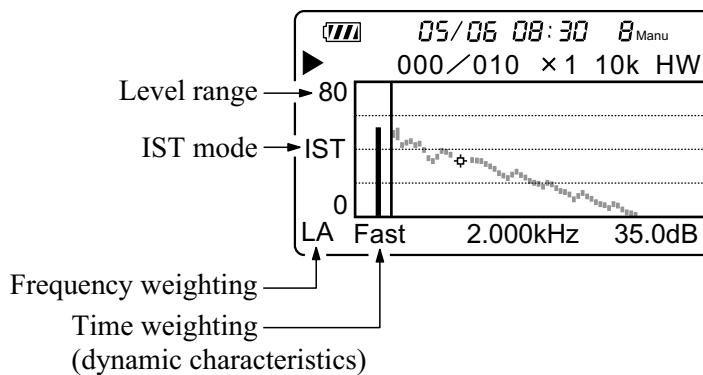
Because measurement starts automatically at the point when the measurement screen is displayed, there is no need to press the Start/Stop key to initiate the measurement. The level display is updated every second, but the elapsed time display continually shows 000.

1. If the unit is in another mode, press the Mode key to select the IST mode.
2. Use the Menu key to call up menu screen 1/4, and set the frequency span, display zoom factor, window function, and cursor position.

### Note

There is no need to set the measurement time (arbitrary).

3. Use the Menu key to return to the measurement screen.



4. Use the A/C/FLAT key to set the frequency weighting.
5. Use the Fast/Slow key to set the time weighting (dynamic characteristics).
6. When performing measurement according to JIS or another standard, select the frequency weighting and time weighting accordingly.

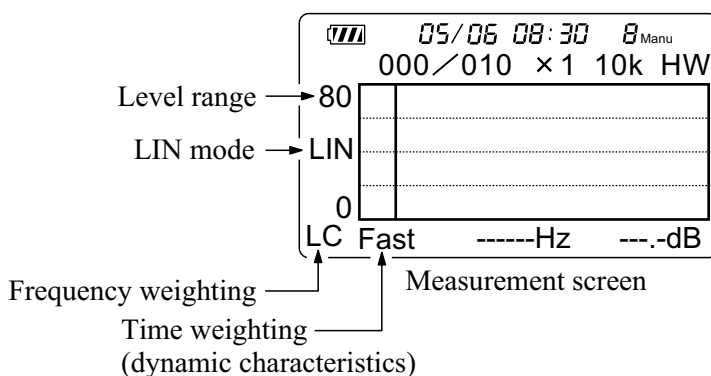
7. Use the Level Range keys to set the level range, so that the graph is approximately centered on the display.  
If overload occurs during measurement, the indication **Ov** appears. If underload occurs, the indication **Un** appears. If **Ov** or **Un** appear frequently, change the level range setting.
8. The cursor position can be moved with the Freq. ◀ and ▶ keys. The current cursor frequency and level are shown at the bottom of the display.
9. The Pause/Cont key can be used to pause and resume the measurement. While measurement is paused, the **||** symbol is shown.

## LIN Mode

1. Press the Mode key to select the LIN mode.

<b>Note</b>
When switching to the LIN mode by pressing the Mode key, data may appear on the display. These data are the result of the previous measurement in LIN mode. Simultaneous measurement in LIN mode and MAX mode is not possible.

2. Use the Menu key to call up menu screen 1/4, and set the frequency span, display zoom factor, measurement time, window function, and cursor position.
3. Use the Menu key to return to the measurement screen.



4. Use the A/C/FLAT key to set the frequency weighting.
5. Use the Fast/Slow key to set the time weighting (dynamic characteristics).
6. When performing measurement according to JIS or another standard, select the frequency weighting and time weighting accordingly.



7. Use the Level Range keys to set the level range, so that the bar graph is approximately centered on the display.

If **Ov** or **Un** appear frequently, change the level range setting.

#### Note

After starting the LIN measurement, it is not possible to change the level range. Use the IST mode to determine a suitable level range before switching to LIN mode.

8. Press the Start/Stop key to start the measurement. During measurement, the ► symbol flashes, and the elapsed time is displayed.
9. The cursor position can be moved with the Freq. ◀ and ► keys. The current cursor frequency and level are shown at the bottom of the display.
10. The Pause/Cont key can be used to pause and resume the measurement (processing). The pause duration is not included in the measurement time. While processing is paused, the || symbol is shown.
11. When the measurement time set in step 2 has elapsed, measurement stops automatically. If you wish to stop the measurement before that, press the Start/Stop key.
12. If overload or underload has occurred at least once during measurement, the indication **Ov** or **Un** appears and stays on. Therefore, when **Ov** or **Un** is shown after measurement is completed, this means that the processing result contains overload or underload data.

#### Important

During measurement (processing), most keys such as the A/C/FLAT key and the Level Range keys are inactive. Only the following keys can be used:

Start/Stop, Pause/Cont, Freq. ◀ , ► , Light

Before starting the measurement, all other settings must be completed.

**Note**

Changing settings such as A/C/FLAT or Fast/Slow after the measurement is completed has no effect on the processing result, and will also not affect manual store. Data will be stored with the settings that were active during measurement.

**Note**

When settings such as A/C/FLAT, Fast/Slow, or Level Range are changed after measurement is completed, the change is shown on the display but does not affect the processing result. When printing, the changed settings and the processing result will also be mismatched. However, when manual store is used, the settings active at the time of measurement are stored together with the processing result. On the recall screen, the actual settings used during measurement will be shown.

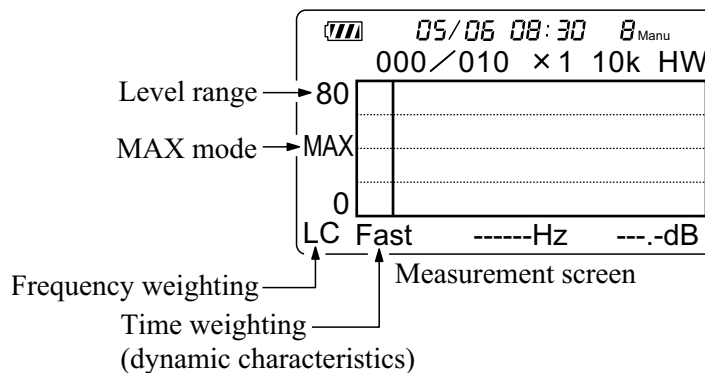
## MAX Mode

1. Press the Mode key to select the MAX mode.

### Note

When switching to the MAX mode by pressing the Mode key, data may appear on the display. These data are the result of the previous measurement in MAX mode. Simultaneous measurement in LIN mode and MAX mode is not possible.

2. Use the Menu key to call up menu screen 1/4, and set the frequency span, display zoom factor, measurement time, window function, and cursor position.
3. Use the Menu key to return to the measurement screen.



4. Use the A/C/FLAT key to set the frequency weighting.
5. Use the Fast/Slow key to set the time weighting (dynamic characteristics).
6. When performing measurement according to JIS or another standard, select the frequency weighting and time weighting accordingly.

7. Use the Level Range keys to set the level range, so that the bar graph is approximately centered on the display. If **Ov** or **Un** appear frequently, change the level range setting.

<b>Note</b>
After starting the MAX measurement, it is not possible to change the level range. Use the IST mode to determine a suitable level range before switching to MAX mode.

