INSTRUCTION MANUAL

1/1·1/3 Octave Real-time Analysis Card

NX-22RT

RION CO., LTD.

Organization of this manual

This manual describes the features and operation principles of the 1/1·1/3 octave real-time analysis card NX-22RT. Read the documentation of the Sound Level Meter NL-22/NL-32 together. This manual contains the following sections.
Page iii contains usage license agreement. Be sure to read the section carefully.

Outline
Provides an outline of the NX-22RT.

Connecting the Card
Explains the inserting and removing the card.

Power On/Off
Describes how to startup the software and operation of power switch.

Menu Screens
Explains the setting of menu screens.

Measurement
Explains the measurement screen and measurement procedure.

Store Operations
Explains the storing data, reading stored data and clearing stored data.

Printing
Explains the printing with sample printout.

Default Settings
Explains the factory default settings of the software.

Commands
Explains command list.

Specifications
List the technical specifications of the NX-22RT.

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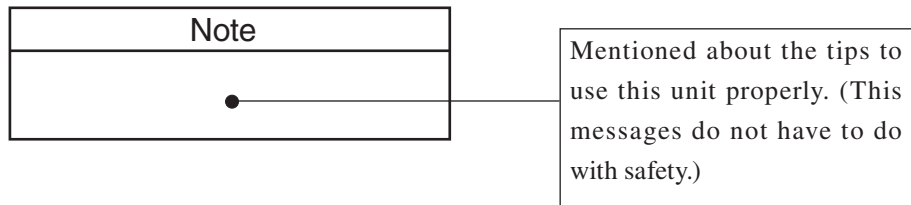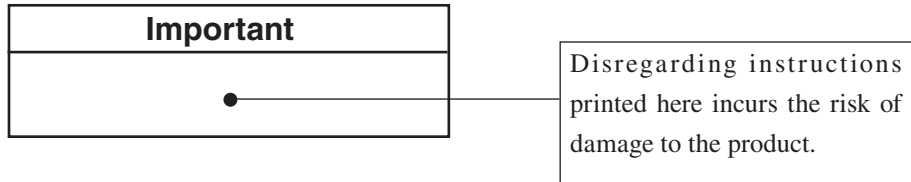
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FOR SAFETY

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.

Important
●

Disregarding instructions printed here incurs the risk of damage to the product.

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Note
●

Mentioned about the tips to use this unit properly. (This messages do not have to do with safety.)

Contents

Outline

This CompactFlash card (CF card) contains software that adds 1/1 octave and 1/3 octave real-time analysis capability to the General-Purpose Sound Level Meter NL-22 or the High-Precision Sound Level Meter NL-32. The 1/1 octave and 1/3 octave real-time analysis functions provided by the NX-22RT card are enabled simply by inserting the card into the sound level meter and turning the unit on.

1/1 and 1/3 octave band analysis can be carried out for the following quantities.

- Sound level L_p
- Equivalent continuous sound level L_{eq}
- Sound exposure level L_E
- Maximum sound level L_{max}

Measurement data can be displayed as a graph or in numeric form. The NX-22RT also functions as a memory card for storing measurement data. Because data are stored in CSV format, they 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, refer to the documentation of the NL-22/NL-32.

Connecting the Card

Inserting and Removing the Card

Important
Make sure that power to the NL-22/NL-32 is turned off before inserting or removing the card.

1. Open the cover of the NL-22/NL-32 card compartment.

2. Insert the NX-22RT card in the card slot.
    Take care not to try inserting the card with wrong orientation. Push the card in carefully, until it is properly seated.

3. To remove the card, push the lever in. The card will emerge from the slot.

Connector section

Front side

Lightly press here and slide to the right

Lever

Insert card with correct orientation

NX-22RT

1/1 · 1/3 Octave RTA Card
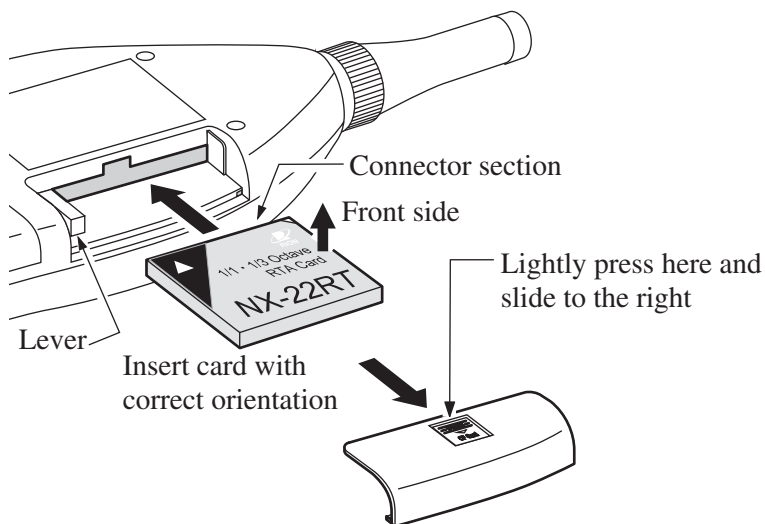
Power On/Off

Startup

When the NX-22RT card is inserted into the NL-22/NL-32 and power is then turned on, the program data contained on the NX-22RT are automatically loaded into the NL-22/NL-32, allowing it to function as 1/1 and 1/3 octave real-time analyzer. To return the NL-22/NL-32 to normal operation, turn power off, remove the NX-22RT 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. When the power-on screen appears, release the Power key.
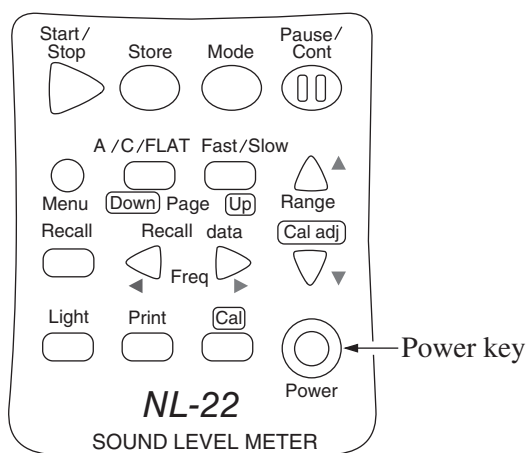
2. Initial screen is shown.
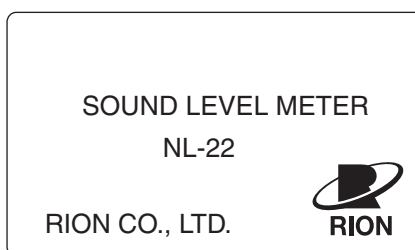
Initial screen

