INSTRUCTION MANUAL

BUILDING ACOUSTIC CARD

NX-28BA

RION CO., LTD.

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Organization of this manual

This manual describes the functions and operation principles of the Building Acoustic Card NX-28BA. Pages iii and following contain usage license agreement, vii and following contain important safety precautions. Be sure to read these sections carefully.

The manual consists of the chapters listed below.

Outline

Gives basic information on the functions of the software.

Installation

Explains how to install or uninstall the program.

Start up

Explains how to start up the program and how to use the function for loading setup files.

Reading the Display

Explains the various items that appear on the display.

Measurement of Airborne Sound Insulation between Rooms

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, calculation of rating quantities, and other aspects.

Measurement of Floor Impact Sound Insulation (Light Impact Source)

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, calculation of rating quantities, and other aspects.

Measurement of Floor Impact Sound Insulation (Heavy Impact Source)

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, calculation of rating quantities, and other aspects.

Measurement of Room Environmental Sound Level

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, calculation of rating quantities, and other aspects.

Measurement of Sound Level from Service Equipment

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, and other aspects.

Measurement of Airborne Sound Insulation of Façade Elements and Façades

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, and other aspects.

Measurement of Reverberation Time

Gives an overview of the measurement and provides information on setting items, operation steps, display of measurement results, calculation of rating quantities, and other aspects.

Overlay Background Level and S/N Caution

Explains how to use the function for checking the level difference to the background noise level when performing measurement in the receiving room.

Setting Monitor Function

Explains how to use the function for automatically establishing settings at start up and for monitoring any changes in the settings.

Waveform Recording Function

Explains how to simultaneously perform waveform recording during measurement.

Communication Commands

Explains how to control settings and operation from a computer via the interface.

Store Data

Gives information on measurement data stored on the CompactFlash (CF) card.

Excel Macro

Explains how to use the excel macro that is available for download at the RION Corporation web site.

Printing

Explains how to print data from the measurement screen and recall screen.

Default Values

Lists the initial settings that are active when the program is reset.

Technical Reference

Provides additional information about reverberation time measurement.

Specifications

Lists the technical specifications of the NX-28BA.

Usage License Agreement

Important
Carefully read and observe the following agreement.

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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.

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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. 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

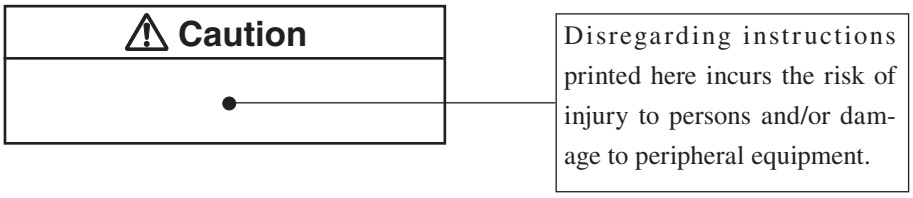
   This agreement is valid until terminated. The user can terminate the agreement at any time by unloading the software from the High-Precision Sound Level Meter NA-28 and destroying the software and associated documentation. The agreement also terminates when the user violates any of the conditions herein. In this case, the user also must destroy the software and unload the software from the High-Precision Sound Level Meter NA-28.

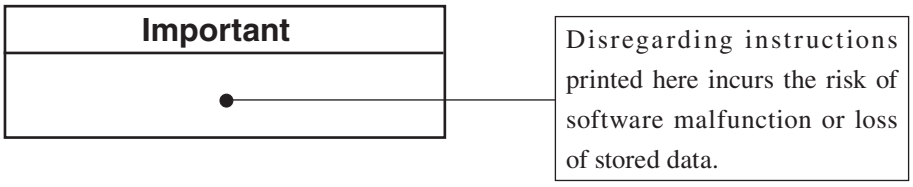
8. Jurisdiction

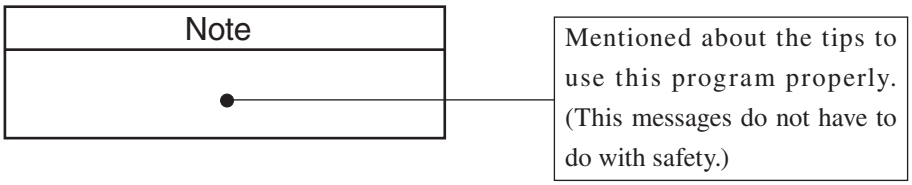
   Any disputes or litigation arising from this agreement will be under the jurisdiction of the Tokyo District Court.

FOR SAFETY

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







⚠ Caution

When performing measurements using high sound pressure levels, it is essential to provide and use adequate hearing protection (such as headphones).

Important

Saving data in internal memory

Before starting up the program provided on the Building Acoustic Card NX-28BA, be sure to copy all data stored in the internal memory of the NA-28 onto a CF card.

This program uses the internal memory during operation. Therefore data that were stored in the internal memory when the NA-28 was operating in normal mode will be erased.

If data exist in the internal memory, a confirmation message will appear when starting up the program by function switching.

Before formatting the card

This program card also contains a program for updating the system version of the NA-28. If you format the card, this capability will be lost. Take care not to accidentally do this if the version updating information is still needed.

Automatic version upgrading at first use

When you use the Building Acoustic Card NX-28BA for the first time (normally this will be for installation), make sure that the card is inserted in the card slot before you turn power to the NA-28 on. If the system version of the NA-28 is not up to date, the version upgrade process will start automatically when you turn the power on. When the process is completed, power goes off automatically.

Then turn power on again to start installation of the Building Acoustic program. For details on this process, refer to the "Installation" section.

After the system version of the NA-28 has been updated, the data in the folder "NA-28" - "system" (version updating information) are no longer needed. You can therefore delete the folder, using a computer.

Contents

Outline

This program card contains software that makes it easy to measure airborne sound insulation and impact sound insulation characteristics as well as reverberation time of buildings, using the Sound Level Meter NA-28 (with 1/3 octave analysis function). The software is subsequently called "this program" or "the program" in this manual.

The program allows JIS and ISO compliant measurements and makes it possible to calculate rating quantities on the NA-28. It also allows calculation of N value and NC value (noise criteria value) which are used for indoor environmental assessments.

The resulting data are stored as text files, and an excel macro for performing detailed index calculations is also provided.

The separately available Waveform Recording Card NX-28WR can be used in conjunction with this program to record the sound pressure waveform at the time of measurement.

Analysis modes

When this program is started, the NA-28 operates in one of the following analysis modes:

- Real-time octave analysis
- Real-time 1/3 octave analysis
- Real-time octave and 1/3 octave analysis

Note
While this program is running, the NA-28 cannot be switched to sound level meter mode.

Measurement modes

This program offers the following seven measurement modes.

- Airborne sound insulation between rooms (see page 29)
  Measurement according to ISO 140-4:1998 (JIS A 1417:2000)
  Measurement according to ISO 717-1:1996 (JIS A 1419-1:2000)
- Floor impact sound insulation (light impact source) (see page 52)
  Measurement according to ISO 140-7:1998 (JIS A 1418-1:2000)
  Measurement according to ISO 717-2:1996 (JIS A 1419-2:2000)
- Floor impact sound insulation (heavy impact source) (see page 74)
  Measurement according to JIS A 1418-2:2000
  Measurement according to JIS A 1419-2:2000
- Room environmental sound level (see pages 95)
  N value calculated according to the guideline by Architectural Institute of Japan
  NC value calculated according to the literature shown below
  L. L. Beranek (ed.): Noise and vibration control.
  McGraw-Hill Book Company, New York, 1971
- Sound level from service equipment (see page 109)
  Measurement according to ISO 16032:2004
- Airborne sound insulation of façade elements and façades (see page 128)
  Measurement according to ISO 140-5:1998
- Reverberation time (see page 148)

Measurement values

This program is capable of handling the following three types of measurement values, but the actual measurement value will depend on the measurement mode.

- Time-weighted sound level L_p
- Time-average sound level L_{eq}
- Time-weighted sound level maximum L_{max}

Installation

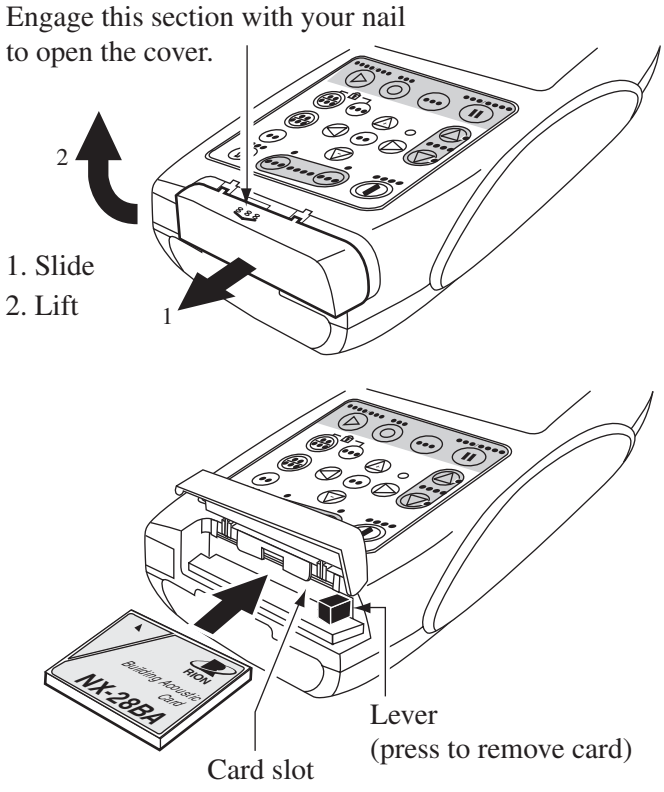
The software on this program card can be used only on one NA-28 at a time. To install the software on multiple NA-28 units, multiple program cards are required.

Installing this program

Important
Make sure that power to the unit is turned off before inserting the card.

To install this program in the sound level meter, proceed as follows.

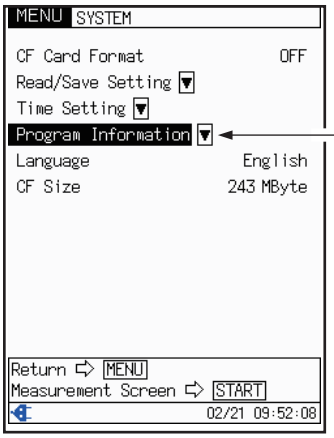
1. Open the cover of the card slot and insert the program card.



2. Press the POWER key to turn power on.

Note
If the system version of the NA-28 is not up to date, the version upgrade process will start automatically. When the process is completed, power goes off automatically. Then repeat the procedure from step 1. (Refer to the section "Automatic version upgrading at first use" on page xi.)

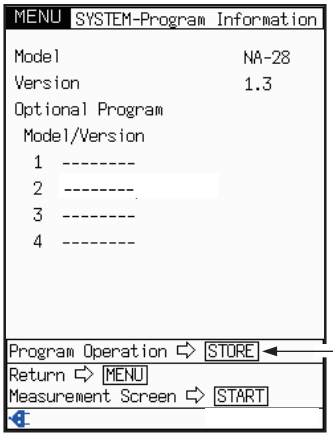
3. Press the MENU key. (The Menu List screen appears.)
4. Select [System] from the list and press the ENT key. (The SYSTEM menu screen appears.)
5. Select [Program Information] and press the ENT key. (The SYSTEM - Program Information screen appears.)



SYSTEM menu screen

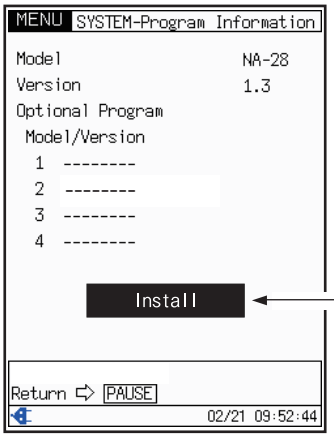
Selecting [Program Information] and pressing ENT brings up the SYSTEM - Program Information screen.

6. Press the STORE key to bring up the installation screen.



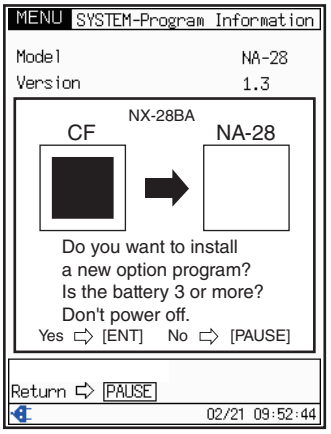
SYSTEM - Program Information screen

7. Use the △ / ▽ keys to select [Install] and press the ENT key.
   A screen for starting the installation process of this program appears. To install the function, press the ENT key. This will cause the program to be installed from the program card in the sound level meter.



Using the △/▽/◁/▷keys to select [Install] and pressing ENT brings up the installation screen.

SYSTEM - Program Information screen



Program installation confirmation screen

■ (black): Program is installed.
□ (white): Program is not installed.

Important
Make sure that the battery indicator has at least 3 segments before starting the installation.
Do not turn power off during the installation. Otherwise program data may be corrupted.

Note
When this program has been installed from the program card in one sound level meter, the card can no longer be used to install the function in another sound level meter, unless it is first uninstalled from the former sound level meter.

When the installation is completed, the power automatically goes off.
Press the POWER key to restart the unit.

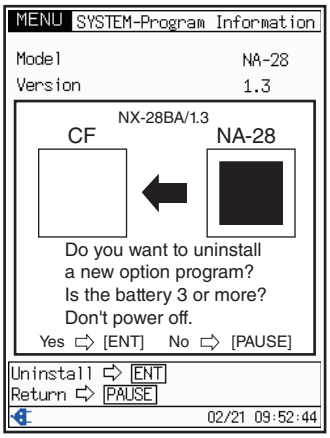
Uninstalling this program

Important
Make sure that power to the unit is turned off before inserting the card.

To uninstall this program from the sound level meter, proceed as follows.

1. Open the cover of the card slot and insert the program card.
2. Press the POWER key to turn power on.
3. If this program is running, switch to NA-28 mode.
   On the menu list screen, select [Option] and press the ENT key.
   The selection function list screen will come up, with [NA-28] already selected. Press the ENT key.
   The unit restarts in NA-28 mode.
4. Press the MENU key. (The Menu List screen appears.)
5. Select [System] from the list and press the ENT key. (The SYSTEM menu screen appears.)
6. Select [Program Information] and press the ENT key. (The SYSTEM - Program Information screen appears.)
7. Press the STORE key to bring up the uninstallation screen.

8. Use the △ / ▽ keys to select [NX-28BA] and press the ENT key. A screen for starting the uninstallation process of this program appears. To uninstall the function, press the ENT key. This will cause the program to be uninstalled from the sound level meter and reinstalled on the program card.



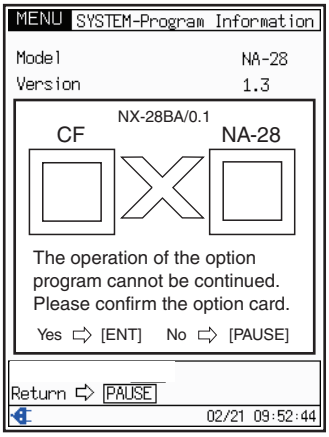
Program uninstallation confirmation screen

Important
Make sure that the battery indicator has at least 3 segments before starting the uninstallation process.
Do not turn power off during the uninstallation process. Otherwise program data may be corrupted.

To remove the program card, turn power to the sound level meter off and push the lever so that the card pops out.

If the program cannot be installed

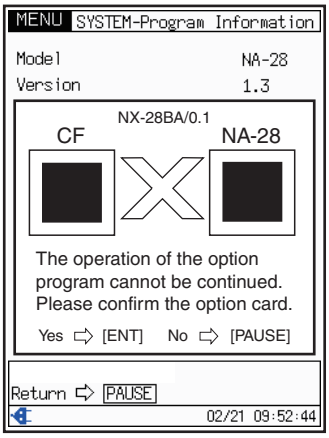
If a program card whose software was installed on a sound level meter is inserted into another sound level meter, attempting to install the software in that sound level meter will result in an error screen such as shown below.



Program installation error screen

Press the PAUSE key of the sound level meter to abort the installation.

If you attempt to install this program on a sound level meter where the program is already installed, an error screen such as shown below appears.



Program installation error screen

Press the PAUSE key of the sound level meter to abort the installation.

Important
Do not turn power off during the installation process. Otherwise program data may be corrupted.

To remove the program card, turn power to the sound level meter off and push the lever so that the card pops out.

Start up

NX-28BA start up

The procedure for starting up this program is as follows.
The same steps are also used to return the NA-28 to the standard condition.

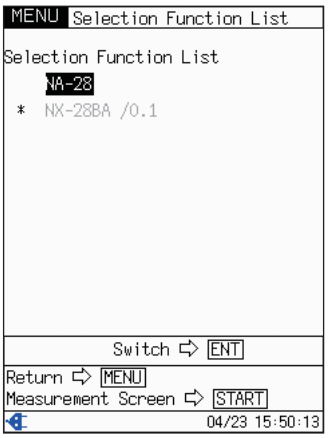
Important
Before starting up the program, be sure to copy all data stored in the internal memory onto a CF card. Because this program uses the internal memory during operation, any stored data will be deleted. If data exist in the internal memory when starting up the program, a confirmation message appears.

1. Turn on power to the sound level meter NA-28 where this program (Building Acoustic Card NX-28BA) is installed.
   The start up screen is shown for about 10 to 15 seconds, and then the measurement screen appears.

Note
If this program was running in the NA-28 before power was turned off the last time, it will start again at power-up.

2. If this program is not running (NA-28 is in normal operation condition), press the MENU key to bring up the menu list screen.

3. Use the △ / ▽ / ◁ / ▷ keys to select [Option] and press the ENT key.
   A screen listing available functions appears.



Function list screen

4. Press the ENT key.
   The program starts up. This takes about 10 to 15 seconds because the NA-28 will restart.

Verifying whether the program is running

You can use the measurement screen to check whether this program is running.

If the program is running, the indication "BA" is shown at the top left of the measurement screen.

(See the chapter "Reading the Display".)

Resume function

When this program is started, the measurement screen will appear. The settings will be the same as those that were active before the last power-down cycle (resume function).

Items not included in the resume function

The following two items are not covered by the resume function.

- Source room data (Items set in Building Acoustic menu for "AirRm" and "Facade" modes)
  These will be set to "OFF" at start up.
- RTime Data (Items set at recall setup screen)
  These will be set to "OFF" at start up.

Note
When power is turned on while a CF card with a setup file in the specified folder is inserted, the setup file will be loaded and will override the resume function settings (see next page).

Loading setup data from a file at startup

If a CF card which contains a setup file in a special folder is inserted in the NA-28 when starting this program, a dialog asking whether to load the settings appears. Either selecting "Yes" at this dialog or waiting for 10 seconds will cause the settings in the file to be loaded.

Folder for setup file: NA-28\SETUP\STARTUP
Naming convention for setup file: NA28SET○.rns (where ○ is a single-digit number)

For details on how to create setup files, refer to the instruction manual of the NA-28.

Note
This program has a function for monitoring any setting changes made after loading a setup file (see page 168).

About setup files

The content of setup files will differ, depending on the installed option program and the startup condition at the time when the setup file is created. Make sure that the startup condition at the time when you use the file is the same as the startup condition that existed at the time when the file was created (For the Building Acoustic Card NX-28BA program, use setup files created with startup conditions (3) or (4) below).

		Function switching	
		NA-28	NX-28BA
Installed option program	None	Startup condition (1)	- - - - - -
	NX-28WR	Startup condition (2)	- - - - - -
	NX-28BA	Startup condition (1)	Startup condition (3)
	NX-28WR NX-28BA	Startup condition (2)	Startup condition (4)

The startup condition saved in a setup file can be checked by opening the file (NA28SET○.rns) with a text editor.

Setup file created in startup condition (1)

```
CSV
std NA,1,3,0,0,2,2,0,0,4,-----
```

Setup file created in startup condition (2)

```
CSV
std NA,1,3,0,0,2,2,0,0,4,-----
opt WR,0,0,0,0,0,0,0,0,70,-----
```

Setup file created in startup condition (3)

```
CSV
std NA,1,3,0,0,2,2,0,0,4,-----
opt BA,6,503,5,3,5,5,5,2,-----
```

Setup file created in startup condition (4)

```
CSV
std NA,1,3,0,0,2,2,0,0,4,-----
opt BA,6,503,5,3,5,5,5,2,-----
opt WR,0,0,0,0,0,0,0,0,70,-----
```

The setup file contents are listed on the next page.

Setup file contents

A setup file created with this program contains the following items.

Calibration Mode
Analysis Mode
Main Channel Frequency Weighting
Main Channel Time Weighting
Level Range Full Scale
Measurement Screen (Graphical Display/Numeric Display)
([Building Acoustic] menu)
Measurement Mode
Store Name
Measurement Time
Source Position
Source Room Measurement Positions
Receive Room Measurement Positions
(Heavy Impact Source) Number of Measurements
BGN Mode
Estimation Curve
Surface Area
Receive Room Volume
(Reverberation) Trigger Level
(Reverberation) Trigger Band
(Reverberation) Sampling Period
(Reverberation) Measurement Time
(Reverberation) Repeat Count
(Reverberation) Alarm Error Rate
([Measurement] menu)
Windscreen Correction
Back Erase
Delay Time
L_{max}/L_{min} Type
Trigger Mode
Trigger Level
Trigger Band (OCT and 1/3 OCT)

Trigger Band (1/3 OCT position in OCT)
Slope
Time Trigger Start Date/Time
Time Trigger End Date/Time
Sleep Mode
Diffuse Field Correction
Sub Channel
Sub Channel Frequency Weighting
Sub Channel Time Weighting

([Display] menu)

Background Noise Overlay
S/N caution

([Input/Output] menu)

AC Output
DC Output
Comparator
Comparator Level
Comparator Band (OCT and 1/3 OCT)
Comparator Band (1/3 OCT position in OCT)
USB Communication
Remote Control
Backlight Intensity
Backlight Time
Beep Sound
Index

(Recall processing menu)

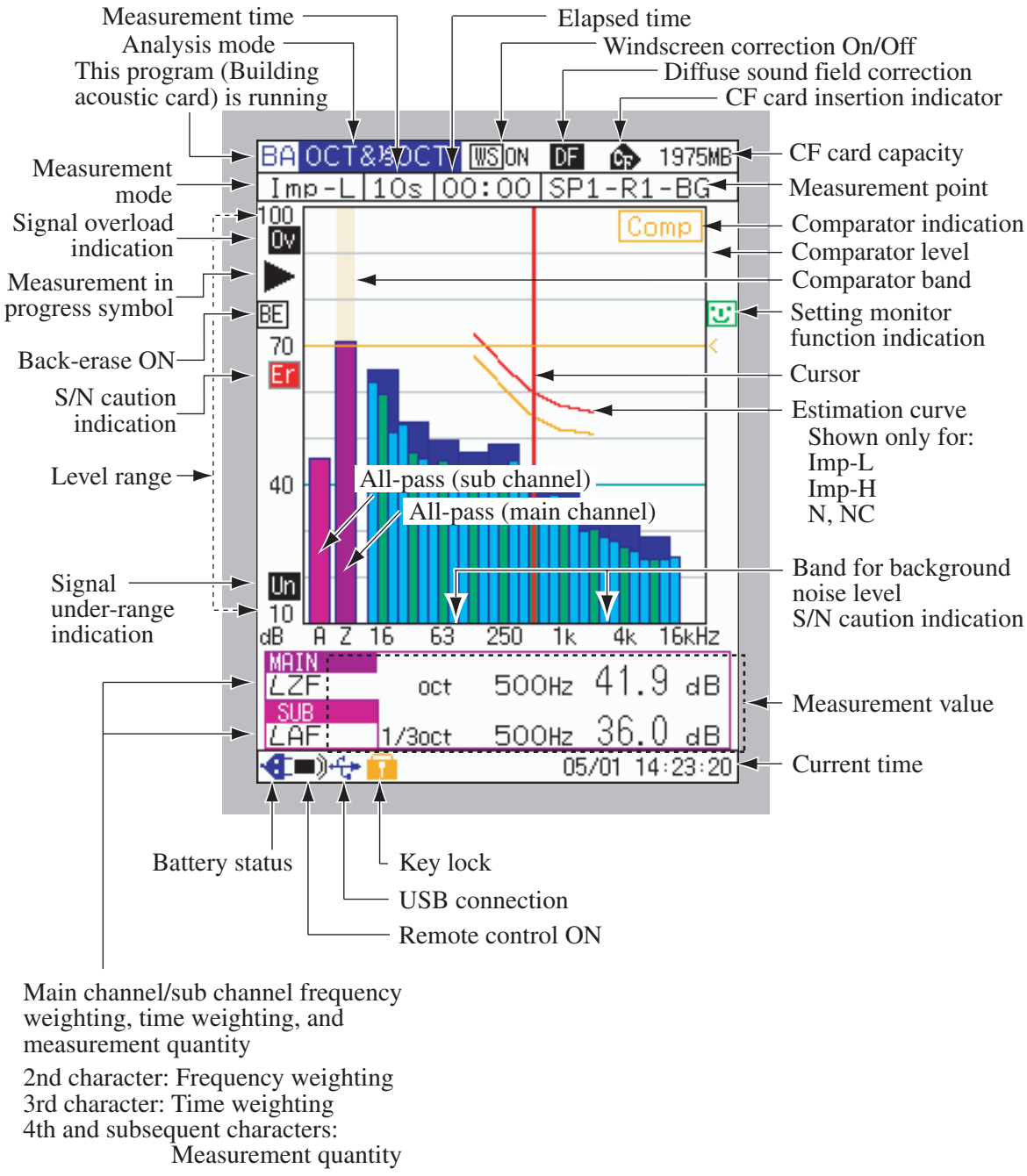
S/N Caution
Background Noise Overlay
Background Noise Correction

(System menu)

Language

Reading the Display

Graphical display



When the program (Building acoustic card NX-28BA) is running, the indication "BA" is shown at the top left of the measurement screen.

Measurement mode

Shows the currently selected measurement mode.

AirRm:	Airborne sound insulation between rooms
Imp-L:	Floor impact sound insulation (light impact source)
Imp-H:	Floor impact sound insulation (heavy impact source)
N:	Room environmental sound level (N value)
NC:	Room environmental sound level (NC value)
ServE:	Sound level from service equipment
AirFa:	Airborne sound insulation of façade elements and façades
RTime:	Reverberation time

Analysis mode

Shows the mode selected for the display.

OCT.:	Octave band analyzer
1/3OCT.:	1/3 octave band analyzer
OCT&1/3OCT:	Octave and 1/3 octave band analyzer

Measurement time

Shows the measurement time that has been set with the Building Acoustic menu.

Elapsed time

Shows the elapsed measurement time in seconds.

Windscreen correction On/Off

[WS ON] is shown when windscreen correction is on.

[WS OFF] is shown when windscreen correction is off.

Diffuse sound field correction

Indicates that the unit has been set up for measurement in a diffuse sound field.

CF card insertion indicator

Indicates that a CF card has been inserted.

CF card capacity

Indicates the remaining capacity of the inserted CF card.

Measurement point

Shows the point being measured or that will be measured.

SP1 to SP8:	Sound source position
R1 to R10:	Receiving room measurement point
S1 to S10:	Source room measurement point
SG:	Measurement at receiving room measurement point/source room measurement point
BG:	Background noise measurement at receiving room measurement point
1 to 5:	Number of measurements for floor impact sound insulation (heavy impact source)
Adr.1 to Adr.5:	Reverberation time measurement count

When measurement data exist for the displayed measurement point, the indication is red.

Comparator indication

When a signal exceeding the comparator level is input in the comparator band, the indication "Comp" is shown and a signal is output from the COMP OUT jack on the bottom panel (open collector).

Comparator level

When the comparator setting is ON, the comparator level set with the [Input/Output] menu is shown as an orange-colored line.

Comparator band

When the comparator setting is ON, the comparator band set with the [Input/Output] menu is shown as an orange-colored band.

Setting monitor function indication

When the setting monitor function is enabled, this symbol is shown.

When a monitored item has been changed, the symbol disappears.

Cursor

You can read the level in each band by moving this cursor. The frequency and level at the cursor position are shown at the bottom of the screen.

Use the ◁ / ▷ keys to move the cursor.

Estimation curve

The estimation curve selected at the Building Acoustic menu and the next higher curve are shown.

(If the highest curve is selected, only one curve is shown.)

Band for background noise level S/N caution indication

When the "S/N caution" item on the [Display] menu is set to "ON" and the measurement is performed at a receiving room measurement point, the band on the horizontal axis (frequency) of the S/N caution function target is highlighted in light blue. For information on measurement modes and bands for S/N caution indication, refer to page 165.

Measurement value

Shows the frequency band and level at the cursor position.

When cursor is at all-pass point:

Upper row shows main channel level

Lower row shows sub channel level

When cursor is not at all-pass point and analysis mode is OCT&1/3OCT:

Upper row shows frequency and level at cursor point for octave mode

Lower row shows frequency and level at cursor point for 1/3 octave mode

When cursor is not at all-pass point and analysis mode is OCT or 1/3OCT:

Upper row shows frequency and level at cursor point

Lower row shows all-pass level for sub channel

Current time

Shows the date and time of the internal clock.

Key lock

Pressing the GRP/NUM and MENU keys together activates the key lock, and this symbol appears.

Pressing the GRP/NUM and MENU keys together once more cancels the key lock.

USB connection

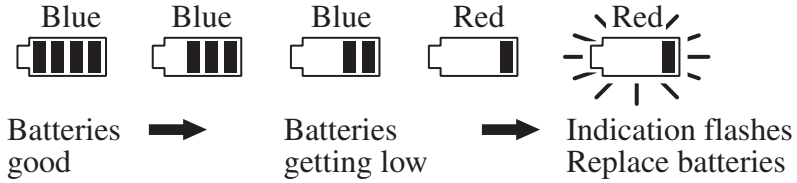
Indicates that the unit is connected to a computer via a USB link and that USB communication is enabled. The symbol does not appear when connected as a removable disc only.

Remote control ON

Indicates that the unit can be controlled with the infrared remote control.

Battery status

When the unit is operated on battery power, it is required to check this indication regularly. The number of blue segments will decrease as the batteries get used up. When the indication starts to flash, correct measurement is not possible. Replace the batteries with a fresh set.



When the unit is being powered from an AC adapter, the power plug symbol ( ) is shown.

Main channel/sub channel frequency weighting

Indicates the main channel and sub channel frequency weighting characteristic.

A: A-weighting, C: C-weighting, Z: Z-weighting (flat response)

The main channel frequency weighting characteristic is set with the FREQ WEIGHT key.

The sub channel frequency weighting characteristic is set from measurement menu.

Main channel/sub channel time weighting

Indicates the main channel and sub channel time weighting characteristic.

F: Fast, S: Slow, τ: 10 ms, I: Impulse (sub channel only)

The main channel time weighting characteristic is set from the TIME WEIGHT key.

The sub channel time weighting characteristic is set from measurement menu.

Note
When returning to the measurement screen after changing the measurement mode to reverberation time, the time weighting characteristics will be set to τ (10 ms). This setting can be changed. When switching the measurement mode from “Reverberation Time” to another measurement mode, the unit reverts to the previous time weighting setting.

Main channel/sub channel measurement quantity

When the displayed measurement quantity is time averaged sound level (L_{eq}) or maximum value (L_{max}), the indication "eq" or "max" is appended to the time-weighted characteristics indication. This does not apply when the displayed measurement quantity is the time weighted sound level (L_p).

The MODE key is used for switching the measurement quantity.

Signal under-range indication

When a signal under-range condition is detected, the indication **Un** (white on black) is shown.

If this indication appears frequently, use the LEVEL △ / ▽ keys to decrease the level range setting.

If processed data contain signal under-range data, the indication Un is shown. This indication remains on the display until the next processing measurement is started.

Note
If the sub channel is On, the under-range indication is based on the frequency weighted characteristic with the lower measurement limit. If A-weighting and C-weighting or A-weighting and Z-weighting are selected (in any channel), the under-range indication is based on the A-weighted measurement value. If C-weighting and Z-weighting are selected, the under-range indication is based on the C-weighted measurement value.

Level range

Indicates the sound pressure level measurement range. This can be switched with the LEVEL △ / ▽ keys.

S/N caution indication

When the difference between the measurement level and the background noise level is small, an error warning indication ([ER]) or caution indication ([Cr]) is shown. For details, see "S/N caution" on page 164.

This function is active during receiving room measurement when "S/N caution" on the Display menu is set to "ON" and background noise measurement is completed.

Back-erase ON

Indicates that the back-erase function has been set to ON.

Measurement in progress symbol

When a measurement is in progress, the ▶ symbol flashes, and the indicator LED flashes in green. During reverberation time measurement, the indicator LED flashes in red.

During measurement pause, the ❙❙ symbol is shown, and the indicator LED flashes in blue.

Signal overload indication

When a signal overload condition is detected, the indication **Ov** (white on black) is shown for at least 1 second. If this indication appears frequently, use the LEVEL △ / ▽ keys to increase the level range setting.

If processed data contain signal overload data, the indication Ov is shown. This indication remains on the display until the next processing measurement is started.

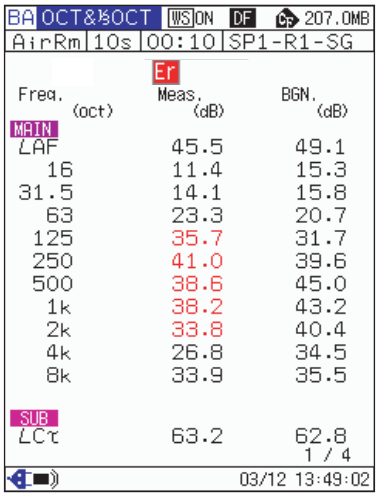
Numeric display screen

An example for OCT & 1/3 OCT analysis is shown below.

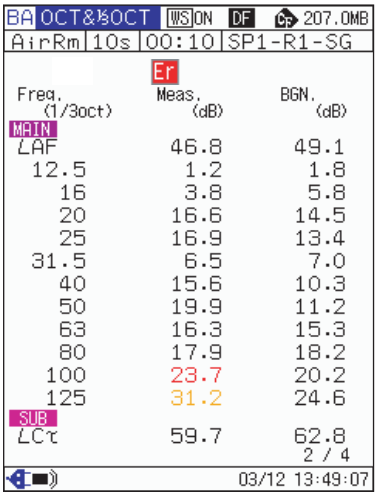
There are four pages for measurement result display. The ◁/▷ keys are used to switch between pages.

In OCT. analysis mode, there is only one page.

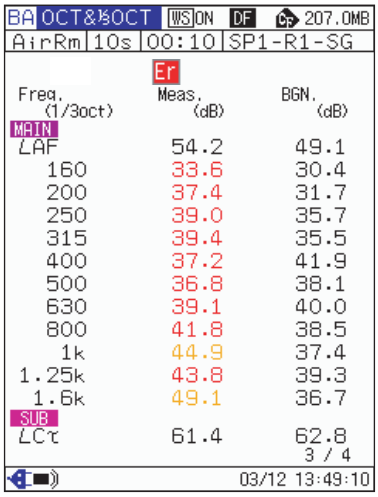
In 1/3 OCT. analysis mode, pages 2 to 4 below are shown as pages 1 to 3.