8. Press the Start/Stop key to start the measurement.  
During measurement, the ► symbol flashes, and the elapsed time is displayed.
9. The cursor position can be moved with the Freq. ◀ and ▶ keys. The current cursor frequency and level are shown at the bottom of the display.
10. The Pause/Cont key can be used to pause and resume the measurement (processing). The pause duration is not included in the measurement time. While processing is paused, the || symbol is shown.
11. When the measurement time set in step 2 has elapsed, measurement stops automatically. If you wish to stop the measurement before that, press the Start/Stop key.

12. If overload or underload has occurred at least once during measurement, the indication **Ov** or **Un** appears and stays on. Therefore, when **Ov** or **Un** is shown after measurement is completed, this means that the processing result contains overload or underload data.

**Important**

During measurement (processing), most keys such as the A/C/FLAT key and the Level Range keys are inactive. Only the following keys can be used:

Start/Stop, Pause/Cont, Freq. ◀, ▶, Light

Before starting the measurement, all other settings must be completed.

**Note**

Changing settings such as A/C/FLAT or Fast/Slow after the measurement is completed has no effect on the processing result, and will also not affect manual store. Data will be stored with the settings that were active during measurement.

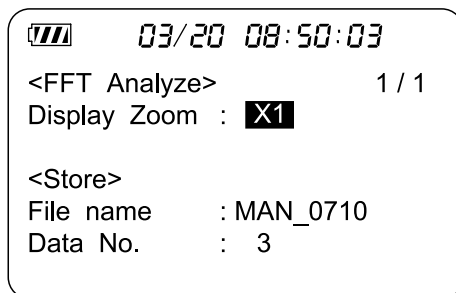
**Note**

When settings such as A/C/FLAT, Fast/Slow, or Level Range are changed after measurement is completed, the change is shown on the display but does not affect the processing result. When printing, the changed settings and the processing result will also be mismatched. However, when manual store is used, the settings active at the time of measurement are stored together with the processing result. On the recall screen, the actual settings used during measurement will be shown.

## Menu Screen in Pause Mode

### Pause condition

During measurement in LIN mode or MAX mode, if there is noise you want to exclude from measurement, you can pause processing by pressing the Pause/Cont key. When you press the key again, processing resumes. In IST mode, the key can be used to pause and resume the display updating. In the pause condition, only the Store, Pause/Cont, Menu, Freq, ◀, ▶, Light, and Print keys are active. Pressing the Menu key brings up a display such as shown below. This allows setting the display zoom, cursor movement control, and the file name and address number for storing data.



# Memory Operations

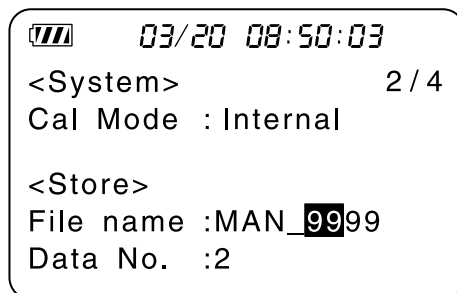
## Storing Data

This unit allows only manual storing of data. Measurement data are stored at the point when the Store key is pressed.

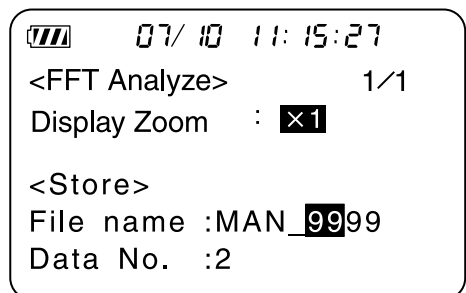
Data can only be stored on the NX-22FT card. For each file name, up to 100 data sets (Data No. 1 to 100) can be stored. Storing data in the internal memory of the NL-22/NL-32 is not possible.

The Procedure for storing data on the NX-22FT card is as follows.

1. Press the Menu key to call up the menu screen.
2. Use the Page Up/Down keys to display the menu screen 2/4. (This step is not necessary in pause mode.)

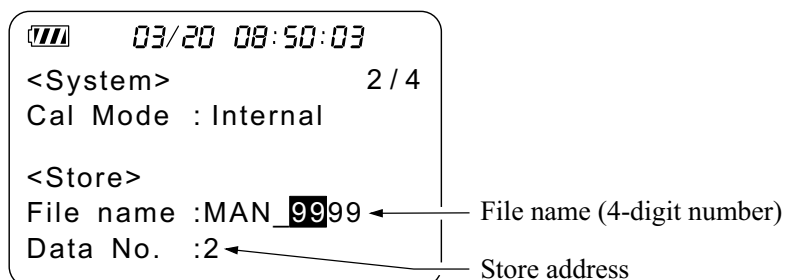


Menu screen 2/4



Menu screen in pause mode

3. Specify a file name (4-digit number).  
The 4-digit number is specified in blocks of 2 digits. Use the ▲ and ▼ keys to move the cursor and use the ◀ and ▶ keys to increase or decrease the number.
4. Specify the store address in the Data No. field.  
Use the ◀ and ▶ keys to make the setting in the range from 1 to 100.



Menu screen 2/4

<b>Important</b>
------------------

<p>The unit does not check whether data to be stored are present. When the Store key is pressed, the data in the currently selected data number are overwritten, even if no new data are available. Use the recall screen (see "Reading Stored Data" on page 31) to check whether data are stored in a specific address.</p>
--

5. Use the Menu key to return to the measurement screen.
6. Measurement (or processing) starts. For information on measurement (processing) methods, see the "Measurement" section starting on page 11.
7. In IST mode, storing of data on the NX-22FT card begins as soon as the Store key is pressed.

In LIN or MAX mode, press the Store key after measurement is completed. The displayed processing result as well as the various parameter settings used during measurement are stored on the NX-22FT card.

The store process is completed in about 1 second, and the Data No. is incremented by 1. With each push of the Store key, the measurement data displayed at that point are stored in the indicated Data No.

The stored data comprise AP(A), AP, levels (or processing results) for all frequencies, and measurement parameters.

<b>Important</b>
------------------

<p>Never turn off the unit or remove the memory card while a store operation is in progress. Otherwise program data can be destroyed.</p>
---

<b>Note</b>
-------------

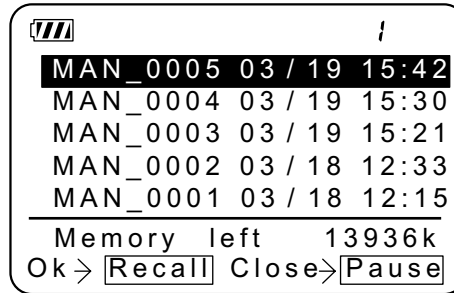
<p>When the data number 100 is reached, a further press of the Store key causes the "100" indication to flash. This indicates that data will not be stored. Use the menu screen 2/4 to select another Data No.</p>
--



## Reading Stored Data

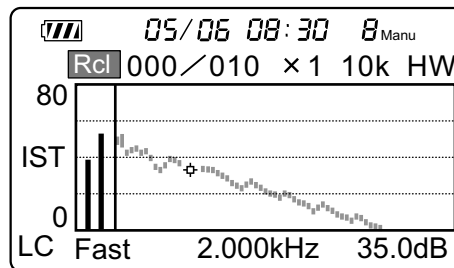
To read data stored on the NX-22FT card, proceed as follows.