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

Measurement screen

Power-off

Turn the unit off by holding down the Power key for at least one second. When the power-off screen appears, release the Power key.
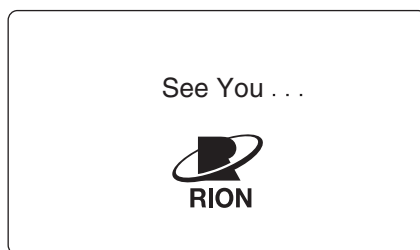
Power-off screen

Menu Screens

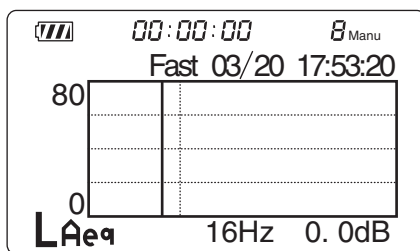There are three menu screens (1/3 to 3/3) which serve for making various settings. While the measurement screen is shown, press the Menu key to bring up the first menu screen. Use the Page Up/Down keys to switch between menu screens 1/3 to 3/3. Use the ▲ and ▼ keys to move the cursor to the desired setting item.

Menu screen 1/3

```
▰▰▰    03/20 08:50:03
<System>           1/3
Meas. time : 10min
Cal Mode   : Internal
Filter    :1/1oct Leq
<Store>
File name  :MAN_0000
Data No.   : 12
```
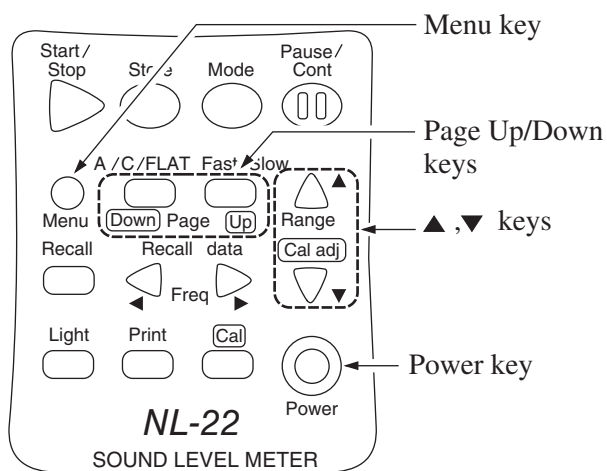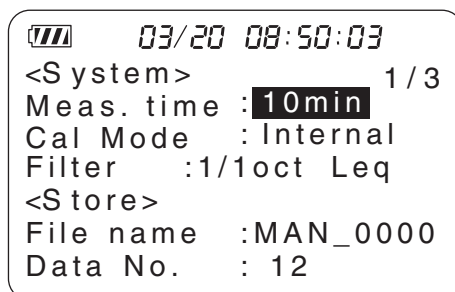
Menu screen 1/3

Meas. time (measurement time)

Use ◀ and ▶ keys to select the measurement time.

Manual ↔ 10 sec ↔ 1 min ↔ 5 min ↔ 10 min ↔ 15 min ↔ 30 min ↔ 1 hour ↔ 8 hours ↔ 24 hours ↔ Manual ⋯

When set to Manual, the maximum measurement time is 24 hours.

Cal mode (calibration mode)

Use the ◀ and ▶ keys to select calibration mode.

Internal: Select this position for electrical calibration of the unit using the built-in oscillator.

External: Select this position for acoustic calibration of the unit using a pistonphone.

For further information on calibration, please refer to the instruction manual NL-22/NL-32.

Filter

Selects the filter and measurement mode.

The ◀ and ▶ keys cycle through the following selections.

1 / 1 oct L_p ↔ 1 / 1 oct L_{max} ↔ 1 / 1 oct L_{eq} ↔ 1 / 1 oct L_E ↔ 1 / 3 oct L_p ↔ 1 / 3 oct L_{max} ↔ 1 / 3 oct L_{eq} ↔ 1 / 3 oct L_E ↔ 1 / 1 oct L_p ↔ ...

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 2/3

```
┌─────────────────────────────┐
│ ⊞      03/20 08:50:03        │
│ <I/O>              2/3       │
│ LCD Contrast : *****--       │
│ Baud rate    : 19200         │
│ Index        : 1             │
│ Output AC/DC : AC            │
│ Light Auto Off: 5min         │
│                             │
└─────────────────────────────┘
```
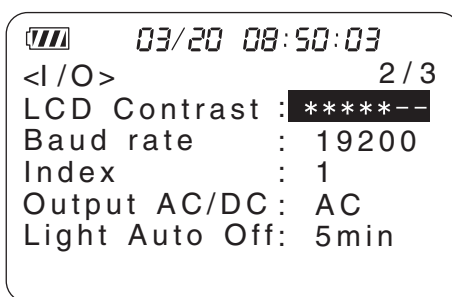
Menu screen 2/3

LCD Contrast

The number of ✳ symbols corresponds to the contrast setting. It can be changed with the ◀ and ▶ keys. There are seven settings.

Baud rate (I/O transfer speed)

This speed setting applies to serial communication with the RS-232-C interface of a PC and to data output to a printer.

Use ◀ and ▶ keys to select the baud rate.

4800 ↔ 9600 ↔ 19200 ↔ 4800 ···(unit: bps)

Index

This is a number identifying the unit when multiple units (up to 255) are used.

Use the ◀ and ▶ keys to set the numbers.

Output AC/DC

Selects whether an AC or DC signal is output from the AC/DC output jack. It can be changed with the ◀ and ▶ keys.

Light Auto Off

To use the automatic backlight turn-off function, set this item to "5 min".

To disable the function, set the item to "Cont.".

It can be changed with the ◀ and ▶ keys.

5 min: Backlight turns itself off automatically after 5 minutes.

Cont: Backlight on/off is controlled by the Light key.

Menu screen 3/3

```
┌─────────────────────────────┐
│ ▓▓▓     03/20 08:50:03      │
│ <Memory>           3/3      │
│ Card format:█Off█           │
│                             │
│ <Time setting>              │
│ Date y/m/d :2002/03/20      │
│ Time      :  22:44:52       │
└─────────────────────────────┘
```
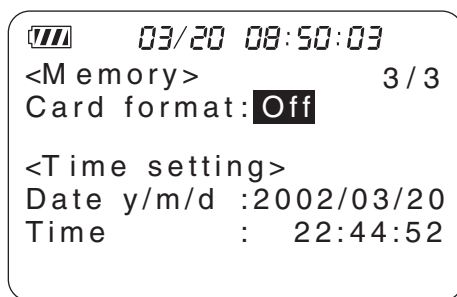
Menu screen 3/3

Card format

The default setting is "Off".

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

For more information on deleting data, refer to page 21.

Date y/m/d

Year/month/day

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.