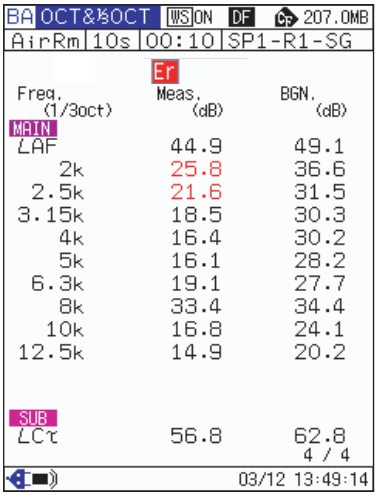
Page 1 (octave)



Page 2 (1/3 octave)



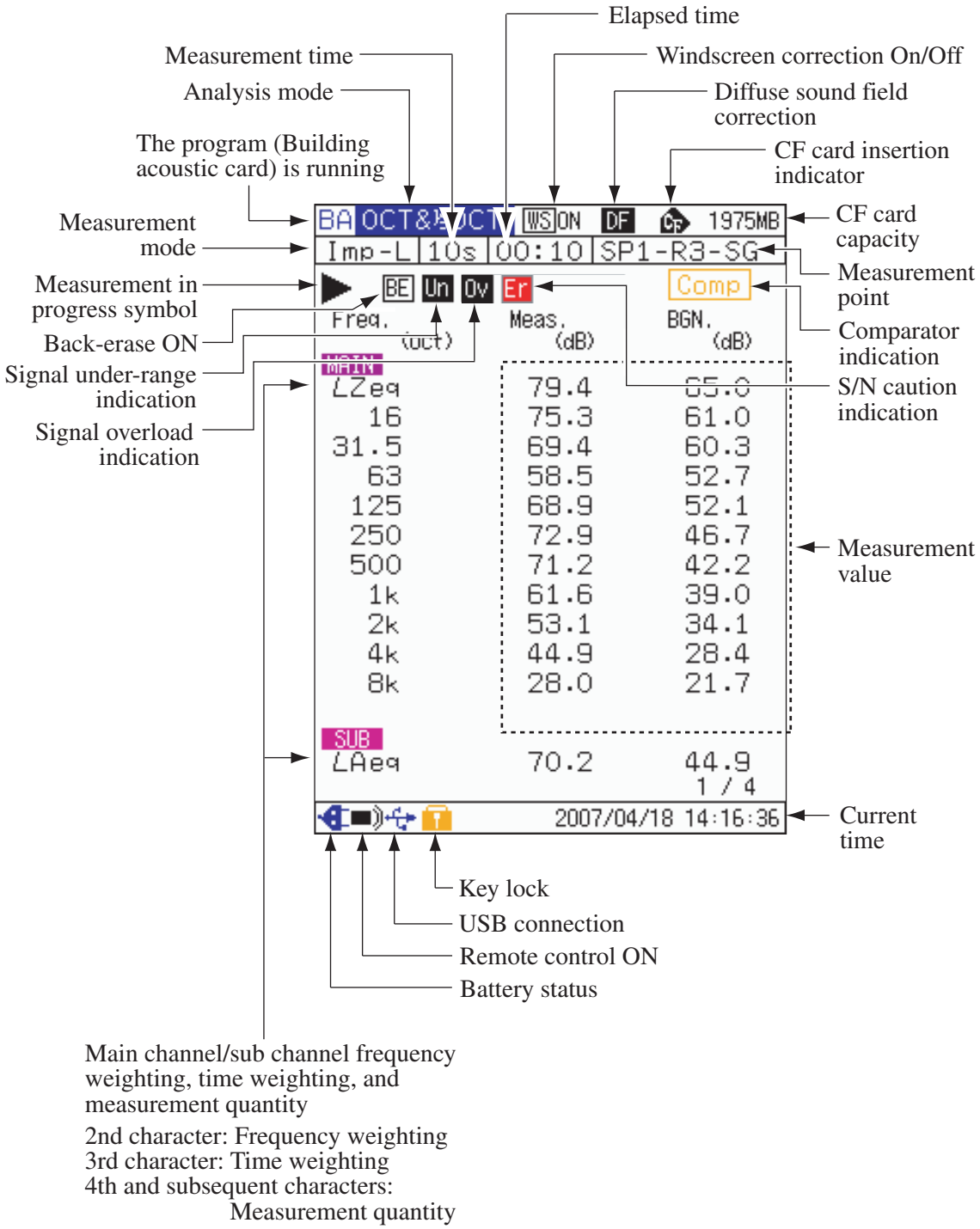
Page 3 (1/3 octave)



Page 4 (1/3 octave)

Items shown on numeric display screen

For an explanation of the items, refer to pages 20 to 25.



Message indication

When you press the START/STOP key or the PAUSE/CONT key, a message such as shown below is shown for about 1 second.

START	START/STOP key was pressed and measurement has started
STOP	Measurement time has elapsed or START/STOP key was pressed and measurement has ended
PAUSE	PAUSE/CONT key was pressed and unit is in pause condition
CONTINUE	PAUSE/CONT key was pressed and measurement was resumed

Measurement of Airborne Sound Insulation between Rooms

Serves for measurement of airborne sound insulation provided by walls, floors, or doors between two rooms. Results are used to calculate sound insulation rank and other parameters.

Measurement is performed according to the compliance standard ISO 140-4:1998 (JIS A 1417:2000), and rating according to ISO 717-1:1996 (JIS A 1419-1:2000).

⚠ Caution

When performing measurements using high sound pressure levels, it is essential to provide and use adequate hearing protection (such as headphones).

Note

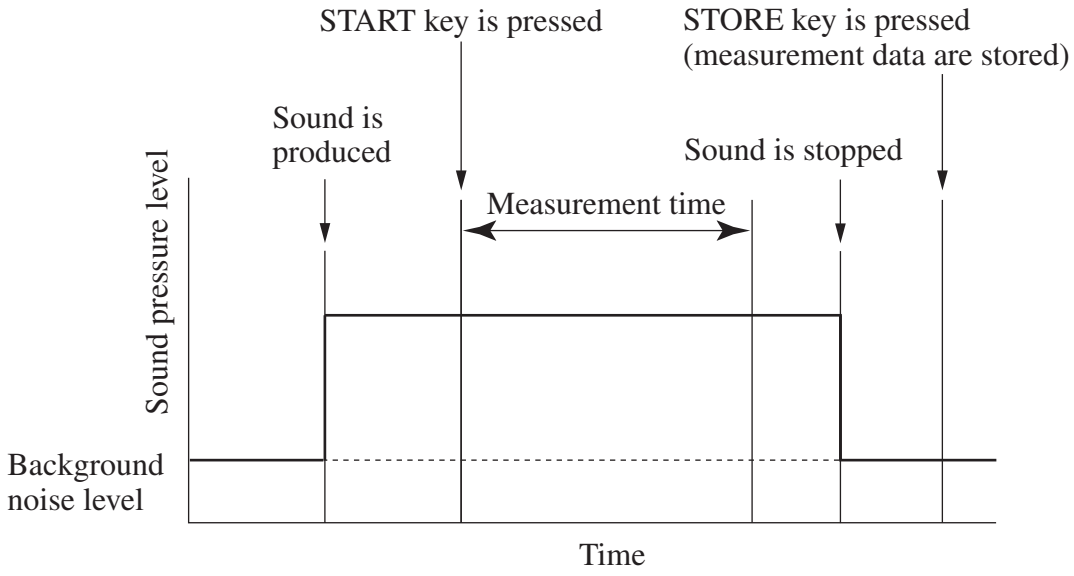
The measurements described in this chapter, unless explicitly specified as background noise measurements, are performed using a sound source.

Measurement outline

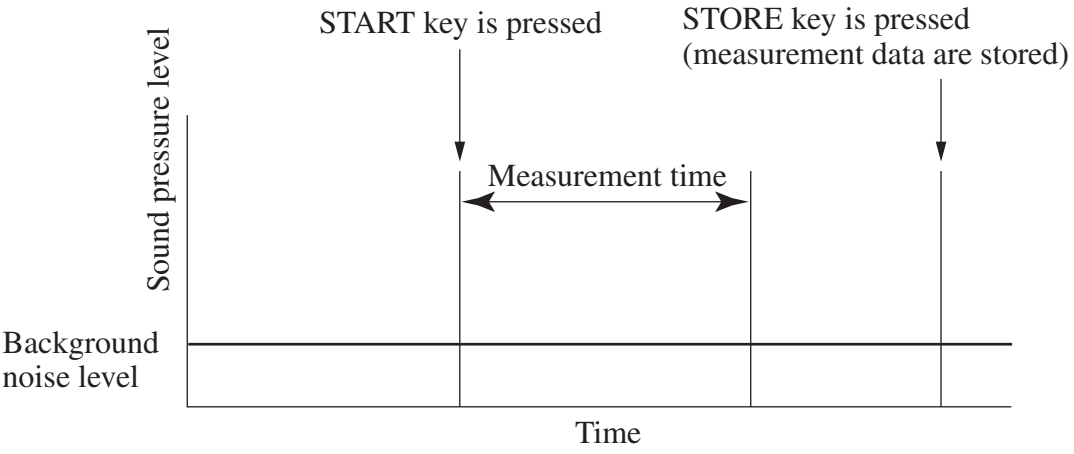
Operation at each measurement point

After pressing the START key, the unit collects data for the preset measurement time and calculates the time-average sound level L_{eq}. The maximum L_{max} for the period is also determined at the same time. (During background noise measurement, only L_{eq} is determined.)

A function (overlay background level) is available for overlaying the background noise level in the receiving room during measurement, and generating a warning when the level difference is small. (The function is not available if the background noise measurement mode was set to "None".)



The principle for background noise measurement is as follows.



Measurement procedure

The order in which measurements are performed at the various measurement points depends on the background noise measurement mode. For details, see the explanation starting on the next page.

Sound source and measurement point indication

The sound sources and measurement points are indicated as follows.

Indication in brackets ( ) refers to on-screen display.

SP1 Sound source (speaker) position 1

R1B Background noise measurement at measurement point 1 in receiving room (SP1-R1-BG)

R2B Background noise measurement at measurement point 2 in receiving room (SP1-R2-BG)

: :

RnB Background noise measurement at measurement point n in receiving room (SP1-Rn-BG)

(n: receiving room measurement position number)

R1 Measurement at measurement point 1 in receiving room (SP1-R1-SG)

R2 Measurement at measurement point 2 in receiving room (SP1-R2-SG)

: :

Rn Measurement at measurement point n in receiving room (SP1-Rn-SG)

(n: receiving room measurement position number)

S1 Measurement at measurement point 1 in source room (SP1-S1-SG)

S2 Measurement at measurement point 2 in source room (SP1-S2-SG)

: :

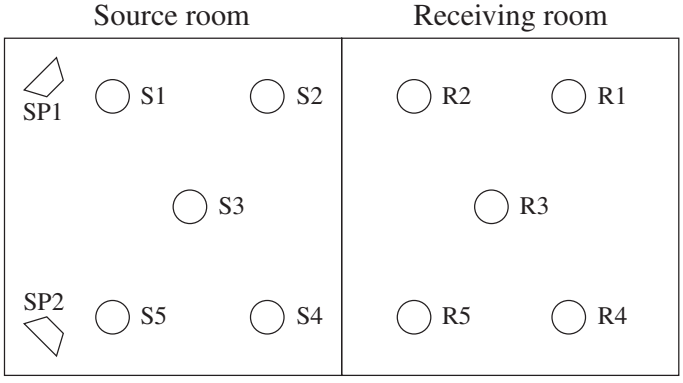
Sm Measurement at measurement point m in source room (SP1-Sm-SG)

(m: source room measurement position number)

SP2 Sound source position 2

: :

SPp Sound source position p (p: sound source position number)



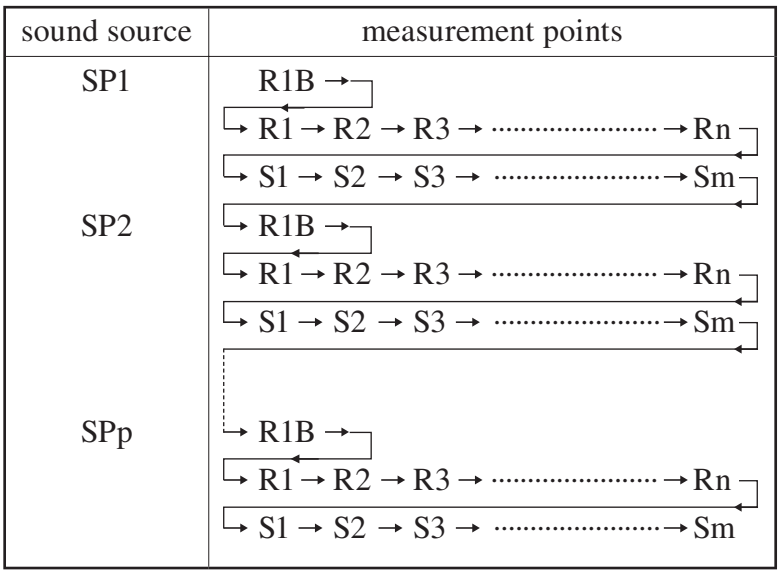
Sound source and measurement point arrangement example

Background noise measurement mode set to "Once"

In this case, background noise measurement is carried out once only at a representative measurement point in the receiving room. Measurement then continues with the measurement points in the receiving room, followed by the measurement points in the source room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.



R1B Background noise measurement at a representative measurement point in receiving room

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at measurement point in source room

(m: source room measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "Before"

Background noise measurement is carried out for all measurement points in the receiving room. Measurement then proceeds with the measurement points in the receiving room, followed by the measurement points in the source room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R2B → R3B → ····· →RnB ↳ R1 → R2 → R3 → ····· → Rn ↳ S1 → S2 → S3 → ····· → Sm
SP2	↳ R1B → R2B → R3B → ····· →RnB ↳ R1 → R2 → R3 → ····· → Rn ↳ S1 → S2 → S3 → ····· → Sm
SPp	↳ R1B → R2B → R3B → ····· →RnB ↳ R1 → R2 → R3 → ····· → Rn ↳ S1 → S2 → S3 → ····· → Sm

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at measurement point in source room

(m: source room measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "During"

In this case, background noise measurement followed by normal measurement with source sound are carried out for all the measurement points in the receiving room. Measurement then proceeds with the measurement points in the source room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R1 → R2B → R2 → R3B → R3 →·····→ RnB → Rn ↳ S1 → S2 → S3 → ·····→ Sm
SP2	↳ R1B → R1 → R2B → R2 → R3B → R3 →·····→ RnB → Rn ↳ S1 → S2 → S3 → ·····→ Sm
SPp	↳ R1B → R1 → R2B → R2 → R3B → R3 →·····→ RnB → Rn ↳ S1 → S2 → S3 → ·····→ Sm

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at measurement point in source room

(m: source room measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "None"

In this case, no background noise measurement is carried out in the receiving room. Measurement immediately starts with the measurement points in the receiving room and then proceeds to the measurement points in the source room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1 → R2 → R3 → ····· → Rn ↳ S1 → S2 → S3 → ····· → Sm
SP2	↳ R1 → R2 → R3 → ····· → Rn ↳ S1 → S2 → S3 → ····· → Sm
SPp	↳ R1 → R2 → R3 → ····· → Rn ↳ S1 → S2 → S3 → ····· → Sm

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at measurement point in source room

(m: source room measurement position number)

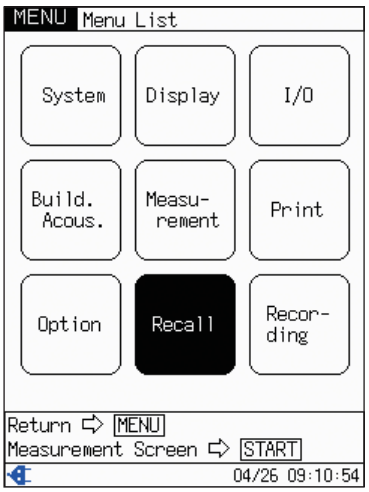
SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Parameter setting

Before starting the measurement of airborne sound insulation between rooms, measurement parameters should be set as follows.

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus for making settings, and press the ENT key. The respective menu screen comes up.
   • [Building Acoustic] • [Measurement] • [Display]
   For an explanation of the respective menu screens, see the following pages. For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.



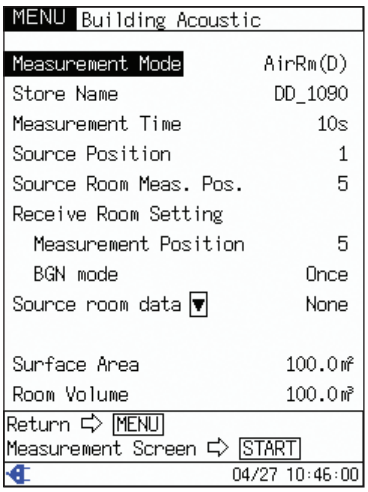
Menu list screen

Important

You must first set the measurement mode to "AirRm" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key. The respective parameter can now be set.
4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key. The new setting is established.
5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for all menus listed in step 2 in the same way.
   Press the START key to return to the measurement screen.

[Building Acoustic] menu ("AirRm" measurement mode)



Building Acoustic menu screen

Measurement mode "AirRm" selected

When "AirRm" is selected, the following parameters can be set.

Store Name DD_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored. This is used for identification when the data is recalled later. The "DD_" indicates that the data are for airborne sound insulation between rooms.

Measurement Time Setting range: 1 to 60 seconds

Specifies the time interval for which measurement data are collected.

Source Position Setting range: 1 to 8

Specifies the number of positions in the source room where the sound source is placed.

Source Room Meas. Pos.

Setting range: 1 to 10

Specifies the number of positions in the source room where the sound level meter (microphone) for measurement is placed.

Receive Room Setting Measurement Position

Setting range: 1 to 10

Specifies the number of positions in the receiving room where the sound level meter (microphone) for measurement is placed.

BGN mode Available settings: "Once", "Before", "During", "None"

Determines the background noise measurement in the receiving room. (For details, see pages 32 to 35.)

Source room data Select data measured with "AirRm"

When there are two or more receiving rooms, the source room data can be selected here, to avoid having to redo the measurement.

When not using this function, select "None".

Surface Area Setting range: 0.0 to 999.9 m^2

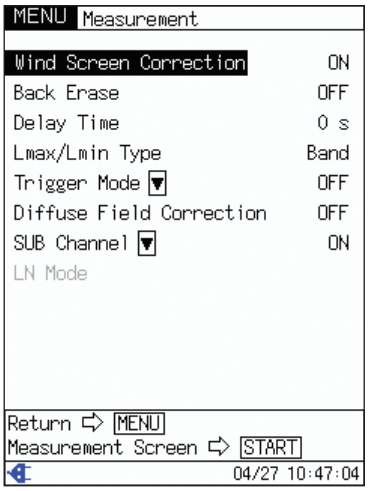
Specifies the surface area of the wall whose sound insulation is being measured.

For details, see the section "Handling of measurement surface area for measurement of sound insulation between rooms" in the "Technical Reference" section on page 260.

Room Volume Setting range: 0.1 to 999.9 m^3

Specifies the volume of the receiving room.

[Measurement] menu



Measurement menu screen

Wind Screen Correction Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase Available settings: "OFF", "5s"

When set to "5s", measurement data for a period of five seconds before the PAUSE/CONT key was pressed will be canceled.

Note
When the NX-28WR is installed and waveform recording function is active, the back erase function is not available.

Delay Time Setting range: 1 to 10 seconds

Specifies the delay time between the point where the START key is pressed and the actual start of measurement.

L_{max}/L_{min} Type Available settings: "AP", “AP(S)”, "Band"

AP: The L_{max} / L_{min} value of Sub channel and each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

AP(S): The L_{max} / L_{min} value of each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

The L_{max} / L_{min} value of the Sub channel is the maximum / minimum value during the measurement period.

Band: The L_{max} / L_{min} value of the Sub channel and each frequency band is the maximum / minimum value during the measurement period.

Trigger Mode Available settings: "OFF", "Level1", "Level2", "Time", "EXT"

For "Level1", further settings for "Trigger Level", "Trigger Band", and "Slope" are required.

For "Level2", further settings for "Trigger Level" and "Trigger Band" are required.

For "Time", further settings for "Trigger Start Time", "Trigger Stop Time", "Sleep Mode" are required.

Diffuse Field Correction

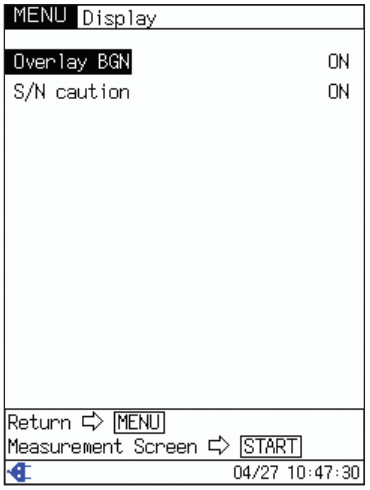
Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" are required.

[Display] menu



Display menu screen

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display.

(For details, see "Overlay background level and S/N caution" on page 164.)

S/N caution Available settings: "ON", "OFF"

Specifies whether to alert the user through a change in display color when the difference to the background noise level is small.

(For details, see "Overlay background level and S/N caution" on page 164.)

Measurement procedure

This section describes representative measurement steps, to be used as reference for actual measurement.

Note
If the measurement point (address) for the current measurement or the next measurement already contains data, the measurement point indication in the measurement screen is shown in red. The data will be overwritten without confirmation when you press the STORE key in step 11.

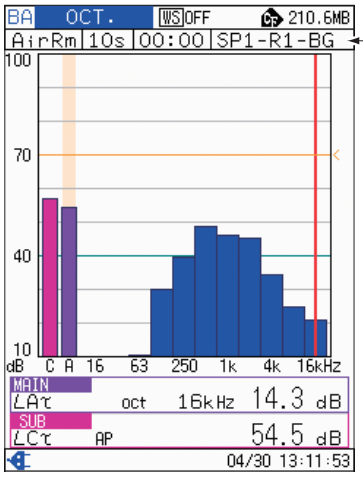
Measurement preparations

1. Determine the sound source positions and source room and receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 36.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12.)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 36.)
   First, use the [Building Acoustic] menu to set the measurement mode to "AirRm". Available setting items differ depending on the measurement mode.

Measurement

6. Set up the sound source in the first sound source position.
7. Set up the sound level meter at the first measurement point.
8. (This step is omitted for background noise measurement.)
   Activate the sound source.
9. Press the START/STOP key on the sound level meter.
   The indication "START" appears and the measurement begins.
   When the preset measurement time has elapsed, measurement stops automatically.
   To stop the measurement before the end of the measurement time, press the START/STOP key.
   For about one second after the measurement was stopped, the indication "STOP" is shown.

10. (This step is omitted for background noise measurement.)
    Turn off the sound source.
11. Press the STORE key to save the measurement data. The indication changes to the next measurement point.
12. Move the sound level meter to the next measurement point. The sequence of measurement points depends on the background noise measurement mode. For details, see pages 32 to 35.
13. When measurement for all measurement points is completed, move the sound source to the next sound source position, and repeat steps 7 to 12.
14. When measurement for all sound source positions is completed, the measurement is finished. The screen indication returns to the first measurement point.



The measurement point (address) currently being measured or scheduled next is shown here.

Changing the measurement point (address)

During measurement, it is possible to skip points in the measurement point sequence or return to earlier points to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement point forward by one position.

Pushing the ▽ key moves the displayed measurement point backward by one position.

After the change, measurement continues from the new point, using the same sequence.

Recall (measurement result display and rating calculation)

The recall function serves to call up stored measurement data.
When using the function, it is also possible to display the ranking and single-number quantities calculated according to the recalled data.

Ranking

The ranking is calculated from the octave data. Consequently, if "1/3 OCT" is selected as analysis mode for the recalled data, it is not calculated or displayed.
The ranking is shown together with the estimation curve.
Bands used for this item: 125 Hz to 2 kHz

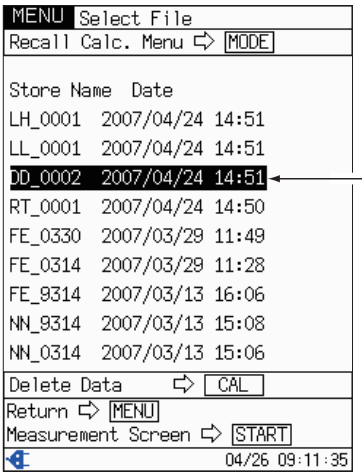
Single-number quantities

Single-number quantities are calculated from the 1/3 octave data. However, if "OCT" is selected as analysis mode for the recalled data, the quantities are calculated from the octave data.
Bands used for this item:

100 Hz to 3.15 kHz
(1/3 octave analysis, simultaneous octave and 1/3 octave analysis)
125 Hz to 2 kHz (octave analysis)

Recall procedure

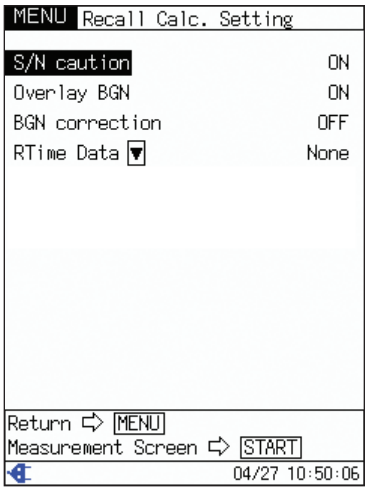
1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall] and press the ENT key.
   The file selection screen appears.



File names starting with "DD" are data of airborne insulation between rooms.

File selection screen

3. Press the MODE key to bring up the [Recall Calc. Setting] screen and set the items listed on next page.
   Use the △ / ▽ keys to select the item and press the ENT key. Then use the △ / ▽ keys to make the setting and press the ENT key once more. When all 4 items have been set, press the MENU key to return to the file selection screen.



Recall Calc. Setting screen

S/N caution Available settings: "ON", "OFF"

When this item is set to ON, a warning/caution indication (red/yellow) is shown when the level difference between the measured level and the background noise level is small. (For details, see "Overlay background level and S/N caution" on page 164.)

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display. (For details, see "Overlay background level and S/N caution" on page 164.)

BGN correction Available settings: "ON", "OFF"

Specifies whether to correct the receiving room measurement results for background noise. For details, see the section "Averaging method and background noise correction" in the "Technical Reference" section on page 253. The background noise correction is applied to the estimation curve and the single-number quantities calculation.

RTime Data

Lets you specify the reverberation time data required for calculation of rating quantities. For details, see the chapter of "Technical Reference".

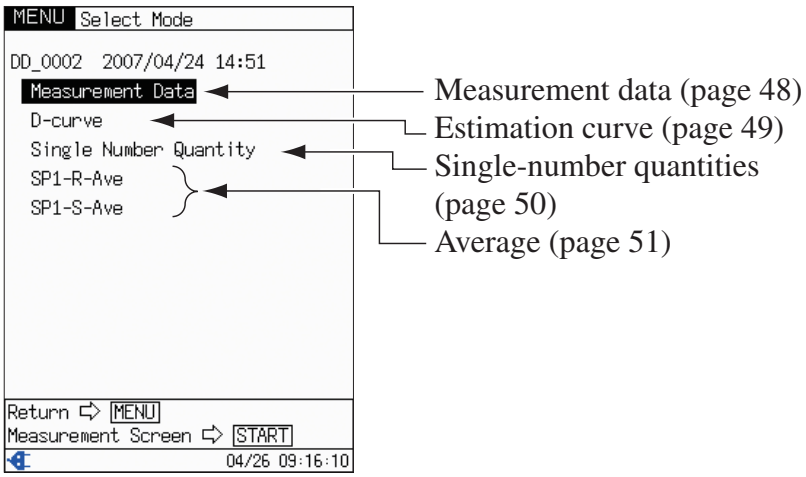
Note
If reverberation time data are not specified, an error will occur when displaying the single-number quantities recall screen (page 50), and a warning message is shown.

Average Method Available settings: "ISO 140", "Arithmetic".

This specifies the method used for calculating average values, as explained in the section "Averaging method and background noise correction" in the "Technical Reference" section on page 253.

When operating with the Japanese language setting, this selection is not shown, because the setting is fixed to "Arithmetic" (JIS compliant).

4. At the file selection screen, use the △ / ▽ keys to select the airborne insulation measurement data to recall (store file name starting with "DD_"), and press the ENT key.
   The recall selection screen appears.



Recall selection screen

In any of the following cases, the "D-curve" (estimation curve) item cannot be selected.

- Analysis mode for the recalled data is "1/3 OCT"
- The unit is operating with a language setting other than Japanese, and "Average Method" on the Recall Calc. Setting screen has been set to "ISO 140".

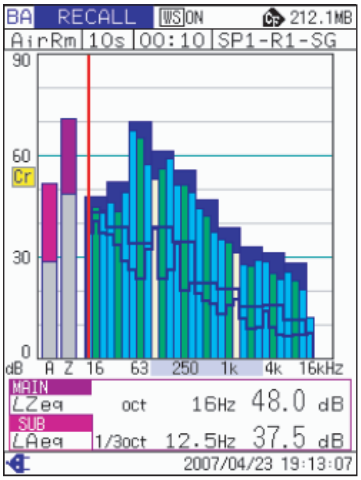
5. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating appear.
   From the recall screens, the following actions are possible.
   Press the MENU key to return to the recall selection screen.
   Press the ENT key to go to the menu list screen.
   The settings for the [Building Acoustic], [Measurement], and [Input/Output] menus made for the recalled data can be checked, but the settings cannot be changed.
   By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
   When a measurement data recall screen is displayed, a "Remeas." indication is shown. Selecting this brings up a measurement screen for the same measurement point as the recalled data.
   When you press the START key, the measurement screen appears again.

Operation at recall screens other than for single-number quantities
The GRP/NUM key switches between graphical and numeric display. On a graphical display (except for estimation curve recall screen), you can use the ◁ / ▷ keys to move the cursor. When there are two or more numeric display pages, you can use the ◁ / ▷ keys to switch between pages.

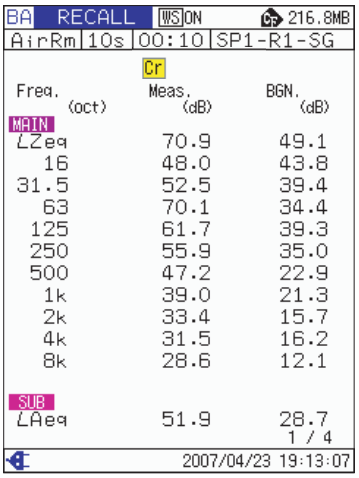
Measurement data recall screen

The data for the measurement point last stored under the selected store file name are shown.

You can use the △ / ▽ keys to change the measurement point.

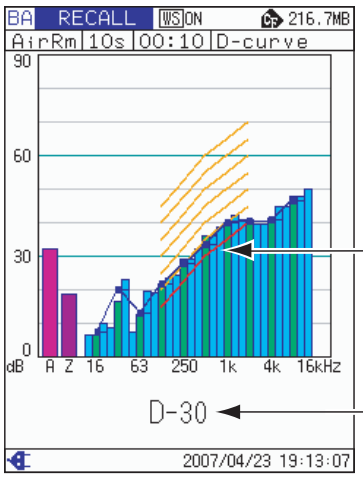


Graphical display

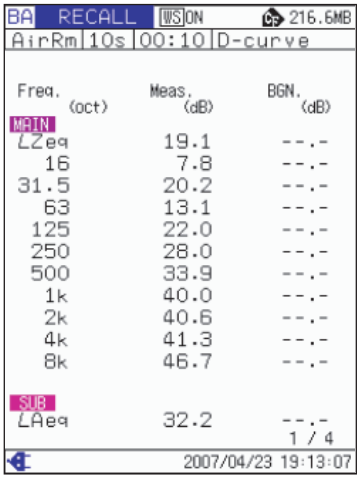


Numeric display

Estimation curve recall screen



Graphical display

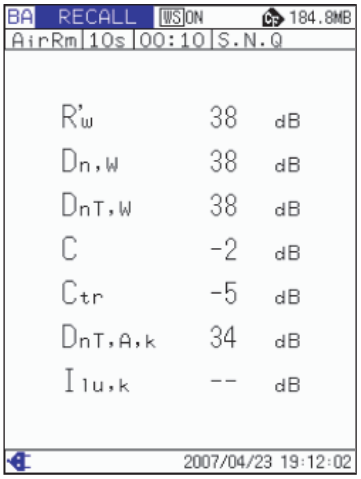


Numeric display

On the graphical display screen, the octave band data are shown as a broken line graph.

When the analysis mode is "OCT & 1/3 OCT", the 1/3 octave data are shown as a bar graph.

Single-number quantities recall screen



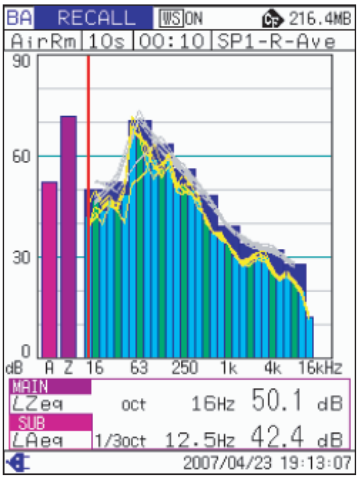
The reverberation time used for the calculation is T20. However, if Txx exists on the reverberation time measurement recall screen due to recalculation, Txx is used.
For information on the surface area used for the calculation, see pages 38 and 260.

If you call up the single-number quantities recall screen without having specified reverberation time data on the Recall Calc. Setting screen (page 45), an error message such as shown below appears. Press the ENT key and then return to the Recall Calc. Setting screen to specify reverberation time data.

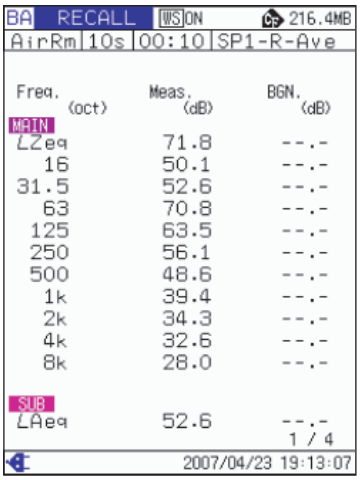
> Reverberation time data not specified.
> Specify data from recall menu.
> Continue: [ENT]

Average value recall screen

Shows the measurement values and averaged values for each sound source position for the receiving room or the source room measurement points.



Graphical display



Numeric display

Bar graph:	Average value
Broken line graph (gray):	Octave band measurement values for each measurement point
Broken line graph (yellow):	1/3 octave band measurement values for each measurement point

Measurement of Floor Impact Sound Insulation (Light Impact Source)

Serves for measurement of impact sound insulation of a building using a standard lightweight impact source. Results are used to calculate sound insulation rank and other parameters.

Measurement is performed according to the compliance standard ISO 140-7:1998 (JIS A 1418-1:2000), and rating according to ISO 717-2:1996 (JIS A 1419-2:2000).

⚠ Caution
When performing measurements using high sound pressure levels, it is essential to provide and use adequate hearing protection (such as headphones).

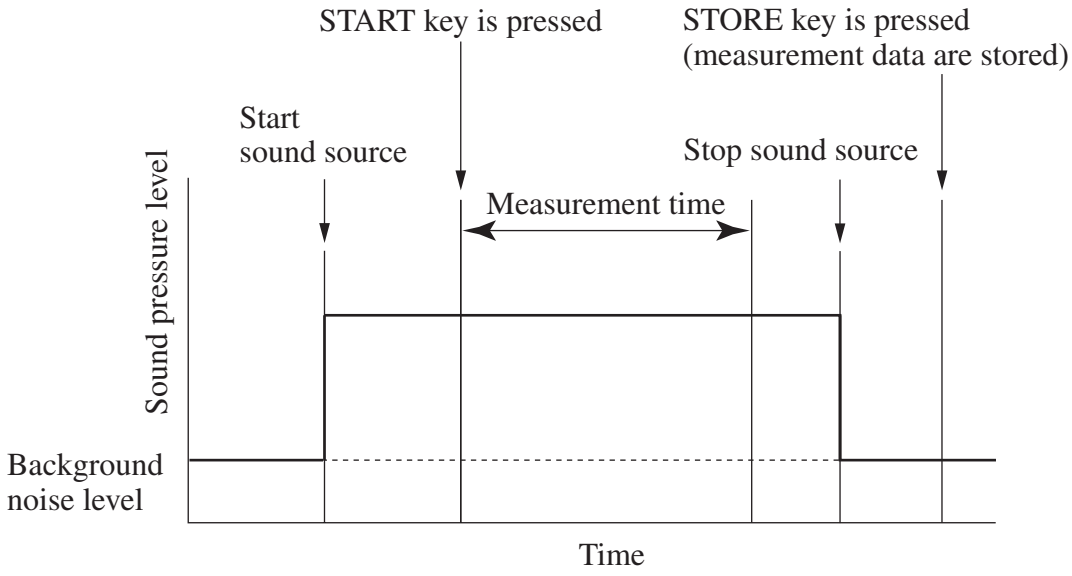
Note
The measurements described in this chapter, unless explicitly specified as background noise measurements, are performed using a sound source.