1. Press the Recall key to bring up the recall screen. Files are listed in descending order of measurement date/time.



Recall screen

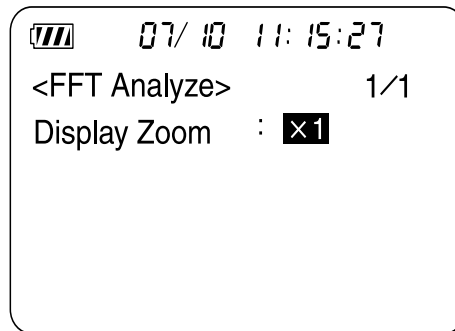
2. Use the Page Up/Down keys to go the screen where the desired file is listed.
3. Use the ▲ and ▼ keys to select the file (the file name is shown in reverse).
4. Press the Recall key. The data of the selected file are shown on the screen. Use the Page Up/Down keys to switch the address (Data No.).



Recall screen

5. You can use the ◀ and ▶ keys to move the cursor position, to check the level for a given frequency.

6. Pressing the Menu key brings up a display such as shown below. This allows setting the display zoom and cursor movement control.



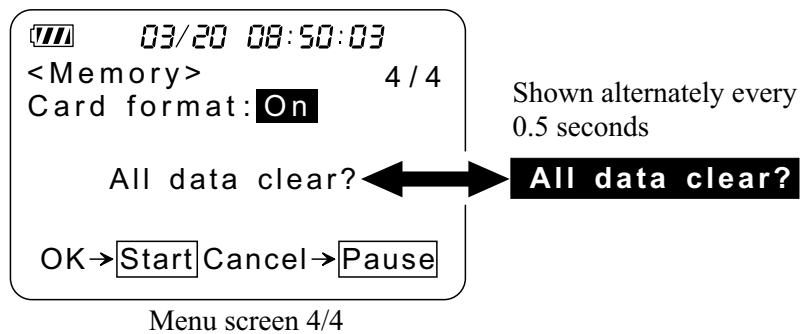
Menu screen

7. To return to the recall screen, press the Recall key or the Pause key.
8. When wishing to pause the recall mode, press the Pause key.

## Erasing Data

To erase all data stored on the NX-22FT card, perform the following steps.

1. Press the Menu key to bring up the menu screen.
2. Use the Page Up/Down keys to switch to menu screen 4/4.
3. Set "Card format" to "On".
4. A screen such as shown below appears. To proceed with erasing all data, press the Start key.



5. All data on the card are erased, and the "Card format" item reverts to "Off".

### Note

Proceed with care when using this function. All stored data on the card (including the Excel file) will be erased. It is not possible to erase data from a specified address individually.



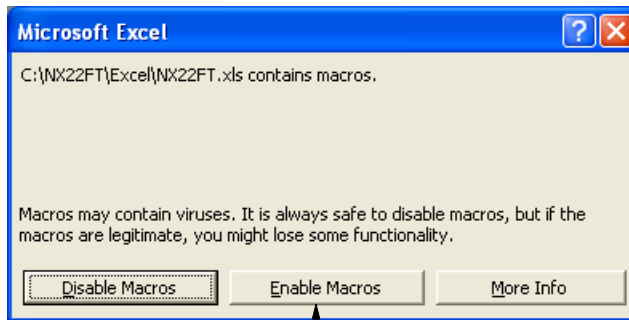
## The first and second lines of the data are header.

Title	Description	Data position	Content	Data length
Address	Address number	Odd-numbered rows/ column 1	1 to 100	4
Calculation mode	Processing mode	Odd-numbered rows/ column 2	IST, LIN, MAX	4
Frequency-weight	Frequency weighting	Odd-numbered rows/ column 3	A, C, FLAT	5
Time-weight	Time weighting	Odd-numbered rows/ column 4	Fast, Slow	5
Level Range	Graph upper limit	Odd-numbered rows/ column 5	80 dB to 140 dB	6
Store time/ Beginning time	Store date/ measurement start date	Odd-numbered rows/ column 6	yyyy/mm/dd hh:mm:ss	20
Freq.Span	Frequency span	Odd-numbered rows/ column 7	2 kHz to 20 kHz	6
Meas.Time(s)	Actual measurement time/ preset measurement time	Odd-numbered rows/ column 8	1 to 999 / 1 to 999	10
Window	Window function	Odd-numbered rows/ column 9	HANN, RECT	5
AP(A)	A-weighted all-pass level	Odd-numbered rows/ column 10	0.0 to 200.0	6
AP	All-pass level	Odd-numbered rows/ column 11	0.0 to 200.0	6
No 1	Level value	Odd-numbered rows/ column 12	0.0 to 200.0	6
...	...	...		6
No200	Level value	Odd-numbered rows/ column 211	0.0 to 200.0	6
-	Return	-	<CR><LF>	2
No201	Level value	Even-numbered rows/ column 1	0.0 to 200.0	6
...	...	...		6
No400	Level value	Even-numbered rows/ column 200	0.0 to 200.0	6
Over	Overload	Even-numbered rows/ column 201	Over, -	5
Under	Underload	Even-numbered rows/ column 202	Under, -	6
Pause	Pause	Even-numbered rows/ column 203	Pause, -	5
-	Return	-	<CR><LF>	2

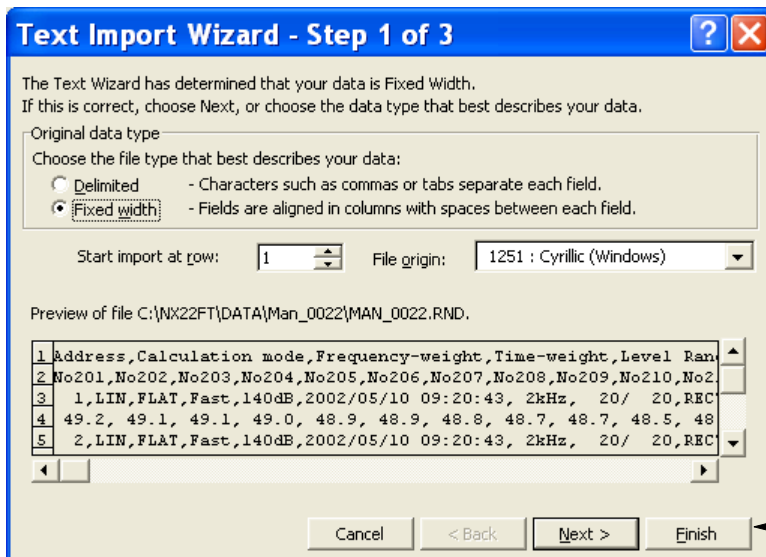
# Convert Data Files

Since the data stored on the NX-22FT card as CVS file format, the data processing on the computer is possible. (As to the file structure, refer to the above.) The NX-22FT card contains "NX-22FT.xls" file which conforms to Microsoft "EXCEL" (spreadsheet program), which allows you to read and process the stored data directly on the "EXCELL". The "NX-22FT.xls" file also has the macro which displays FFT spectrums using data shown on the EXCEL.