When you select one of the items year, month, day, hours, minutes, seconds, the indication "Set ready? → Start " flashes. Pressing the Start key in this condition allows you to set the internal clock. The clock then starts running from the new time.

Measurement

Measurement Screens

There are two types of measurement screen: graph display and numeric display. The Mode key serves to switch between the two screens.

Graph display

A screen such as shown below will not appear in actual operation.

The illustration is intended to show all display elements.
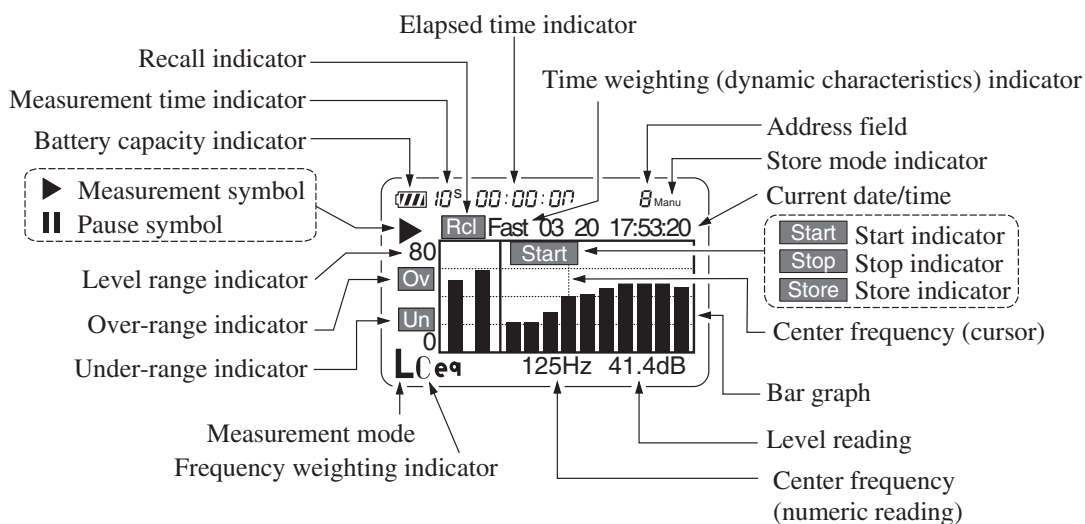
(The size and font of the actual display may differ.)

Battery capacity indicator

When operating the unit on batteries, periodically check this indicator to determine the remaining battery capacity. The number of black segments decreases as the batteries are used up. When the display starts to flash, correct measurement is no longer possible. Replace the batteries with a fresh set.

When the unit is powered from the AC adapter, the "Batteries good" indication is shown.

Batteries good → Batteries partly depleted → Flashing Replace batteries
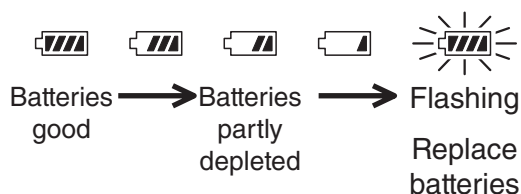
Measurement time indicator

Shows the measurement time selected on menu screen 1/3. If "Manual" (arbitrary measurement time) is selected, the indication is blank.

Recall indicator

Indicates that data stored in memory are being displayed.

Elapsed time indicator

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

Time weighting indicator

Shows the selected time weighting setting.

Select the setting with the Fast/Slow key.

Address field

Shows the "Data No." selected on menu screen 1/3. On the Recall screen, the setting can be changed directly with the Page Up/Down keys.

Store mode indicator

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

Current date

Shows the current date (month, day) and time (hours, minutes, seconds).

Start indicator

This indicator appears for 1 second at measurement start.

Stop indicator

This indicator appears for 1 second at measurement stop.

Store indicator

Lights up for 1 second when store to memory is carried out.

Center frequency (cursor)

The cursor indicates the center frequency. It can be moved with the Freq. ◀ and ▶ keys.

For 1/1 oct

AP (A) ↔ AP ↔ 16 Hz ↔ 31.5 Hz ↔ 63 Hz ↔ 125 Hz ↔ 250 Hz ↔ 500 Hz ↔ 1 kHz ↔ 2 kHz ↔ 4 kHz ↔ 8 kHz (↔ AP ⋯)

For 1/3 oct

AP (A) ↔ AP ↔ 12.5 Hz ↔ 16 Hz ↔ 20 Hz ↔ 25 Hz ↔ 31.5 Hz ↔ 40 Hz ↔ 50 Hz ↔ 63 Hz ↔ 80 Hz ↔ 100 Hz ↔ 125 Hz ↔ 160 Hz ↔ 200 Hz ↔ 250 Hz ↔ 315 Hz ↔ 400 Hz ↔ 500 Hz ↔ 630 Hz ↔ 800 Hz ↔ 1 kHz ↔ 1.25 kHz ↔ 1.6 kHz ↔ 2 kHz ↔ 2.5 kHz ↔ 3.15 kHz ↔ 4 kHz ↔ 5 kHz ↔ 6.3 kHz ↔ 8 kHz ↔ 10 kHz ↔ 12.5 kHz ↔ 16 kHz (↔ AP ⋯)

Linearity range during filter operation is 70 dB.

Bar graph

Shows the sound pressure level at the center frequency of each band. The indication is updated every 100 milliseconds.

Level reading

Shows the measured value for the selected center frequency.

Center frequency (numeric reading)

Shows the selected center frequency.

Frequency weighting indicator

Shows the selected frequency weighting setting. You can switch the setting with the A/C/FLAT key.

L_A : A

L_C : C

L_p : FLAT

The third and fourth digit are shown when processed values are sellected. The meaning is as follows.

$L_{Aeq}, L_{Ceq}, L_{peq}$: Equivalent continuous sound level

L_{AE}, L_{CE}, L_{pE} : Sound exposure level

$L_{Amax}, L_{Cmax}, L_{pmax}$: Maximum time-weighted sound level

Measurement mode

The measurement mode selected on menu screen 1/3 is shown here, together with the frequency weighting.

Under-range indicator

`Un` is shown for at least 1 second when all-pass level AP becomes +7.5 dB or under of lower display limit.

Over-range indicator

`Ov` is shown for at least 1 second when all-pass level AP becomes -2 dB or over of display full-scale point.

Level range indicator

Shows the upper and lower limit of the bar graph. The following seven settings are available:

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

Use the Level Range keys to select the setting.

▶ Measurement symbol

Flashes while a measurement or processing is in progress.

⏸ Pause symbol

Lights up when processing or storing is paused. In the paused condition, the sound level reading is not updated.

Numeric display

When you press the Mode key while the graph display is shown, the unit switches to the numeric display.