Measurement outline

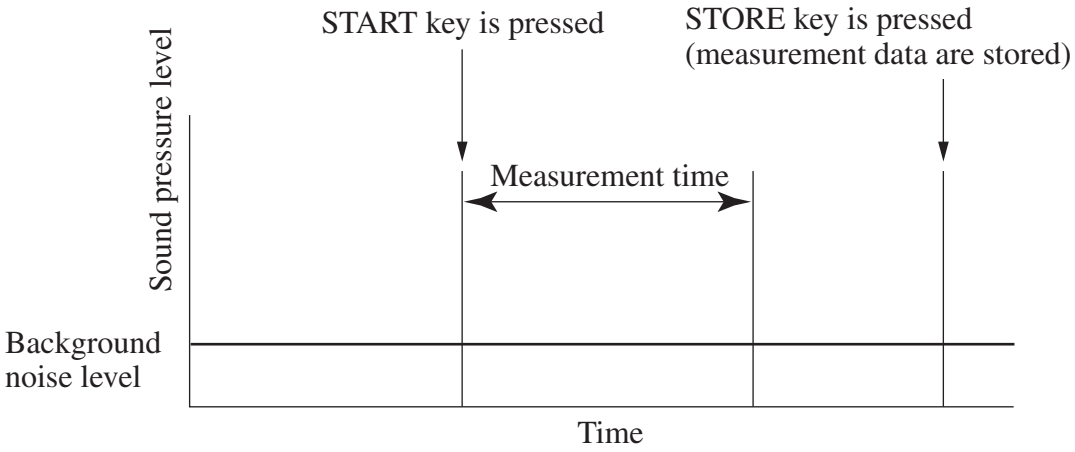
Operation at each measurement point

After pressing the START key, the unit collects data for the preset measurement time and calculates the time-average sound level L_{eq}. The maximum L_{max} for the period is also determined at the same time. (During background noise measurement, only L_{eq} is determined.)

A function (overlay background level) is available for overlaying the background noise level in the receiving room during measurement, and generating a warning when the level difference is small. (The function is not available if the background noise measurement mode was set to "None".)



The principle for background noise measurement is as follows.



Measurement procedure

The order in which measurements are performed at the various measurement points depends on the background noise measurement mode. For details, see the explanation starting on the next page.

Sound source and measurement point indication

The sound sources and measurement points are indicated as follows.

Indication in brackets ( ) refers to on-screen display.

SP1 Sound source position 1

R1B Background noise measurement at measurement point 1 in receiving room (SP1-R1-BG)

R2B Background noise measurement at measurement point 2 in receiving room (SP1-R2-BG)

: :

RnB Background noise measurement at measurement point n in receiving room (SP1-Rn-BG)

(n: receiving room measurement position number)

R1 Measurement at measurement point 1 in receiving room (SP1-R1-SG)

R2 Measurement at measurement point 2 in receiving room (SP1-R2-SG)

: :

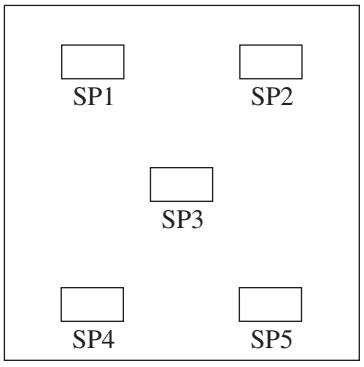
Rn Measurement at measurement point n in receiving room (SP1-Rn-SG)

(n: receiving room measurement position number)

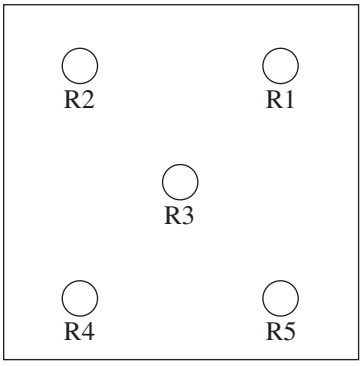
SP2 Sound source position 2

: :

SPp Sound source position p (p: sound source position number)



Sound source point arrangement example



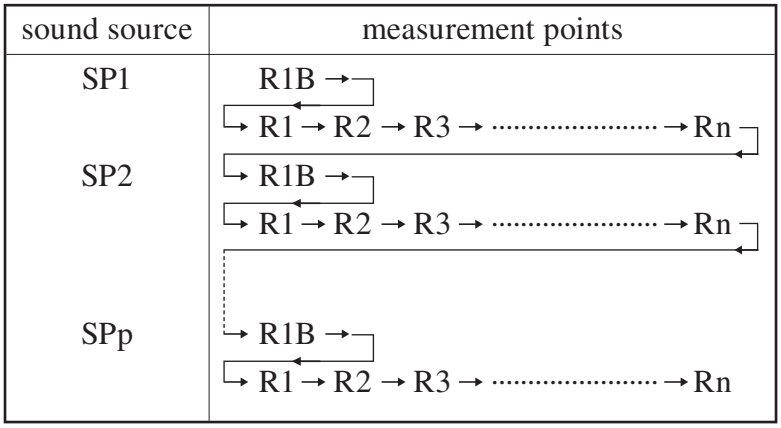
Receiving room measurement point arrangement example

Background noise measurement mode set to "Once"

Background noise measurement is carried out once only at a representative measurement point in the receiving room. Measurement then continues with all measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.



R1B Background noise measurement at a representative measurement point in receiving room

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "Before"

Background noise measurement is carried out for all measurement points in the receiving room. Measurement then proceeds with the measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R2B → R3B → ····· →RnB → R1 → R2 → R3 → ····· → Rn
SP2	→ R1B → R2B → R3B → ····· →RnB → R1 → R2 → R3 → ····· → Rn
SPp	→ R1B → R2B → R3B → ····· →RnB → R1 → R2 → R3 → ····· → Rn

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "During"

Background noise measurement followed by normal measurement with sound source activated is carried out for all measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R1 → R2B → R2 → R3B → R3 →·····→ RnB → Rn
SP2	→ R1B → R1 → R2B → R2 → R3B → R3 →·····→ RnB → Rn
SPp	→ R1B → R1 → R2B → R2 → R3B → R3 →·····→ RnB → Rn

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "None"

No background noise measurement is carried out in the receiving room. Measurement immediately starts with the measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1 → R2 → R3 → ····· → Rn
SP2	R1 → R2 → R3 → ····· → Rn
SPp	R1 → R2 → R3 → ····· → Rn

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

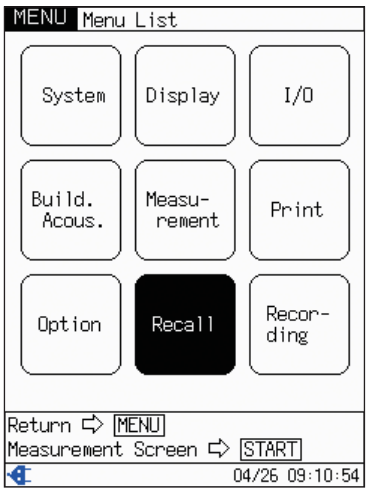
SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Parameter setting

Before starting the measurement of floor impact sound insulation (light impact source), measurement parameters should be set as follows.

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus for making settings, and press the ENT key. The respective menu screen comes up.
   • [Building Acoustic] • [Measurement] • [Display]
   For an explanation of the respective menu screens, see the following pages. For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.



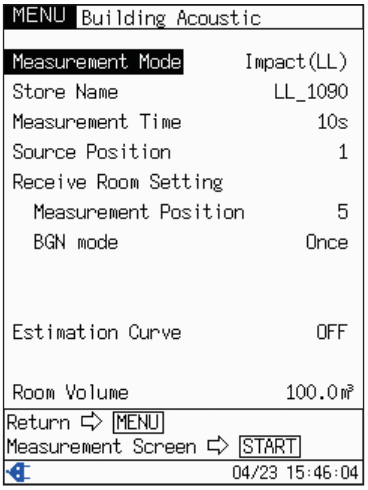
Menu list screen

Important

You must first set the measurement mode to "Impact(LL)" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key. The respective parameter can now be set.
4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key. The new setting is established.
5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for all menus listed in step 2 in the same way. Press the START key to return to the measurement screen.

[Building Acoustic] menu ("Impact(LL)" measurement mode)



Building Acoustic menu screen

Measurement mode "Impact(LL)" selected

When "Impact(LL)" is selected, the following parameters can be set.

Store Name LL_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored. This is used for identification when the data is recalled later. The "LL_" indicates that the data are for "Impact(LL)".

Measurement Time Setting range: 1 to 60 seconds

Specifies the time interval for which measurement data are collected.

Source Position Setting range: 1 to 8

Specifies the number of positions in the source room where the sound source is placed.

Receive Room Setting Measurement Position

Setting range: 1 to 10

Specifies the number of positions in the receiving room where the sound level meter (microphone) for measurement is placed.

BGN mode Available settings: "Once", "Before", "During", "None"

Determines the background noise measurement in the receiving room. (For details, see pages 55 to 58.)

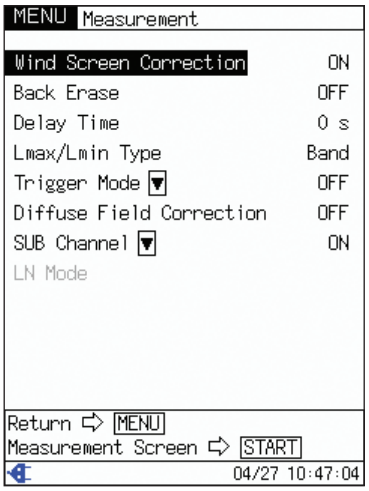
Estimation Curve Available settings: "Off", "L-30", "L-35" to "L-80"

The curve selected here and the next higher curve are shown on the measurement screen.

Room Volume Setting range: 0.1 to 999.9 m^3

Specifies the volume of the receiving room.

[Measurement] menu



Measurement menu screen

Wind Screen Correction Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase Available settings: "OFF", "5s"

When set to "5s", measurement data for a period of five seconds before the PAUSE/CONT key was pressed will be canceled.

Note
When the NX-28WR is installed and waveform recording function is active, the back erase function is not available.

Delay Time Setting range: 1 to 10 seconds

Specifies the delay time between the point where the START key is pressed and the actual start of measurement.

L_{max}/L_{min} Type Available settings: "AP", “AP(S)”, "Band"

AP: The L_{max} / L_{min} value of Sub channel and each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

AP(S): The L_{max} / L_{min} value of each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

The L_{max} / L_{min} value of the Sub channel is the maximum / minimum value during the measurement period.

Band: The L_{max} / L_{min} value of the Sub channel and each frequency band is the maximum / minimum value during the measurement period.

Trigger Mode Available settings: "OFF", "Level1", "Level2", "Time", "EXT"

For "Level1", further settings for "Trigger Level", "Trigger Band", and "Slope" are required.

For "Level2", further settings for "Trigger Level" and "Trigger Band" are required.

For "Time", further settings for "Trigger Start Time", "Trigger Stop Time", "Sleep Mode" are required.

Diffuse Field Correction

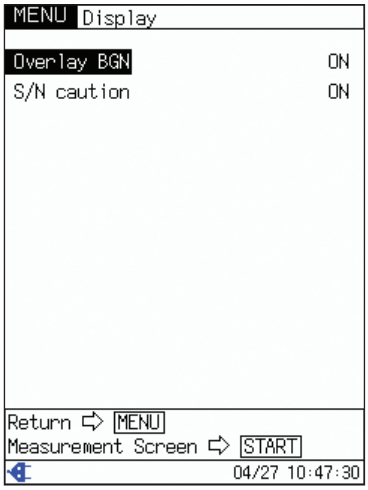
Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" are required.

[Display] menu



Display menu screen

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display.

(For details, see "Overlay background level and S/N caution" on page 164.)

S/N caution Available settings: "ON", "OFF"

Specifies whether to alert the user through a change in display color when the difference to the background noise level is small.

(For details, see "Overlay background level and S/N caution" on page 164.)

Measurement procedure

This section describes representative measurement steps, to be used as reference for actual measurement.

Note
If the measurement point (address) for the current measurement or the next measurement already contains data, the measurement point indication in the measurement screen is shown in red. The data will be overwritten without confirmation when you press the STORE key in step 11.

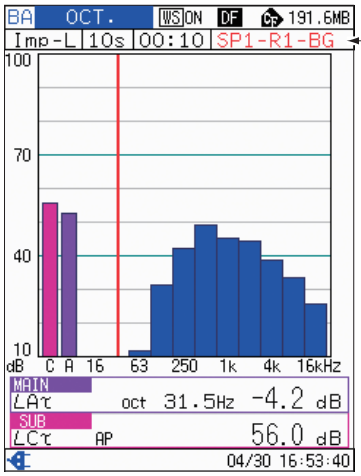
Measurement preparations

1. Determine the sound source positions and receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 59.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12.)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 59.)
   First, use the [Building Acoustic] menu to set the measurement mode to "Impact(LL)". Available setting items differ depending on the measurement mode.

Measurement

6. Set up the sound source in the first sound source position.
7. Set up the sound level meter at the first measurement point.
8. (This step is omitted for background noise measurement.)
   Start sound source.
9. Press the START/STOP key on the sound level meter.
   The indication "START" appears and the measurement begins.
   When the preset measurement time has elapsed, measurement stops automatically.
   To stop the measurement before the end of the measurement time, press the START/STOP key.
   For about one second after the measurement was stopped, the indication "STOP" is shown.

10. (This step is omitted for background noise measurement.)
    Turn off the sound source.
11. Press the STORE key to save the measurement data. The indication changes to the next measurement point.
12. Move the sound level meter to the next measurement point. The sequence of measurement points depends on the background noise measurement mode. For details, see pages 55 to 58.
13. When measurement for all measurement points is completed, move the sound source to the next sound source position, and repeat steps 7 to 12.
14. When measurement for all sound source positions is completed, the measurement is finished. The screen indication returns to the first measurement point.



The measurement point (address) currently being measured or scheduled next is shown here.

Changing the measurement point (address)

During measurement, it is possible to skip points in the measurement point sequence or return to earlier points to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement point forward by one position.

Pushing the ▽ key moves the displayed measurement point backward by one position.

After the change, measurement continues from the new point, using the same sequence.

Recall (measurement result display and rating calculation)

The recall function serves to call up stored measurement data.
When using the function, it is also possible to display the ranking and single-number quantities calculated according to the recalled data.

Ranking

The ranking is calculated from the octave data. Consequently, if "1/3 OCT" is selected as analysis mode for the recalled data, it is not calculated or displayed.
The ranking is shown together with the estimation curve.
Bands used for this item: 125 Hz to 2 kHz

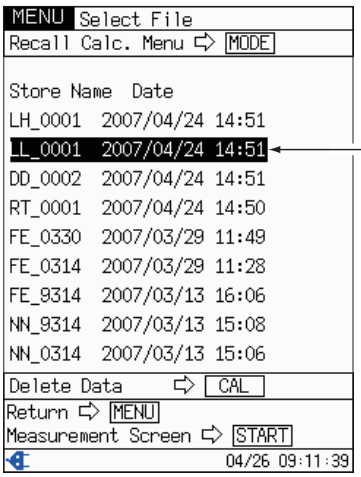
Single-number quantities

Single-number quantities are calculated from the 1/3 octave data. However, if "OCT" is selected as analysis mode for the recalled data, the quantities are calculated from the octave data.
Bands used for this item:

100 Hz to 3.15 kHz
(1/3 octave analysis, simultaneous octave and 1/3 octave analysis)
125 Hz to 2 kHz (octave analysis)

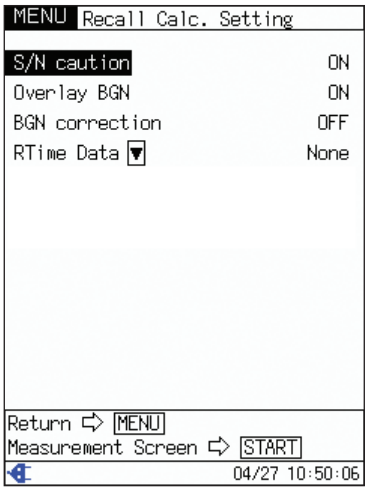
Recall procedure

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall] and press the ENT key. The file selection screen appears.



File selection screen

3. Press the MODE key to bring up the [Recall Calc. Setting] screen and set the items listed on next page.
   Use the △ / ▽ keys to select the item and press the ENT key. Then use the △ / ▽ keys to make the setting and press the ENT key once more. When all 4 items have been set, press the MENU key to return to the file selection screen.



Recall Calc. Setting screen

S/N caution Available settings: "ON", "OFF"

When this item is set to ON, a warning/caution indication (red/yellow) is shown when the level difference between the measured level and the background noise level is small. (For details, see "Overlay background level and S/N caution" on page 164.)

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display. (For details, see "Overlay background level and S/N caution" on page 164.)

BGN correction Available settings: "ON", "OFF"

Specifies whether to correct the receiving room measurement results for background noise. For details, see the section "Averaging method and background noise correction" in the "Technical Reference" section on page 253. The background noise correction is applied to the estimation curve and the single-number quantities calculation.

RTime Data

It enables to specify the reverberation time data required for calculation of rating quantities. For details, see the chapter of "Technical Reference".

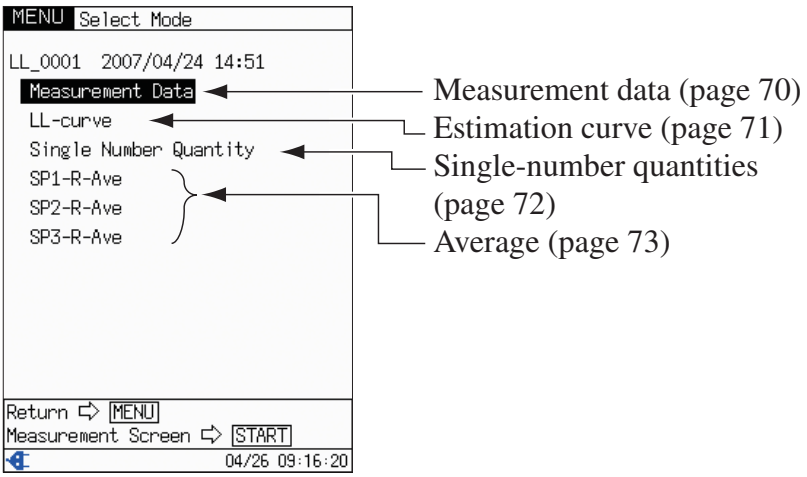
Note
If reverberation time data are not specified, an error will occur when displaying the single-number quantities recall screen (page 72), and a warning message is shown.

Average Method Available settings: "ISO 140", "Arithmetic".

This specifies the method used for calculating average values, as explained in the section "Averaging method and background noise correction" in the "Technical Reference" section on page 253.

When operating with the Japanese language setting, this selection is not shown, because the setting is fixed to "Arithmetic" (JIS compliant).

4. At the file selection screen, use the △ / ▽ keys to select the impact insulation of floors (lightweight) measurement data to recall (store file name starting with "LL_"), and press the ENT key.
   The recall selection screen appears.



Recall selection screen

In any of the following cases, the "LL-curve" (estimation curve) item cannot be selected.

- Analysis mode for the recalled data is "1/3 OCT"
- The unit is operating with a language setting other than Japanese, and "Average Method" on the Recall Calc. Setting screen has been set to "ISO 140".

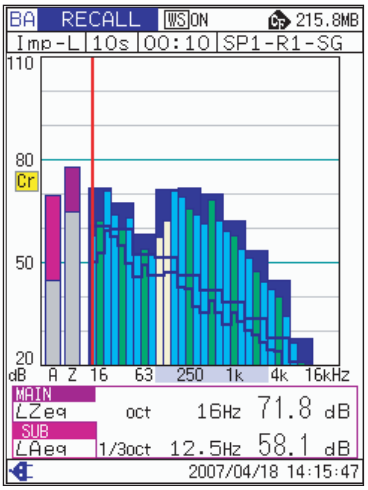
5. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating appear.
   From the recall screens, the following actions are possible.
   Press the MENU key to return to the recall selection screen.
   Press the ENT key to go to the menu list screen.
   The settings for the [Building Acoustic], [Measurement], and [Input/Output] menus made for the recalled data can be checked, but the settings cannot be changed.
   By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
   When a measurement data recall screen is displayed, a "Remeas." indication is shown. Selecting this brings up a measurement screen for the same measurement point as the recalled data.
   When you press the START key, the measurement screen appears again.

Operation at recall screens other than for single-number quantities
The GRP/NUM key switches between graphical and numeric display. On a graphical display (except for estimation curve recall screen), you can use the ◁ / ▷ keys to move the cursor. When there are two or more numeric display pages, you can use the ◁ / ▷ keys to switch between pages.

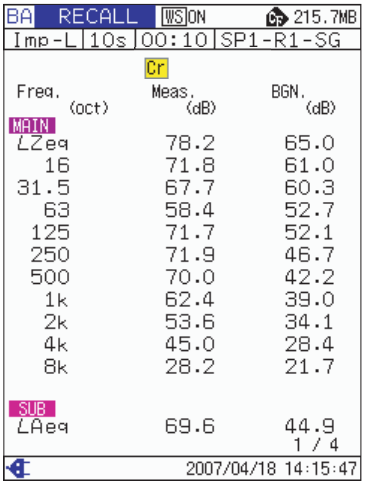
Measurement data recall screen

The data for the measurement point last stored under the selected store file name are shown.

You can use the △ / ▽ keys to change the measurement point.

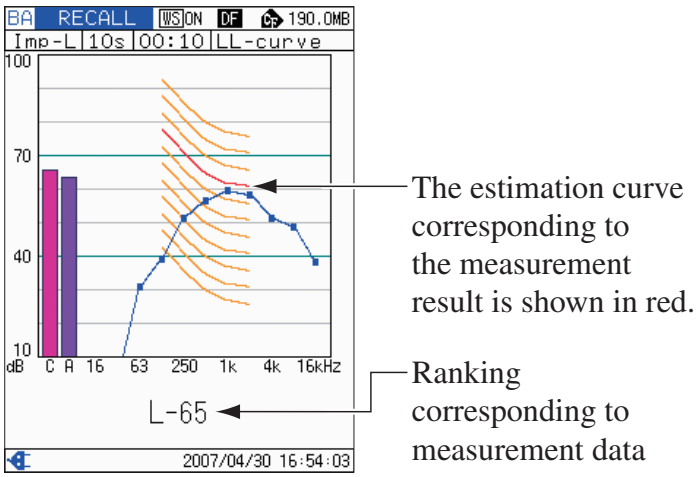


Graphical display

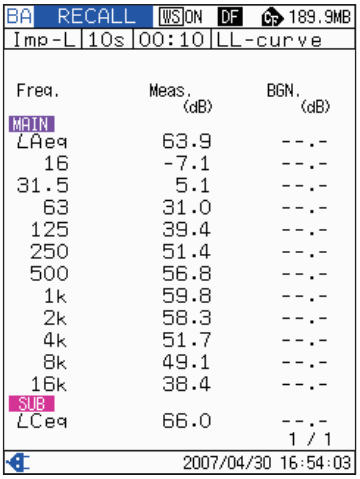


Numeric display

Estimation curve recall screen



Graphical display

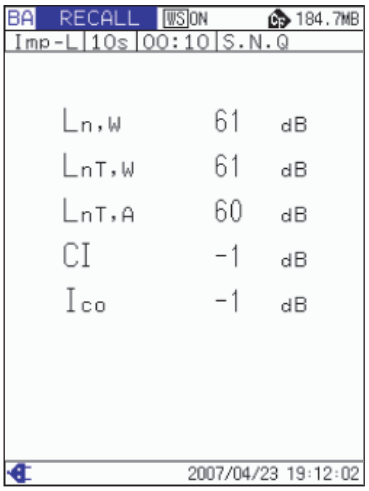


Numeric display

On the graphical display screen, the octave band data are shown as a broken line graph.

When the analysis mode is "OCT & 1/3 OCT", the 1/3 octave data are shown as a bar graph.

Single-number quantities recall screen



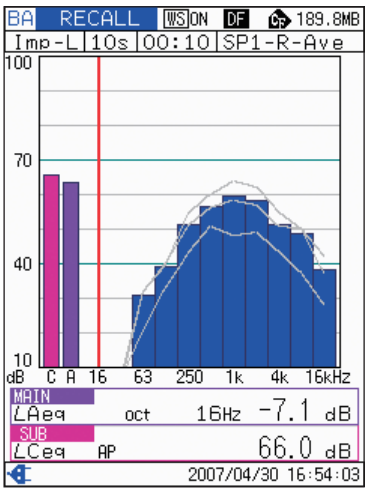
The reverberation time used for the calculation is T20. However, if Txx exists on the reverberation time measurement recall screen due to recalculation, Txx is used.

If you call up the single-number quantities recall screen without having specified reverberation time data on the Recall Calc. Setting screen (page 67), an error message such as shown below appears. Press the ENT key and then return to the Recall Calc. Setting screen to specify reverberation time data.

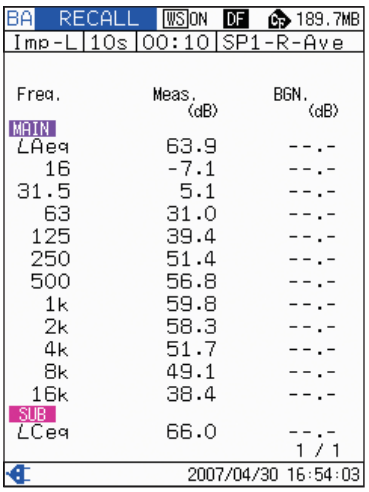
> Reverberation time data not specified.
> Specify data from recall menu.
> Continue: [ENT]

Average value recall screen

Shows the measurement values and averaged values of each measurement point for each sound source position for the receiving room.



Graphical display



Numeric display

Bar graph:	Average value
Broken line graph (gray):	Octave band measurement values for each measurement point
Broken line graph (yellow):	1/3 octave band measurement values for each measurement point

Measurement of Floor Impact Sound Insulation (Heavy Impact Source)

Serves for measurement of impact sound insulation of a building using a standard heavy impact source. Results are used to calculate sound insulation rank and other parameters.

Measurement is performed according to the compliance standard JIS A 1418-2:2000, and rating according to JIS A 1419-2:2000.

⚠ Caution
When performing measurements using high sound pressure levels, it is essential to provide and use adequate hearing protection (such as headphones).

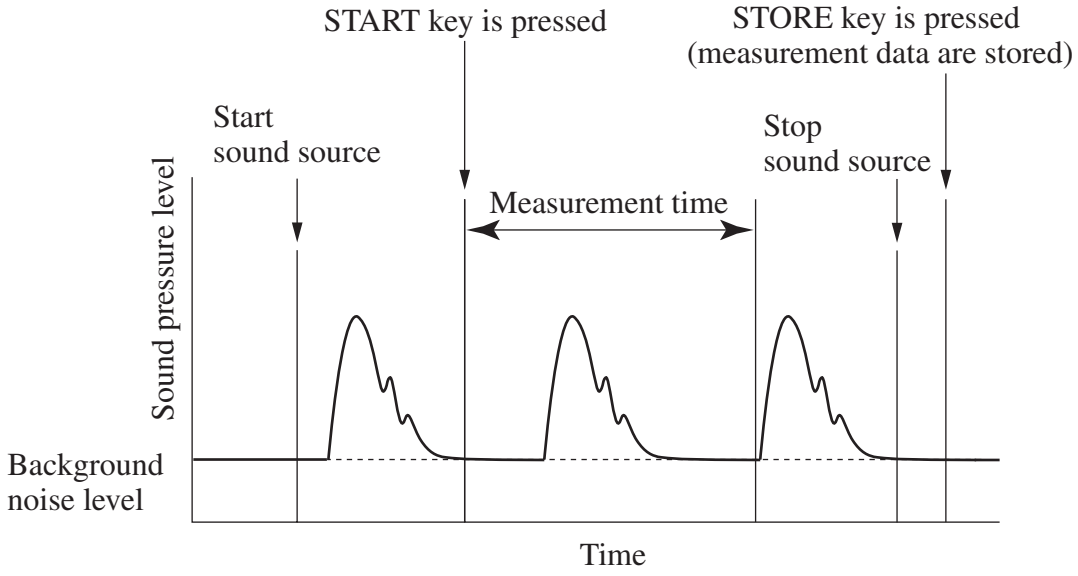
Note
The measurements described in this chapter, unless explicitly specified as background noise measurements, are performed using a sound source.

Measurement outline

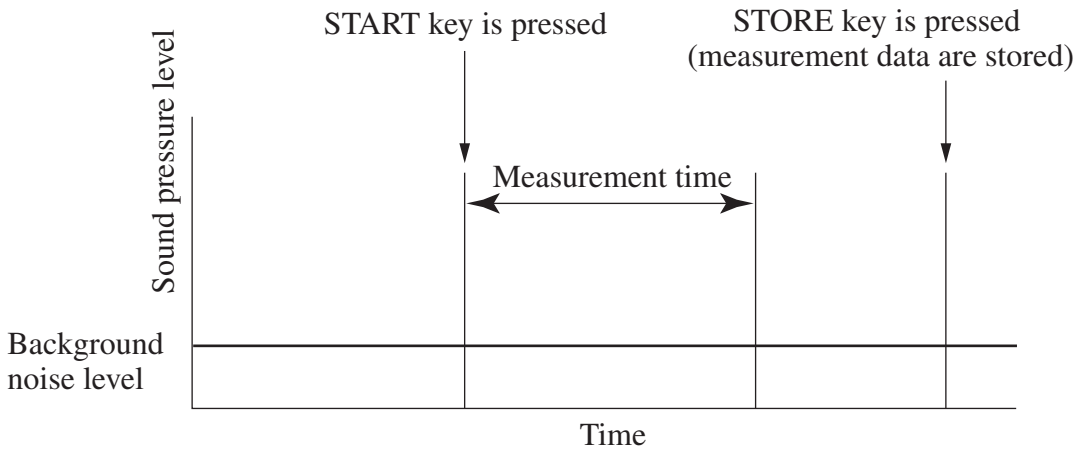
Operation at each measurement point

After pressing the START key, the unit collects time-weighted sound level L_p data for the preset measurement time and takes the maximum value L_{max} as the measurement value for this measurement. This is repeated for the preset number of times, and for each measurement point. For background noise measurement, the time-average sound level L_{eq} is taken as the measurement value.

A function (overlay background level) is available for overlaying the background noise level in the receiving room during measurement, and generating a warning when the level difference is small. (The function is not available if the background noise measurement mode was set to "None".)

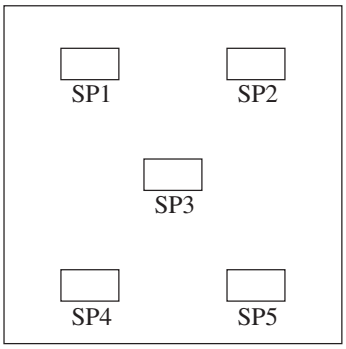


The principle for background noise measurement is as follows.

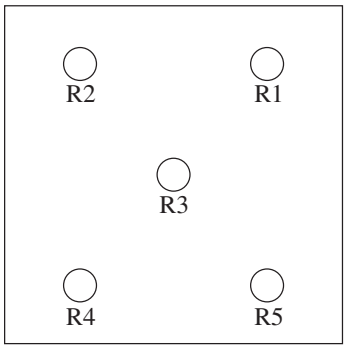


Measurement procedure

The order in which measurements are performed at the various measurement points depends on the background noise measurement mode. For details, see the explanation starting on the next page.



Sound source point arrangement example



Receiving room measurement point arrangement example

Sound source and measurement point indication

The sound sources and measurement points are indicated as follows.

Indication in brackets ( ) refers to on-screen display.

SP1 Sound source position 1

R1B Background noise measurement at measurement point 1 in receiving room (SP1-R1-BG)

R2B Background noise measurement at measurement point 2 in receiving room (SP1-R2-BG)

: :

RnB Background noise measurement at measurement point n in receiving room (SP1-Rn-BG) (n: receiving room measurement position number)

R1 Measurement point 1 in receiving room

$R_{1, 1}$ The first measurement at measurement point 1 in receiving room (SP1-R1-1)

$R_{1, 2}$ The second measurement at measurement point 1 in receiving room (SP1-R1-2)

: :

$R_{1, m}$ The m-th measurement at measurement point 1 in receiving room (SP1-R1-m)

R2 Measurement point 2 in receiving room

$R_{2, 1}$ The first measurement at measurement point 2 in receiving room (SP1-R2-1)

$R_{2, 2}$ The second measurement at measurement point 2 in receiving room (SP1-R2-2)

: :

$R_{2, m}$ The m-th measurement at measurement point 2 in receiving room (SP1-R2-m)

: :

Rn Measurement point n in receiving room (n: receiving room measurement position number)

$R_{n, 1}$ The first measurement at measurement point n in receiving room (SP1-Rn-1)

$R_{n, 2}$ The second measurement at measurement point n in receiving room (SP1-Rn-2)

: :

$R_{n, m}$ The m-th measurement at measurement point n in receiving room (SP1-Rn-m)

(m: measurement times)

SP2 Sound source position 2

: :

SPp Sound source position p (p: sound source position number)

Background noise measurement mode set to "Once"

Background noise measurement is carried out once only at a representative measurement point in the receiving room. Measurement then continues with all measurement points in the receiving room, for the preset number of times, with sound source activated.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measure-ment points	
SP1	R1	R1B → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	→ $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	Rn	→ $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$
SP2	R1	→ R1B → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	→ $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	Rn	→ $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$
SPp	R1	→ R1B → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	→ $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	Rn	→ $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$

R1B Background noise measurement at a representative measurement point in receiving room

R1, R2, ..., Rn

Measurement points in receiving room

(n: receiving room measurement position number)

$R_{i,1}$, $R_{i,2}$, ..., $R_{i,m}$

Measurement count (m: measurement count number) at measurement point i (i = 1, 2, ..., n) in receiving room

SP1, SP2, ..., SPp

Sound source position (p: Sound source position number)

Background noise measurement mode set to "Before"

Background noise measurement is carried out for all measurement points in the receiving room. Measurement then continues with all measurement points in the receiving room, for the preset number of times, with sound source activated.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measure-ment points	
SP1	R1	R1B → R2B → R3B → ····· → RnB → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	→ $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	Rn	→ $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$
SP2	R1	→ R1B → R2B → R3B → ····· → RnB → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	→ $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	Rn	→ $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$
SPp	R1	→ R1B → R2B → R3B → ····· → RnB → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	→ $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	Rn	→ $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room (n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement points in receiving room (n: receiving room measurement position number)

$R_{i,1}$, $R_{i,2}$, ..., $R_{i,m}$

Measurement count (m: measurement count number) at measurement point i (i = 1, 2, ..., n) in receiving room

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "During"

At each measurement point in the receiving room, background noise measurement followed by measurement with sound source activated is carried out for the preset number of times.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measure-ment points	
SP1	R1	R1B → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	R2B → $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	R3	R3B → $R_{3,1}$ → $R_{3,2}$ → $R_{3,3}$ → ····· → $R_{3,m}$
	Rn	RnB → $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$
SP2	R1	R1B → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	R2B → $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	R3	R3B → $R_{3,1}$ → $R_{3,2}$ → $R_{3,3}$ → ····· → $R_{3,m}$
	Rn	RnB → $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$
SPp	R1	R1B → $R_{1,1}$ → $R_{1,2}$ → $R_{1,3}$ → ····· → $R_{1,m}$
	R2	R2B → $R_{2,1}$ → $R_{2,2}$ → $R_{2,3}$ → ····· → $R_{2,m}$
	R3	R3B → $R_{3,1}$ → $R_{3,2}$ → $R_{3,3}$ → ····· → $R_{3,m}$
	Rn	RnB → $R_{n,1}$ → $R_{n,2}$ → $R_{n,3}$ → ····· → $R_{n,m}$

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement point in receiving room

(n: receiving room measurement position number)

$R_{i,1}$, $R_{i,2}$, ..., $R_{i,m}$

Measurement count (m: measurement count number) at measurement point i (i = 1, 2, ..., n) in receiving room

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "None"

At each measurement point in the receiving room, measurement with sound source activated is carried out for the preset number of times.

This procedure is then repeated for another sound source position.

No background noise measurement is carried out in the receiving room.