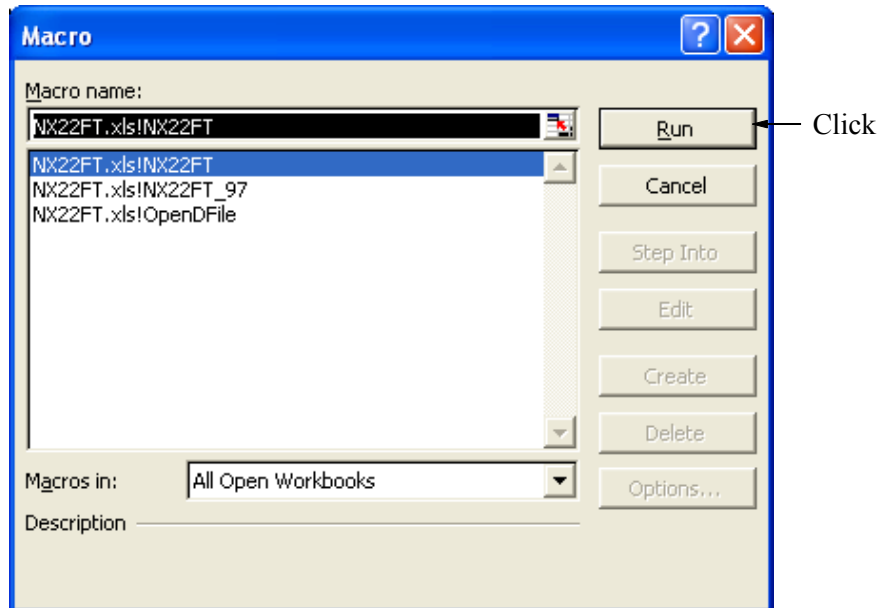
1. When you open the file NX22FT.XLS, the following message appears.



2. Open the data file (\*.RND). (It is not necessary to select the data file format.)
3. As a screen shown bellow appears, click on [Finish] button.



4. With the window still active, click on [Tools] - [Macro] - [Macros].
5. Select [NX22FT.xls!NX22FT] from the list and click on the [Run] button.



### Important

If the macro is being run in Excel 97 and if the data file contains more than 50 data sets, an "Not enough memory" error will occur. In such a case, select [NX22FT.xls!NX22FT\_97] and click on the [Run] button. After creating the 49th or 98th graph work sheet, a new work book (named Book1.xls etc.) will be created, and graph work sheet generation continues. When using Excel 2000, no "Not enough memory" error occurs, also if you click on [NX22FT.xls!NX22FT]. All graphs will be created within one work book.

6. During macro processing, the following work sheets will be created.

- ORIGINAL The selected data file is read into this work sheet in comma delimited form. (For a data example, see Excel file.)

Address	Calculation mode	Frequency-weight	Time-weight
No201	No202	No203	No204
1	LIN	FLAT	Fast
49.2	49.1	49.1	49.0
2	LIN	FLAT	Fast
49.2	49.1	49.1	49.0
3	LIN	A	Fast
4.4	4.1	5.5	3.6

- LIST Vertical/horizontal converted sheet. The first row is the header, and subsequent rows are data. (For a data example, see Excel file.)

Address	1	2	3
Calculation mode	LIN	LIN	LIN
Frequency-weight	FLAT	FLAT	A
Time-weight	Fast	Fast	Fast
Level Range	140dB	140dB	80dB
Store time/Beginning time	2002/5/10 9:20	2002/5/10 9:20	2002/5/10 10:31
Freq.Span	2kHz	2kHz	20kHz
Meas.Time(s)	20/ 20	20/ 20	10/ 10
Window	RECT	RECT	HANN
AP(A)	82.6	82.6	-
AP	87.3	87.3	55.6
No 1	68.0	68.0	27.1
No 2	67.9	67.9	31.6
⋮	⋮	⋮	⋮
No399	46.8	46.8	0.0
No400	46.8	46.8	0.0
Over	-	-	-
Under	Under	Under	-
Pause	-	-	-



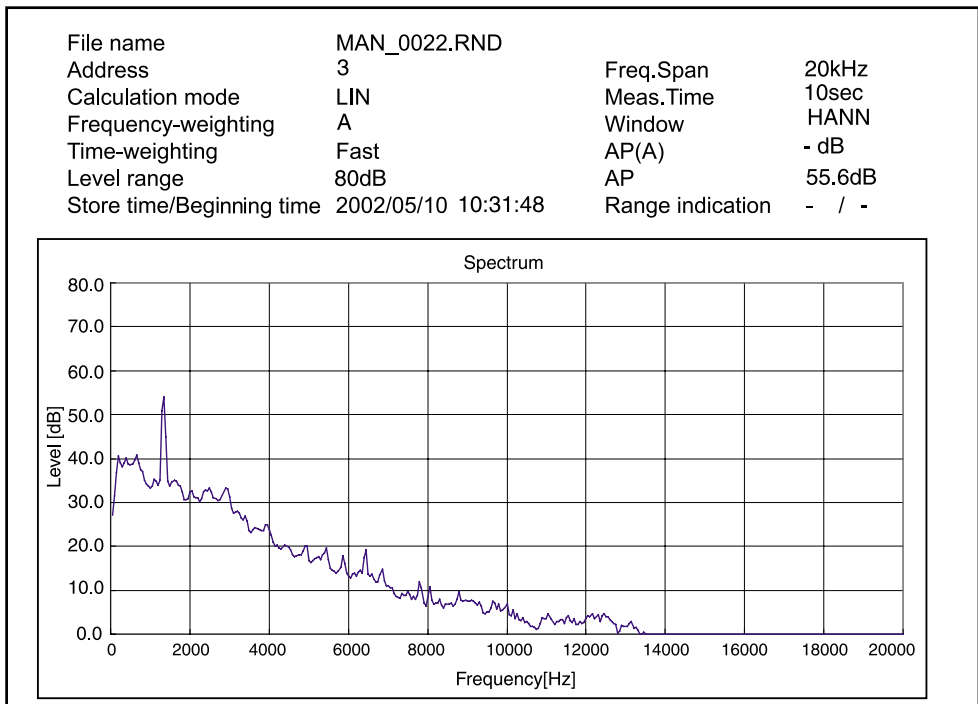
· G\_LIST

Odd rows are the header and even rows are the data. The spectrum number in the header is converted into frequency (unit: Hz). Address numbers where no data exist are omitted. (For a data example, see Excel file.)

Address	1	Address	2	Address	3
Calculation mode	LIN	Calculation mode	LIN	Calculation mode	LIN
Frequency-weighting	FLAT	Frequency-weighting	FLAT	Frequency-weighting	A
Time-weighting	Fast	Time-weighting	Fast	Time-weighting	Fast
Level range	140dB	Level range	140dB	Level range	80dB
Store time/Beginning time	2002/05/10 09:20:43	Store time/Beginning time	2002/05/10 09:20:43	Store time/Beginning time	2002/05/10 10:31:48
Freq.Span	2kHz	Freq.Span	2kHz	Freq.Span	20kHz
Meas.Time	20sec	Meas.Time	20sec	Meas.Time	10sec
Window	RECT	Window	RECT	Window	HANN
AP(A)	82.6	AP(A)	82.6	AP(A)	-
AP	87.3	AP	87.3	AP	55.6
5	68.0	5	68.0	50	27.1
⋮		⋮		⋮	
2000	46.8	2000	46.8	20000	0.0
Over	-	Over	-	Over	-
Under	Under	Under	Under	Under	-
Pause	-	Pause	-	Pause	-