When "1/1 oct" was selected for the "Filter" item on menu screen (1/3), there is one screen.

```
▥ 10ˢ 00:00:00        8 Manu
          Slow LCeq 1/1oct
AP(A): 59.4 ☐
   AP: 66.2 ☐
   16: 46.0        1k: 55.4
 31.5: 47.0        2k: 50.6
   63: 53.4        4k: 45.8
  125: 62.8        8k:
```
Over-range indicator
Under-range indicator
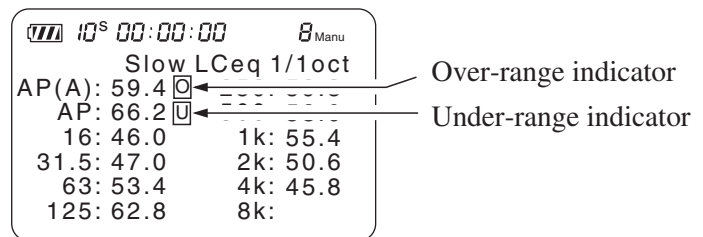
When "1/3 oct" was selected for the "Filter" item on menu screen (1/3), there are three screens. You can switch between them with the Page Up/Down keys.

```
▥ 10ˢ 00:00:00        8 Manu
         Fast LC   1/3oct (1)
AP(A): 63.7      31.5: 51.2
   AP: 67.8        40: 50.0
 12.5: 47.8        50: 50.0
   16: 51.3        63: 48.9
   20: 52.4        80: 50.1
   25: 50.7       100: 53.8
```
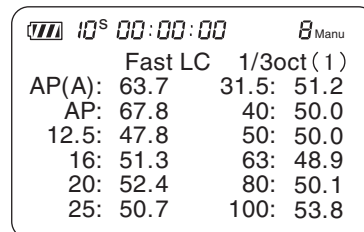
Measurement Procedure

Note
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.

1. Set the measurement time and measurement mode.
   Press the Menu key to call up the menu screen 1/3. (If 1/3 is not shown, use the Page Up/Down keys to switch the display.)

```
┌─────────────────────────────┐
│ ▨▨▨    03/20 08:50:03        │
│ <System>            1/3      │
│ Meas. time  :[10min] ◄────── Measurement time
│ Cal Mode    : Internal       │
│ Filter    :1/1oct Leq ◄───── Measurement mode
│ <Store>                      │
│ File name    :MAN_0000       │
│ Data No.     : 12            │
└─────────────────────────────┘
```

Menu screen 1/3

2. Use the ▲ and ▼ keys to move the cursor to the "Meas. time", and use the ◄ and ► keys to select the measurement time.
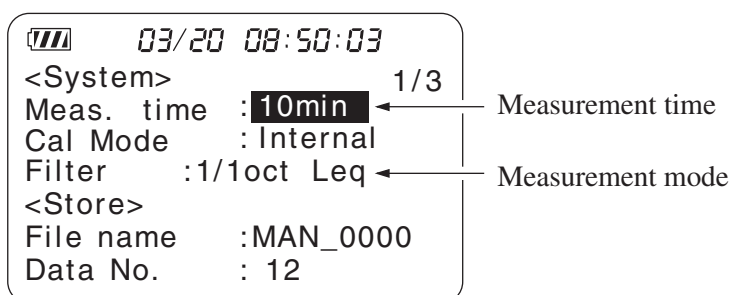   The following settings are available: Manual (arbitrary measurement time), 10 sec, 1 min, 5 min, 10 min, 15 min, 30 min, 1 hour, 8 hours, 24 hours. Also when "Manual" is selected, the maximum measurement time is 24 hours.

3. Use the ▲ and ▼ keys to move the cursor to the "Filter" item, and use the ◄ and ► keys to select the filter and measurement mode.
   The following settings are available: 1/1 oct L_p, 1/1 oct L_{max}, 1/1 oct L_{eq}, 1/1 oct L_E, 1/3 oct L_p, 1/3 oct L_{max}, 1/3 oct L_{eq}, 1/3 oct L_E.

4. Press the Menu key to return to the measurement screen.

5. Select the frequency weighting with the A/C/FLAT key. Regardless of the selected setting, the A-weighted sound pressure level (noise level) is always shown in the "AP (A)" field. The "AP" field shows the sound pressure level weighted according to the selected setting, and the frequency analysis result also reflects the frequency weighting setting.

6. Use the Fast/Slow key to select the time weighting. Normally, the "Fast" setting should be used.

Note
This unit uses high-speed sampling of the sound pressure waveform for L_{eq} and L_E processing. The result is therefore unaffected by time weighting characteristics and accurate also for a short time period.

7. When performing measurements according to JIS or other standards, the frequency weighting and time weighting setting required by the standard should be selected.

8. Use the Level Range keys to select the level range. Choose a setting in which the bar graph indication registers to about the middle of the range. If the Ov (Over) or Un (Under) indicators show up frequently, change the level range setting.

9. Press the Start/Stop key to start measurement.
   During measurement, the ▶ symbol flashes and the elapsed measurement time is displayed.

Note
When the measurement mode is L_p (L_A, L_C), measurement operation begins as soon as the measurement screen is displayed. The level indication is updated every second, but the elapsed time indication continues to show 00:00:00. When you press the Start/Stop key, the elapsed time indication is updated.

10. On the graph display, the cursor indicating the center frequency can be moved with the Freq. ◀ and ▶ keys. The numeric reading for the frequency indicated by the cursor is shown at the bottom right of the screen.

The bar graph center frequencies are as shown below.

1/1 oct band filter

    AP (A)*, AP*, 16 Hz, 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz

1/3 oct band filter

    AP (A)*, AP*, 12.5 Hz, 16 Hz, 20 Hz, 25 Hz, 31.5 Hz, 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1 kHz, 1.25 kHz, 1.6 kHz, 2 kHz, 2.5 kHz, 3.15 kHz, 4 kHz, 5 kHz, 6.3 kHz, 8 kHz, 10 kHz, 12.5 kHz, 16 kHz

    * AP (A) value: Always shows the A-weighted all-pass value, regardless of the frequency weighting setting. If "A" has been selected as frequency weighting, nothing is shown here. (On the numeric display screen, "---.-" is shown.)

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

11. During measurement or processing, the Pause/Cont key can be used to pause and resume the measurement (or to pause and update the level indication). During pause, the pause symbol ‖ is shown. (Any pause intervals are not included in the measurement time.)

Note
It is also possible to use the Mode key during measurement to read L_{eq}, L_E, L_{max} up to that point. This applies only to the numeric level display. Changing the A/C/FLAT or Fast/Slow setting after measurement is completed has no effect on the displayed processing result.

12. When the measurement time set in step 2 has elapsed, the measurement terminates automatically. When wishing to terminate the measurement earlier, press the Start/Stop key.