The measurement sequence is as follows.

sound source	measure-ment points	
SP1	R1	$R_{1,1} \rightarrow R_{1,2} \rightarrow R_{1,3} \rightarrow \cdots\cdots \rightarrow R_{1,m}$
	R2	$R_{2,1} \rightarrow R_{2,2} \rightarrow R_{2,3} \rightarrow \cdots\cdots \rightarrow R_{1,m}$
	Rn	$R_{n,1} \rightarrow R_{n,2} \rightarrow R_{n,3} \rightarrow \cdots\cdots \rightarrow R_{n,m}$
SP2	R1	$R_{1,1} \rightarrow R_{1,2} \rightarrow R_{1,3} \rightarrow \cdots\cdots \rightarrow R_{1,m}$
	R2	$R_{2,1} \rightarrow R_{2,2} \rightarrow R_{2,3} \rightarrow \cdots\cdots \rightarrow R_{2,m}$
	Rn	$R_{n,1} \rightarrow R_{n,2} \rightarrow R_{n,3} \rightarrow \cdots\cdots \rightarrow R_{n,m}$
SPp	R1	$R_{1,1} \rightarrow R_{1,2} \rightarrow R_{1,3} \rightarrow \cdots\cdots \rightarrow R_{1,m}$
	R2	$R_{2,1} \rightarrow R_{2,2} \rightarrow R_{2,3} \rightarrow \cdots\cdots \rightarrow R_{2,m}$
	Rn	$R_{n,1} \rightarrow R_{n,2} \rightarrow R_{n,3} \rightarrow \cdots\cdots \rightarrow R_{n,m}$

R1, R2, ..., Rn

Measurement point in receiving room

(n: receiving room measurement position number)

$R_{i,1}$, $R_{i,2}$, ..., $R_{i,m}$

Measurement count (m: measurement count number) at measurement point i (i = 1, 2, ..., n) in receiving room

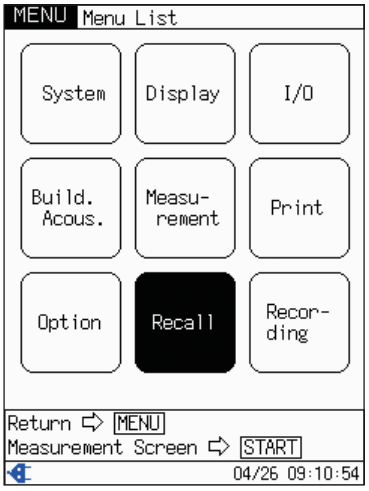
SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Parameter setting

Before starting the measurement of floor impact sound insulation (heavy impact source), measurement parameters should be set as follows.

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus for making settings, and press the ENT key. The respective menu screen comes up.
   • [Building Acoustic] • [Measurement] • [Display]
   For an explanation of the respective menu screens, see the following pages. For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.



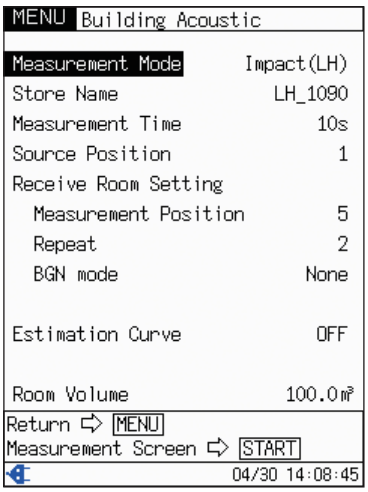
Menu list screen

Important

You must first set the measurement mode to "Impact(LH)" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key. The respective parameter can now be set.
4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key. The new setting is established.
5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for all menus listed in step 2 in the same way. Press the START key to return to the measurement screen.

[Building Acoustic] menu ("Impact(LH)" measurement mode)



Building Acoustic menu screen

Measurement mode "Impact(LH)" selected

When "Impact(LH)" is selected, the following parameters can be set.

Store Name LH_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored. This is used for identification when the data is recalled later. The "LH_" indicates that the data are for "Impact(LH)".

Measurement Time Setting range: 1 to 60 seconds

Specifies the time interval for which measurement data are collected.

Source Position Setting range: 1 to 8

Specifies the number of positions in the source room where the sound source is placed.

Receive Room Setting Measurement Position

Setting range: 1 to 10

Specifies the number of positions in the receiving room where the sound level meter (microphone) for measurement is placed.

Repeat Available settings: 1 to 5

Measurement at each measurement point is carried out for the number of times set here.

BGN mode Available settings: "Once", "Before", "During", "None"

Determines the background noise measurement in the receiving room. (For details, see pages 78 to 81.)

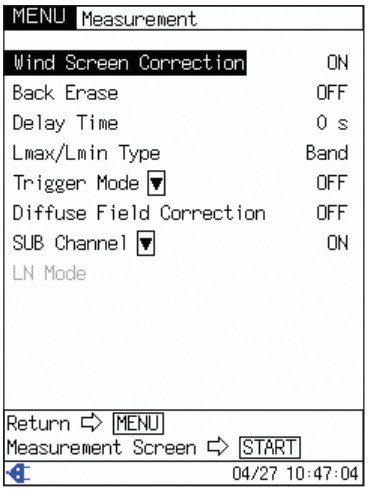
Estimation Curve Available settings: "OFF", "L-30", "L-35" to "L-80"

The curve selected here and the next higher curve are shown on the measurement screen.

Room Volume Setting range: 0.1 to 999.9 m^3

Specifies the volume of the receiving room.

[Measurement] menu



Measurement menu screen

Wind Screen Correction Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase Available settings: "OFF", "5s"

When set to "5s", measurement data for a period of five seconds before the PAUSE/CONT key was pressed will be canceled.

Note
When the NX-28WR is installed and waveform recording function is active, the back erase function is not available.

Delay Time Setting range: 1 to 10 seconds

Specifies the delay time between the point where the START key is pressed and the actual start of measurement.

L_{max}/L_{min} Type Available settings: "AP", “AP(S)”, "Band"

AP: The L_{max} / L_{min} value of Sub channel and each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

AP(S): The L_{max} / L_{min} value of each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

The L_{max} / L_{min} value of the Sub channel is the maximum / minimum value during the measurement period.

Band: The L_{max} / L_{min} value of the Sub channel and each frequency band is the maximum / minimum value during the measurement period.

For measurement of impact sound insulation of floors (heavy source), "Band" is normally used.

When the menu screen is opened from the measurement screen and the measurement mode is changed to "Floor Impact Sound Insulation (Heavy Impact Source)", this item will be automatically set to "Band". The setting can be changed.

When changing from “Floor Impact Sound Insulation (Heavy Impact Source)” to another measurement mode, the unit reverts to the previous L_{max} / L_{min} type setting.

Trigger Mode Available settings: "OFF", "Level1", "Level2", "Time", "EXT"

For "Level1", further settings for "Trigger Level", "Trigger Band", and "Slope" are required.

For "Level2", further settings for "Trigger Level" and "Trigger Band" are required.

For "Time", further settings for "Trigger Start Time", "Trigger Stop Time", "Sleep Mode" are required.

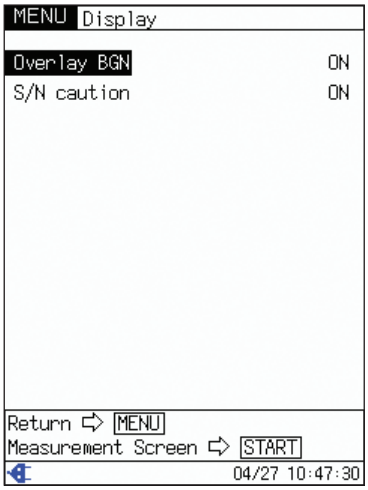
Diffuse Field Correction
Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" become available.

[Display] menu



Display menu screen

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display.

(For details, see "Overlay background level and S/N caution" on page 164.)

S/N caution Available settings: "ON", "OFF"

Specifies whether to alert the user through a change in display color when the difference to the background noise level is small.

(For details, see "Overlay background level and S/N caution" on page 164.)

Measurement procedure

This section describes representative measurement steps, to be used as reference for actual measurement.

Note
If the measurement point (address) for the current measurement or the next measurement already contains data, the measurement point indication in the measurement screen is shown in red. The data will be overwritten without confirmation when you press the STORE key in step 11.

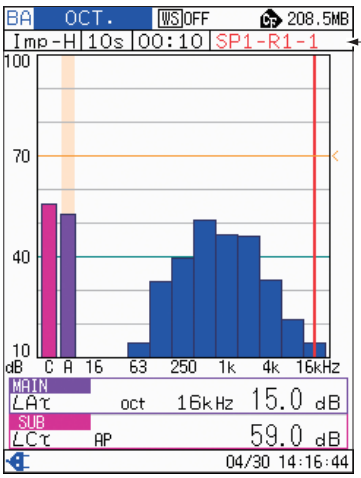
Measurement preparations

1. Determine the sound source positions and receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 82.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 82.)
   First, use the [Building Acoustic] menu to set the measurement mode to "Impact(LH)". Available setting items differ depending on the measurement mode.

Measurement

6. Set up the sound source in the first sound source position.
7. Set up the sound level meter at the first measurement point.
8. (This step is omitted for background noise measurement.)
   Start sound source.
9. Press the START/STOP key on the sound level meter.
   The indication "START" appears and the measurement begins.
   When the preset measurement time has elapsed, measurement stops automatically.
   To stop the measurement before the end of the measurement time, press the START/STOP key.
   For about one second after the measurement was stopped, the indication "STOP" is shown.

10. (This step is omitted for background noise measurement.)
    Turn off the sound source.
11. Press the STORE key to save the measurement data. The measurement count indication is incremented by one.
12. Repeat steps 8 to 10 for the number of times determined by the measurement count setting. (Background noise measurement is carried out only once.) The indication then changes to the next measurement point.
13. Move the sound level meter to the next measurement point. The sequence of measurement points depends on the background noise measurement mode. For details, see pages 78 to 81.
14. When measurement for all measurement points is completed, move the sound source to the next sound source position, and repeat steps 7 to 12.
15. When measurement for all sound source positions is completed, the measurement is finished. The screen indication returns to the first measurement point.



The measurement point (address) and the measurement count currently being measured or scheduled next is shown here.

Changing the measurement point (address)

During measurement, it is possible to skip points in the measurement point sequence or return to earlier points to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement count indication is incremented by one.

Pushing the ▽ key moves the displayed measurement count indication is decremented by one.

See "Measurement procedure".

After the change, measurement continues from the new count, using the same sequence.

Recall (measurement result display and rating calculation)

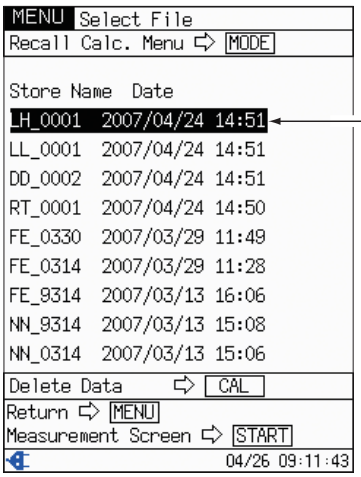
The recall function serves to call up stored measurement data.
When using the function, it is also possible to display the ranking calculated according to the recalled data.

Ranking

The ranking is calculated from the octave data. Consequently, if "1/3 OCT" is selected as analysis mode for the recalled data, it is not calculated or displayed.
The ranking is shown together with the estimation curve.
Bands used for this item: 63 Hz to 500 Hz

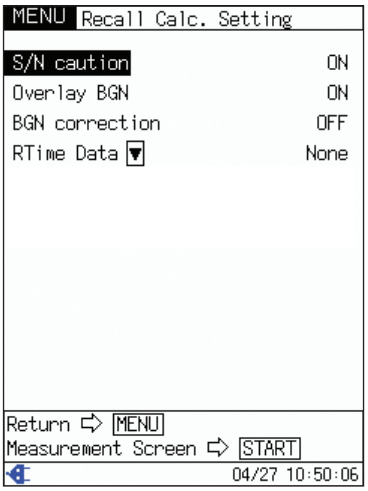
Recall procedure

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall] and press the ENT key. The file selection screen appears.



File selection screen

3. Press the MODE key to bring up the [Recall Calc. Setting] screen and set the items listed below.
   Use the △ / ▽ keys to select the item and press the ENT key. Then use the △ / ▽ keys to make the setting and press the ENT key once more. When all items have been set, press the MENU key to return to the file selection screen.



Recall Calc. Setting screen

S/N caution Available settings: "ON", "OFF"

When this item is set to ON, a warning/caution indication (red/yellow) is shown when the level difference between the measured level and the background noise level is small. (For details, see "Overlay background level and S/N caution" on page 164.)

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display. (For details, see "Overlay background level and S/N caution" on page 164.)

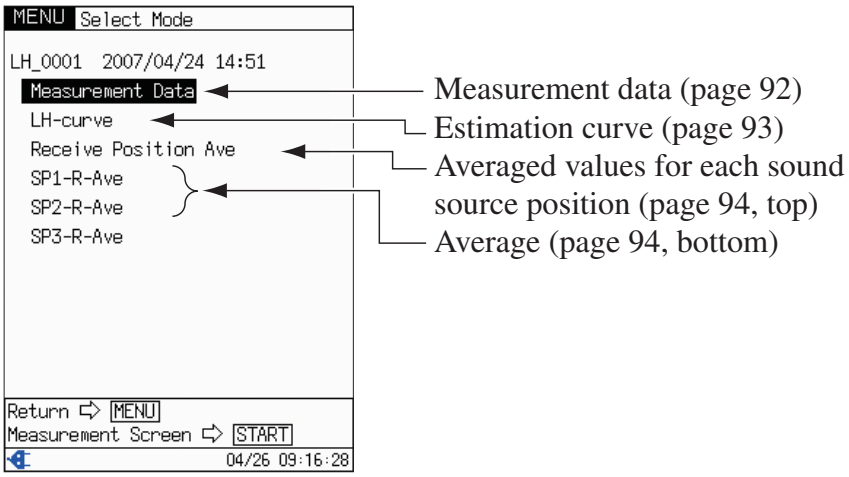
BGN correction Available settings: "ON", "OFF"

Specifies whether to correct the receiving room measurement results for background noise. For details, see the section "Averaging method and background noise correction" in the "Technical Reference" section on page 253. The background noise correction is applied to the estimation curve calculation.

RTime Data This setting can be made, but it is not used for floor impact sound insulation (heavy impact source) measurement.

Average Method This setting can be made, but it is not used for measurement of floor impact sound insulation (heavy impact source).
When operating with the Japanese language setting, this item is not shown.

4. At the file selection screen, use the △ / ▽ keys to select the airborne insulation measurement data to recall (store file name starting with "LH_"), and press the ENT key.
   The recall selection screen appears.



Recall selection screen

When the analysis mode for the recalled data is "1/3 OCT", the "L curve" (estimation curve) cannot be selected.

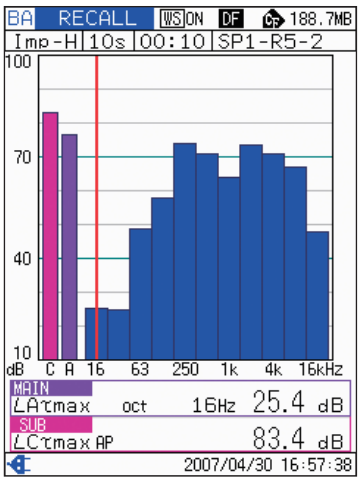
5. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating appear.
   From the recall screens, the following actions are possible.
   Press the MENU key to return to the recall selection screen.
   Press the ENT key to go to the menu list screen.
   The settings for the [Building Acoustic], [Measurement], and [Input/Output] menus made for the recalled data can be checked, but the settings cannot be changed.
   By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
   When a measurement data recall screen is displayed, a "Remeas." indication is shown. Selecting this brings up a measurement screen for the same measurement point as the recalled data.
   When you press the START key, the measurement screen appears again.

Operation at recall screens
The GRP/NUM key switches between graphical and numeric display. On a graphical display (except for estimation curve recall screen), you can use the ◁ / ▷ keys to move the cursor. When there are two or more numeric display pages, you can use the ◁ / ▷ keys to switch between pages.

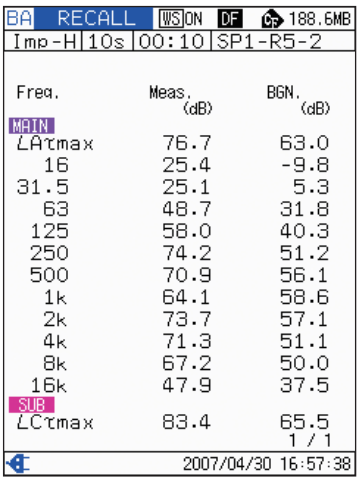
Measurement data recall screen

The data for the measurement point last stored under the selected store file name are shown.

You can use the △ / ▽ keys to change the measurement point.

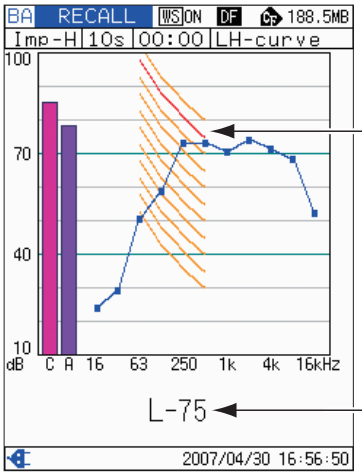


Graphical display



Numeric display

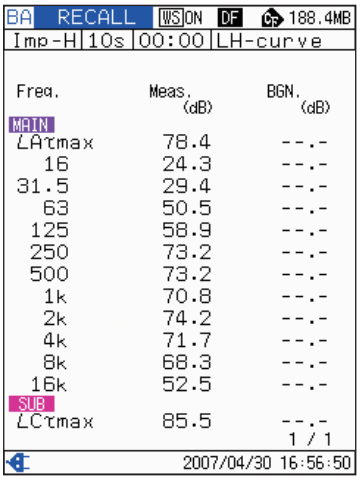
Estimation curve recall screen



The estimation curve corresponding to the measurement result is shown in red.

Ranking corresponding to measurement data

Graphical display

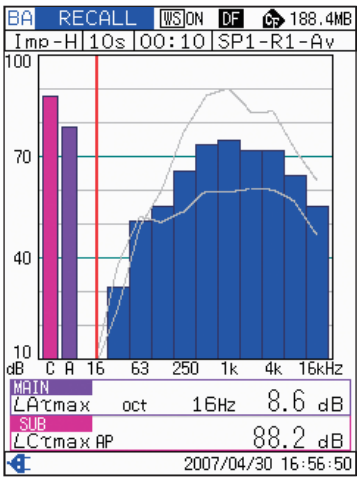


Numeric display

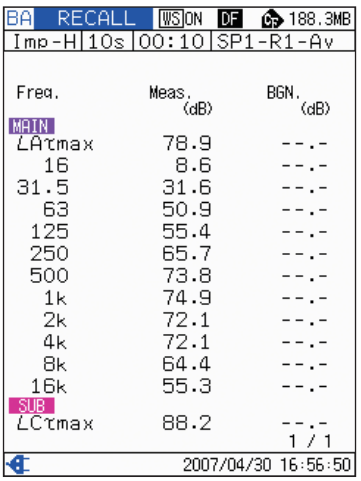
On the graphical display screen, the octave band data are shown as a broken line graph. When the analysis mode is "OCT & 1/3 OCT", the 1/3 octave data are shown as a bar graph.

Average value recall screen for each measurement

Shows the measurement values and averaged values for each measurement count at a measurement point.



Graphical display



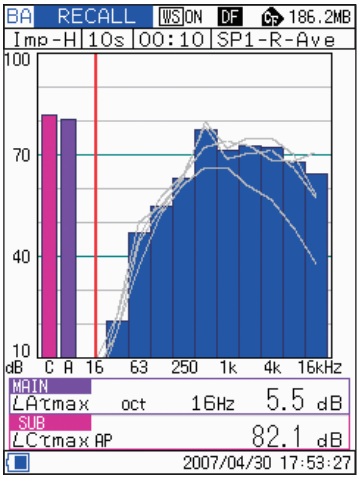
Numeric display

Bar graph: Average value

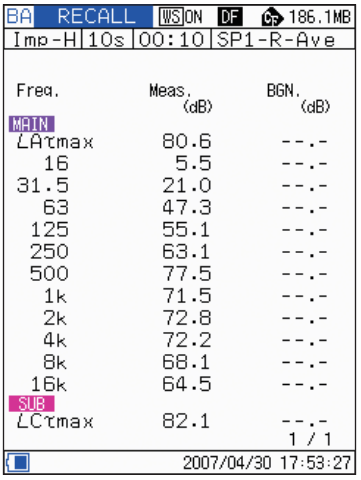
Broken line graph: Measurement values for each measurement count

Average value recall screen for all measurements

Shows the measurement values and averaged values for each sound source position for the receiving room measurement points.



Graphical display



Numeric display

Bar graph: Average value

Broken line graph (gray): Octave band measurement values for each measurement point

Broken line graph (yellow): 1/3 octave band measurement values for each measurement point

Measurement of Room Environmental Sound Level

The environmental sound level in the normal condition of a room is measured, and the N value or NC value is calculated as evaluation quantity.

N value: Guideline value according to Architectural Institute of Japan

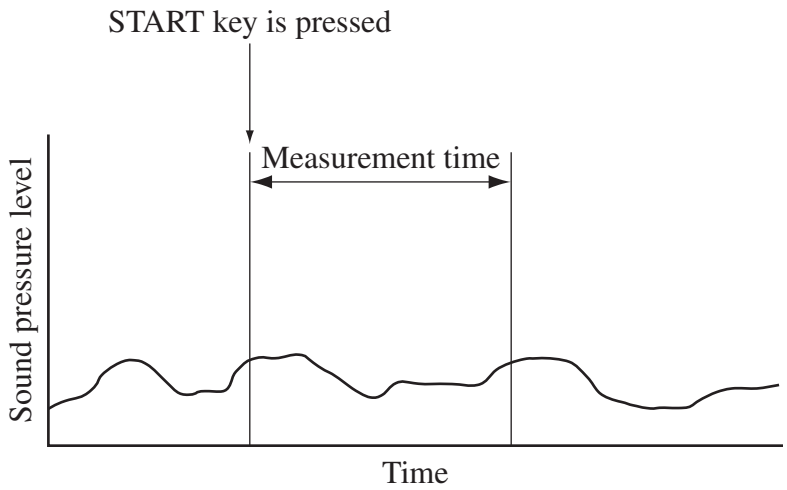
NC-value: According to the literature shown below

L. L. Beranek (ed.): Noise and vibration control.
McGraw-Hill Book Company, New York, 1971

Measurement outline

Operation at each measurement point

After pressing the START key, the unit collects data for the preset measurement time and calculates the time-average sound level L_{eq}. The maximum L_{max} for the period is also determined at the same time.



Measurement procedure

The measurement sequence is as follows.

Indication in brackets ( ) refers to on-screen display.

R1 → R2 → R3→ ..... → Rn

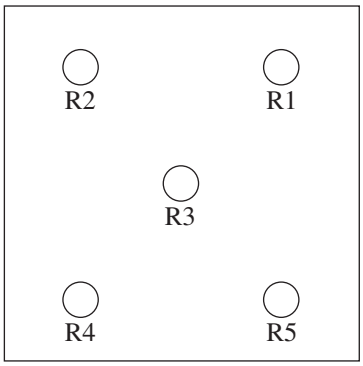
R1 Measurement at measurement point 1 in receiving room (SP1-R1-SG)

R2 Measurement at measurement point 2 in receiving room (SP1-R2-SG)

⋮ ⋮

Rn Measurement at measurement point n in receiving room (SP1-Rn-SG)

(n: receiving room measurement position number)

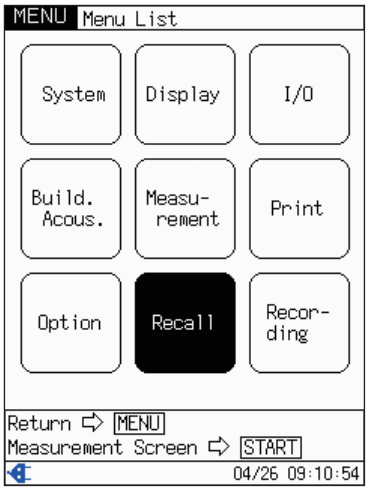


Receiving room measurement point arrangement example

Parameter setting

Before starting the measurement of the room environmental sound level, measurement parameters should be set as follows.

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus for making settings, and press the ENT key. The respective menu screen comes up.
   • [Building Acoustic] • [Measurement]
   For an explanation of the respective menu screens, see the following pages. For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.
   Because the measurement of room environmental sound level does not include background noise measurement, no settings need to be made on the [Display] menu.



Menu list screen

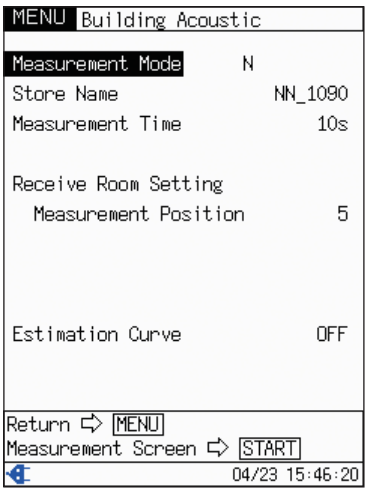
Important

You must first set the measurement mode to "N" or "NC" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key. The respective parameter can now be set.
4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key. The new setting is established.

5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for two menus listed in step 2 in the same way. Press the START key to return to the measurement screen.

[Building Acoustic] menu ("N", "NC" measurement mode)



Building Acoustic menu screen

Measurement Mode "N" or NC" selected

When one of the above is selected, the following parameters can be set.

Store Name NN_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored. This is used later as identifier when recalling measurement results. "NN" indicates "N" or "NC".

Measurement Time Setting range: 1 to 60 seconds

Specifies the time interval for which measurement data are collected.

Receive Room Setting Measurement Position

Setting range: 1 to 10

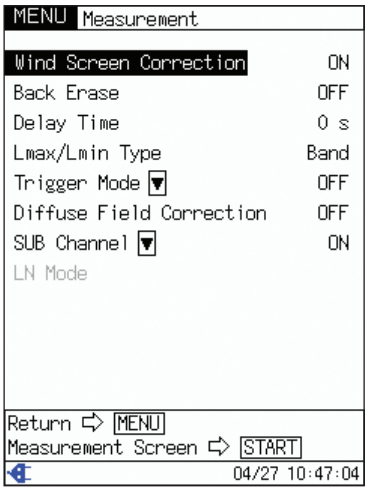
Specifies the number of positions in the receiving room where the sound level meter (microphone) for measurement is placed.

Estimation Curve Available settings for "N", N value: "OFF", "N-20", "N-25" to "N-85"

Available settings for "NC", NC value: "OFF", "NC-15", "NC-20" to "NC-65"

The curve selected here and the next higher curve are shown on the measurement screen.

[Measurement] menu



Measurement menu screen

Wind Screen Correction Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase Available settings: "OFF", "5s"

When set to "5s", measurement data for a period of five seconds before the PAUSE/CONT key was pressed will be canceled.

Note
When the NX-28WR is installed and waveform recording function is active, the back erase function is not available.

Delay Time Setting range: 1 to 10 seconds

Specifies the delay time between the point where the START key is pressed and the actual start of measurement.

L_{max}/L_{min} Type Available settings: "AP", “AP(S)”, "Band"

AP: The L_{max} / L_{min} value of Sub channel and each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

AP(S): The L_{max} / L_{min} value of each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

The L_{max} / L_{min} value of the Sub channel is the maximum / minimum value during the measurement period.

Band: The L_{max} / L_{min} value of the Sub channel and each frequency band is the maximum / minimum value during the measurement period.

Trigger Mode Available settings: "OFF", "Level1", "Level2", "Time", "EXT"

For "Level1", further settings for "Trigger Level", "Trigger Band", and "Slope" are required.

For "Level2", further settings for "Trigger Level" and "Trigger Band" are required.

For "Time", further settings for "Trigger Start Time", "Trigger Stop Time", "Sleep Mode" are required.

Diffuse Field Correction

Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" become available.

Measurement procedure

This section describes representative measurement steps, to be used as reference for actual measurement.

Note
If the measurement point (address) for the current measurement or the next measurement already contains data, the measurement point indication in the measurement screen is shown in red. The data will be overwritten without confirmation when you press the STORE key in step 8.

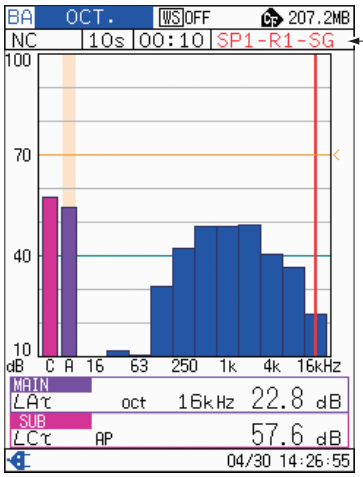
Measurement preparations

1. Determine receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 97.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12.)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 97.)
   First, use the [Building Acoustic] menu to set the measurement mode to "N" or "NC". Available setting items differ depending on the measurement mode.

Measurement

6. Set up the sound level meter at the first measurement point.
7. Press the START/STOP key on the sound level meter.
   The indication "START" appears and the measurement begins.
   When the preset measurement time has elapsed, measurement stops automatically.
   To stop the measurement before the end of the measurement time, press the START/STOP key.
   For about one second after the measurement was stopped, the indication "STOP" is shown.
8. Press the STORE key to save the measurement data. The indication changes to the next measurement point.
9. Move the sound level meter to the next measurement point.

10. When measurement for all measurement points has been carried out, the measurement is completed. The measurement point indication on the screen returns to the initial condition.



The measurement point (address) currently being measured or scheduled next is shown here.

Changing the measurement point (address)

During measurement, it is possible to skip points in the measurement point sequence or return to earlier points to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement point forward by one position.

Pushing the ▽ key moves the displayed measurement point backward by one position.

After the change, measurement continues from the new point, using the same sequence.

Recall (measurement result display and rating calculation)

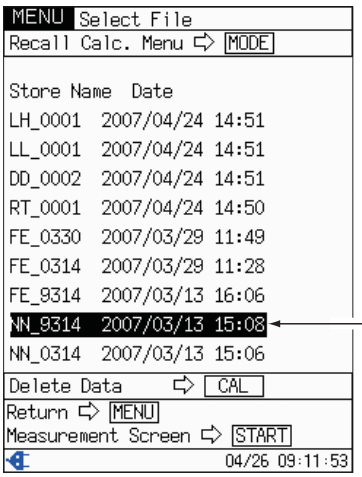
The recall function serves for displaying stored measurement results.
When using the function, it is also possible to display the ranking calculated according to the recalled data.

Ranking

The ranking is calculated from the octave data. Consequently, if "1/3 OCT" is selected as analysis mode for the recalled data, it is not calculated or displayed.
The ranking is shown together with the estimation curve.
Bands used for this item: N-curve 63 Hz to 4 kHz
NC-curve 63 Hz to 8 kHz

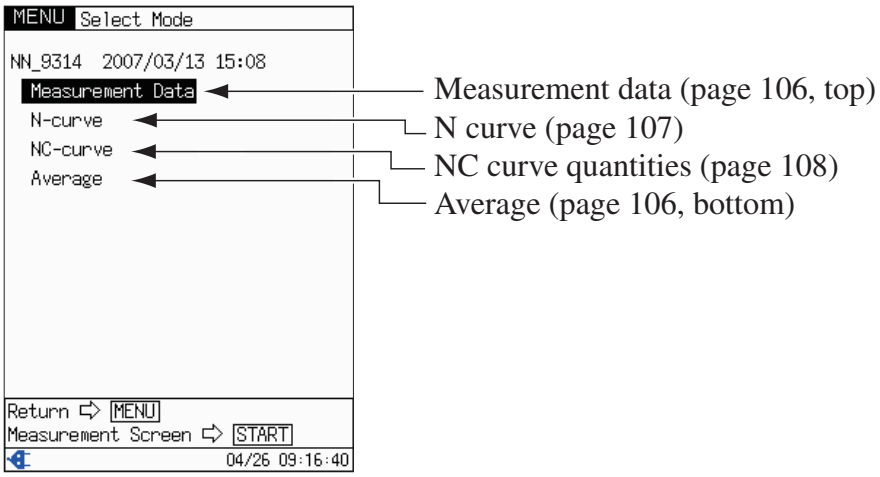
Recall procedure

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall] and press the ENT key. The file selection screen appears.



File selection screen

3. At the file selection screen, use the △ / ▽ keys to select the room environmental sound measurement data to recall (store file name starting with "NN_"), and press the ENT key.
   The recall selection screen appears.



Recall selection screen

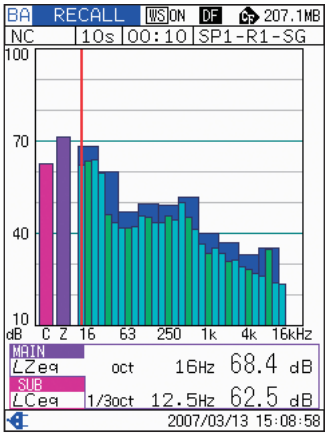
When the analysis mode for the recalled data is "1/3 OCT", the "N value curve" and "NC value curve" (estimation curve) cannot be selected.

4. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating appear.
   From the recall screens, the following actions are possible.
   Press the MENU key to return to the recall selection screen.
   Press the ENT key to go to the menu list screen.
   The settings for the [Building Acoustic], [Measurement], and [Input/Output] menus made for the recalled data can be checked, but the settings cannot be changed.
   By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
   When a measurement data recall screen is displayed, a "Remeas." indication is shown. Selecting this brings up a measurement screen for the same measurement point as the recalled data.
   When you press the START key, the measurement screen appears again.

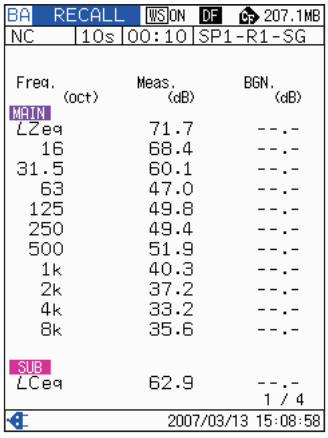
Measurement data recall screen

The data for the measurement point last stored under the selected store file name are shown.

You can use the △ / ▽ keys to change the measurement point.



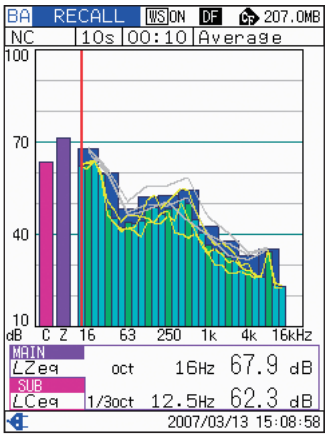
Graphical display



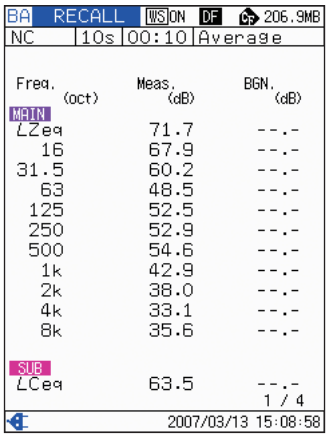
Numeric display

Average value recall screen

Shows the measurement values and averaged values of each measurement point.



Graphical display

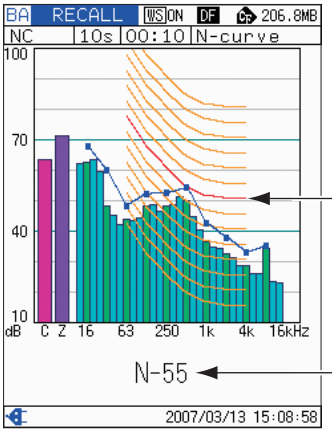


Numeric display

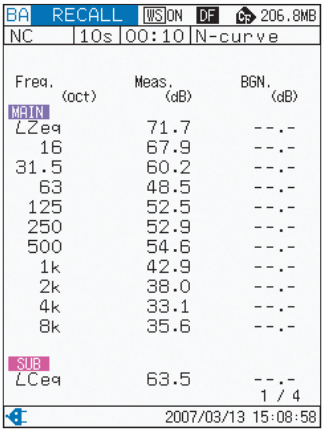
Bar graph:	Average value
Broken line graph (gray):	Octave band measurement values for each measurement point
Broken line graph (yellow):	1/3 octave band measurement values for each measurement point

Operation at recall screens
The GRP/NUM key switches between graphical and numeric display. On a graphical display (except for N curve recall screen and NC curve recall screen), you can use the ◁ / ▷ keys to move the cursor. When there are two or more numeric display pages, you can use the ◁ / ▷ keys to switch between pages.