· Fig.XXX

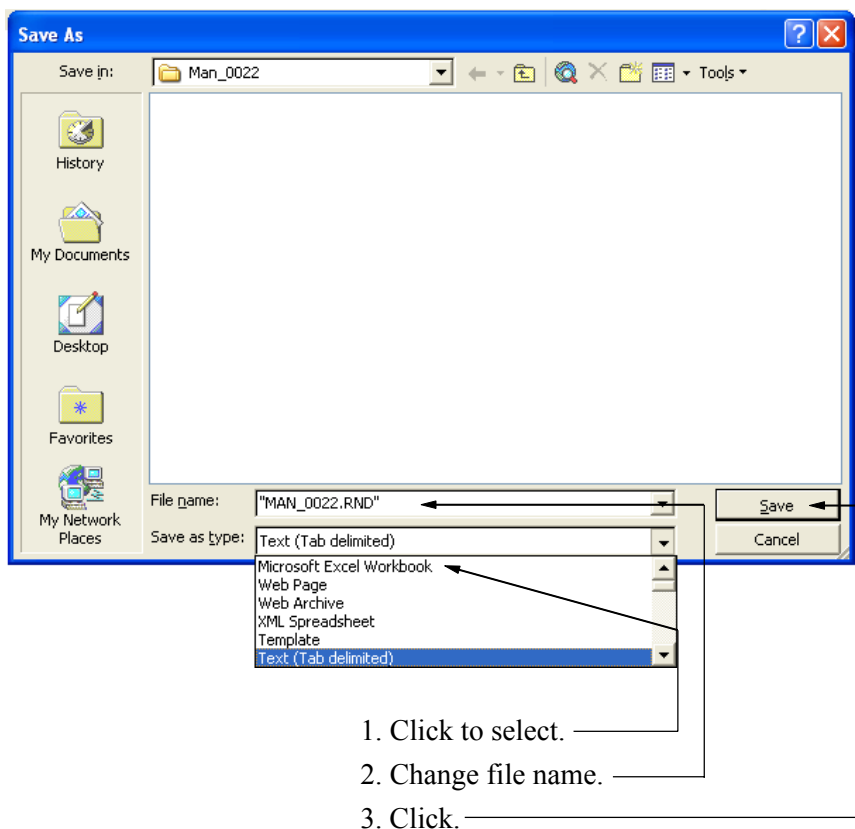
Each sheet contains a graph for data in one address number. XXX is the address number. As for G\_LIST, address numbers where no data exist are omitted. (For a data example, see Excel file.)



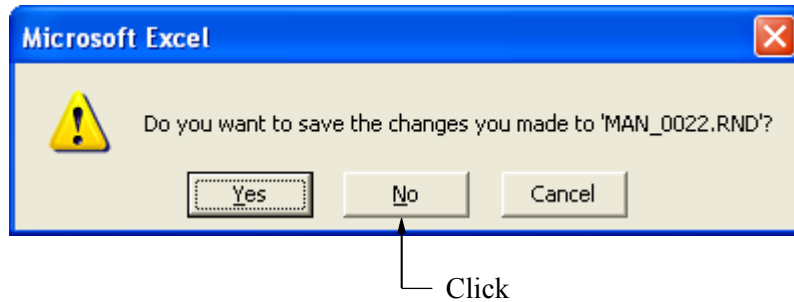
**Note**

When printing a graph (Fig.XXX sheet), choose "landscape" as printing orientation.

7. To store the result of macro processing, change the name or use a different folder. To store all work sheets, choose "Microsoft Excel book" as file type. If you overwrite the original data file with the same name, the data format will be changed and the file can no longer be used by the sound level meter for data recall. Some data may also be erased.



8. If you attempt to close the application without storing the work book with the same name as the data file, the message shown below will appear. Select [No] to close the application while retaining the original file.



# Printing

When an optional printer is connected, information shown on the screen can be printed out as hard copy.

For information on connection and setup of the printer, please refer to the Instruction Manual for the NL-22/NL-32.

## Printing out measurement parameters

Any displayed menu screen can be printed out as hard copy.

1. Press the Menu key to call up the menu screen.
2. Use the Page Up/Down keys to switch to the menu screen to be printed (1/4 to 4/4).
3. Press the Print key.

A sample printout is shown below. Actual font and size will be different.

Print example

Menu screen 1/4 sample printout

```
05/10 14:58:13
<FFT Analyze> 1/4
Freq. Span : 2kHz
Display Zoom : x1
Meas. Time(s) : 10
Window : HANN
```

## Printing out data during measurement

In IST mode, it is possible to print out the measurement graph display together with information on measurement settings (measurement start date/time, measurement time, time weighting, measurement mode, frequency weighting).

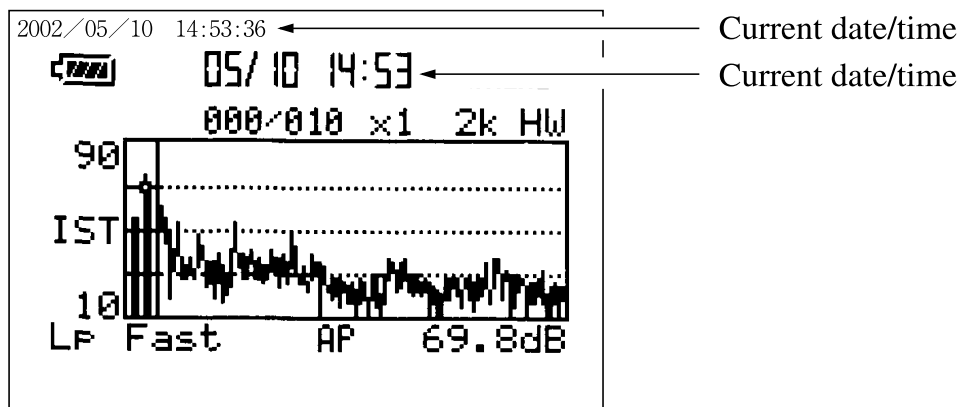
1. Press the Print key during the measurement.

Current measurement data are printed out.

A sample printout is shown below. Actual font and size will be different.

### Print example

IST mode sample printout



## Printing out measurement results

In LIN mode and MAX mode, it is possible to print out the measurement screen (processing screen) graph display together with information on measurement settings (measurement start date/time, current date/time [print date/time] measurement time, time weighting, measurement mode, frequency weighting).

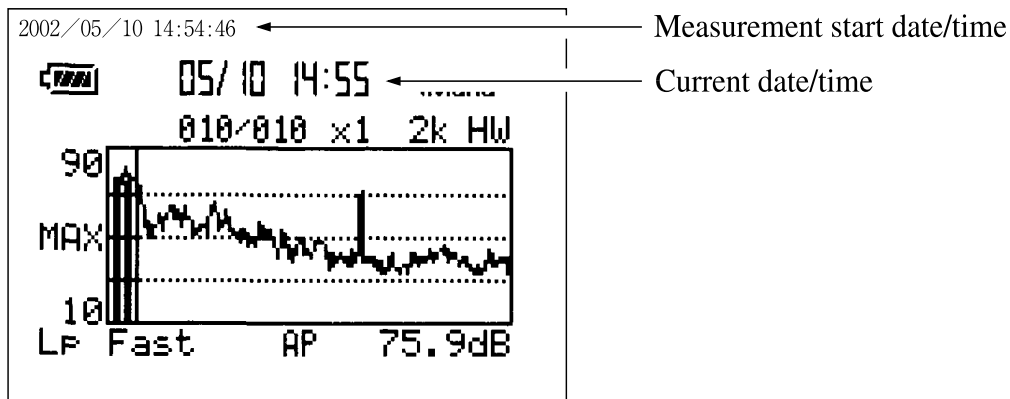
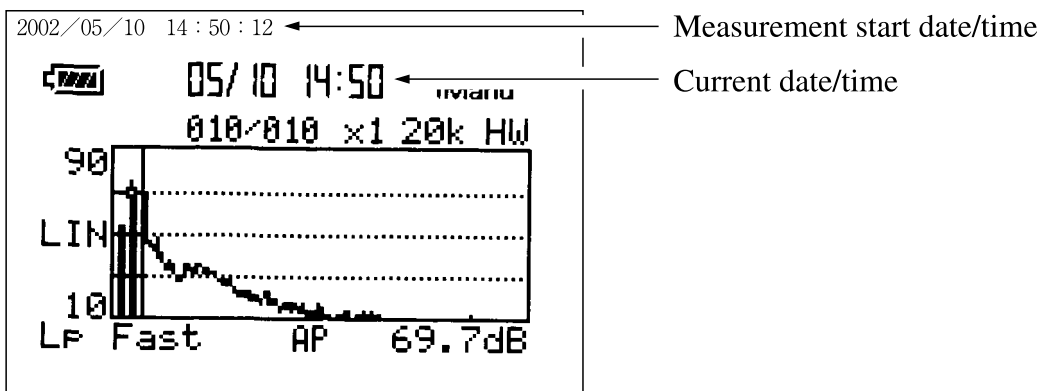
1. Press the Print key during the measurement.