    If Manual was selected, the Start/Stop key must be used to conclude the measurement.

    If an under-range condition or over-range condition occurs at least once during measurement, the $\boxed{\text{Ov}}$ (Over) or $\boxed{\text{Un}}$ (Under) indicator appears, to show that the processing data contain over-range or under-range data.

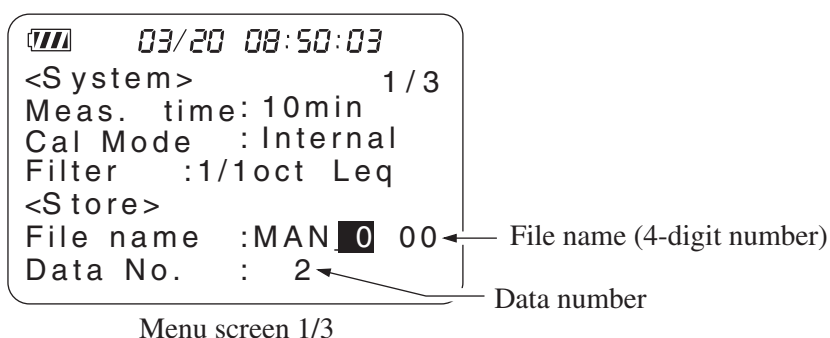| **Important** |
|---|
| During measurement other than L_p, most of the keys such as the A/C/FLAT key and Level Range keys are inoperative. Only the following four keys can be used: Start/Stop, Pause/Cont, Mode, Light. All other settings must be made before starting the measurement. |

Store 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-22RT 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-22RT 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 1/3.

3. Specify a file name (4 numeric digits).
   Use the ▲ and ▼ keys to move the cursor and use the ◀ and ▶ keys to change the numerals (two digits at a time).

4. Select the data number for the store address.
   You can use the ◀ and ▶ keys to set the data number to a value between 1 to 100.

```
┌─────────────────────────────┐
│ ▨▨▨    03/20 08:50:03        │
│ <System>              1/3    │
│ Meas. time: 10min            │
│ Cal Mode  : Internal         │
│ Filter    :1/1oct Leq        │
│ <Store>                      │
│ File name  :MAN▮0▮ 00 ◀───── File name (4-digit number)
│ Data No.   :  2 ◀            │
└─────────────────────────────┘
                    └───────── Data number
```
Menu screen 1/3

Important
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. Bring up the recall screen to check data stored in memory card (see "Reading Stored Data" on page 20).

5. Press the Menu key to call up the measurement screen.

6. Perform the measurement as described in the preceding chapter "Measurement".

7. Press the Store key.

   The measurement data at point when the key was pressed is stored in NX-22RT card.

   The store process is completed in about one second, and the data number is incremented by 1. Pressing the Store key repeatedly allows you to consecutively store data.

   The stored data comprise AP (A), AP of each frequency band level and measurement settings.

Important
Never turn off the unit or remove the card, During the store operation is in progress. Otherwise internal program can be destroyed.

Note
When the data number 100 is reached, the indication does not change further and does not return to 1. When the Store key is pressed in this condition, the "100" indication flashes, but data are not stored. Select another number on Menu screen 1/3.

Reading Stored Data

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

1. Press the Recall key to bring up the recall screen.

    The file names are sorted by measurement time, in descending order.

```
┌─────────────────────────────────────┐
│ ▨▨▨▨                          ⌇       │
│ ┌───────────────────────────────────┐│
│ │MAN_00 05   03 / 19   15: 42       ││
│ │MAN_00 04   03 / 19   15: 30       ││
│ │MAN_00 03   03 / 19   15: 21       ││
│ │MAN_00 02   03 / 18   12: 33       ││
│ │MAN_00 01   03 / 18   12: 15       ││
│ └───────────────────────────────────┘│
│   Memory    left         13936k      │
│ Ok →  Recall    Close → Pause        │
└─────────────────────────────────────┘
```

Recall screen

2. Use the Page Up/Down keys to go to the page with desired file name.

3. Use the ▲ and ▼ keys to highlight the desired file name.

4. Press Recall key.

    The data of the selected file are shown on the display.

    Press Page Up/Down keys to switch the desired file name.

5. The ◀ and ▶ keys shift the each center frequency band.

6. To return to the recall screen, press the Recall key or the Pause key.

7. To terminate the recall mode, press the Pause key.

Clearing Stored Data

To clear all data stored on the NX-22RT card, proceed 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 3/3.

3. Use the ▲ and ▼ keys to select "Card format" and use the ◀ and ▶ keys to change the setting to "On".

4. The display shown below appears when "Card format" is set to "On".

    To clear the all data, press the Start key.

```
┌─────────────────────────────────┐
│ ▨▨▨    03/20 08:50:03           │
│ <Memory>                  3/3    │
│ Card format  : On                │
│                                  │
│       All data clear?            │
│                                  │
│ OK→ Start  Close→ Pause          │
└─────────────────────────────────┘
```
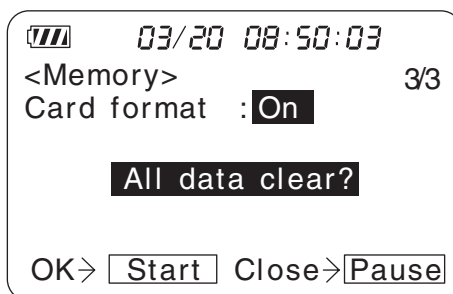
5. The all data of the card are cleared, and the display returns to menu screen 3/3 with the "Card format" item set to "Off".

Note
It is not possible to selectively delete data in a specific address. Be very careful when clearing process from memory card is proceeded. It clears all data from the card.

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.
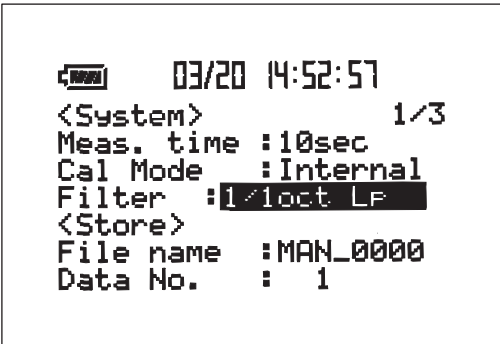
Printing out measurement parameters

The contents of the display can be printed out.