N curve (estimation curve) recall screen

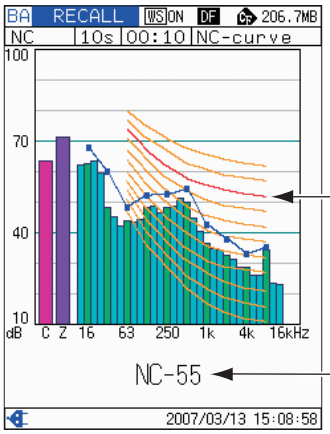


Graphical display



Numeric display

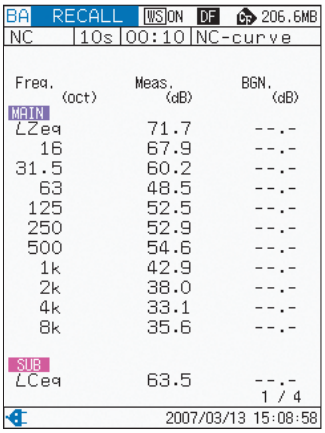
NC curve (estimation curve) recall screen



The estimation curve corresponding to the measurement result is shown in red.

NC value corresponding to measurement data

Graphical display



Numeric display

N curve recall screen, NC curve recall screen

On the graphical display screen, the octave band data are shown as a broken line graph.

When the analysis mode is "OCT & 1/3 OCT", the 1/3 octave data are shown as a bar graph.

Measurement of Sound Level from Service Equipment

Service equipment such as plumbing, air-conditioning etc. in the room is activated and the sound level is measured.

The program does not perform evaluation quantity calculation for this item, but the excel macro that is available from Rion includes this capability.

Reference standard: ISO 16032:2004

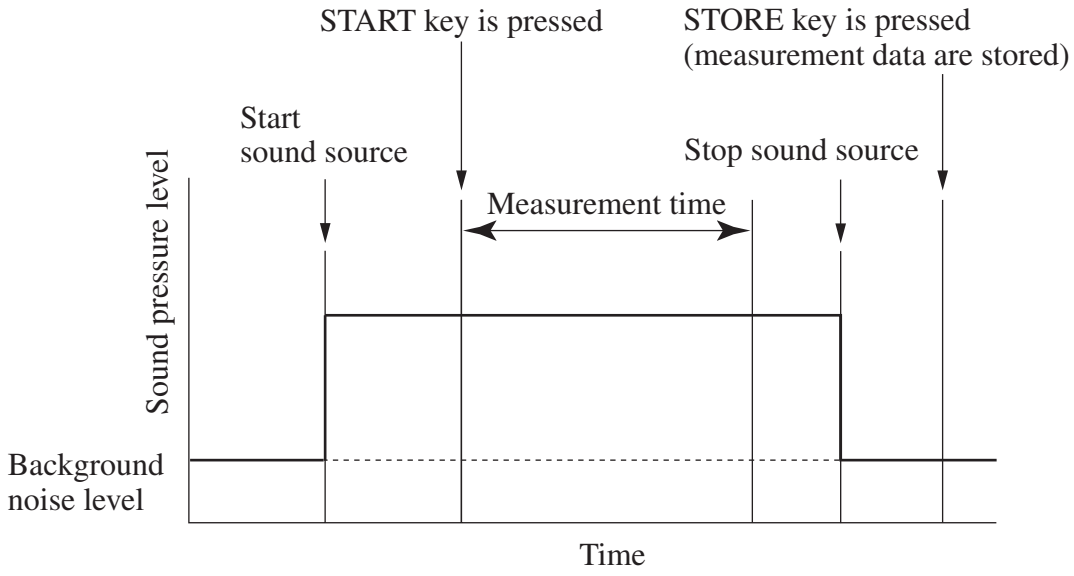
Note
The measurements described in this chapter, unless explicitly specified as background noise measurements, are performed using a sound source.

Measurement outline

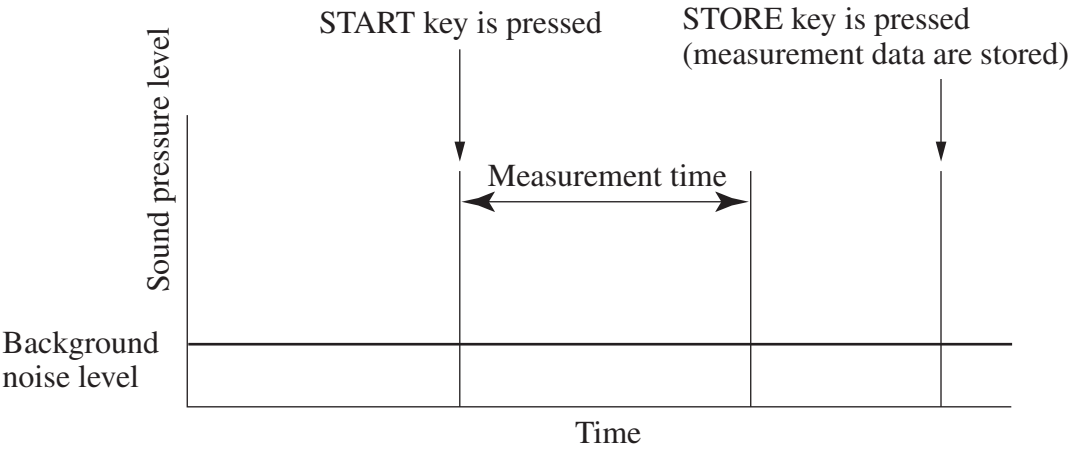
Operation at each measurement point

After pressing the START key, the unit collects data for the preset measurement time and calculates the time-average sound level L_{eq}. The maximum L_{max} for the period is also determined at the same time. (During background noise measurement, only L_{eq} is determined.)

A function (overlay background level) is available for overlaying the background noise level in the receiving room during measurement, and generating a warning when the level difference is small. (The function is not available if the background noise measurement mode was set to "None".)



The principle for background noise measurement is as follows.



Measurement procedure

The order in which measurements are performed at the various measurement points depends on the background noise measurement mode. For details, see the explanation starting on the next page.

Sound source and measurement point indication

The sound sources and measurement points are indicated as follows.

Indication in brackets ( ) refers to on-screen display.

SP1 Sound source (plumbing, air-conditioning etc.) 1

R1B Background noise measurement at measurement point 1 in receiving room (SP1-R1-BG)

R2B Background noise measurement at measurement point 2 in receiving room (SP1-R2-BG)

: :

RnB Background noise measurement at measurement point n in receiving room (SP1-Rn-BG)

(n: receiving room measurement position number)

R1 Measurement at measurement point 1 in receiving room (SP1-R1-SG)

R2 Measurement at measurement point 2 in receiving room (SP1-R2-SG)

: :

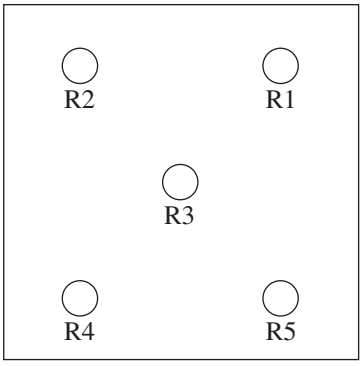
Rn Measurement at measurement point n in receiving room (SP1-Rn-SG)

(n: receiving room measurement position number)

SP2 Sound source 2

: :

SPp Sound source p (p: sound source number)



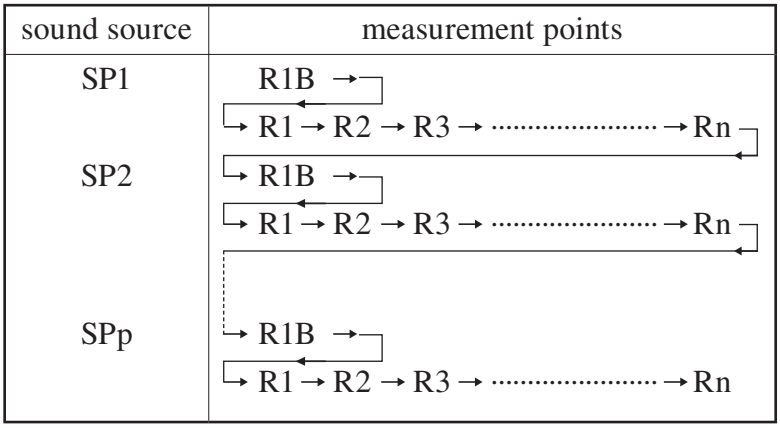
Receiving room measurement point arrangement example

Background noise measurement mode set to "Once"

In this case, background noise measurement is carried out once only at a representative measurement point in the receiving room. Measurement then continues with the measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.



R1B Background noise measurement at a representative measurement point in receiving room

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

SP1, SP2, ..., SPp

Sound source (p: sound source number)

Background noise measurement mode set to "Before"

Background noise measurement is carried out for all measurement points in the receiving room. Measurement then proceeds with the measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R2B → R3B → ····· → RnB ↳ R1 → R2 → R3 → ····· → Rn
SP2	↳ R1B → R2B → R3B → ····· → RnB ↳ R1 → R2 → R3 → ····· → Rn
SPp	↳ R1B → R2B → R3B → ····· → RnB ↳ R1 → R2 → R3 → ····· → Rn

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

SP1, SP2, ..., SPp

Sound source p (p: sound source number)

Background noise measurement mode set to "During"

In this case, background noise measurement followed by normal measurement with source sound are carried out for all the measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R1 → R2B → R2 → R3B → R3 → ····· → RnB → Rn
SP2	→ R1B → R1 → R2B → R2 → R3B → R3 → ····· → RnB → Rn
SPp	→ R1B → R1 → R2B → R2 → R3B → R3 → ····· → RnB → Rn

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

SP1, SP2, ..., SPp

Sound source p (p: sound source number)

Background noise measurement mode set to "None"

In this case, no background noise measurement is carried out in the receiving room. Measurement immediately starts with the measurement points in the receiving room.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1 → R2 → R3 → ····· → Rn
SP2	R1 → R2 → R3 → ····· → Rn
SPp	R1 → R2 → R3 → ····· → Rn

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

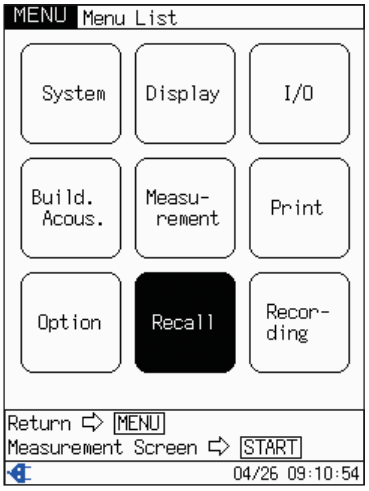
SP1, SP2, ..., SPp

Sound source p (p: sound source number)

Parameter setting

Before starting the measurement of sound level from service equipment, measurement parameters should be set as follows.

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus for making settings, and press the ENT key. The respective menu screen comes up.
   • [Building Acoustic] • [Measurement] • [Display]
   For an explanation of the respective menu screens, see the following pages. For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.



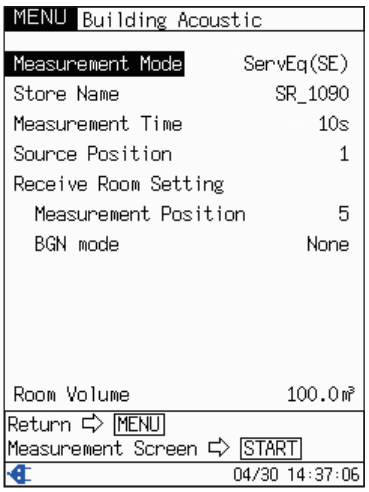
Menu list screen

Important

You must first set the measurement mode to "ServEq(SE)" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key. The respective parameter can now be set.
4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key. The new setting is established.
5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for all menus listed in step 2 in the same way. Press the START key to return to the measurement screen.

[Building Acoustic] menu ("ServEq(SE)" measurement mode)



Building Acoustic menu screen

Measurement Mode "ServEq(SE)" selected

When "ServEq(SE)" is selected, the following parameters can be set.

Store Name SR_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored. This is used for identification when the data is recalled later. The "SR_" indicates that the data are for "ServEq(SE)".

Measurement Time Setting range: 1 to 60 seconds

Specifies the time interval for which measurement data are collected.

Source Position Setting range: 1 to 8

Specifies the number of the sound source (plumbing, air-conditioning etc.)

Receive room Setting Measurement Position

Setting range: 1 to 10

Specifies the number of positions in the receiving room where the sound level meter (microphone) for measurement is placed.

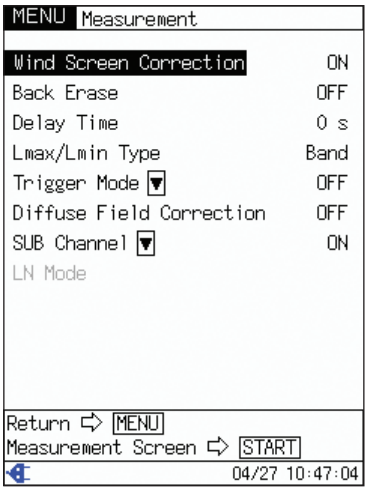
BGN mode Available settings: "Once", "Before", "During", "None"

Determines the background noise measurement in the receiving room. (For details, see pages 112 to 115.)

Room Volume Setting range: 0.1 to 999.9 m^3

Specifies the volume of the receiving room.

[Measurement] menu



Measurement menu screen

Wind Screen Correction Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase Available settings: "OFF", "5s"

When set to "5s", measurement data for a period of five seconds before the PAUSE/CONT key was pressed will be canceled.

Note
When the NX-28WR is installed and waveform recording function is active, the back erase function is not available.

Delay Time Setting range: 1 to 10 seconds

Specifies the delay time between the point where the START key is pressed and the actual start of measurement.

L_{max}/L_{min} Type Available settings: "AP", “AP(S)”, "Band"

AP: The L_{max} / L_{min} value of Sub channel and each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

AP(S): The L_{max} / L_{min} value of each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

The L_{max} / L_{min} value of the Sub channel is the maximum / minimum value during the measurement period.

Band: The L_{max} / L_{min} value of the Sub channel and each frequency band is the maximum / minimum value during the measurement period.

For measurement of sound level from service equipment, "AP" is normally used.

Trigger Mode Available settings: "OFF", "Level1", "Level2", "Time", "EXT"

For "Level1", further settings for "Trigger Level", "Trigger Band", and "Slope" are required.

For "Level2", further settings for "Trigger Level" and "Trigger Band" are required.

For "Time", further settings for "Trigger Start Time", "Trigger Stop Time", "Sleep Mode" are required.

Diffuse Field Correction

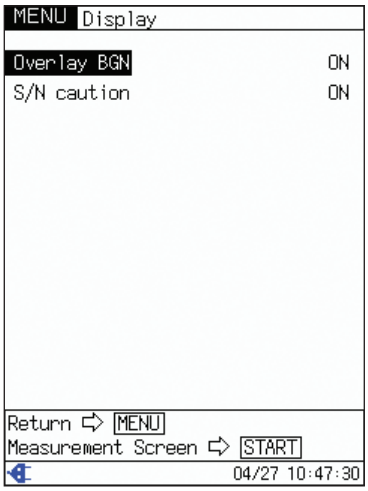
Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" are required.

[Display] menu



Display menu screen

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display.

(For details, see "Overlay background level and S/N caution" on page 164.)

S/N caution indication

This setting can be made, but it is not used for measurement of sound level from service equipment.

Measurement procedure

This section describes representative measurement steps, to be used as reference for actual measurement.

Note
If the measurement point (address) for the current measurement or the next measurement already contains data, the measurement point indication in the measurement screen is shown in red. The data will be overwritten without confirmation when you press the STORE key in step 11.

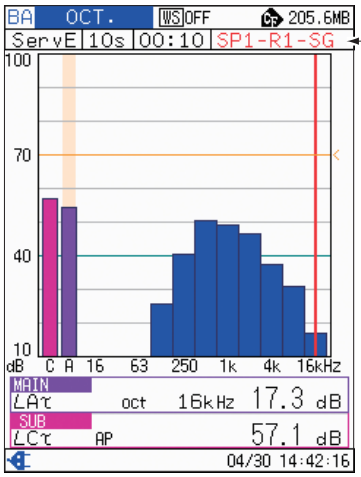
Measurement preparations

1. Determine the sound source positions and receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 116.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12.)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 116.)
   First, use the [Building Acoustic] menu to set the measurement mode to "ServEq(SE)". Available setting items differ depending on the measurement mode.

Measurement

6. Prepare the service equipment that will be the first sound source.
7. Set up the sound level meter at the first measurement point.
8. (This step is omitted for background noise measurement.)
   Start the sound source service equipment.
9. Press the START/STOP key on the sound level meter.
   The indication "START" appears and the measurement begins.
   When the preset measurement time has elapsed, measurement stops automatically.
   To stop the measurement before the end of the measurement time, press the START/STOP key.
   For about one second after the measurement was stopped, the indication "STOP" is shown.

10. (This step is omitted for background noise measurement.)
    Stop the sound source service equipment.
11. Press the STORE key to save the measurement data. The indication changes to the next measurement point.
12. Move the sound level meter to the next measurement point. The sequence of measurement points depends on the background noise measurement mode. For details, see pages 112 to 115.
13. When measurement for all measurement points is completed, prepare the service equipment that will be the next sound source, and repeat steps 7 to 12.
14. When measurement for all sound sources has been carried out, the measurement is completed. The measurement point indication on the screen returns to the initial condition.



The measurement point (address) currently being measured or scheduled next is shown here.

Changing the measurement point (address)

During measurement, it is possible to skip points in the measurement point sequence or return to earlier points to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement point forward by one position.

Pushing the ▽ key moves the displayed measurement point backward by one position.

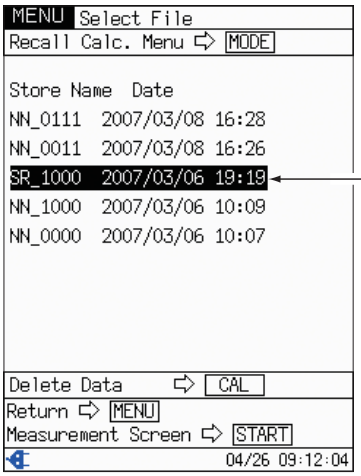
After the change, measurement continues from the new point, using the same sequence.

Recall (measurement result display and rating calculation)

The recall function serves to call up stored measurement data.

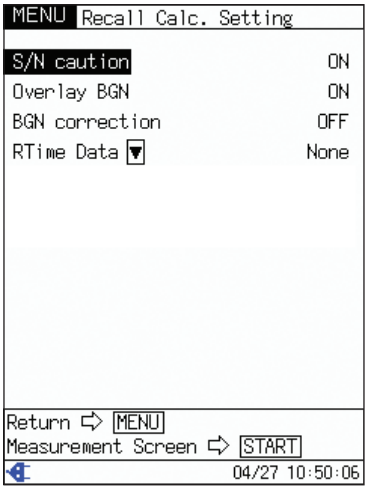
Recall procedure

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall] and press the ENT key. The file selection screen appears.



File selection screen

3. Press the MODE key to bring up the [Recall Calc. Setting] screen and set the items listed on next page.
   Use the △ / ▽ keys to select the item and press the ENT key. Then use the △ / ▽ keys to make the setting and press the ENT key once more. When all 4 items have been set, press the MENU key to return to the file selection screen.



Recall Calc. Setting screen

S/N caution

This setting can be made, but it is not used for measurement of sound level from service equipment.

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display. (For details, see "Overlay background level and S/N caution" on page 164.)

BGN correction Available settings: "ON", "OFF"

This setting can be made, but it is not used for sound level from service equipment measurement.

RTime Data

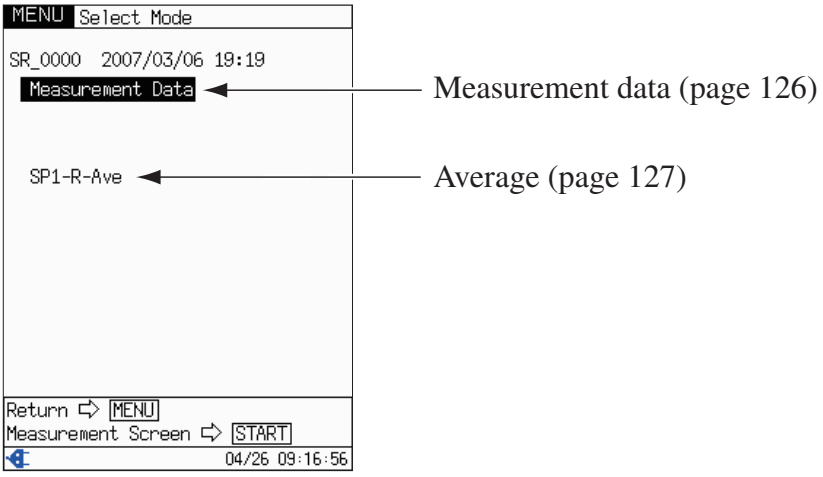
This setting can be made, but it is not used for sound level from service equipment measurement.

Average Method

This setting can be made, but it is not used for measurement of sound level from service equipment.

When operating with the Japanese language setting, this item is not shown.

4. At the file selection screen, use the △ / ▽ keys to select the service equipment measurement data to recall (store file name starting with "SR_"), and press the ENT key.
   The recall selection screen appears.



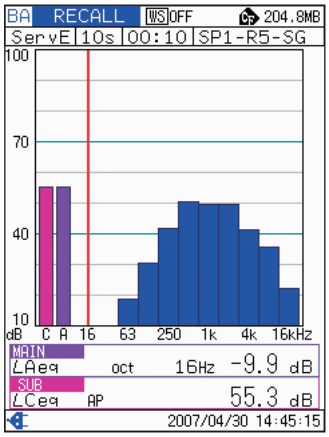
Recall selection screen

5. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating appear.
   From the recall screens, the following actions are possible.
   Press the MENU key to return to the recall selection screen.
   Press the ENT key to go to the menu list screen.
   The settings for the [Building Acoustic], [Measurement], and [Input/Output] menus made for the recalled data can be checked, but the settings cannot be changed.
   By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
   When a measurement data recall screen is displayed, a "Remeas." indication is shown. Selecting this brings up a measurement screen for the same measurement point as the recalled data.
   When you press the START key, the measurement screen appears again.

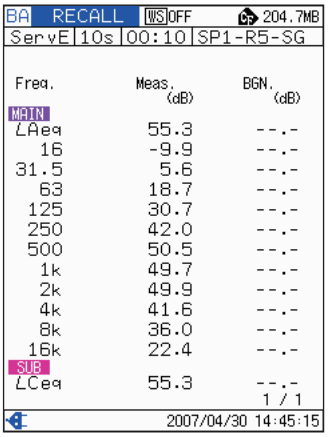
Measurement data recall screen

The data for the measurement point last stored under the selected store file name are shown.

You can use the △ / ▽ keys to change the measurement point.



Graphical display

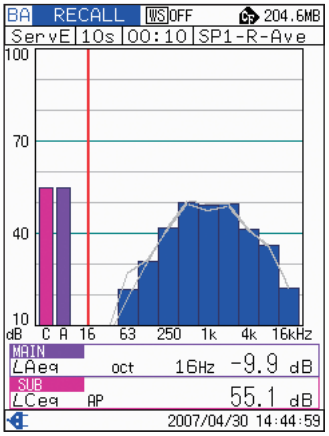


Numeric display

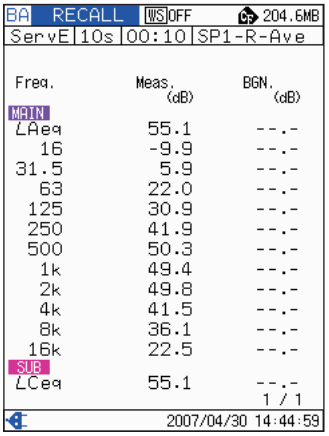
On the measurement data recall screen and average value recall screen, the GRP/NUM key switches between graphical and numeric display.
On a graphical display, you can use the ◁ / ▷ keys to move the cursor.
When there are two or more numeric display pages, you can use the ◁ / ▷ keys to switch between pages.

Average value recall screen

Shows the measurement values and averaged values for each sound source position for the receiving room or the source room measurement points.



Graphical display



Numeric display

Bar graph:	Average value
Broken line graph (gray):	Octave band measurement values for each measurement point
Broken line graph (yellow):	1/3 octave band measurement values for each measurement point

Measurement of Airborne Sound Insulation of Façade Elements and Façades

The insulation effect of the façade (outer wall) is measured.
The program does not perform evaluation quantity calculation for this item, but the excel macro that is available from Rion includes this capability.

Measurement is performed according to the compliance standard ISO 140-5:1998.

⚠ Caution
When performing measurements using high sound pressure levels, it is essential to provide and use adequate hearing protection (such as headphones).

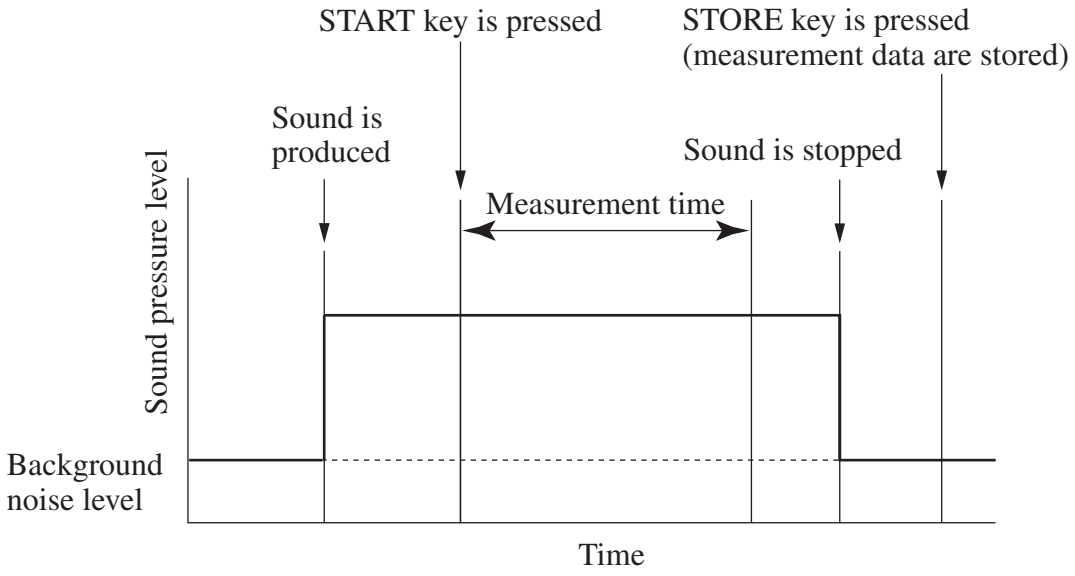
Note
The measurements described in this chapter, unless explicitly specified as background noise measurements, are performed using a sound source.

Measurement outline

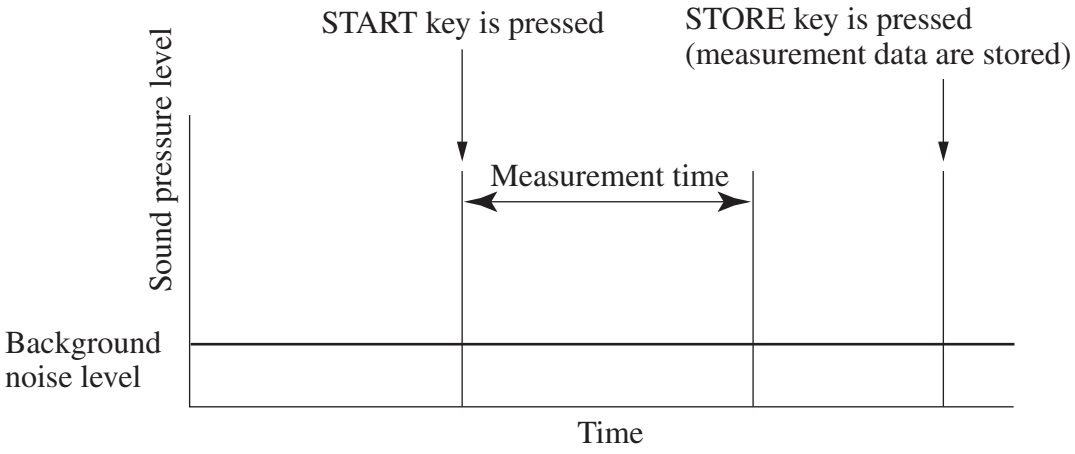
Operation at each measurement point

After pressing the START key, the unit collects data for the preset measurement time and calculates the time-average sound level L_{eq}. The maximum L_{max} for the period is also determined at the same time. (During background noise measurement, only L_{eq} is determined.)

A function (overlay background level) is available for overlaying the background noise level in the receiving room during measurement, and generating a warning when the level difference is small. (The function is not available if the background noise measurement mode was set to "None".)



The principle for background noise measurement is as follows.



Measurement procedure

The order in which measurements are performed at the various measurement points depends on the background noise measurement mode. For details, see the explanation starting on the next page.

Sound source and measurement point indication

The sound sources and measurement points are indicated as follows.

Indication in brackets ( ) refers to on-screen display.

SP1 Sound source (speaker) position 1

R1B Background noise measurement at measurement point 1 in receiving room (SP1-R1-BG)

R2B Background noise measurement at measurement point 2 in receiving room (SP1-R2-BG)

: :

RnB Background noise measurement at measurement point n in receiving room (SP1-Rn-BG)

(n: receiving room measurement position number)

R1 Measurement at measurement point 1 in receiving room (SP1-R1-SG)

R2 Measurement at measurement point 2 in receiving room (SP1-R2-SG)

: :

Rn Measurement at measurement point n in receiving room (SP1-Rn-SG)

(n: receiving room measurement position number)

S1 Measurement at measurement point 1 in source room (SP1-S1-SG)

S2 Measurement at measurement point 2 in source room (SP1-S2-SG)

: :

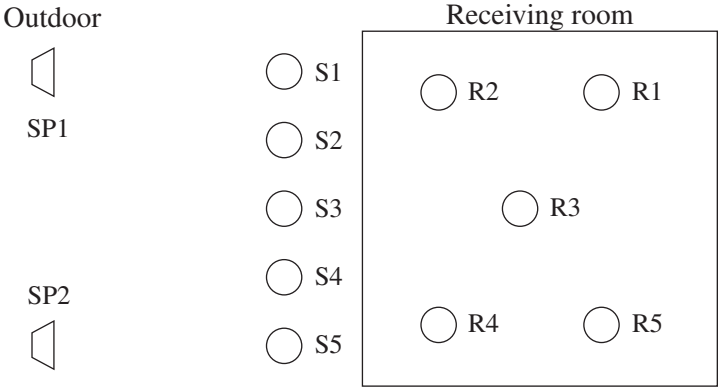
Sm Measurement at measurement point m in source room (SP1-Sm-SG)

(m: source room measurement position number)

SP2 Sound source position 2

: :

SPp Sound source position p (p: sound source position number)



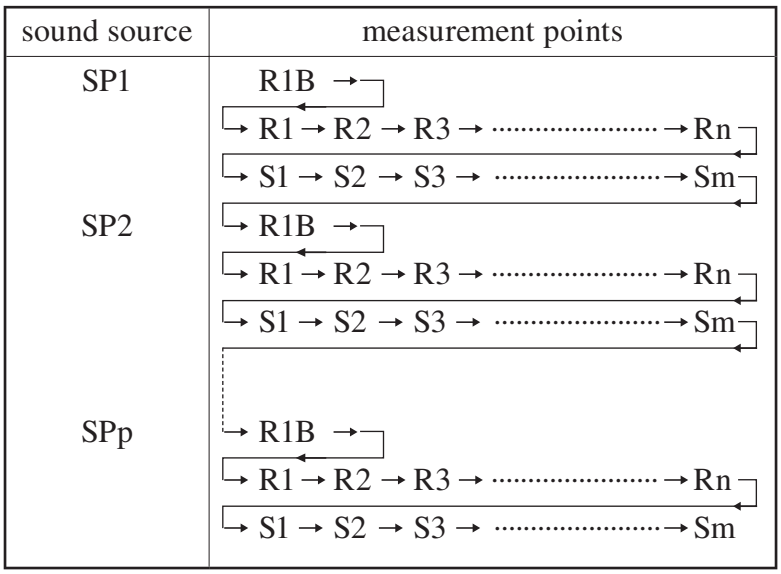
Outdoor and receiving room measurement point arrangement example

Background noise measurement mode set to "Once"

Background noise measurement is carried out once only at a representative measurement point in the receiving room. Measurement then continues with all measurement points in the receiving room, and all outside measurement points.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.



R1B Background noise measurement at a representative measurement point in receiving room

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at outdoor measurement point

(m: outdoor measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "Before"

Background noise measurement is carried out for all measurement points in the receiving room. Measurement then continues with all measurement points in the receiving room, and all outside measurement points.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R2B → R3B → ····· → RnB → R1 → R2 → R3 → ····· → Rn → S1 → S2 → S3 → ····· → Sm
SP2	→ R1B → R2B → R3B → ····· → RnB → R1 → R2 → R3 → ····· → Rn → S1 → S2 → S3 → ····· → Sm
SPp	→ R1B → R2B → R3B → ····· → RnB → R1 → R2 → R3 → ····· → Rn → S1 → S2 → S3 → ····· → Sm

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at outdoor measurement point

(m: outdoor measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "During"

At each measurement point in the receiving room, background noise measurement followed by measurement with sound source activated is carried out. This is followed by measurement at all outside measurement points.

This procedure is then repeated for another sound source position.

The measurement sequence is as follows.

sound source	measurement points
SP1	R1B → R1 → R2B → R2 → R3B → R3 → ····· → RnB → Rn → S1 → S2 → S3 → ····· → Sm
SP2	→ R1B → R1 → R2B → R2 → R3B → R3 → ····· → RnB → Rn → S1 → S2 → S3 → ····· → Sm
SPp	→ R1B → R1 → R2B → R2 → R3B → R3 → ····· → RnB → Rn → S1 → S2 → S3 → ····· → Sm

R1B, R2B, ..., RnB

Background noise measurement at measurement point in receiving room

(n: receiving room measurement position number)

R1, R2, ..., Rn

Measurement at measurement point in receiving room

(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at outdoor measurement point

(m: outdoor measurement position number)

SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Background noise measurement mode set to "None"

No background noise measurement is carried out in the receiving room. Measurement immediately starts with the measurement points in the receiving room, followed by measurement at all outside measurement points.
This procedure is then repeated for another sound source position.
The measurement sequence is as follows.

sound source	measurement points
SP1	R1 → R2 → R3 → ····· → Rn → S1 → S2 → S3 → ····· → Sm
SP2	→ R1 → R2 → R3 → ····· → Rn → S1 → S2 → S3 → ····· → Sm
SPp	→ R1 → R2 → R3 → ····· → Rn → S1 → S2 → S3 → ····· → Sm

R1, R2, ..., Rn

Measurement at measurement point in receiving room
(n: receiving room measurement position number)

S1, S2, ..., Sm

Measurement at outdoor measurement point
(m: outdoor measurement position number)

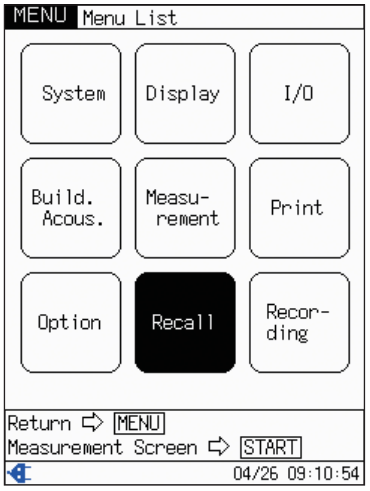
SP1, SP2, ..., SPp

Sound source position (p: sound source position number)

Parameter setting

Before starting the measurement of airborne sound insulation of façade elements and façades, measurement parameters should be set as follows.