Measurement data obtained at this point are printed out.

A sample printout is shown below. Actual font and size will be different.

Print example

LIN mode sample printout



MAX mode sample printout

# Default Values

The factory default settings of the unit are as listed below.

FFT Calculation mode	IST
Fast/Slow (Time Weighting)	Fast
A/C/FLAT (Frequency Weighting)	A
Level Range	50 to 130 (dB)
Freq. Span (Frequency Span)	20 KHz
Display Zoom	× 1
Meas. Time (Measurement Time)	10 (sec.)
Windows Function	HANN
Cursor Position	Freq
Cal Mode (Calibration Mode)	Internal
File name	MAN_0000
Data No.	1
LCD Contrast	*****_
Baud Rate	19200 (bps)
Index	1
Light Auto Off	5 min
Card format	Off

When you turn power to the unit on while holding down the Start/Stop key, the unit will be initialized to the above settings. The time and memory contents are not reset.

# Communication Commands

For details on communication commands, please refer to the Serial Interface Instruction Manual of the NL-22/NL-32.

## Command List

Command	Function	Page
<b>Basic setting and display commands</b>		
MTI	Set measurement time .....	51
MTI?	Get measurement time setting .....	51
RNG	Set level range .....	51
RNG?	Get level range setting .....	51
TMC	Set time weighting .....	52
TMC?	Get time weighting setting .....	52
WGT	Set frequency weighting .....	52
WGT?	Get frequency weighting setting .....	52
OPE	Set FFT processing mode .....	53
OPE?	Get FFT processing mode setting .....	53
FRQ	Set frequency span .....	53
FRQ?	Get frequency span setting .....	53
ZOM	Set display zoom factor .....	54
ZOM?	Get display zoom factor setting .....	54
WND	Set FFT window function .....	54
WND?	Get FFT window function setting .....	54
<b>Operation commands</b>		
PSE	Pause/resume measurement .....	55
PSE?	Get measurement/pause status .....	55
SRT	Start/stop measurement .....	55
SRT?	Get measurement start/stop status .....	55
STO	Start/stop memory store .....	55



Command	Function	Page
<b>Memory and store commands</b>		
ADR	Set address .....	56
ADR?	Get address setting .....	56
CDR?	Get remaining card capacity .....	56
FMT	Delete all files from memory card .....	56
RCL	Activate recall state .....	57
RCL?	Get recall status state .....	57
SNR?	Get store name shown on recall menu .....	57
SNS	Set store name .....	58
SNS?	Get store name .....	58
<b>Calibration commands</b>		
CAL	Activate calibration mode .....	59
CAL?	Get calibration status .....	59
CBM	Perform adjustment with Cal control .....	59
CBM?	Get Cal control level setting .....	59

Command	Function	Page
<b>Various setting and information commands</b>		
BAT?	Get battery status .....	60
BLA	Set backlight auto turn-off.....	60
BLA?	Get backlight auto turn-off setting .....	60
CLK	Set date and time .....	61
CLK?	Get date and time setting .....	61
DCL	Initialize unit (reset to factory defaults) .....	61
LTI?	Get elapsed time since measurement start .....	62
VER?	Get version information .....	62
<b>Measurement data retrieve commands</b>		
DOD?	Get currently displayed level value .....	63
<b>Communication control commands</b>		
BRT	Set baud rate .....	63
EST?	Get error information .....	63
IDX	Set index number .....	64
IDX?	Get index number .....	64
RET	Set response processing for commands to on/off.....	64
RET?	Get response processing setting .....	64
RMT	Set local/remote mode .....	65
RMT?	Get local/remote setting .....	65
XON	Set control mode .....	65
XON?	Get control mode setting .....	65

## Command Format

In this manual, 1 character is represented as "□", a space as "\_", parameters as "p1,p2,...", and response data as "d1,d2,...". Parameters and response data may be more than 1 character long.

Commands consists of three letters which are not case-sensitive (upper-case or lower-case can be used).

□□□

When a command has one parameter, the parameter follows the command. It can be appended to the command either directly or with a separating space.

□□□p1            Acceptable

□□□\_p1            Acceptable

When a command has several parameters, the parameters must be separated by a space.

□□□p1\_p2            Acceptable

□□□p1p2            Not acceptable

<b>Note</b>
One command block can only contain one command. Do not include several commands in a block.

A request command consists of the command, any required parameter, and a "?". The command and "?" or parameter and "?" may be separated by a space.

□□□?            Acceptable

□□□\_?            Acceptable

□□□p1?            Acceptable

□□□p1\_?            Acceptable

Unless specified otherwise, parameters and response data are of variable length. Depending on the value range, the length of the parameter will differ. There is no need for padding with spaces or other measures.

□□□\_1            Acceptable

□□□\_10            Acceptable

□□□\_01            Not acceptable

## Command Send Example

To set frequency weighting to "C"

<STX>	01	C	WGT	1	<ETX>	00	<CR><LF>
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

- (1) Start of transfer data and command
- (2) ID number (hexadecimal). The ID number range is 0 to 255. In a command string, this is expressed as 01 (= ID number 1) to FF (= ID number 255).

Note
Do not use the ASCII code "1" here. Use the binary code "01".

- (3) Attribute ("C" for command)
- (4) Command
- (5) Parameter (corresponds to p1, p2, etc. in command description section starting on next page)
- (6) Command end
- (7) BCC (Entering 00 disables BCC checking for (1) to (6).)
- (8) Transfer data end

## Command Description

### Basic setting and display commands

#### MTI

Set measurement time

MTIp1

p1 = 1 to 999 (seconds)

Up to 3-digit integers accepted.

4-digit integers and higher will cause error return (0002).

Transfer format: Command block

#### MTI?

Get measurement time setting

Response data to MTI?

Response data d1

d1: Corresponds to p1

During recall, the recorded measurement time setting is returned.

Transfer format: Response block

#### RNG

Set level range

RNGp1

p1 = 7: 0 to 80 dB

p1 = 8: 10 to 90 dB

p1 = 9: 20 to 100 dB

p1 = 10: 30 to 110 dB

p1 = 11: 40 to 120 dB

p1 = 12: 50 to 130 dB

p1 = 13: 60 to 140 dB

During recall, the recorded level range setting is returned.

Transfer format: Command block

#### RNG?

Get level range setting

Response to RNG?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

## **TMC**

Set time weighting (dynamic characteristics)

TMCp1

p1 = 0: Fast

p1 = 1: Slow

Transfer format: Command block

## **TMC?**

Get time weighting setting

Response data to TMC?

Response data d1

d1: Corresponds to p1

During recall, the recorded time weighting (dynamic characteristics) setting is returned.