1. Press the Menu key to call up the menu screen.

2. Use the Page Up/Down keys to select the page you want to print out (1/3 to 3/3).

3. Press the Print key.

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

Sample printout

Sample printout of menu screen 1/3

```
       03/20 14:52:57
<System>              1/3
Meas. time :10sec
Cal Mode   :Internal
Filter   :1/1oct Lp
<Store>
File name  :MAN_0000
Data No.   :  1
```

Sample printout of menu screen 2/3

```
🔋      03/20 14:53:23
<I/O>                2/3
LCD Contrast :*****--
Baud rate    : 9600
Index        :   1
Output AC/DC :AC
Light Auto Off: 5min
```

Sample printout of menu screen 3/3

```
🔋      03/20 14:53:50
<Memory>             3/3
Card format: Off

<Time setting>
Date y/m/d:2002/03/20
Time       :  14:53:50
```

Printing out data during measurement

It is possible to print out the measurement graph display together with numeric data and information on measurement settings (measurement start date/time, measurement time, time weighting, filter and measurement mode settings, frequency weighting).

1. Press the Print key during the measurement.
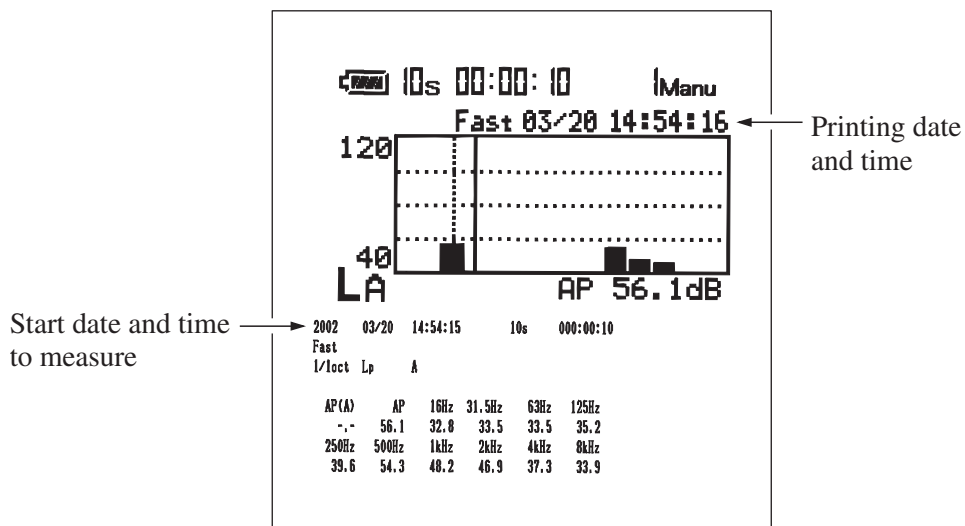   Current measurement data are printed out.

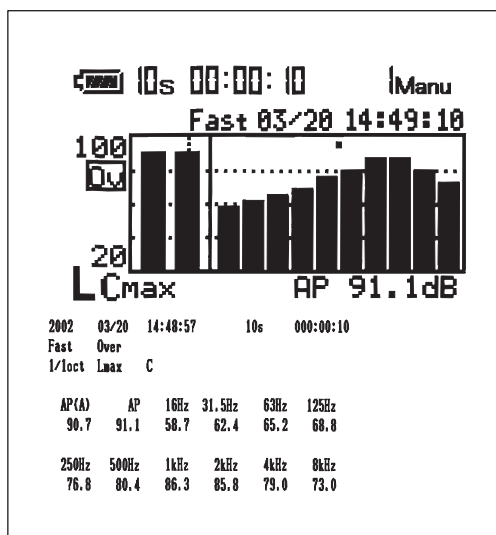A sample printout is shown below. Actual font and size will be different.

Print example

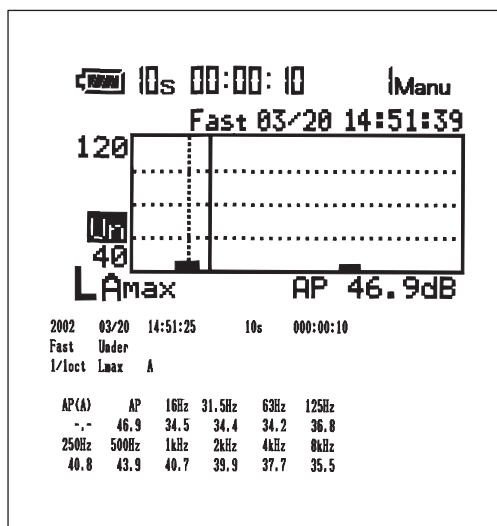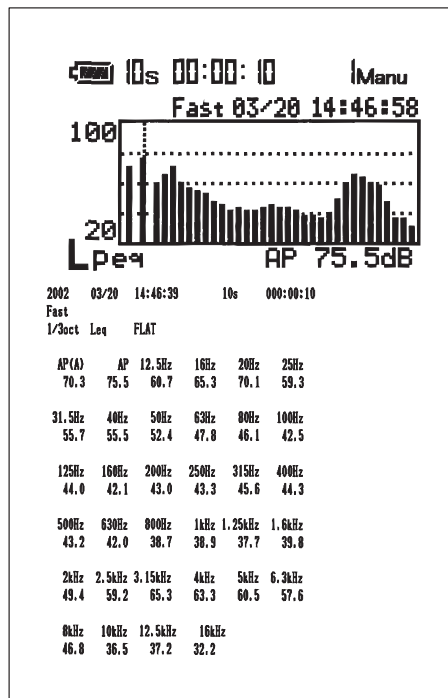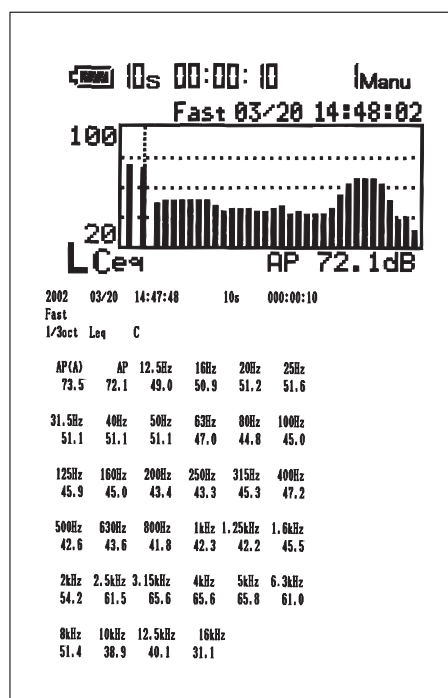1/1 octave band (L_p) sample printout
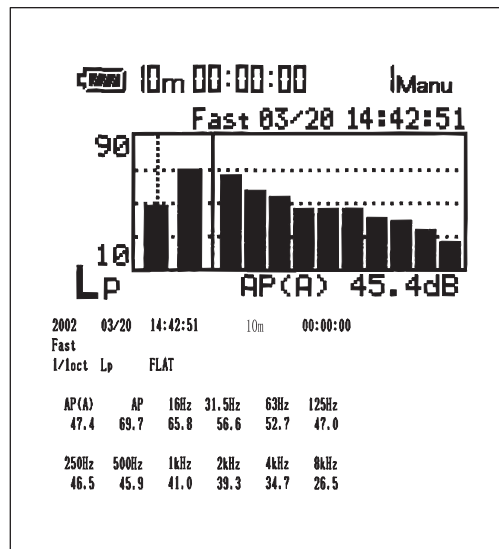
1/1 octave band (L_A) sample printout