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus for making settings, and press the ENT key. The respective menu screen comes up.
   • [Building Acoustic] • [Measurement] • [Display]
   For an explanation of the respective menu screens, see the following pages. For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.



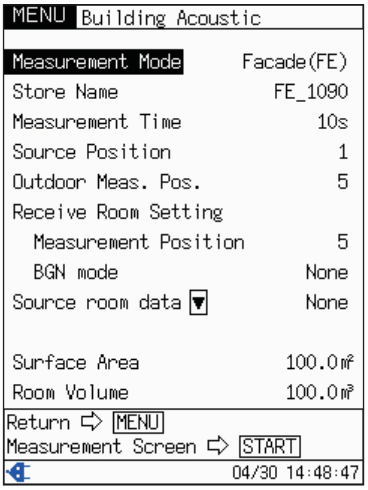
Menu list screen

Important

You must first set the measurement mode to "Facade(FE)" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key. The respective parameter can now be set.
4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key. The new setting is established.
5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for all menus listed in step 2 in the same way. Press the START key to return to the measurement screen.

[Building Acoustic] menu ("Facade(FE)" measurement mode)



Building Acoustic menu screen

Measurement mode "Facade(FE)" selected

When "Facade(FE)" is selected, the following parameters can be set.

Store Name FE_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored. This is used for identification when the data is recalled later. The "FE_" indicates that the data are for "Facade(FE)".

Measurement Time Setting range: 1 to 60 seconds

Specifies the time interval for which measurement data are collected.

Source Position Setting range: 1 to 8

Specifies the number of positions outside where the sound source is placed.

Outdoor Meas. Pos. Setting range: 1 to 10

Specifies the number of positions outside where the sound level meter (microphone) for measurement is placed.

Receive Room Setting Measurement Position

Setting range: 1 to 10

Specifies the number of positions in the receiving room where the sound level meter (microphone) for measurement is placed.

BGN mode Available settings: "Once", "Before", "During", "None"

Determines the background noise measurement in the receiving room. (For details, see pages 131 to 134.)

Source room data Select data measured with "Facade(FE)"

Select from data measured with airborne sound insulation of façade.

This function allows use of already measured source room data to eliminate the need for repeated measurement at outside measurement points when there are two or more receiving rooms.

When not using the function, select "None".

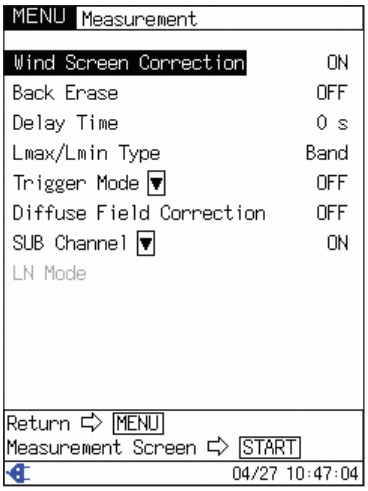
Surface Area Setting range: 0.0 to 999.9 m^2

Specifies the surface area of the wall whose sound insulation is being measured.

Room Volume Setting range: 0.1 to 999.9 m^3

Specifies the volume of the receiving room.

[Measurement] menu



Measurement menu screen

Wind Screen Correction Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase Available settings: "OFF", "5s"

When set to "5s", measurement data for a period of five seconds before the PAUSE/CONT key was pressed will be canceled.

Note
When the NX-28WR is installed and waveform recording function is active, the back erase function is not available.

Delay Time Setting range: 1 to 10 seconds

Specifies the delay time between the point where the START key is pressed and the actual start of measurement.

L_{max}/L_{min} Type Available settings: "AP", “AP(S)”, "Band"

AP: The L_{max} / L_{min} value of Sub channel and each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

AP(S): The L_{max} / L_{min} value of each frequency band is the sound pressure level at the moment the sound pressure level in the AP Main channel reached the maximum / minimum value during the measurement period.

The L_{max} / L_{min} value of the Sub channel is the maximum / minimum value during the measurement period.

Band: The L_{max} / L_{min} value of the Sub channel and each frequency band is the maximum / minimum value during the measurement period.

Trigger Mode Available settings: "OFF", "Level1", "Level2", "Time", "EXT"

For "Level1", further settings for "Trigger Level", "Trigger Band", and "Slope" are required.

For "Level2", further settings for "Trigger Level" and "Trigger Band" are required.

For "Time", further settings for "Trigger Start Time", "Trigger Stop Time", "Sleep Mode" are required.

Diffuse Field Correction

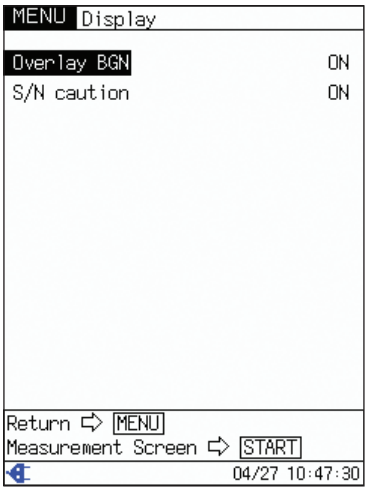
Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" become available.

[Display] menu



Display menu screen

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display.

(For details, see "Overlay background level and S/N caution" on page 164.)

S/N caution

This setting can be made, but it is not used for airborne sound insulation of façade elements and façade measurement.

Measurement procedure

This section describes representative measurement steps, to be used as reference for actual measurement.

Note
If the measurement point (address) for the current measurement or the next measurement already contains data, the measurement point indication in the measurement screen is shown in red. The data will be overwritten without confirmation when you press the STORE key in step 11.

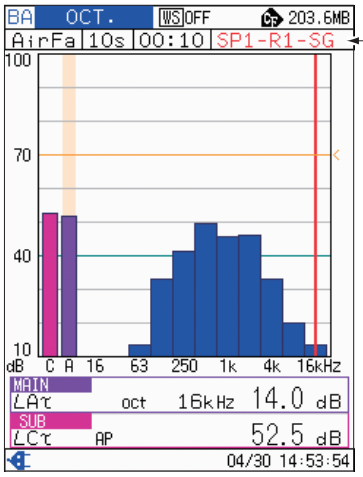
Measurement preparations

1. Determine the sound source position, outside measurement points, and receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 135.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12.)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 135.)
   First, use the [Building Acoustic] menu to set the measurement mode to "(FE)". Available setting items differ depending on the measurement mode.

Measurement

6. Set up the sound source in the first sound source position.
7. Set up the sound level meter at the first measurement point.
8. (This step is omitted for background noise measurement.)
   Activate the sound source.
9. Press the START/STOP key on the sound level meter.
   The indication "START" appears and the measurement begins.
   When the preset measurement time has elapsed, measurement stops automatically.
   To stop the measurement before the end of the measurement time, press the START/STOP key.
   For about one second after the measurement was stopped, the indication "STOP" is shown.

10. (This step is omitted for background noise measurement.)
    Turn off the sound source.
11. Press the STORE key to save the measurement data. The indication changes to the next measurement point.
12. Move the sound level meter to the next measurement point. The sequence of measurement points depends on the background noise measurement mode. For details, see pages 131 to 134.
13. When measurement for all measurement points is completed, move the sound source to the next sound source position, and repeat steps 7 to 12.
14. When measurement for all sound source positions is completed, the measurement is finished. The screen indication returns to the first measurement point.



The measurement point (address) currently being measured or scheduled next is shown here.

Changing the measurement point (address)

During measurement, it is possible to skip points in the measurement point sequence or return to earlier points to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement point forward by one position.

Pushing the ▽ key moves the displayed measurement point backward by one position.

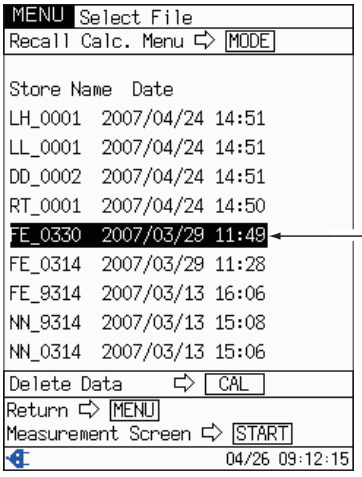
After the change, measurement continues from the new point, using the same sequence.

Recall (measurement result display and rating calculation)

The recall function serves to call up stored measurement data.
When using the function, it is also possible to display specified rating quantities calculated according to the recalled data.

Recall procedure

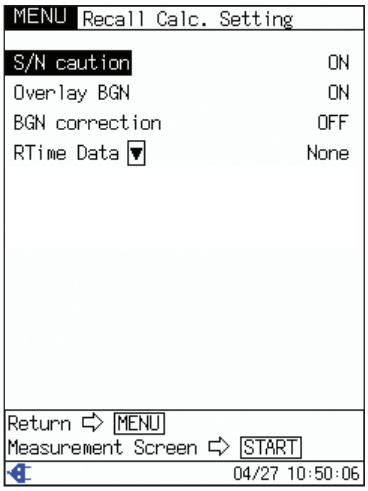
1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall] and press the ENT key.
   The file selection screen appears.



File names starting with "FE" are data of airborne insulation of façade.

File selection screen

3. Press the MODE key to bring up the [Recall Calc. Setting] screen and set the items listed below.
   Use the △ / ▽ keys to select the item and press the ENT key. Then use the △ / ▽ keys to make the setting and press the ENT key once more. When all 4 items have been set, press the MENU key to return to the file selection screen.



Recall Calc. Setting screen

S/N caution

This setting can be made, but it is not used for airborne sound insulation of façade elements and façade measurement.

Overlay BGN Available settings: "ON", "OFF"

Specifies whether to overlay the background noise level onto the measurement value display.

(For details, see "Overlay background level and S/N caution" on page 164.)

BGN correction

This setting can be made, but it is not used for airborne sound insulation of façade elements and façade measurement.

RTime Data

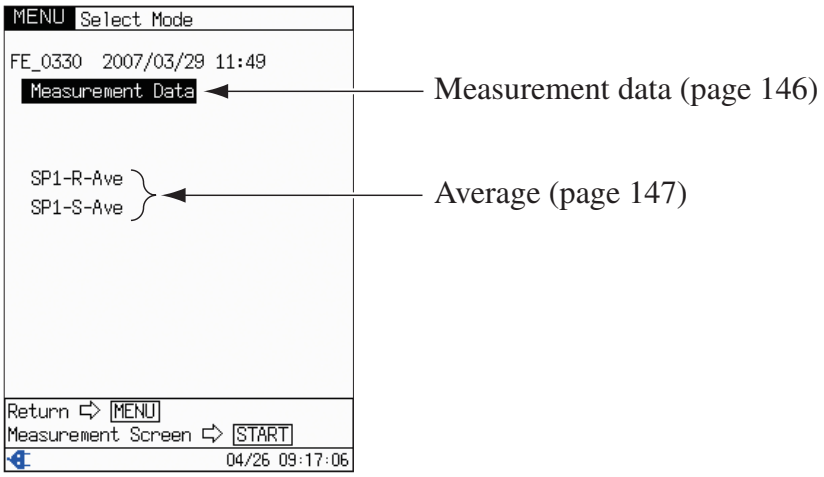
This setting can be made, but it is not used for airborne sound insulation of façade elements and façade measurement.

Average Method

This setting can be made, but it is not used for airborne sound insulation of façade elements and façade measurement.

When operating with the Japanese language setting, this item is not shown.

4. At the file selection screen, use the △ / ▽ keys to select the airborne insulation of façade elements and façade measurement data to recall (store file name starting with "FE_"), and press the ENT key.
   The recall selection screen appears.



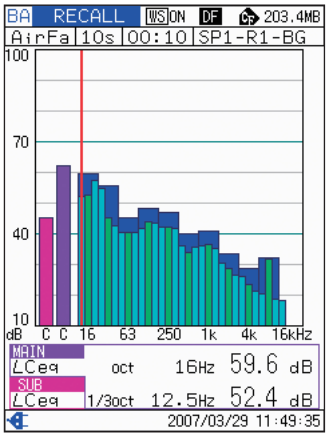
Recall selection screen

5. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating appear.
   From the recall screens, the following actions are possible.
   Press the MENU key to return to the recall selection screen.
   Press the ENT key to go to the menu list screen.
   The settings for the [Building Acoustic], [Measurement], and [Input/Output] menus made for the recalled data can be checked, but the settings cannot be changed.
   By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
   When a measurement data recall screen is displayed, a "Remeas." indication is shown. Selecting this brings up a measurement screen for the same measurement point as the recalled data.
   When you press the START key, the measurement screen appears again.

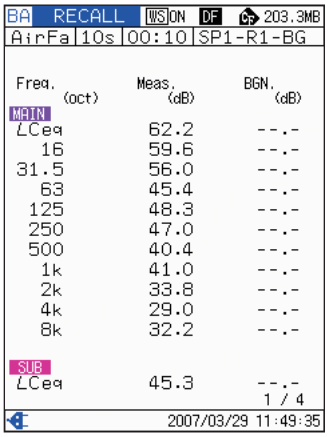
Measurement data recall screen

The data for the measurement point last stored under the selected store file name are shown.

You can use the △ / ▽ keys to change the measurement point.



Graphical display

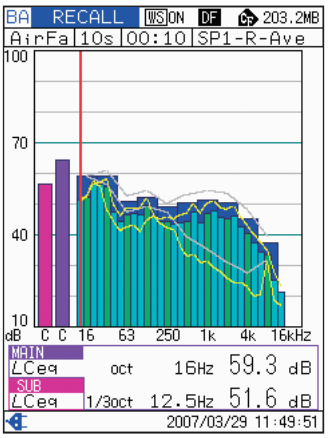


Numeric display

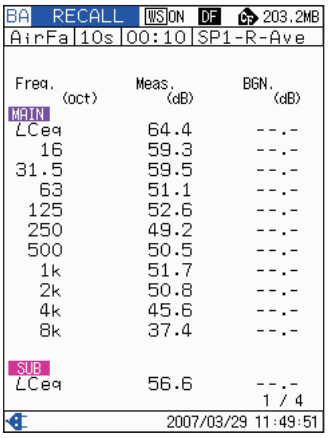
On the measurement data recall screen and average value recall screen, the GRP/NUM key switches between graphical and numeric display.
On a graphical display, you can use the ◁ / ▷ keys to move the cursor.
When there are two or more numeric display pages, you can use the ◁ / ▷ keys to switch between pages.

Average value recall screen

Shows the measurement values and averaged values of each receiving room or outside measurement point for each sound source position.



Graphical display



Numeric display

Bar graph:	Average value
Broken line graph (gray):	Octave band measurement values for each measurement point
Broken line graph (yellow):	1/3 octave band measurement values for each measurement point

Measurement of Reverberation Time

The procedure for measuring the reverberation time in the receiving room is described here. The result is used for evaluating the acoustic characteristics of the room and for calculating the insulation rating.
For a technical explanation regarding the measurement, refer to the "Technical Reference" section.

⚠ Caution

When performing measurements using high sound pressure levels, it is essential to provide and use adequate hearing protection (such as headphones).

Note

When using the RION Random Noise Generator SF-06 as sound source with the automatic interval output function enabled, set the ON time and OFF time to suitable values, taking the measurement time and processing time into consideration. An example is shown on page 152.

Note

The time weighting characteristic should normally be set to τ (10 ms).

Measurement outline

Basic measurement operation

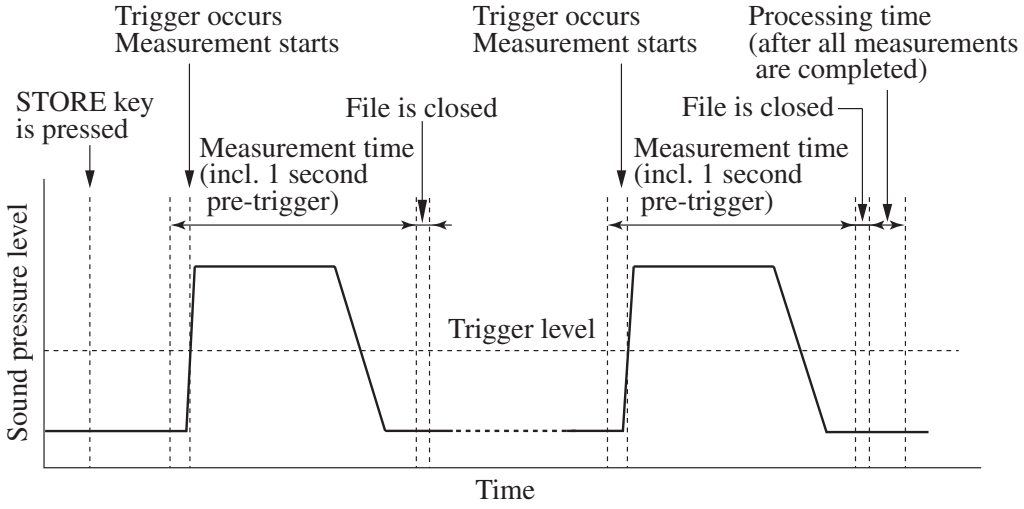
One second after pressing the STORE key the unit goes into trigger standby mode.

When the trigger level is exceeded, measurement data are collected for the preset measurement time and saved on the CF card. After measurement has been performed for the preset repeat count, the sound pressure level decay curve is calculated according to the least squares method, the reverberation time (T20, T30) is determined, and the average is calculated and stored on the CF card.

T20: Reverberation time defined as the period during which the sound pressure level falls by 20 dB, starting at a point 5 dB below the steady level.

T30: Reverberation time defined as the period during which the sound pressure level falls by 30 dB, starting at a point 5 dB below the steady level.

See the section "Calculation of T20 and T30 values during reverberation time measurement" in the "Technical Reference" section on page 252.



Measurement repeat count

In the receiving room, the measurement is repeated for the preset count.

After the first measurement and the file closing interval (1 second) are finished, the next trigger standby condition is activated after 1 second.

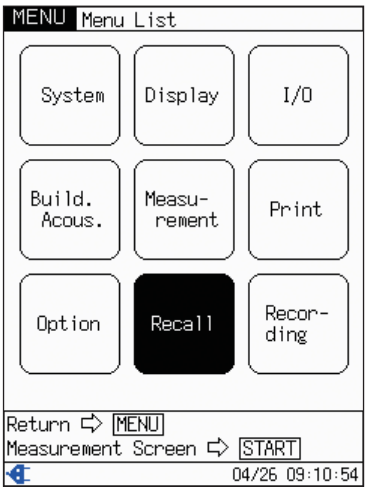
Reverberation time calculation

When all measurements are finished, the reverberation time data obtained with each measurement are averaged and taken as the reverberation time.

Parameter setting

Before starting the reverberation time measurement, set the measurement parameters as follows.

1. Press the MENU key to bring up the menu list screen.



Menu list screen

2. Use the △ / ▽ / ◁ / ▷ keys to select the following menus, and press the ENT key.
   The respective menu screen appears.
   • [Building Acoustic] • [Measurement]
   For an explanation of the respective menu screens, see the following pages.
   For information on the [Input/Output] menu, refer to the instruction manual of the NA-28.
   Because the reverberation time measurement does not include background noise measurement, no settings need to be made on the [Display] menu.

Important
You must first set the measurement mode to "Reverb (RT)" on the [Building Acoustic] menu. Available setting items differ depending on the measurement mode.

3. Use the △ / ▽ keys to select the setting item and press the ENT key.
   The respective parameter can now be set.

4. Use the △ / ▽ keys to change the setting option or numeral and press the ENT key.
   The new setting is established.
5. When all items have been set, press the MENU key to return to the menu screen.
6. Make settings for all menus listed in step 2 in the same way. Then press the START key to return to the measurement screen.

Setting example for using the automatic interval output function of the SF-06

When using the RION Random Noise Generator SF-06 as sound source for reverberation time measurement, the automatic interval output function can be used as follows.

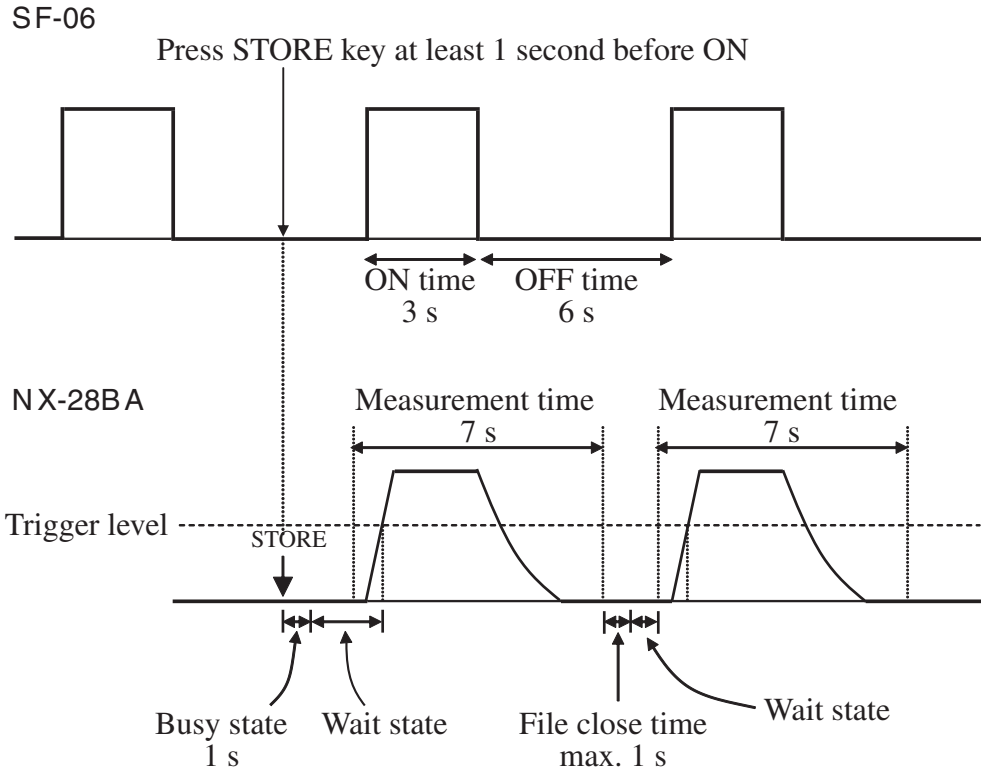
SF-06 setup NX-28BA setup

ON time + OFF time ≥ measurement time + 2 seconds

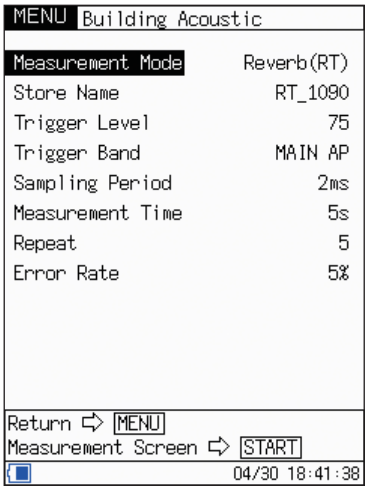
Make measurement time settings taking the following into consideration:

(Interval noise ON time + pretrigger 1 s + fall time)

is included in the measurement time.



[Building Acoustic] menu ("Reverb (RT)" measurement mode)



Building Acoustic menu screen

Measurement Mode "Reverb (RT)" selected

When "Reverb (RT)" is selected, the following parameters can be set.

Store Name RT_xxxx (where xxxx is any 4-digit number)

Name of the folder where measurement result data files are stored.

This is used for identification when the data is recalled later.

The "RT_" indicates that the data are for reverberation time.

Trigger Level Setting range: 60 to 130 dB (in 1-dB steps)

Trigger Band Available settings: Main channel all-pass, Sub channel all-pass, Frequency band

When the trigger level in the selected trigger band is exceeded, the measurement starts and data are collected.

Sampling Period Available settings: 2 ms, 5 ms, 10 ms

Specifies the measurement data collection interval.

Measurement Time Depending on sampling period setting, the measurement time setting range is as follows (incl. 1 s pre-trigger).

2 ms:	2 to 16 s
5 ms:	2 to 40 s
10 ms:	2 to 60 s

This is the period during which measurement values are taken.

Repeat Setting range: 1 to 10

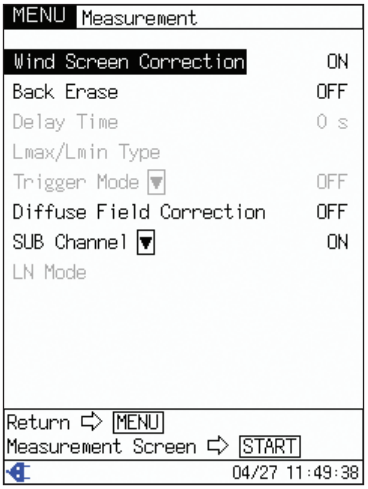
Specifies the number of times the measurement is repeated.

Error Rate Available settings: "OFF" or 1 to 100%

When the ratio of T30 to T20 exceeds the selected setting, the error rate is shown in red on the recall screen as a warning.

For details, refer to the "Technical Reference" section.

[Measurement] menu



Measurement menu screen

Wind Screen Correction

Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

Back Erase — The setting can be made, but is disregarded for this mode, because the auto store function used for reverberation time measurement does not support it.

Delay Time — Cannot be set.

L_{max}/L_{min} Type — Cannot be set.

Trigger Mode — Cannot be set.

Diffuse Field Correction

Available settings: "ON", "OFF"

Refer to the instruction manual of the NA-28.

SUB Channel — Available settings: "ON", "OFF"

For "ON", further settings for "Frequency weighting characteristics" and "Time weighting characteristics" are required.

Measurement procedure

This section describes representative measurement steps.

(Measurement preparations)

1. Determine the sound source positions and receiving room measurement points.
2. Set the measurement parameters. (See "Parameter setting" on page 150.)
3. Turn on power to the NA-28 where this program is installed.
4. Verify that the program has started up properly. (See "NX-28BA start up" on page 12.)
5. Use the menu screens for making parameter settings. (See "Parameter setting" on page 150.)
   First, use the [Building Acoustic] menu to set the measurement mode to "Reverb (RT)". Available setting items differ depending on the measurement mode.

Note
When returning to the measurement screen after changing the measurement mode to reverberation time, the time weighting characteristics will be set to τ (10 ms). This setting can be changed. When switching the measurement mode from “Reverberation Time” to another measurement mode, the unit reverts to the previous time weighting setting.

(Measurement)

6. Set up the sound source.
7. Set up the sound level meter at the measurement point.
8. Press the STORE key of the sound level meter.
   The unit goes into trigger standby mode.
9. Activate the sound source.
   When using the RION Random Noise Generator SF-06 as sound source with the automatic interval output function enabled, set the ON time and OFF time to suitable values, taking the measurement time and processing time into consideration.

10. The trigger is activated. After the "measurement time" (including 1 second pre-trigger) has elapsed, the measurement stops automatically and the indication "STOP" is shown.
    The measurement data are stored, the measurement count indication is incremented, and the unit again goes into trigger standby mode.
11. When measurement has been repeated for the number of times specified by the count setting, the measurement is finished. The reverberation time is calculated, and the result is stored on CF card.

Note
If an overload condition has occurred during the measurement, the indication Ov stays on until the next measurement is started (STORE key is pressed).

Changing the measurement sequence (address)

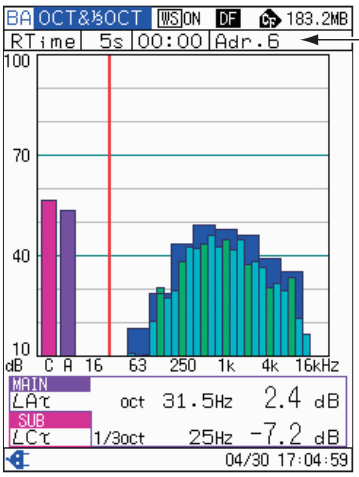
During measurement, it is possible to skip measurements sequence to next or return to previous sequence to redo a measurement. To do this, proceed as follows.

During standby or pause

Pushing the △ key moves the displayed measurement sequence forward by one increment.

Pushing the ▽ key moves the displayed measurement sequence backward by one decrement.

After the change, measurement continues from the new sequence, using the same sequence.

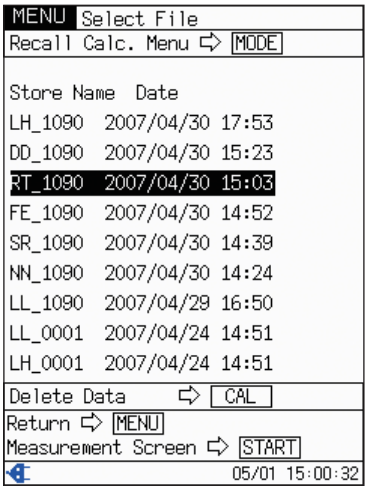


The measurement sequence (address) is shown here.

Recall (measurement result display and rating calculation)

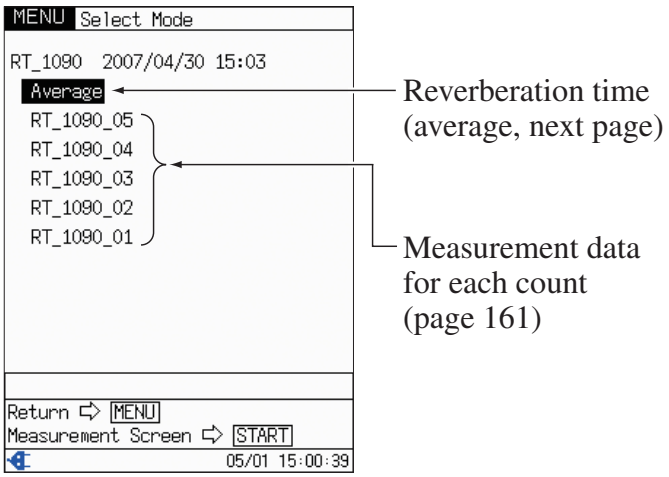
Recall procedure

1. Press the MENU key to bring up the menu list screen.
2. Use the △ / ▽ / ◁ / ▷ keys to select [Recall], and press the ENT key. The file selection screen appears.



File selection screen

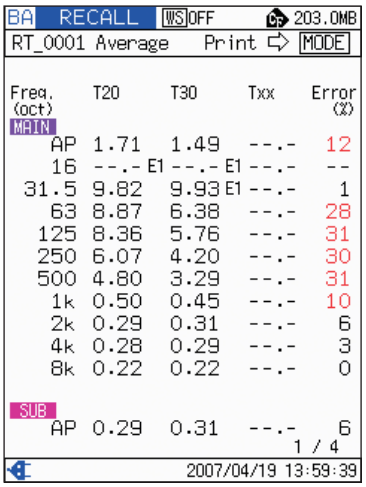
3. At the file selection screen, use the △ / ▽ keys to select the reverberation time measurement data to recall (store file name starting with "RT_"), and press the ENT key.
   The recall selection screen appears.



Recall selection screen

4. Select the measurement data and rating to display, and press the ENT key.
   The selected measurement data and rating indication appear.

Reverberation time (average) recall screen

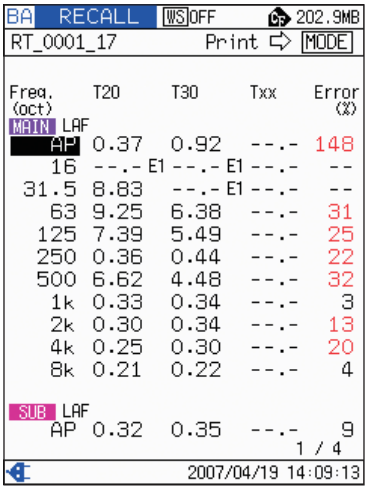


Txx is shown only for frequency band where the reverberation time was recalculated (see page 162).

When there are two or more display pages, you can use the ◁/▷ keys to switch between pages.

Press the MENU key to return to the recall selection screen.
When you press the START key, the measurement screen appears again.
By pressing the MODE key, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
When you press the ENT key, the menu list screen appears.
The settings on the "Building Acoustic", "Measurement", and "Input/Output" menus can be viewed but not changed.
By selecting the [Print] menu, the recalled data can be printed. (For details, see the section "Printing" on page 244.)

Measurement data recall screen for each count



For both the average value and measurement values, when the error rate (%) exceeds the preset alarm threshold, the Error values for that band are shown in red.
When the reverberation time cannot be calculated, the indication "E1", "E2" etc. is shown. For details regarding error messages, refer to the "Technical Reference" section.

When there are two or more display pages, you can use the ◁/▷ keys to switch between pages.

Press the MENU key to return to the recall selection screen.
When you press the START key, the measurement screen appears again.
By pressing the MODE key, the recalled data can be printed. (For details, see the section "Printing" on page 244.)
When you select a band and press the ENT key, a reverberation decay curve showing the level change appears. At this screen, you can freely specify two points and recalculate the reverberation time for the specified interval. (Refer to the section "Reverberation time recalculation (Txx)" on the next page.)

Reverberation time recalculation (Txx)

Separate from the T20 and T30 values that are calculated during measurement, you can specify an interval on the reverberation decay curve and calculate the reverberation time for that interval.

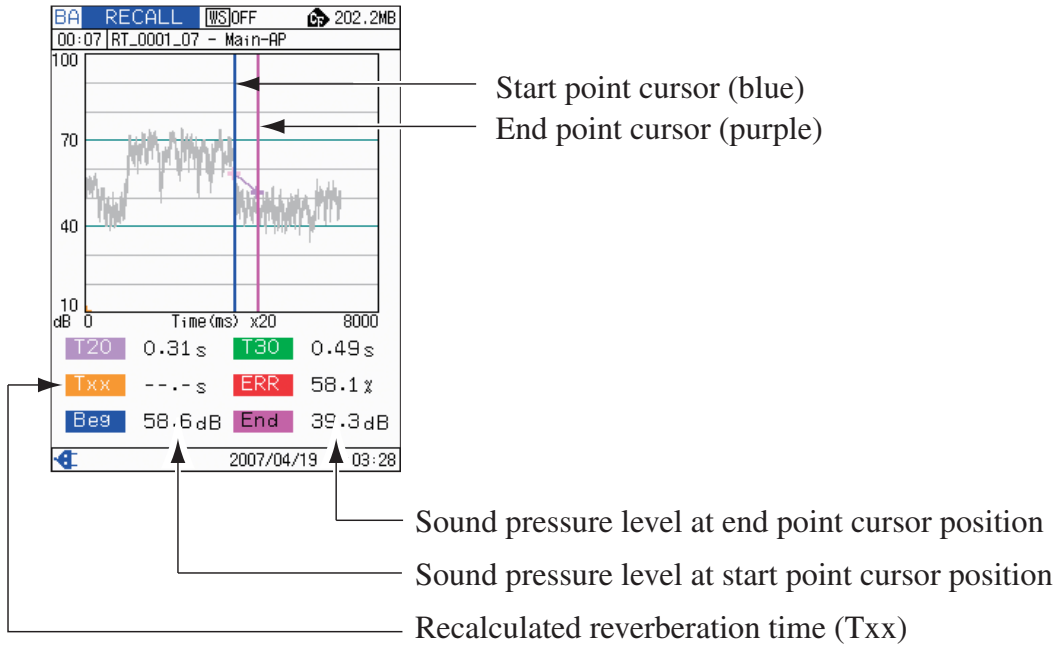
The reverberation time calculated in this way is stored as "Txx" on the CF card.

This is carried out for each measurement and each band separately.

Important
The T20 value is normally used for the single-number quantities calculated from the measurement of airborne sound insulation between rooms. However, when Txx from a recalculation at a recall screen exists, this value will be used.

Recalculation procedure

1. Carry out the recall steps as described on pages 159 to 161 to bring up the measurement data recall screen.
2. Use the △ / ▽ keys to select a band.
3. Press the ENT key. The reverberation decay curve is shown.



Reverberation decay curve

4. Move the two cursors (start point: blue, end point: purple) to specify the interval for which to recalculate the reverberation time.
   Use the MODE key to select the cursor and use the ◁ / ▷ keys to move the cursor.
   The LEVEL △ / ▽ keys can be used to enlarge or reduce the horizontal axis (time axis).