Transfer format: Response block

## **WGT**

Set frequency weighting

WGTP1

p1 = 0: A weighting

p1 = 1: C weighting

p1 = 2: FLAT response

Transfer format: Command block

## **WGT?**

Get frequency weighting setting

Response data to WGT?

Response data d1

d1: Corresponds to p1

During recall, the recorded frequency weighting setting is returned.

Transfer format: Response block

**OPE**

Set FFT processing mode

OPEp1

p1 = 0: IST

p1 = 1: LIN

p1 = 2: MAX

Transfer format: Command block

**OPE?**

Get FFT processing mode setting

Response data to OPE?

Response data d1

d1: Corresponds to p1

During recall, the recorded FFT processing mode is returned.

Transfer format: Response block

**FRQ**

Set frequency span

FRQp1

p1 = 2: 2 kHz

p1 = 3: 5 kHz

p1 = 4: 10 kHz

p1 = 5: 20 kHz

Transfer format: Command block

**FRQ?**

Get frequency span setting

Response data to FRQ?

Response data d1

d1: Corresponds to p1

During recall, the recorded frequency span is returned.

Transfer format: Response block

**ZOM**

Set display zoom factor

ZOMp1

p1 = 1: ×1

p1 = 2: ×2

p1 = 4: ×4

Transfer format: Command block

**ZOM?**

Get display zoom factor setting

Response data to ZOM?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

**WND**

Set FFT window function

WNDp1

p0 = RECT

p1 = HANN

Transfer format: Command block

**WND?**

Get FFT window function setting

Response data to WND?

Response data d1

d1: Corresponds to p1

During recall, the recorded window function is returned.

Transfer format: Response block



## Operation commands

### PSE

Pause/restart measurement

PSEp1

p1 = 0: Restart measurement

p1 = 1: Pause measurement

Transfer format: Command block

### PSE?

Get measurement/pause status

Response data to PSE?

Response data d1

d1: 1 if paused, otherwise 0

Transfer format: Response block

### SRT

Start/stop measurement

SRTp1

p1 = 0: Stop measurement

p1 = 1: Start measurement

Transfer format: Command block

### SRT?

Get measurement running status

Response data to SRT?

Response data d1

d1: 1 if measurement in progress, otherwise 0

Transfer format: Response block

### STO

Start/stop memory store

STOp1

p1 = 1: Start store (data number incremented by 1)

## Memory and store commands

### ADR

Set address

ADRp1

p1 = Any address

Transfer format: Command block

### ADR?

Get address setting

Response data to ADR?

Response data d1

d1: Currently selected address number (displayed address)

Transfer format: Response block

### CDR?

Get remaining card capacity

Response data to CDR?

Response data d1

d1: Card capacity in KB

Transfer format: Response block

### FMT

Delete all files from memory card

No parameter

Transfer format: Command block

**RCL****Activate recall state**

This command immediately calls up the recall screen. The displayed address is the address that was selected when the recall screen was last terminated.

RCLp1\_p2

p1 = 0: Cancel recall mode

p1 = 1: Activate recall mode

p2: Store name(Example: MAN\_0001; where "MAN" is in capitals)

Transfer format: Command block

**RCL?****Get recall state**

Response data to RCL?

Response data d1

d1=0: Recall not active

d1=1: Recall mode active

Transfer format: Response block

**SNR?****Get store name shown on recall menu**

- No parameter
- Return data format

Example: AU1\_0001

When there are two or more store data, the names are returned as separate blocks.

When card recall is used and there are no store data, the string "NO FILE NAME" is returned.

Transfer format: Response block

## **SNS**

### Set store name

SNSp1

p1 = 0000 to 9999

Takes a 4-digit integer. If a string other than a 4-digit integer is specified, an error (0002) is returned.

If the same store name already exists on the card, an error (0004) is returned (the setting is effective).

Transfer format: Command block

## **SNS?**

### Get store name

SNS?

d1 = p1

Example: 0010 ("0010" part of "MAN\_0010")

Transfer format: Response block

## Calibration commands

### CAL

Activate calibration mode

CALp1

p1 = 0: Cancel calibration mode

p1 = 1: Internal calibration mode

p1 = 2: External calibration mode

Transfer format: Command block

### CAL?

Get calibration status

Response data to CAL?

Response data d1

d1: Corresponds to p1

d1 = 1: Internal calibration mode

d1 = 2: External calibration mode

d1 = 0: Other mode

Transfer format: Response block

### CBM

Perform adjustment with Cal control

CBMp1

p1 = 0: Reduce level setting

p1 = 1: Increase level setting

Transfer format: Command block

### CBM?

Get Cal control level setting

Response data to CBM?

Response data d1

p1 = 118 to 670 (irregular steps)

Transfer format: Response block

## Various Setting and information commands

### BAT?


Get battery status

Response data to BAT?

Response data d1

d1 = 0: Battery indicator flashing

d1 = 1: 

d1 = 2: 

d1 = 3: 

d1 = 4: 

Transfer format:      Response block

### BLA

Set backlight auto turn-off

BLAp1

p1 = 0: Disable

p1 = 1: Enable

Transfer format:      Command block

### BLA?

Get backlight auto turn-off setting

Response data to BLA?

Response data d1

d1:      Corresponds to p1

Transfer format:      Response block

**CLK**

Set date and time

CLKp1\_p2\_p3\_p4\_p5\_p6

p1:	4-digit year	p2:	Month
p3:	Day	p4:	Hours
p5:	Minutes	p6:	Seconds

1 can also be specified as 01.

Transfer format: Command block

**CLK?**

Get date and time setting

Response data to CLK?

Response data d1,d2,d3,d4,d5,d6

d1 to d6: Correspond to p1 to p6

1 is returned as 01.

During recall, the recorded date is returned.

Transfer format: Response block

**DCL**

Initialize unit (reset to factory defaults)

- Clock is not reset.
- Contents of manual store memory are not cleared.
- Option function setting is not changed.
- No parameter

Transfer format: Command block

## **LTI?**

Get elapsed time since start of measurement

Response data to LTI?

Response data d1

d1:           Seconds

Maximum: 999

During recall, the recorded elapsed time is returned.

Transfer format:    Response block

## **VER?**

Get version information

Response data to VER?

Response data d1,d2

d1:           Sound level meter model

Example:    NL-22

d2:           Software version

Example:    1.00

Transfer format:    Response block



## Measurement data retrieve commands

### DOD?

Get currently displayed level value

Response data to DOD?

Response data d1,d2,d3, ... dn, dn+1, dn+2, dn+3

d1 to dn: Value for corresponding band

In calibration mode, only 1 set of data (Cal data) is returned.

dn+1: Overload information (yes: 1, no: 0)

dn+2: Underload information (yes: 1, no: 0)

dn+3: Pause information (yes: 1, no: 0)

Transfer format: Response block

## Communication Control Commands

### BRT

Set baud rate

BRTp1

p1 = 2: 4800 bps

p1 = 3: 9600 bps

p1 = 4: 19200 bps

The baud rate setting is changed after a confirmation response.

Transfer format: Command block

### EST?

Get error information

Response data to EST?

Response data d1

d1: Error processing or command processing error

Recorded 4-digit error code

Transfer format: Response block

## **IDX**

Set index number

IDXp1

p1 = 1 to 255, default: 1

Transfer format: Command block

## **IDX?**

Get index number

Response data to IDX?

Response data d1

d1 = Corresponds to p1 (selected index number)

Transfer format: Response block

## **RET**

Set response processing for commands to on/off

RETp1

p1 = 0: Disable response processing

p1 = 1: Enable response processing

Transfer format: Command block

## **RET?**

Get response processing setting

Response data to RET?