Printing date and time

Start date and time to measure

1/1 octave band (L_{Cmax}) sample printout

1/1 octave band (L_{Amax}) sample printout

1/3 octave band ($L_{p\text{eq}}$) sample printout

```
      10s  00:00:10          Manu
            Fast 03/20 14:46:58
 100

  20
 Lpeq                 AP  75.5dB
```

2002	03/20	14:46:39		10s	000:00:10

Fast
1/3oct Leq FLAT

AP(A)	AP	12.5Hz	16Hz	20Hz	25Hz
70.3	75.5	60.7	65.3	70.1	59.3

31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz
55.7	55.5	52.4	47.8	46.1	42.5

125Hz	160Hz	200Hz	250Hz	315Hz	400Hz
44.0	42.1	43.0	43.3	45.6	44.3

500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz
43.2	42.0	38.7	38.9	37.7	39.8

2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz
49.4	59.2	65.3	63.3	60.5	57.6

8kHz	10kHz	12.5kHz	16kHz
46.8	36.5	37.2	32.2

1/3 octave band (L_{Ceq}) sample printout

```
      10s  00:00:10          Manu
            Fast 03/20 14:48:02
 100

  20
 LCeq                 AP  72.1dB
```

2002	03/20	14:47:48		10s	000:00:10

Fast
1/3oct Leq C

AP(A)	AP	12.5Hz	16Hz	20Hz	25Hz
73.5	72.1	49.0	50.9	51.2	51.6

31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz
51.1	51.1	51.1	47.0	44.8	45.0

125Hz	160Hz	200Hz	250Hz	315Hz	400Hz
45.9	45.0	43.4	43.3	45.3	47.2

500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz
42.6	43.6	41.8	42.3	42.2	45.5

2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz
54.2	61.5	65.6	65.6	65.8	61.0

8kHz	10kHz	12.5kHz	16kHz
51.4	38.9	40.1	31.1

Printing out stored data

You can read data stored on the NX-22RT card and print these data.

The following explanation assumes that data have been stored in the card.

1. Press the Recall key to call up the Recall screen.

2. Select the name of the file with the data to be printed, and press the Recall key (see "Reading Stored Data" on page 20.)

3. When the desired data are displayed on the screen, use the Page Up/Down keys to select the address (Data No.) to be printed.
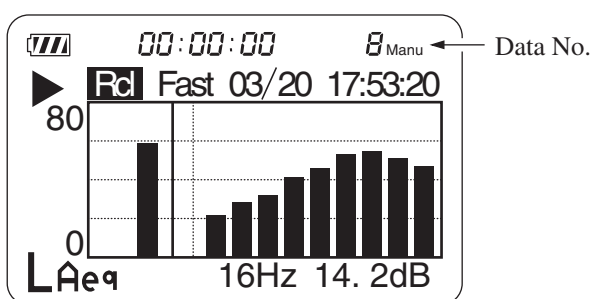
Recall data screen

4. Press the Print key.

Default Settings

The factory default settings are listed below.

Fast/Slow (time weighting)	Fast
A/C/FLAT (frequency weighting)	A
Level Range	50 to 130 dB
Meas. Time	10 min
Cal Mode	Internal
Filter	1/1 oct L_p
File name	MAN_0000
Data No.	1
LCD Contrast	∗∗∗∗
Baud Rate	19200 bps
Index	1
Output AC/DC	AC
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.

Commands

For details on the setting of the commands, please refer to the Serial Interface Manual of Sound Level Meter NL-22/NL-32.

Command List

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

Note
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
ID number should be expressed by binary code "01", not by ASCII code "1".

(3) Attribute ("C" for command)

(4) Command

(5) Parameter (corresponds to p1, p2, etc. in command description section
of the manual)

(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 = 0:	Arbitrary	p1 = 1 to 3:	Not accepted
p1 = 4:	10 s	p1 = 5:	1 m
p1 = 6:	5 m	p1 = 7:	10 m
p1 = 8:	15 m	p1 = 9:	30 m
p1 = 10:	1 h	p1 = 11:	8 h
p1 = 12:	24 h		

Transfer format: Command block

MTI?

Get measurement time setting

NL-22/NL-32 response data to MTI?

Response data d1

d1:   Corresponds to p1

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		

* Valid only when using NX-22RT

Transfer format: Command block

RNG?

Get level range setting

NL-22/NL-32 response to RNG?

Response data d1

d1:   Corresponds to p1

Transfer format: Response block

TMC

Set time weighting

TMCp1

p1 = 0:   Fast

p1 = 1:   Slow

Transfer format: Command block

TMC?

Get time weighting setting

NL-22/NL-32 response data to TMC?

Response data d1

d1:   Corresponds to p1

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

NL-22/NL-32 response data to WGT?

Response data d1

d1:   Corresponds to p1

Transfer format: Response block

Operation commands

PSE

Pause/restart measurement and memory store

PSEp1

p1 = 0:   Restart measurement or memory store

p1 = 1:   Pause measurement or memory store

Transfer format: Command block

PSE?

Get measurement and memory store pause status

NL-22/NL-32 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

NL-22/NL-32 response data to SRT?

Response data d1

d1:   1 if measurement in progress, otherwise 0

Transfer format: Response block

STO

Start memory store

STOp1

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

Memory and store commands

ADR

Set address

Address setting

ADRp1

p1 = Any address

Transfer format: Command block

ADR?

Get address setting

NL-22/NL-32 response data to ADR?

Response data d1

d1:   Currently selected address number (displayed address)

Transfer format: Response block

CDR?

Get remaining card capacity

NL-22/NL-32 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:　　　File name (Example: MAN_0001; where "MAN" is in capitals)

Transfer format:　　Command block

RCL?

Get recall state

NL-22/NL-32 response data to RCL?

Response data d1

d1=0:　not recall state

d1=1:　recall state

Transfer format:　　Response block

SNR?

Get store name shown on recall menu

No parameter

Return data format

Example:　　MAN_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

NL-22/NL-32 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

NL-22/NL-32 response data to CBM?

Response data d1

d1 = 118 to 670 (irregular steps)

Transfer format: Response block

Various setting and information commands

BAT?

Get battery status

NL-22/NL-32 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 function

BLAp1

p1 = 0:   Disable

p1 = 1:   Enable

Transfer format: Command block

BLA?

Get backlight auto turn-off setting

NL-22/NL-32 response data to BLA?