5. Press the START key to recalculate the reverberation time for the specified interval. The result is shown as Txx.

6. Press the STORE key to store the calculated Txx on the CF card.
   If you leave this screen without pressing the STORE key, the calculated Txx value will not be stored.

Overlay Background Level and S/N Caution

The program has a function for overlaying the previously measured background noise level on the screen for measurements at receiving room measurement points, and for displaying a warning or caution when the difference between the measured sound pressure level and the background noise level is small. This function is not available when performing measurements at source room measurement points.
The overlay and S/N caution functions are available when set to "ON" on the [Display] menu screen or [Recall Calc. Setting] screen, and when background noise measurement data are available under the same store name.

Overlay background level

When the graphical display is selected, the background noise is shown as an overlay for each band. When the numeric display is selected, background noise level figures are shown in a separate column at right.

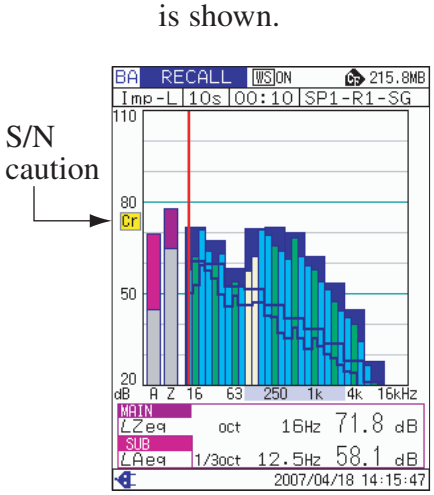
S/N caution

Error warning

The display color for each band is red when the difference to the background noise level is less than 6 dB.
When there is at least one band where an alarm condition occurred, the indication Er is shown.

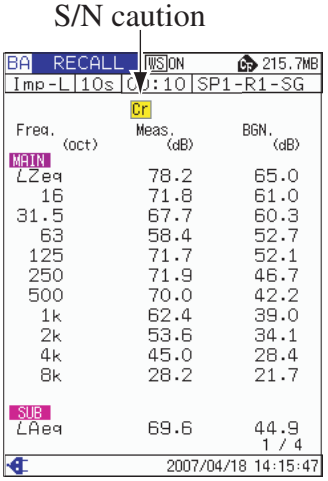
Caution

The display color for each band is yellow when the difference to the background noise level is between 6 dB and 15 dB (when operating with the Japanese language setting) or between 6 dB and 10 dB (when operating with a language setting other than Japanese).
When there is at least one band where a caution condition occurred but no band where an alarm condition occurred, the indication Cr is shown.



Graphical display

Caution condition occurred in a band, Cr is shown.



Numeric display

Applicable measurement modes and bands

The measurement modes (for all bands) where the overlay background level function can be used, and the bands for which the S/N caution function can be used are listed below.

Measurement of airborne sound insulation between rooms

S/N caution function target band

OCT. analysis: 125 Hz to 2 kHz
(range defined by estimation curve)

1/3 OCT. analysis: 100 Hz to 3.15 kHz

Measurement of floor impact sound insulation (light impact source)

S/N caution function target band

OCT. analysis: 125 Hz to 2 kHz
(range defined by estimation curve)

1/3 OCT. analysis: 100 Hz to 3.15 kHz

Measurement of floor impact sound insulation (heavy impact source)

S/N caution function target band

OCT. analysis: 63 Hz to 500 Hz
(range defined by estimation curve)

1/3 OCT. analysis: 50 Hz to 630 Hz

Measurement of sound level from service equipment

Only overlay background level function can be used. The S/N caution indication is not available.

Measurement of airborne sound insulation of façade

Only overlay background level function can be used. The S/N caution indication is not available.

When the following conditions for the measurement screen or recall screen (graphical display) are met, the band on the horizontal axis (frequency) of the S/N caution function target specified above is highlighted in light blue.

- S/N caution function has been set to "ON" with [Display] menu screen or [Recall Calc. Setting] screen.
- Measurement is performed at a receiving room measurement point.

Screens with S/N caution indication

Measurement Mode	Measurement screen	Recall screen			
		Receiving room measurement value	Estimation curve	Single-number quantities	Receiving room average value
AirRm	Er, Cr	Er, Cr	Er	Er	
Impact(LL)	Er, Cr	Er, Cr	Er	Er	
Impact(LH)	Er, Cr	Er, Cr	Er		
ServEq	Er, Cr	Er, Cr			
Fcade	Er, Cr	Er, Cr			

AirRm: Airborne sound insulation between rooms
Impact(LL): Floor impact sound insulation (light impact source)
Impact(LH): Floor impact sound insulation (heavy impact source)
ServEq: Sound level from service equipment
Fcade: Airborne sound insulation of facade
Er: Background noise alarm indication
Cr: Background noise caution indication

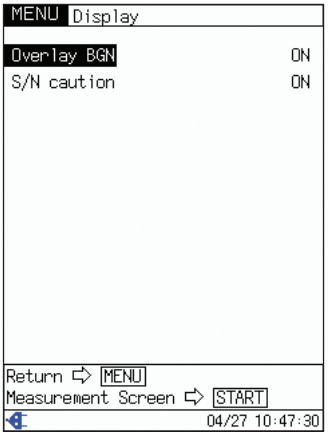
Settings for overlay background level function and S/N caution indication

On measurement screen

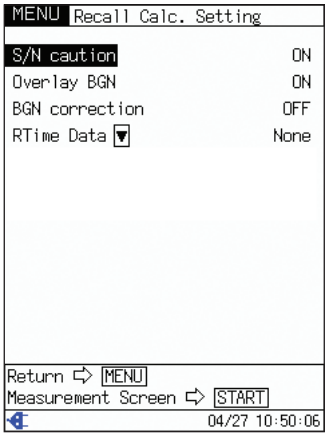
Use the display menu to set "Overlay BGN" and "S/N caution" to "ON".

On recall screen

Use the recall calc. setting screen to set "Overlay BGN" and "S/N caution" to "ON".



Display menu screen

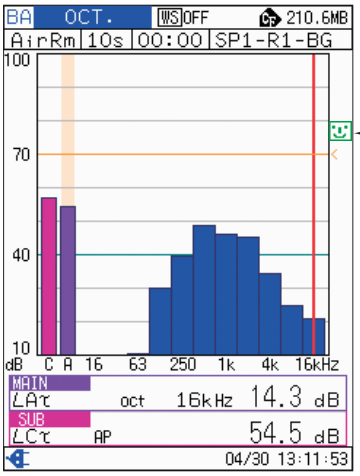


Recall Calc. Setting screen

Setting Monitor Function

Loading a setup file at start up to establish settings will automatically activate a function that monitors any changes made to the settings. While the setting monitor function is active, a mark for the function is shown on the measurement screen.

By checking that the mark is shown at the end of a measurement, the operator can make sure that the measurement was completed without inadvertently changing any settings. If an attempt is made to change settings, a confirmation message appears to ensure that the change is intended. When the change is made, the setting monitor mark disappears and the function is no longer active.



Setting monitor mark display example

Monitored setting items

- Frequency weighting (separately for main channel and sub channel)
- Time weighting (separately for main channel and sub channel)
- Analysis mode
- Measurement mode
- Measurement time
- Windscreen correction
- Delay time
- L_{max}/L_{min} type
- Diffuse field correction
- Sub channel on/off
- AC output
- DC output
- S/N caution
- Overlay background level
- Background Noise Correction

Setting change confirmation

When one of the monitored settings is changed with the panel keys, a confirmation message appears when leaving the menu screen where the change was made. To go ahead with the change, press the ENT key. This will terminate the setting monitor function.

To cancel the change, press the PAUSE/CONT key. All changes made on the menu screen will be canceled.

Important
For setting changes made with the remote control or by communication commands, no confirmation message is shown.

Waveform Recording Function

If program data from the Waveform Recording Card NX-28WR have been installed in the NA-28, the waveform recording function can be used in conjunction with this program to record the actual sound pressure waveform at the time of measurement.

The resulting PCM format WAVE files are stored on the CF card together with the measurement data.

* For details in installing the NX-28WR program, refer to the instruction manual of the Waveform Recording Card NX-28WR.
* For information on stored WAVE files, see the section "Store Data".
* Recorded WAVE files cannot be played or analyzed on the NA-28 itself.

Important
The back erase function is not available while waveform recording function is active.

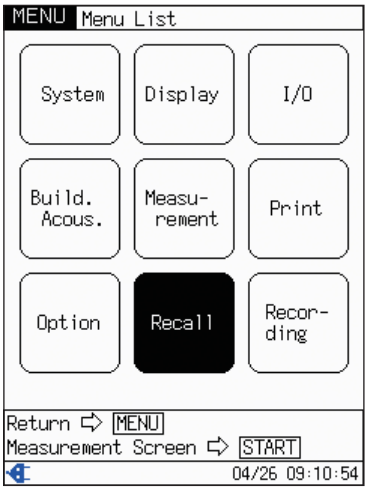
Waveform recording start/stop

Waveform recording is carried out simultaneously with the measurement in the currently selected measurement mode.

- During reverberation time measurement, waveform recording starts from the pre-trigger point (after STORE key was pressed, 1 second before trigger event) and continues until the preset measurement time has elapsed.
- In other measurement modes except reverberation time measurement, recording starts from point where the START key is pressed, and terminates when the preset measurement time has elapsed.

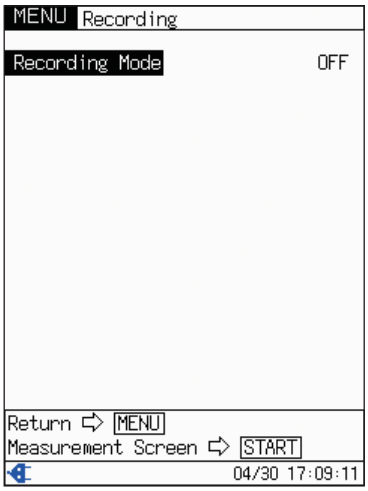
Starting the waveform recording function

1. Press the MENU key to bring up the menu list screen.



Menu list screen

2. Use the △ / ▽ / ◁ / ▷ keys to select [Recording] and press the ENT key. The recording function menu screen appears.

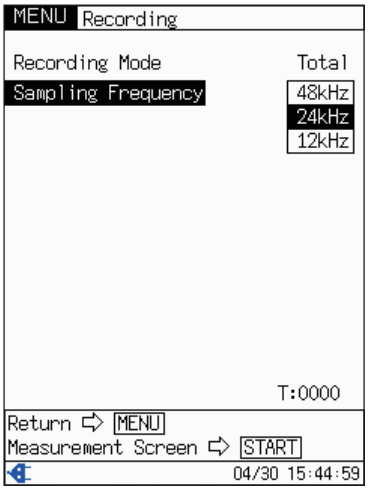


Recording function menu screen

3. (Set "Recording Mode" to "Total".)
   Use the △, ▽ keys to select "Recording Mode" and press the ENT key.
   Next, use the △, ▽ keys to select "Total" and press the ENT key.
   Selecting the "Total" setting activates the waveform recording function.
   While this program is active, event recording is not available.

Recording mode selection screen

4. (Select the sampling frequency.)
   Use the △, ▽ keys to select "Sampling Frequency" and press the ENT key.
   The sampling frequency selection screen appears.
   When analysis mode is "OCT&1/3OCT"
   Available settings: 48 kHz, 24 kHz, 12 kHz
   When analysis mode is "OCT" or "1/3OCT."
   Available settings: 64 kHz, 32 kHz, 16 kHz



Sampling frequency selection screen

5. Use the △, ▽ keys to select the sampling frequency and press the ENT key.
   The sampling frequency is set.

6. Press the MENU key or the START key.
   If you press the MENU key, the menu list screen appears again.
   If you press the START key, the measurement screen appears again.

Communication Commands

When this program is installed, the communication commands listed from page 177 can be used in addition to the regular communication commands of the NA-28. However, as explained below, some regular commands cannot be used or are subject to limitations.

Unavailable command

When this program is installed, the following regular communication command of the NA-28 cannot be used:

DRD
Continuous output

MTI
Set measurement time

MXD
Peak hold

LNM
L_N mode

DPI
Toggle display

LXI
Percentile level

ADP
Sub channel additional processing

SMD
Store mode

SNS
Store name

PLP
Auto 1 store cycle

ADR
Store address

LTC
Trigger channel for SLM mode

CMC
Comparator channel for SLM mode

MDC
Clear stored data from internal memory

SRT
START/STOP measurement processing

STO
Store

Commands with changed function or limitations

When this program is installed, the following regular communication commands of the NA-28 have different parameter requirements or operate differently.

IMD

Toggle SLM/RTA mode

SLM mode cannot be specified. If specified, error 0002 is returned.

DSP

Set display data

Processing value that are not supported by the current measurement mode cannot be specified. If specified, error 0002 is returned.

TTR

Trigger time

The trigger interval (parameter p9) setting has no effect. The parameter is permanently set to "OFF".

Command List

Dedicated communication commands for this program are listed below.

S: Setting command (command for making an NA-28 setting)

R: Request command (command for obtaining status information or measurement data from NA-28)

Command Description

BMD

Measurement mode

Measurement mode setting command BMD p1

Parameter	Content
p1 = 0	Airborne insulation
p1 = 1	Floor impact sound insulation (light impact source)
p1 = 2	Floor impact sound insulation (heavy impact source)
p1 = 3	Room environmental sound level N value
p1 = 4	Room environmental sound level NC value
p1 = 5	Sound level from service equipment
p1 = 6	Airborne sound insulation of façade
p1 = 7	Reverberation time

Request command BMD?

Response data d1

Return value Content

Same as for setting command

BSN

Store name (Measurement room number)

Store name setting command BSN p1

Parameter	Content
p1 = 0 to 9999	Store name (measurement room number)

Request command BSN?

Response data d1

Return value Content

Same as for setting command

BMT

Measurement time

Measurement time setting command BMT p1

Parameter	Content
p1 = 1 to 60	Measurement time (seconds)

Request command BMT?

Response data d1

Return value	Content
Same as for setting command	

BSP

Sound source position number

Sound source position number setting command BSP p1

Parameter	Content
p1 = 1 to 8	Number of sound sources

Request command BSP?

Response data d1

Return value	Content
Same as for setting command	

BSM

Source room measurement position number

Source room measurement position number setting command BSM p1

Parameter	Content
p1 = 1 to 10	Number of measurement points in source room

Request command BSM?

Response data d1

Return value	Content
Same as for setting command	

BRM

Receiving room measurement position number

Receiving room measurement position number setting command

BRM p1

Parameter	Content
p1 = 1 to 10	Number of measurement points in receiving room

Request command BRM?

Response data d1

Return value Content

Same as for setting command

BMN

Receiving room measurement count

Receiving room measurement count setting command

BMN p1

Parameter	Content
p1 = 1 to 5	Number of measurement repeats at each point in receiving room

Request command BMN?

Response data d1

Return value Content

Same as for setting command

BBM

Receiving room background noise measurement mode

Receiving room background noise measurement mode setting command — BBM p1

Parameter	Content
p1 = 0	Once
p1 = 1	Before
p1 = 2	During
p1 = 3	None

Request command — BBM?

Response data d1

Return value Content

Same as for setting command

BVL

Volume of measurement room

Volume of measurement room setting command — BVL p1

Parameter	Content
p1 = 1 to 9999	Volume of measurement target room (m^3) The setting is made using the range 1 to 9999, but internally the values are taken as follows. 1 → 0.1, 100 → 10.0, 9999 → 999.9

Request command — BVL?

Response data d1

Return value Content

Same as for setting command

BBO

Overlay background level

Overlay background level setting command BBO p1

Parameter	Content
p1 = 0	OFF
p1 = 1	ON

Request command BBO?

Response data d1

Return value Content

Same as for setting command

BWC

Warning/caution indication

Warning/caution indication setting command BWC p1

Parameter	Content
p1 = 0	OFF
p1 = 1	ON

Request command BWC?

Response data d1

Return value Content

Same as for setting command

BBC

Background noise correction

Background noise correction setting command BBC p1

Parameter	Content
p1 = 0	OFF
p1 = 1	ON

Request command BBC?

Response data d1

Return value Content

Same as for setting command

BRD

Reverberation time data

Reverberation time data setting command BRD p1

Parameter	Content
p1 = 1 to 9999	Store name
p1 = 10000	None

If specified data do not exist on CF card, error 0002 is returned.

Request command BRD?

Response data d1

Return value	Content
Same as for setting command	

BAR

Area of measurement surface

Measurement room floor area setting command BAR p1

Parameter	Content
p1 = 1 to 9999	Floor area of measurement target room (m^2) The setting is made using the range 1 to 9999, but internally the values are taken as follows. 1 → 0.1, 100 → 10.0, 9999 → 999.9

Request command BAR?

Response data	d1
Return value	Content
	Same as for setting command

BSD

Source room data

Source room data setting command BSD p1

Parameter	Content
p1 = 1 to 9999	Store name
p1 = 10000	None If specified data do not exist on CF card, error 0002 is returned.

Request command BSD?

Response data	d1
Return value	Content
	Same as for setting command

BLL

Lightweight floor impact sound level estimation curve

Estimation curve display setting command BLL p1

Parameter	Content
p1 = 0	OFF
p1 = 1	L-30
p1 = 2	L-35
p1 = 3	L-40
p1 = 4	L-45
p1 = 5	L-50
p1 = 6	L-55
p1 = 7	L-60
p1 = 8	L-65
p1 = 9	L-70
p1 = 10	L-75
p1 = 11	L-80

Request command BLL?

Response data d1

Return value Content

Same as for setting command

BLH

Heavy source floor impact sound level estimation curve

Estimation curve display setting command BLH p1

Parameter	Content
p1 = 0	OFF
p1 = 1	L-30
p1 = 2	L-35
p1 = 3	L-40
p1 = 4	L-45
p1 = 5	L-50
p1 = 6	L-55
p1 = 7	L-60
p1 = 8	L-65
p1 = 9	L-70
p1 = 10	L-75
p1 = 11	L-80

Request command BLH?

Response data d1

Return value Content

Same as for setting command

BNN

Room environmental sound level N curve

Estimation curve display setting command BNN p1

Parameter	Content
p1 = 0	OFF
p1 = 1	N-20
p1 = 2	N-25
p1 = 3	N-30
p1 = 4	N-35
p1 = 5	N-40
p1 = 6	N-45
p1 = 7	N-50
p1 = 8	N-55
p1 = 9	N-60
p1 = 10	N-65
p1 = 11	N-70
p1 = 12	N-75
p1 = 13	N-80
p1 = 14	N-85

Request command BNN?

Response data d1

Return value Content

Same as for setting command

BNC

Room environmental sound level NC curve

Estimation curve display setting command BNC p1

Parameter	Content
p1 = 0	OFF
p1 = 1	N-15
p1 = 2	N-20
p1 = 3	N-25
p1 = 4	N-30
p1 = 5	N-35
p1 = 6	N-40
p1 = 7	N-45
p1 = 8	N-50
p1 = 9	N-55
p1 = 10	N-60
p1 = 11	N-65

Request command BNC?

Response data d1

Return value Content

Same as for setting command

RTL

(Reverberation) Trigger level

Trigger level setting command RTL p1

Parameter	Content
p1 = 60 to 130	Measurement start trigger level (1-dB steps)

Request command RTL?

Response data d1

Return value Content

Same as for setting command

RTB

(Reverberation) Trigger band

Trigger band setting command RTB p1 p2

1st parameter	Content (Octave unit)
p1 = 0	Sub channel AP
p1 = 1	Main channel AP
p1 = 2	16 Hz
p1 = 3	31.5 Hz
p1 = 4	63 Hz
p1 = 5	125 Hz
p1 = 6	250 Hz
p1 = 7	500 Hz
p1 = 8	1 kHz
p1 = 9	2 kHz
p1 = 10	4 kHz
p1 = 11	8 kHz
p1 = 12	16 kHz

2nd parameter	Content (1/3 offset in octave)
p2 = 0	Bottom band
p2 = 1	Center band
p2 = 2	Top band

To use 1/3 octave band triggering, specify the octave band with p1 and the bottom/center/top allocation for the trigger with p2.
When using octave band triggering, the p2 parameter also needs to be specified for reasons of syntax, but the setting will always be processed as p2=1 (center). Also, p1=12 (16 kHz) cannot be specified.

Request command RTB?

Response data	d1, d2
Return value	Content
Same as for setting command	

RPL

(Reverberation) Sampling period

Sampling period setting command RPL p1

Parameter	Content
p1 = 0	2 ms
p1 = 1	5 ms
p1 = 2	10 ms

Request command RPL?

Response data d1

Return value Content

Same as for setting command

RME

(Reverberation) Measurement time

Measurement time setting command RME p1

Parameter Content

p1 = 2 to 16 (sampling period 2 ms)

p1 = 2 to 40 (sampling period 5 ms)

p1 = 2 to 60 (sampling period 10 ms)

Measurement time (including pre-trigger)

Request command RME?

Response data d1

Return value Content

Same as for setting command

RNM

(Reverberation) Repeat count

Measurement repeat count setting command RNM p1

Parameter	Content
p1 = 1 to 10	Number of times reverberation time measurement is carried out

Request command RNM?

Response data d1

Return value Content

Same as for setting command

REL

(Reverberation) Error rate

Error rate setting command REL p1

Parameter	Content
p1 = 0	OFF
p1 = 1 to 100	Threshold for alarm indication based on calculated error rate (%)

Request command REL?

Response data d1

Return value Content

Same as for setting command

BST

* Get all measurement parameters (no corresponding operation)

Only valid if the unit is currently in L_p mode (except pause). In other cases, error 0003 is returned.

Request command BST?

Response data d1, d2, ..., d29

Return value	Content
d1	Measurement mode Corresponds to BMD? command
d2	Store name (measurement room number) Corresponds to BSN? command
d3	Measurement time Corresponds to BMT? command
d4	Sound source position number Corresponds to BSP? command
d5	Source room measurement position number Corresponds to BSM? command
d6	Receiving room measurement position number Corresponds to BRM? command
d7	Receiving room measurement count Corresponds to BMN? command
d8	Receiving room background noise measurement mode Corresponds to BBM? command
d9	Volume of measurement room Corresponds to BVL? command
d10	Overlay background level Corresponds to BBO? command
d11	Warning/caution indication Corresponds to BWC? command
d12	Background noise correction Corresponds to BBC? command
d13	Reverberation time data Corresponds to BRD? command

d14	(Not used)
d15	Area of measurement surface Corresponds to BAR? command
d16	Source room data Corresponds to BSD? command
d17	(Not used)
d18	Lightweight floor impact sound level estimation curve Corresponds to BLL? command
d19	Heavy source floor impact sound level estimation curve Corresponds to BLH? command
d20	Room environmental sound level N curve Corresponds to BNN? command
d21	Room environmental sound level NC curve Corresponds to BNC? command
d22	(Reverberation) Trigger level Corresponds to RTL? command
d23	(Reverberation) Trigger band Corresponds to d1 of RTB? command
d24	(Reverberation) Trigger band Corresponds to d2 of RTB? command
d25	(Reverberation) Sampling period Corresponds to RPL? command
d26	(Reverberation) Measurement time Corresponds to RME? command
d27	(Reverberation) Repeat count Corresponds to RNM? command
d28	(Reverberation) Alarm error rate Corresponds to REL? command
d29	(Not used)

Store Data

Store name

This program assigns a store name to measurement result data for storing on the CF card.

Store name configuration

XX_xxxx

- Any 4-digit number (used to identify measurement date/time or location or similar)
- Two capital letters indicating measurement mode
  - DD Airborne sound insulation between rooms
  - LL Floor impact sound insulation (light impact source)
  - LH Floor impact sound insulation (heavy impact source)
  - NN Room environmental sound level
  - SR Sound level from service equipment
  - FE Airborne sound insulation of façade elements and façades
  - RT Reverberation time

Folder structure

Measurement data, waveform recording data, and reverberation time measurement auto store data are saved on the CF card, using the folder structure shown below.
Some actual examples are shown on the following pages.

[NA-28] folder

(Measurement other than floor impact sound insulation (heavy impact source) or reverberation time)

- [(Store name)] folder
  - (Store name).RND Measurement data
  - (Store name)_(sound source position)_(measurement point)_(background noise/measurement).WAV Waveform recording data

(Floor impact sound insulation (heavy impact source) measurement)

- [(Store name)] folder
  - (Store name).RND Measurement data
  - (Store name)_(sound source position)_(measurement point)_(background noise/measurement count).WAV Waveform recording data

(Reverberation time measurement)

- [(Store name)] folder
  - (Store name).RND Measurement data
  - (Store name)_(repeat count) folder
    - (Store name)_(repeat count).RNH
    - (Store name)_(repeat count).RND
    - SOUND
      - (Store name)_(repeat count).WAV Waveform recording data

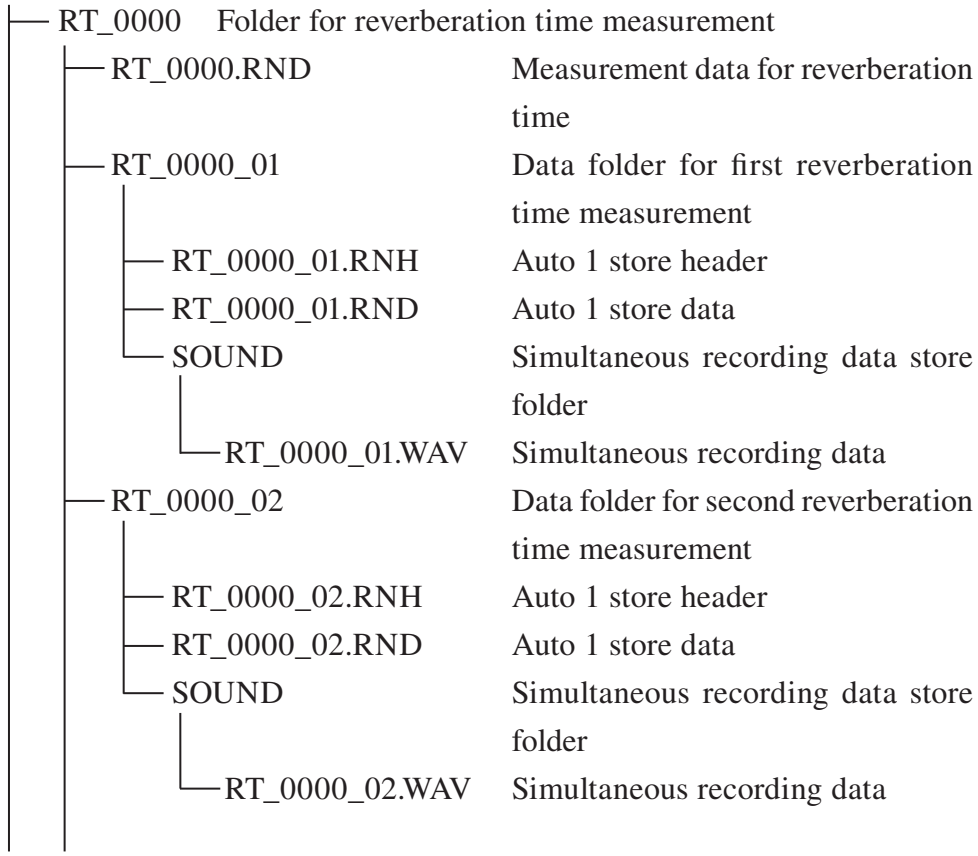
About waveform recording data

Sound source position	SP1, SP2, SP3, ..., SP8	
Measurement point	R1, R2, R3, ..., R10	Receiving room side
	S1, S2, S3, ..., S10	Source room side
Background noise	BG	
Measurement	SG	
Measurement count	1, 2, 3, 4, 5	

NA-28

- DD_0000 Folder for measurement of airborne insulation
  - DD_0000.RND Measurement data for airborne insulation
  - DD_0000_SP1-R1-BG.WAV Recording data for airborne insulation [Background noise 1]
  - DD_0000_SP1-R1-SG.WAV Recording data for airborne insulation [Receiving room 1]
  - DD_0000_SP1-S1-SG.WAV Recording data for airborne insulation [Source room 1]
- LL_0000 Folder for measurement of floor impact sound insulation (light impact source)
  - LL_0000.RND Measurement data for floor impact sound insulation (light impact source)
  - LL_0000_SP1-R1-BG.WAV Recording data for floor impact sound insulation (light impact source) [Background noise 1]
  - LL_0000_SP1-R1-SG.WAV Recording data for floor impact sound insulation (light impact source) [Receiving room 1]
- LH_0000 Folder for measurement of floor impact sound insulation (heavy impact source)
  - LH_0000.RND Measurement data for floor impact sound insulation (heavy impact source)
  - LH_0000_SP1-R1-BG.WAV Recording data for floor impact sound insulation (heavy impact source) [Background noise 1]
  - LH_0000_SP1-R1-1.WAV Recording data for floor impact sound insulation (heavy impact source) [Receiving room 1-1]
  - LH_0000_SP1-R1-2.WAV Recording data for floor impact sound insulation (heavy impact source) [Receiving room 1-2]

- NN_0000 Folder for measurement of room environmental sound level [N/NC]
  - NN_0000.RND Measurement data for room environmental sound level [N/NC]
  - NN_0000_SP1-R1-SG.WAV Recording data for room environmental sound level [N/NC] [Receiving room 1]
- SR_0000 Folder for measurement of sound level from service equipment
  - SR_0000.RND Measurement data for sound level from service equipment
  - SR_0000_SP1-R1-BG.WAV Recording data for sound level from service equipment [Background noise 1]
  - SR_0000_SP1-R1-SG.WAV Recording data for sound level from service equipment [Receiving room 1]
- FE_0000 Folder for measurement of airborne sound insulation of façade
  - FE_0000.RND Measurement data for airborne sound insulation of façade
  - FE_0000_SP1-R1-BG.WAV Recording data for airborne sound insulation of façade [Background noise 1]
  - FE_0000_SP1-R1-SG.WAV Recording data for airborne sound insulation of façade [Receiving room 1]
  - FE_0000_SP1-S1-SG.WAV Recording data for airborne sound insulation of façade [Source room 1]


RT_0000 Folder for reverberation time measurement
RT_0000.RND
Measurement data for reverberation time
RT_0000_01
Data folder for first reverberation time measurement
RT_0000_01.RNH
Auto 1 store header
RT_0000_01.RND
Auto 1 store data
SOUND
Simultaneous recording data store folder
RT_0000_01.WAV
Simultaneous recording data
RT_0000_02
Data folder for second reverberation time measurement
RT_0000_02.RNH
Auto 1 store header
RT_0000_02.RND
Auto 1 store data
SOUND
Simultaneous recording data store folder
RT_0000_02.WAV
Simultaneous recording data

Measurement data for airborne sound insulation between rooms

File name: (Store name).RND

File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

The contents of the header section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Separator type	(None)		CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT____, 1/3 OCT____, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON_, OFF	
Diffuse sound field correction	Diffuse Field	4	ON_, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type1	Type of file format used by this program. Type 1 indicates measurement data file other than floor impact sound insulation (heavy impact source) or reverberation time.
Measurement mode	Meas Mode	3	DD	DD indicates data for airborne insulation
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to _99 (seconds)	
Receiving room volume	Volume	6	xxx.y (m^3)	

Item	Title string	Number of bytes	Content	Description
Area of measurement surface	Area	6	xxx.y (m^2)	
Sound source position	Source Pos	3	_1 to _8	
Source room measurement position number	Source Room	3	_1 to 10	
Receiving room measurement position number	Receive Room	3	_1 to 10	
Measurement repeat count	Repeat	3	_1	Always 1
Background noise measurement mode	Background	7	None__, Once__, Before, During	
Source room data	Source Room	8	DD_???? None___	????: 0000 to 9999
Estimation curve	Rank	6	OFF__	Always OFF
L_{max}/L_E measurement	Lmax/LE	4	OFF	Always OFF

Data section

The data section is configured as follows.

Sound source position 1 data (40 lines)
- Source room measurement point 1 L_{eq} data
- Source room measurement point 2 L_{eq} data
- ⋮
- Source room measurement point 10 L_{eq} data
- Receiving room measurement point 1 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- Receiving room measurement point 2 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- ⋮
- Receiving room measurement point 10 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data

Sound source position 2 data (40 lines)

Sound source position 3 data (40 lines)

⋮

Sound source position 8 data (40 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Line number	Address	4	__1 to 320	
Measurement order	Order	4	__1 to _30	
Measurement mode	Mode	5	Leq_, Lmax	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	_80, _90, - - -, 130	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	_1 to 99 (seconds)	Actual measurement time
Sub channel allpass value	AP-Sub	6	_-9.9 to 205.6 (dB)	
Main channel allpass value	AP-Main	6		
Octave band values	16	6	_-9.9 to 205.6 (dB)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

Item	Title string	Number of bytes	Content	Description
1/3 octave band values	12.5	6	_-9.9 to 205.6 (dB)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz
Over-range	Over	5	Over, ____	Over-range condition occurred
Under-range	Under	6	Under, _____	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No

Item	Title string	Number of bytes	Content	Description
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Background Receive___ Source____	Background: Background noise measurement Receive: Receiving room measurement Source: Source room measurement
Measurement point		3	_1 to 10	
Measurement type	Flag	3	_0, _1	_0: L_{eq}, _1: L_{max}

Measurement data for Floor impact sound insulation (light impact source)

File name: (Store name).RND

File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

The contents of the header section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Separator type	(None)		CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT____, 1/3 OCT____, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON_, OFF	
Diffuse sound field correction	Diffuse Field	4	ON_, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type1	Type of file format used by this program. Type 1 indicates measurement data file other than floor impact sound insulation (heavy impact source) or reverberation time.
Measurement mode	Meas Mode	3	LL	LL indicates data for floor impact sound insulation (light impact source)
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to _99 (seconds)	

Item	Title string	Number of bytes	Content	Description
Receiving room volume	Volume	6	xxx.y (m^3)	
Area of measurement surface	Area	6	---.- (m^2)	(Not used)
Sound source position	Source Pos	3	_1 to _8	
Source room measurement position number	Source Room	3	_0	Always 0
Receiving room measurement position number	Receive Room	3	_1 to 10	
Measurement repeat count	Repeat	3	_1	Always 1
Background noise measurement mode	Background	7	None__, Once__, Before, During	
Source room data	Source Room	8	None___	Always None
Estimation curve	Rank	6	LL-30, LL-35 etc. OFF__	Ranking set before measurement
L_{max}/L_E measurement	Lmax/LE	4	OFF_	Always OFF

Data section

The data section is configured as follows.

Sound source position 1 data (40 lines)
- Source room measurement point 1 data (blank line)
- Source room measurement point 2 data (blank line)
- ⋮
- Source room measurement point 10 data (blank line)
- Receiving room measurement point 1 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- Receiving room measurement point 2 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- ⋮
- Receiving room measurement point 10 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data

Sound source position 2 data (40 lines)

Sound source position 3 data (40 lines)

⋮

Sound source position 8 data (40 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Line number	Address	4	__1 to 320	
Measurement order	Order	4	__1 to _30	
Measurement mode	Mode	5	Leq_, Lmax	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	_80, _90, - - -, 130	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	_1 to 99 (seconds)	Actual measurement time
Sub channel allpass value	AP-Sub	6	_-9.9 to 205.6 (dB)	
Main channel allpass value	AP-Main	6		
Octave band values	16	6	_-9.9 to 205.6 (dB)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

Item	Title string	Number of bytes	Content	Description
1/3 octave band values	12.5	6	_-9.9 to 205.6 (dB)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz
Over-range	Over	5	Over, ____	Over-range condition occurred
Under-range	Under	6	Under, _____	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No

Item	Title string	Number of bytes	Content	Description
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Background Receive___	Background: Background noise measurement Receive: Receiving room measurement
Measurement point		3	_1 to 10	
Measurement type	Flag	3	_0, _1	_0: L_{eq}, _1: L_{max}

Measurement data for Floor impact sound insulation (heavy impact source)

File name: (Store name).RND
File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

The contents of the header section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Header string	Number of bytes	Content	Description
Separator type	(None)		CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT____, 1/3 OCT____, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON_, OFF	
Diffuse sound field correction	Diffuse Field	4	ON_, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type2	Type of file format used by this program. Type 2 indicates floor impact sound insulation (heavy impact source) measurement data file.
Measurement mode	Meas Mode	3	LH	LH indicates data for floor impact sound insulation (heavy impact source)
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to _99 (seconds)	

Item	Header string	Number of bytes	Content	Description
Receiving room volume	Volume	6	xxx.y (m^3)	
Area of measurement surface	Area	6	___._ (m^2)	(Not used)
Sound source position	Source Pos	3	_1 to _8	
Source room measurement position number	Source Room	3	_0	Always 0
Receiving room measurement position number	Receive Room	3	_1 to 10	
Measurement repeat count	Repeat	3	_1 to _5	
Background noise measurement mode	Background	7	None__, Once__, Before, During	
Source room data	Source Room	8	None	Always None
Estimation curve	Rank	6	LH-30, LH-40 etc. OFF__	Ranking set before measurement
L_{max}/L_E measurement	Lmax/LE	4	OFF	Always OFF

Data section

The data section is configured as follows.