Response data d1

d1 = Corresponds to p1

Transfer format: Response block

**RMT**

Set local/remote mode

RMTp1

p1 = 0: Set to local mode

p1 = 1: Set to remote mode

Transfer format: Command block

**RMT?**

Get remote/local mode setting

Response data to RMT?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

**XON**

Select control mode

XONp1

p1 = 0: Use RTS/CTS control (no X parameter control)

p1 = 1: Use X parameter control (no RTS/CTS parameter control)

Transfer format: Command block

**XON?**

Get control mode setting

Response data to XON?

Response data d1

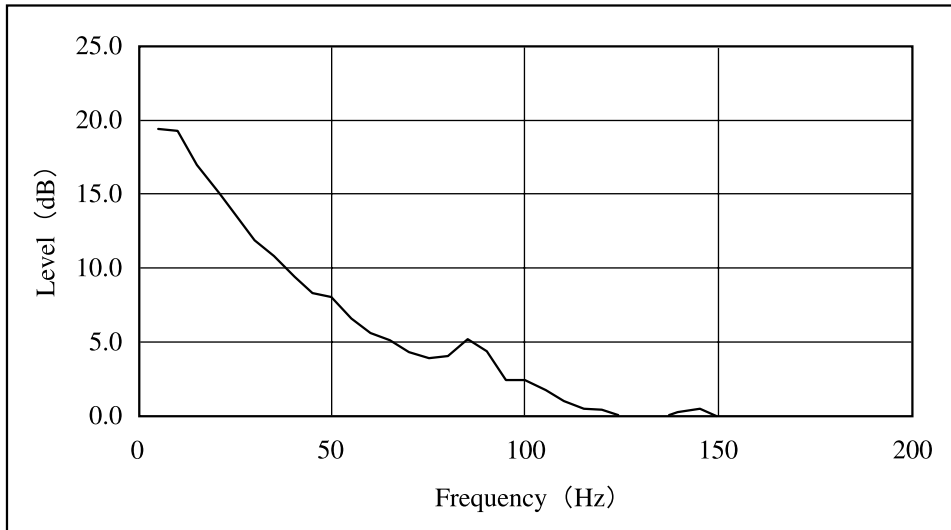
d1: Corresponds to p1

Transfer format: Response block

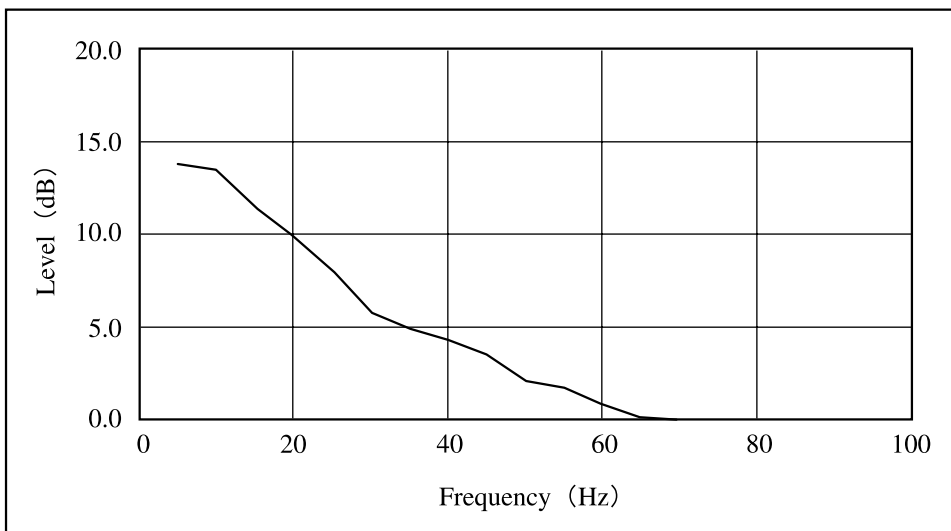
# Reference

## Inherent noise FFT spectrum

Example for residual noise spectrum, measured with dummy microphone connected (frequency span 2 kHz)



NL-22 inherent noise spectrum



NL-32 inherent noise spectrum

# Specifications

Media 16 MB CompactFlash card

Suitable sound level meters

Sound Level Meter Class2, NL-22

Sound Level Meter Class1, NL-32

Measurement functions

1. FFT processed spectrum (with selected frequency weighting)
2. Sound pressure level with flat response or with C weighting
3. A-weighted sound pressure level (noise level)

\*Functions 1, 2, 3 are performed simultaneously.

Measurement time: 1 to 999 seconds

Frequency span settings

2 kHz, 5 kHz, 10 kHz, 20 kHz

Frequency span and sampling frequency

Frequency span	Sampling frequency	Sampling cycle	Frame time	Frequency resolution
20 kHz	48 kHz	20.8 $\mu$ sec	20 msec	50 Hz
10 kHz	24 kHz	41.7 $\mu$ sec	40 msec	25 Hz
5 kHz	12 kHz	83.3 $\mu$ sec	80 msec	12.5 Hz
2 kHz	4.8 kHz	208 $\mu$ sec	200 msec	5 Hz

Anti-aliasing filter 14th-order Chebyshev filter

: At frequency span  $\times$  1.4: -70 dB

Window types Rectangular, Hanning

Number of analysis lines

400 (excluding DC component)

## Display

### Measurement screen

FFT analysis result and all-pass level shown simultaneously

Number of display lines for FFT: 100

Zoom factor:  $\times 1$ ,  $\times 2$ ,  $\times 4$

AP, AP(A)

Overload, underload, battery capacity, measurement parameters, display function, date/time

### Sensitivity calibration screen

C-weighted sound pressure level calibration screen

### Menu screen

6 screens for date/time, measurement parameters, and display functions

## Processing

Instantaneous, linear average, maximum value

Measurement time: 1 to 999 seconds

\* Number of FFT frames determined by measurement time and frequency span

## Level range

7 steps

60 to 140 dB

50 to 130 dB

40 to 120 dB

30 to 110 dB

20 to 100 dB

10 to 90 dB

0 to 80 dB

## Inherent noise level

### Noise (sound pressure level)

	Mounted in NL-22	Mounted in NL-32
A-weighted	22 dB or less	20 dB or less
C-weighted	27 dB or less	25 dB or less
FLAT	32 dB max.	30 dB max.

Linearity range	70 dB (noise level and spectrum)
FFT display range	80 dB
Frequency weighting	A, C, FLAT
Time weighting	Fast, Slow
Memory	Manual store on NX-22FT card Max. 100 data sets per file Max. 50 files
Excel file	Included on NX-22FT card Contains macro for converting manually stored data files to Microsoft Excel format

## Outputs

### AC/DC output connector

AC output for selected frequency characteristic (AP)

DC output not selectable

Full-scale -10 dB: 1 Vrms

I/O connector Allows data output and control of sound level meter via RS-232C or USB port

Allows screen hard copy output to printer

Transfer principle Transfer principle: synchronous

Data word length: 8 bit

Stop bits: 1

Parity check: none

Baud rate: 4800, 9600 or 19200 bps

Flow control: yes

X parameter or RTS/CTS control

No comparator output

**Battery life**                      Four IEC LR6 (size "AA")batteries  
   Approx. 16 hours (NL-22 with NX-22FT mounted)  
   Approx. 14 hours (NL-32 with NX-22FT mounted)

**Dimensions and mass** 36.4 (H) × 42.8 (W) × 3.3 (D) mm, approx. 11.4 g

**Supplied accessories**

Instruction manual	1
Inspection certificate	1