Response data d1

d1:   Corresponds to p1

Transfer format: Response block

CLK

Set current year, month, day, hours, minutes, seconds

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 year, month, day, hours, minutes, seconds setting

NL-22/NL-32 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.

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 or memory store

NL-22/NL-32 response data to LTI?

Response data d1,d2,d3

d1:   Hours

d2:   Minutes

d3:   Seconds

Maximum: 200:00:00

Transfer format: Response block

OPE

Set filter and measurement mode

OPEp1

p1=0:　　1/1 oct L_p

p1=1:　　1/1 oct L_{max}

p1=2:　　1/1 oct L_{eq}

p1=3:　　1/1 oct L_E

p1=4:　　1/3 oct L_p

p1=5:　　1/3 oct L_{max}

p1=6:　　1/3 oct L_{eq}

p1=7:　　1/3 oct L_E

· Corresponds to filter settings on menu screen.

· Cannot be set in Recall or Cal mode.

Transfer format:　　Command block

OPE?

Get filter and measurement mode

NL-22/NL-32 response data to OPE?

Response data d1

d1:　　Corresponds to p1

· In Recall mode, filter and measurement mode of recalled data are returned.

Transfer format:　　Response block

OUT

Set NL-22/NL-32 output signal to AC or DC

OUTp1

p1 = 0: AC OUT

p1 = 1: DC OUT

Transfer format:　　Command block

OUT?

Get AC/DC output setting

NL-22/NL-32 response data to OUT?

Response data d1

d1: Corresponds to p1

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

NL-22/NL-32 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

NL-22/NL-32 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 or Off

RETp1

p1 = 0:   Disable response processing

p1 = 1:   Enable response processing

Transfer format: Command block

RET?

Get response processing setting

NL-22/NL-32 response data to RET?

Response data d1

d1 = Corresponds to p1

Transfer format: Response block

RMT

Set remote/local mode

RMTp1

p1 = 0:   Set to local mode

p1 = 1:   Set to remote mode

Transfer format: Command block

RMT?

Get remote/local mode setting

NL-22/NL-32 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 control)

Transfer format: Command block

XON?

Get control mode setting

NL-22/NL-32 response data to XON?

Response data d1

d1:   Corresponds to p1

Transfer format: Response block

Specifications

Media   CompactFlash

Applicable sound level meters

                     Sound Level Meter NL-22

                     Sound Level Meter NL-32

Applicable standards IEC 61260:1995 Class 1

                     JIS C 1514:2002 Class 1

    When used in NL-22

                     IEC 61672-1:2002 Class 2

                     JIS C 1513:2002 Class 1

                     JIS C 1509-1:2005 Class 2

    When used in NL-32

                     IEC 61672-1:2002 Class 1

                     JIS C 1513:2002 Class 1

                     JIS C 1509-1:2005 Class 1

Measurement functions

                     Sound level L_p

                     Equivalent continuous sound level L_{eq}

                     Sound exposure level L_E

                     Maximum sound level L_{max}

                     * Able to choose one of the measurement functions.

                      L_N and L_{min} measurement are not available

Measurement time   10 sec, 1 min, 5 min, 10 min, 15 min, 30 min, 1 hour,

                     8 hours, 24 hours

Measurement range 28 to 130 dB (A weighting)

Time weighting   Fast, Slow

Frequency weighting A, C, FLAT

Linearity range   70 dB

Level range selection   7 ranges

                     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

Over-range indicator   `Ov` is shown when all-pass level AP becomes -2 dB or over of display full-scale point.

Under-range indicator `Un` is shown when all-pass level AP becomes +7.5 dB or under of lower display limit.

Remaining battery capacity warning

         5-step indication

Clock   Year/month/day/hour/minute/second
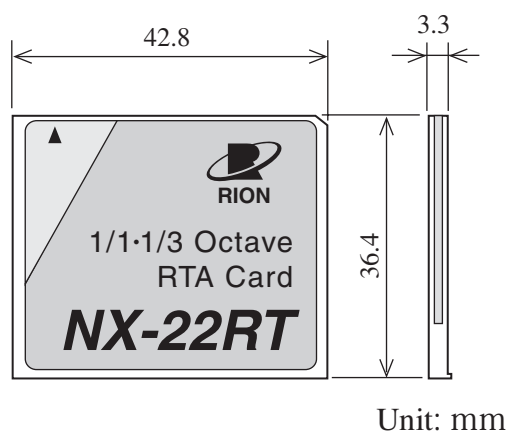
Analyzer frequency bands

         Analysis results are weighted with selected frequency characteristics

   1/1 octave band pass filter

         16 Hz to 8 kHz, AP(A), AP

         Configuration

         12th-order Butterworth band pass digital filter

         Center frequencies

            Base-2

            16 Hz to 8 kHz

            Exact center frequencies are calculated as powers of 2

            $1000 \text{ Hz} \times 2^{n}$, n = -6 to 3

   1/3 octave band pass filter

         12.5 Hz to 16 kHz, AP(A), AP

         Configuration

         6th-order Butterworth band pass digital filter

         Center frequencies

            Base-2

            $1000 \text{ Hz} \times 2^{n/3}$, n = -19 to 12

            Exact center frequencies are calculated as powers of 2

            12.5 Hz to 16 kHz

         AP is the all-pass value. AP(A) always shows A-weighted all-pass value regardless of frequency weighting setting.

Memory	Manual store on NX-22RT card
	Max. 100 data sets per file
	Max. 100 files
	Not available during auto store
Outputs	
AC/DC output	Selectable AC or DC output
AC output	AP value is output
	Full-scale -10 dB: 1 Vrms
DC output	AP value is output Respond to L_p value
	Full-scale -10 dB: 2.5 V, 0.25 V/10 dB
I/O connector	Sound level meter control from and data output to a computer via the RS-232-C or the USB interfaces.
	Graphical and numerical data output to printer

Transfer protocol

Transfer principle:	asynchronous
Data word length:	8 bit
Stop bits:	1 bit
Parity check:	none
Baud rate:	4800, 9600 or 19200 bps
Flow control:	yes
	select X parameter or RTS/CTS

Comparator output

Battery life (20°C)

Four IEC LR6 batteries

Approx. 15 h (NL-22 with NX-22RT)

Approx. 13 h (NL-32 with NX-22RT)

Ambient conditions	-10 to 50°C
	10% to 90%RH (no condensation)
Dimensions	Approx. 36.4 (H) × 42.8 (W) × 3.3 (thickness) mm
Weight	Approx. 11.4 g

Supplied accessories

Instruction manual	1
Inspection certificate	1

42.8

3.3

▲

RION

1/1·1/3 Octave
RTA Card

NX-22RT

36.4

Unit: mm

External view and dimensional drawing