Sound source position 1 data (60 lines)
- Receiving room measurement point 1 background noise data (L_{eq})
  - L_{max} data (1st time)
  - L_{max} data (2nd time)
  - L_{max} data (3rd time)
  - L_{max} data (4th time)
  - L_{max} data (5th time)
- Receiving room measurement point 2 background noise data (L_{eq})
  - L_{max} data (1st time)
  - L_{max} data (2nd time)
  - L_{max} data (3rd time)
  - L_{max} data (4th time)
  - L_{max} data (5th time)
- ⋮
- Receiving room measurement point 10 background noise data (L_{eq})
  - L_{max} data (1st time)
  - L_{max} data (2nd time)
  - L_{max} data (3rd time)
  - L_{max} data (4th time)
  - L_{max} data (5th time)

Sound source position 2 data (60 lines)

Sound source position 3 data (60 lines)

⋮

Sound source position 8 data (60 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	String	Number of bytes	Content	Description
Line number	Address	4	__1 to 480	
Measurement order	Order	4	__1 to _30	
Measurement mode	Mode	5	Leq_, Lmax	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	_80, _90, - - -, 130	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	_1 to 99 (seconds)	Actual measurement time
Sub channel all-pass value	AP-Sub	6	_-9.9 to 205.6 (dB)	
Main channel all-pass value	AP-Main	6		
Octave band values	16	6	_-9.9 to 205.6 (dB)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

Item	String	Number of bytes	Content	Description
1/3 octave band values	12.5	6	_-9.9 to 205.6 (dB)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz
Over-range	Over	5	Over, ____	Over-range condition occurred
Under-range	Under	6	Under, _____	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No

Item	String	Number of bytes	Content	Description
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Background Receive___	Background: Background noise measurement Receive: Receiving room measurement
Measurement point		3	_1 to 10	
Measurement type	Flag	3	0 to 5	0: Background noise measurement 1 to 5: measurement count

Measurement data for Room environmental sound level

File name: (Store name).RND

File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

The contents of the header section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Separator type	(None)		CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT____, 1/3 OCT____, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON_, OFF	
Diffuse sound field correction	Diffuse Field	4	ON_, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type1	Type of file format used by this program. Type 1 indicates measurement data file other than floor impact sound insulation (heavy impact source) or reverberation time.
Measurement mode	Meas Mode	3	NN	NN indicates data for room environmental sound level
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to _99 (seconds)	

Item	Title string	Number of bytes	Content	Description
Receiving room volume	Volume	6	---.- (m^3)	(Not used)
Area of measurement surface	Area	6	---.- (m^2)	(Not used)
Sound source position	Source Pos	3	_1 to _8	
Source room measurement position number	Source Room	3	_0	Always 0
Receiving room measurement position number	Receive Room	3	_1 to 10	
Measurement repeat count	Repeat	3	_1	Always 1
Background noise measurement mode	Background	7	None__	Always None
Source room data	Source Room	8	None___	Always None
Estimation curve	Rank	6	NN-15, NN-20, N-20_, N-25_ etc. OFF__,	Ranking set before measurement
L_{max}/L_E measurement	Lmax/LE	4	OFF_	Always OFF

Data section

The data section is configured as follows.

Sound source position 1 data (40 lines)
- Source room measurement point 1 data (blank line)
- Source room measurement point 2 data (blank line)
- ⋮
- Source room measurement point 10 data (blank line)
- Receiving room measurement point 1 background noise data (blank line)
  - L_{eq} data
  - L_{max} data
- Receiving room measurement point 2 background noise data (blank line)
  - L_{eq} data
  - L_{max} data
- ⋮
- Receiving room measurement point 10 background noise data (blank line)
  - L_{eq} data
  - L_{max} data

Sound source position 2 data (40 lines)

Sound source position 3 data (40 lines)

⋮

Sound source position 8 data (40 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Line number	Address	4	__1 to 320	
Measurement order	Order	4	__1 to _30	
Measurement mode	Mode	5	Leq_, Lmax	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	_80, _90, - - -, 130	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	_1 to 99 (seconds)	Actual measurement time
Sub channel allpass value	AP-Sub	6	_-9.9 to 205.6 (dB)	
Main channel allpass value	AP-Main	6		
Octave band values	16	6	_-9.9 to 205.6 (dB)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

Item	Title string	Number of bytes	Content	Description
1/3 octave band values	12.5	6	_-9.9 to 205.6 (dB)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz
Over-range	Over	5	Over, ____	Over-range condition occurred
Under-range	Under	6	Under, _____	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No

Item	Title string	Number of bytes	Content	Description
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Receive___	Receive: Receiving room measurement
Measurement point		3	_1 to 10	
Measurement type	Flag	3	_0, _1	_0: L_{eq}, _1: L_{max}

Measurement data for Sound level from service equipment

File name: (Store name).RND

File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

The contents of the header section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Separator type	(None)		CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT____, 1/3 OCT____, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON_, OFF	
Diffuse sound field correction	Diffuse Field	4	ON_, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type1	Type of file format used by this program. Type 1 indicates measurement data file other than floor impact sound insulation (heavy impact source) or reverberation time.
Measurement mode	Meas Mode	3	SR	SR indicates data for sound level from service equipment
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to _99 (seconds)	

Item	Title string	Number of bytes	Content	Description
Receiving room volume	Volume	6	xxx.y (m^3)	
Area of measurement surface	Area	6	---.- (m^2)	(Not used)
Sound source position	Source Pos	3	_1 to _8	
Source room measurement position number	Source Room	3	_0	Always 0
Receiving room measurement position number	Receive Room	3	_1 to 10	
Measurement repeat count	Repeat	3	_1	Always 1
Background noise measurement mode	Background	7	None__, Once__, Before, During	
Source room data	Source Room	8	None___	Always None
Estimation curve	Rank	6	OFF__	Always OFF
L_{max}/L_E measurement	Lmax/LE	4	OFF_	Always OFF

Data section

The data section is configured as follows.

Sound source position 1 data (40 lines)
- Source room measurement point 1 data (blank line)
- Source room measurement point 2 data (blank line)
- ⋮
- Source room measurement point 10 data (blank line)
- Receiving room measurement point 1 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- Receiving room measurement point 2 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- ⋮
- Receiving room measurement point 10 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data

Sound source position 2 data (40 lines)

Sound source position 3 data (40 lines)

⋮

Sound source position 8 data (40 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Line number	Address	4	__1 to 320	
Measurement order	Order	4	__1 to _30	
Measurement mode	Mode	5	Leq_, Lmax	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	_80, _90, - - -, 130	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	_1 to 99 (seconds)	Actual measurement time
Sub channel allpass value	AP-Sub	6	_-9.9 to 205.6 (dB)	
Main channel allpass value	AP-Main	6		
Octave band values	16	6	_-9.9 to 205.6 (dB)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

Item	Title string	Number of bytes	Content	Description
1/3 octave band values	12.5	6	_-9.9 to 205.6 (dB)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz
Over-range	Over	5	Over, ____	Over-range condition occurred
Under-range	Under	6	Under, _____	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No

Item	Title string	Number of bytes	Content	Description
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Background Receive___	Background: Background noise measurement Receive: Receiving room measurement
Measurement point		3	_1 to 10	
Measurement type	Flag	3	_0, _1	_0: L_{eq}, _1: L_{max}

Measurement data for Airborne sound insulation of façade elements and façades

File name: (Store name).RND

File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

The contents of the header section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Separator type	(None)		CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT____, 1/3 OCT____, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON_, OFF	
Diffuse sound field correction	Diffuse Field	4	ON_, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type1	Type of file format used by this program. Type 1 indicates measurement data file other than floor impact sound insulation (heavy impact source) or reverberation time.
Measurement mode	Meas Mode	3	FE	FE indicates data for airborne sound insulation of façade
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to _99 (seconds)	

Item	Title string	Number of bytes	Content	Description
Receiving room volume	Volume	6	xxx.y (m^3)	
Area of measurement surface	Area	6	xxx.y (m^2)	
Sound source position	Source Pos	3	_1 to _8	
Outdoor measurement position number	Source Room	3	_1 to 10	
Receiving room measurement position number	Receive Room	3	_1 to 10	
Measurement repeat count	Repeat	3	_1	Always 1
Background noise measurement mode	Background	7	None__, Once__, Before, During	
Source room data	Source Room	8	FE_???? None___	????: 0000 to 9999
Estimation curve	Rank	6	OFF__	Always OFF
L_{max}/L_E measurement	Lmax/LE	4	OFF	Always OFF

Data section

The data section is configured as follows.

Sound source position 1 data (40 lines)
- Outdoor measurement point 1 L_{eq} data
- Outdoor measurement point 2 L_{eq} data
- ⋮
- Outdoor measurement point 10 L_{eq} data
- Receiving room measurement point 1 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- Receiving room measurement point 2 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data
- ⋮
- Receiving room measurement point 10 background noise data (L_{eq})
  - L_{eq} data
  - L_{max} data

Sound source position 2 data (40 lines)

Sound source position 3 data (40 lines)

⋮

Sound source position 8 data (40 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters. Commas are included in the byte count. "_" in the "Content" column signifies a space.

Item	Title string	Number of bytes	Content	Description
Line number	Address	4	__1 to 320	
Measurement order	Order	4	__1 to _30	
Measurement mode	Mode	5	Leq_, Lmax	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	_80, _90, - - -, 130	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	_1 to 99 (seconds)	Actual measurement time
Sub channel allpass value	AP-Sub	6	_-9.9 to 205.6 (dB)	
Main channel allpass value	AP-Main	6		
Octave band values	16	6	_-9.9 to 205.6 (dB)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

Item	Title string	Number of bytes	Content	Description
1/3 octave band values	12.5	6	_-9.9 to 205.6 (dB)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz
Over-range	Over	5	Over, ____	Over-range condition occurred
Under-range	Under	6	Under, _____	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No

Item	Title string	Number of bytes	Content	Description
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Background Receive___ Source____	Background: Background noise measurement Receive: Receiving room measurement Source: Source room measurement
Measurement point		3	_1 to 10	
Measurement type	Flag	3	_0, _1	_0: L_{eq}, _1: L_{max}

Measurement data for Reverberation time

File name: (Store name).RND

File format: CSV (ASCII code)

Measurement data file consist of header section and data section.

Header section

Item	Header string	Number of bytes	Content	Description
Separator type	(None)	4	CSV	Indicates a CSV file
Model	Model	8	NX-28BA	Identifies this program
Version	Version	3	xy	Indicates the version of this program. "xy" stands for Ver. x.y
Analysis mode	Function Mode	11	1/1 OCT, 1/3 OCT, 1/1&1/3 OCT	
Windscreen correction	Wind Screen	4	ON, OFF	
Diffuse sound field correction	Diffuse Field	4	ON, OFF	
Device number	Index	4	001 to 255	Number as specified in "Index" field of Input/Output menu
File format	File Format	6	Type3	Type of file format used by this program. Type 3 indicates reverberation time measurement data file.
Measurement mode	Meas Mode	3	RT	RT indicates data for reverberation time
Store name	Store Name	5	0000 to 9999	
Measurement time	Set Time	4	__0 to 99 (seconds)	
Receiving room volume	Volume	4	___	(not used)
Trigger Level	Trigger Level	4	60 to 130 (dB)	
Trigger Band	Trigger Band	8	Main AP, Sub AP, 12.5 Hz etc.	
Sampling Period	Sampling Period	5	_2ms, _5ms, 10ms	
Repeat count	Repeat	3	1 to 10	
Error rate	Error Rate	4	0 to 100 (%)	

Data section

The data section is configured as follows.

The first measurement data (7 lines)
- Reverberation time data (T20)
- Reverberation time data (T30)
- Reverberation time data (Txx)
- Start point of reverberation time calculation
- End point of reverberation time calculation
- Error (T20)
- Error (T30)

The second measurement data (7 lines)

The third measurement data (7 lines)

⋮

The 30th measurement data (7 lines)

The following pages show the data (L_{eq} data, L_{max} data) content for the respective measurement points.

The contents of the data section are listed below. The section is one line, containing the items in the sequence shown, with commas as delimiters.

Item	String	Number of bytes	Content	Description
Line number	Address	4	1 to 210	
Measurement order	Order	4	1 to 30	
Measurement mode	Mode	5	T20, T30, Txx, BGadr, ENadr, ER20, ER30	
Sub channel frequency weighting	FW Sub	2	A, C, Z	
Sub channel time weighting	TW Sub	2	F, S, t, I	
Main channel frequency weighting	FW Main	2	A, C, Z	
Main channel time weighting	TW Main	2	F, S, t	
Level range	Range	4	___ (spaces)	
Measurement date	Date	11	yyyy/mm/dd	
Measurement time	Store Time	9	hh:mm:ss	
Measurement elapsed time	Meas Time	3	1 to 99 (seconds)	Actual measurement time
Sub channel all-pass value	AP-Sub	6	-9.9 to 205.6 (seconds) (When measurement mode is T20, T30, Txx)	
Main channel all-pass value	AP-Main	6		
Octave band values	16	6	-9.9 to 205.6 (seconds) (When measurement mode is T20, T30, Txx)	16 Hz
	31.5	6		31.5 Hz
	63	6		63 Hz
	125	6		125 Hz
	250	6		250 Hz
	500	6		500 Hz
	1k	6		1 kHz
	2k	6		2 kHz
	4k	6		4 kHz
	8k	6		8 kHz
	16k	6		16 kHz

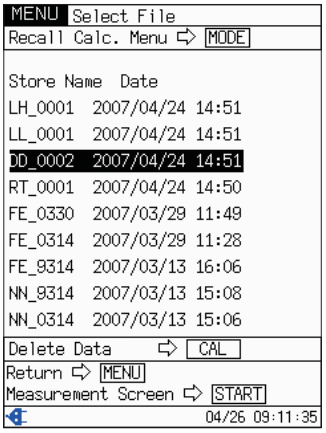
Item	String	Number of bytes	Content	Description
1/3 octave band values	12.5	6	-9.9 to 205.6 (seconds) (When measurement mode is T20, T30, Txx)	12.5 Hz
	16	6		16 Hz
	20	6		20 Hz
	25	6		25 Hz
	31.5	6		31.5 Hz
	40	6		40 Hz
	50	6		50 Hz
	63	6		63 Hz
	80	6		80 Hz
	100	6		100 Hz
	125	6		125 Hz
	160	6		160 Hz
	200	6		200 Hz
	250	6		250 Hz
	315	6		315 Hz
	400	6		400 Hz
	500	6		500 Hz
	630	6		630 Hz
	800	6		800 Hz
	1k	6		1 kHz
	1.25k	6		1.25 kHz
	1.6k	6		1.6 kHz
	2k	6		2 kHz
	2.5k	6		2.5 kHz
	3.15k	6		3.15 kHz
	4k	6		4 kHz
	5k	6		5 kHz
	6.3k	6		6.3 kHz
	8k	6		8 kHz
	10k	6		10 kHz
	12.5k	6		12.5 kHz
	16k	6		16 kHz
	20k	6		20 kHz

Item	String	Number of bytes	Content	Description
Over-range	Over	5	Over	Over-range condition occurred
Under-range	Under	6	Under	Under-range condition occurred
Measurement planned	Planed	2	1, 0	1: Yes, 0: No
Measurement completed	Completed	2	1, 0	1: Yes, 0: No
Sound source position	Source Pos	2	1 to 8	
Measurement position type	Meas Pos	11	Receive	Receiving room measurement
Measurement point		3	1 to 10	
Measurement type	Flag	2	1 to 7	1: T20, 2: T30, 3: Txx, 4: StartPos., 5: EndPos., 6: ErrorT20, 7: ErrorT30

Deleting stored data

Measurement data stored on the CF card can be deleted as follows.

1. Press the MENU key to bring up the menu list screen.
2. Select the "Recall" menu and press the ENT key.
   The file selection screen comes up.



File selection screen

3. Select the data to delete and press the CAL key.
4. A confirmation message appears. Press the ENT key to go ahead with the delete process.
   To cancel the delete process, press the PAUSE key.

Excel Macro

An excel macro optimized for handling measurement data files created with this program is available.
Using the macro on a computer allows calculation and display of the items listed below.
The macro file can be downloaded from the RION web site (http://www.rion.co.jp/english/).

English version

Evaluation of airborne sound insulation between rooms

Standard compliance: ISO 140-4, ISO 717-1
Calculates single-number quantities.

Evaluation of floor impact sound insulation (light impact source)

Standard compliance: ISO 140-7, ISO 717-2
Calculates single-number quantities.

Evaluation of airborne sound insulation of façade

Standard compliance: ISO 140-5, ISO 717-1
Calculates single-number quantities.

Evaluation of sound level from service equipment

Standard compliance: ISO 16032

Japanese version

Evaluation of airborne sound insulation between rooms

Standard compliance: JIS A 1417, JIS A 1419-1
Calculates ranking (D value) of sound level difference between rooms and displays an estimation curve.

Evaluation of floor impact sound insulation (light impact source)

Standard compliance: JIS A 1418-1, JIS A 1419-2
Calculates ranking (LL value) of floor impact sound insulation (light impact source) and displays an estimation curve.

Evaluation of floor impact sound insulation (heavy impact source)

Standard compliance: JIS A 1418-2, JIS A 1419-2
Calculates ranking (LH value) of floor impact sound insulation (heavy impact source) and displays an estimation curve.

Evaluation of room environmental sound level

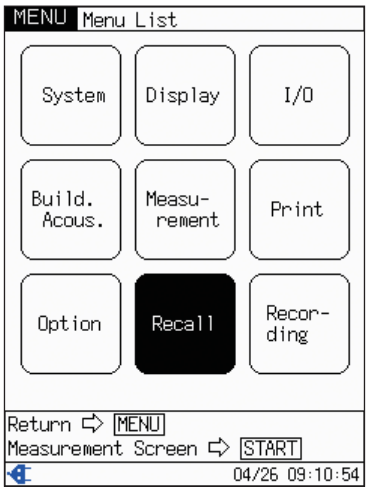
Calculates N value and NC value (noise criteria value) and displays an estimation curve.

Printing

The various measurement screens can be printed out on a printer.
Data stored on CF card can be printed from a recall screen.
In both cases, except when printing a specified range from a numeric recall screen, the printed content will be a hard copy of the current screen contents.
When carrying out the steps for printing, a menu screen appears, but the actual printout will reflect the immediately preceding screen content.
When printing a specified range from a numeric recall screen, the data for all measurement points in the recalled range can be printed continuously.

Measurement screen printing

1. While the measurement screen that you want to print is displayed, press the MENU key or ENT key.
   The menu list screen appears.



Menu list screen

2. Use the △ / ▽ / ◁ / ▷ keys to select [Print] and press the ENT key.
   The immediately preceding measurement screen is shown again, and a printing confirmation message appears.
3. Press the ENT key to start printing.
   To cancel printing, press the PAUSE key.

Recall screen printing

Data stored on CF card can be recalled and printed out while being shown on a recall screen.

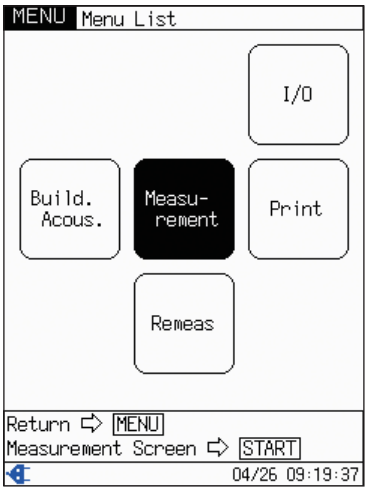
Printing is possible at the measurement data recall screen, average value recall screen, single-number quantities recall screen, estimation curve recall screen, etc. From the measurement data recall screen, it is possible to specify a range of measurement points for printing in one operation.

For information on recall steps, see the respective measurement mode sections.

Note
Only the recall screens can be printed. Selection menu screens cannot be printed.

Printing measurement results other than reverberation time

1. While the recall screen that you want to print is displayed, press the ENT key.
   The menu list screen appears.



Menu list screen

The "Remeas" indication is shown only for a measurement data recall screen.

2. Use the △ / ▽ / ◁ / ▷ keys to select [Print] and press the ENT key.
   The immediately preceding recall screen is shown again, and a printing confirmation message appears.

3. Select "Display Print" and press the ENT key to start printing.
   If you select "Specified Address Point" and then press the ENT key, the print range specify screen appears.
   (The indication "Specified Address Point" appears only on the measurement data recall screen.)
   To cancel printing, select "Cancel" and press the ENT key.

4. (Specify print Range)
   Specify the range to print using measurement points. Refer to the measurement sequence information in the sections on each measurement mode to specify the print start address and print end address.
   When you select "Start Address" or "End Address" and press the ENT key, a list of measurement points (addresses) that can be specified appears. Select an address from the list and press the ENT key.
   When you select "Execute" and press the ENT key, the range between the start address and end address is printed.

   Printing a specified range from a numeric recall screen
   When you have selected to print a specified range from a numeric recall screen, the data for all bands will be printed on one sheet, also for 1/3 octave analysis, and octave and 1/3 octave analysis (see sample printout below).

DD DD_0200 SP1 ReceiveRoom Pos.03 018
2007/06/13 14:47:45
MEASUREMENT TIME: 00:00:10

MAIN LZeq 68.3dB SUB LAeq 53.8dB

Freq. (Hz)	1/3oct (dB)	BGN (dB)	Freq. (Hz)	1/3oct (dB)	BGN (dB)	Freq. (Hz)	1/3oct (dB)	BGN (dB)
12.5	47.1	51.0	200	56.5	35.0	3.15k	30.7	22.0
16	43.2	43.5	250	53.8	30.5	4k	27.2	18.7
20	51.0	50.2	315	46.9	27.3	5k	25.5	14.8
25	46.9	46.8	400	46.3	29.7	6.3k	30.9	11.9
31.5	45.6	45.1	500	44.9	29.9	8k	32.1	10.1
40	45.8	41.5	630	44.0	25.2	10k	30.8	11.6
50	54.4	41.7	800	44.3	24.8	12.5k	21.9	9.2
63	63.2	48.6	1k	40.8	23.8			
80	57.6	35.6	1.25k	41.0	23.2			
100	58.8	37.0	1.6k	37.9	21.7			
125	53.6	34.2	2k	37.0	21.5			
160	57.5	36.1	2.5k	32.8	22.4 C			

Freq. (Hz)	oct (dB)	BGN (dB)	Freq. (Hz)	oct (dB)	BGN (dB)	Freq. (Hz)	oct (dB)	BGN (dB)
16	52.8	53.9	250	58.7	36.8	4k	33.2	24.3
31.5	51.2	50.0	500	49.9	33.5	8k	36.2	16.2
63	64.8	49.5	1k	47.1	28.9			
125	61.8	40.7	2k	41.2	26.7 C			

Sample printout for numeric recall screen
(Printing of specified range from measurement data recall screen)

Printing reverberation time measurement results

1. While the recall screen that you want to print is displayed, press the MODE key.
   A printing confirmation message appears.
2. Press the ENT key to start printing.
   To cancel printing, press the PAUSE key.

Default Values

The program can be reset to the default condition by accessing the system menu, selecting "Save/Load Settings" → "Reset to default values" and pressing the ENT key. The settings of the NA-28 itself are also reset by this action. The default settings are as listed below.
The clock is not reset by this action, and the inserted CF card is not affected.

Measurement Screen	Graphical display
Calibration Mode	Internal
Analysis Mode	Octave band
Main Channel Frequency Weighting	A
Main Channel Time Weighting	F
Level Range Full Scale	120 dB
[Building Acoustic] menu	
Measurement Mode	Airborne
Store Name	0000
Measurement Time	10 s
Source Position	1
Source Room Measurement Positions	5
Receive Room Measurement Positions	5
(Heavy Impact Source) Number of Measurements	1
BGN Mode	Once
Source Room Data	None
Estimation Curve	OFF
Surface Area	100.0 m^2
Receive Room Volume	100.0 m^3
(Reverberation) Trigger Level	75 dB
(Reverberation) Trigger Band	MAIN AP
(Reverberation) Sampling Period	2 ms
(Reverberation) Measurement Time	5 s
(Reverberation) Repeat Count	1
(Reverberation) Alarm Error Rate	5%

[Measurement] menu

Windscreen Correction	OFF
Back Erase	OFF
Delay Time	0 s
L_{max}/L_{min} Type	Band
Trigger Mode	OFF
Trigger Level	70
Trigger Band (OCT and 1/3 OCT)	MAIN AP
Trigger Band (1/3 OCT position in OCT)	Center (communication only)
Slope	+
Time Trigger Start Date/Time	01/01 00:00
Time Trigger End Date/Time	01/01 00:00
Sleep Mode	ON
Diffuse Field Correction	OFF
Sub Channel	OFF
Sub Channel Frequency Weighting	C
Sub Channel Time Weighting	F

[Display] menu

Background Noise Overlay	ON
S/N caution	ON

[Input/Output] menu

AC Output	MAIN
DC Output	MAIN
Comparator	OFF
Comparator Level	70
Comparator Band (OCT and 1/3 OCT)	MAIN AP
Comparator Band (1/3 OCT position in OCT)	Center (communication only)
USB Communication	OFF
Remote Control	OFF
Backlight Intensity	Low
Backlight Time	30 sec
Beep Sound	ON
Index	1

Recall Calc. Setting

S/N Caution	ON
Background Noise Overlay	ON
Background Noise Correction	ON
RTime Data	None

Technical Reference

Technical explanation of reverberation time measurement

Error rate

If the T20 and T30 values calculated for a given frequency band during reverberation time measurement differ significantly, there may be a problem with the data. When calculating T20 and T30, the NX-28BA program also determines the difference between T20 and T30 as a ratio and expresses this as the "error rate".

Before starting a measurement, an error rate threshold is specified. Then, at the recall screen, if the error rate exceeds this threshold, the "Error" item for the respective frequency band is shown in red. Use this indication to determine whether to redo the measurement or perform recalculation (Txx) of reverberation time for specified interval at the recall screen.

Error messages E1 and E2

If the reverberation time cannot be displayed on the reverberation time measurement recall screen, the indication "E1" or "E2" may be shown.

If E1 (ERROR 1) is shown

This can be due to two reasons:

1. The measurement time was too short.
2. The S/N ratio was insufficient.

In case of 1., increase the measurement time setting. In case of 2., increase the sound source output level or lower the noise level.

If E2 (ERROR 2) is shown

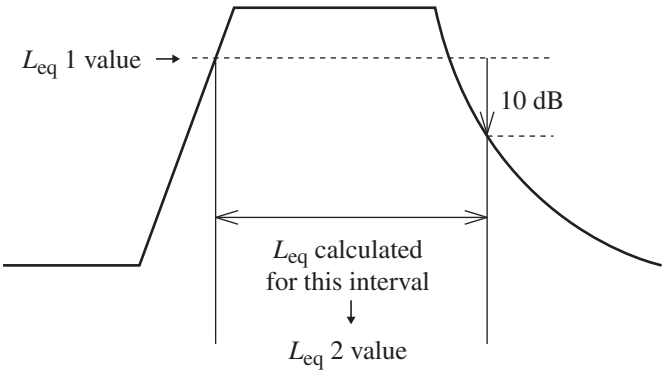
The number of samples was insufficient. In this case, shorten sampling period.

Calculation of T20 and T30 values during reverberation time measurement

For automatic calculation of T20 and T30 values, this program determines the start point for calculating the reverberation time as follows.

1. L_{eq} for 1-second interval after trigger level was exceeded is calculated (L_{eq} 1 value).
2. Using data for the entire measurement, the L_{eq} for the interval from the point where the level exceeded the L_{eq} 1 value for the first time until the level next falls to 10 dB below the L_{eq} 1 value is calculated. This is the L_{eq} 2 value.
3. The larger of the L_{eq} 1 and L_{eq} 2 values is taken as the steady level of the noise source.
4. The point where the level is 5 dB lower than the steady level is used as the start point for calculating the reverberation time.
5. The time from the start point until the level has dropped by 20 dB is multiplied by 3 and taken as the T20 value. The time from the start point until the level has dropped by 30 dB is multiplied by 2 and taken as the T30 value.

Note
If the background noise level fluctuates excessively, the steady level may be calculated somewhat lower than the actual level. In such a case, specify the calculation interval and recalculate Txx (see page 162).



L_{eq} 2 calculation method

Averaging method and background noise correction

When the unit is operating with a language setting other than Japanese, two different averaging methods are available for the recall processing of the measurement modes for airborne sound insulation between rooms and floor impact sound insulation (light impact source). The settings are "ISO 140" and "Arithmetic".

When the unit is operating with the Japanese language setting, the averaging method is always set to "Arithmetic" in compliance with JIS specifications. For details on the two averaging methods, see the section starting on page 255.

By setting background noise correction to ON using the recall processing menu, the influence of background noise can be compensated for. This setting is valid for the measurement of airborne sound insulation between rooms, floor impact sound insulation (light impact source), and floor impact sound insulation (heavy impact source).

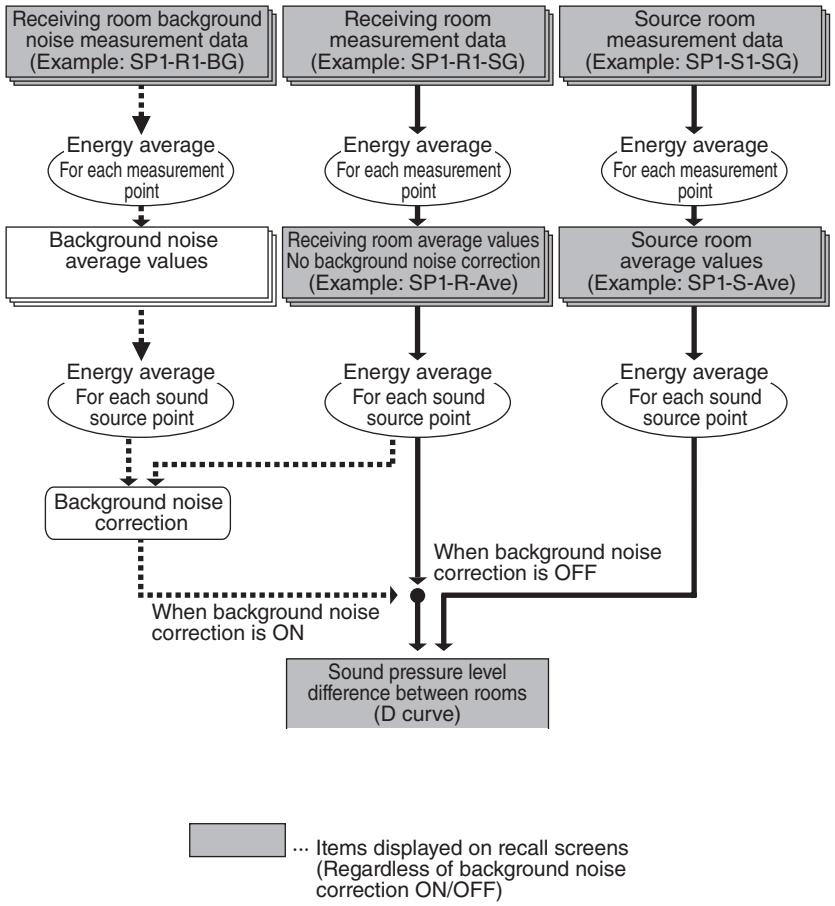
Correction is provided for the respective bands of the receiving room measurement data for which background noise measurement was carried out. For airborne sound insulation between rooms and floor impact sound insulation (light impact source), the correction method differs according to the language setting and averaging method setting, as listed in the table on the next page. For floor impact sound insulation (heavy impact source), correction is always carried out by energy subtraction when the difference between receiving room measurement data and background noise measurement data is 6 dB or more and less than 15 dB, regardless of language setting and averaging method setting.

Among the recall screens, the correction result is reflected on the estimation curve screen and the single-number quantities screen. Even with background noise correction set to ON, the measurement data screen shows the unaltered measurement data, and the measurement point average and [SP-R-Ave...] screens are based on measurement data regardless of background noise correction.

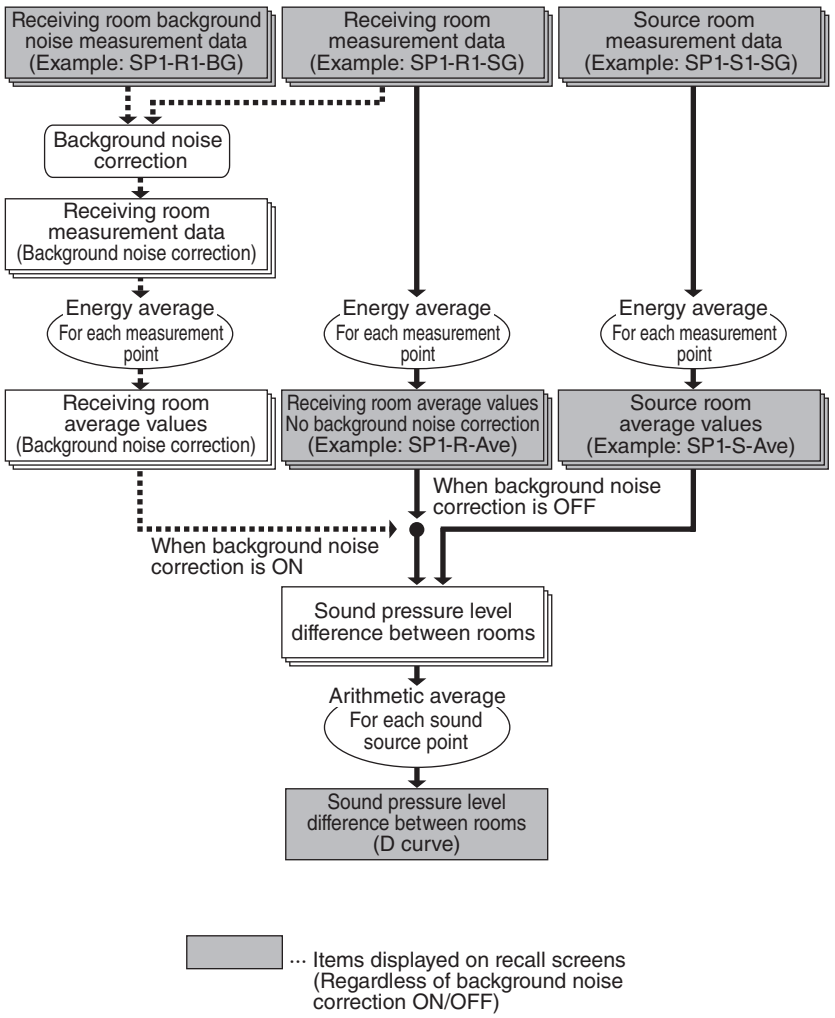
Background noise correction in measurement modes for airborne sound insulation between rooms and floor impact sound insulation (light impact source)

<table>
<tr><td>Language setting</td><td colspan="3">Other than Japanese</td><td colspan="2">Japanese</td></tr>
<tr><td>Averaging method</td><td>ISO 140</td><td colspan="2">Arithmetic</td><td colspan="2">Arithmetic</td></tr>
<tr><td>Recall processing</td><td>Single-number quantities</td><td>Single-number quantities</td><td>Estimation curve</td><td>Single-number quantities</td><td>Estimation curve</td></tr>
<tr><td rowspan="3">Background correction method according to difference between receiving room measurement data and background noise measurement data</td><td colspan="2">10 dB or more
↓
No correction</td><td colspan="3">15 dB or more
↓
No correction</td></tr>
<tr><td colspan="2">More than 6 dB, less than 10 dB
↓
Energy subtraction correction</td><td colspan="3">6 dB or more, less than 15 dB
↓
Energy subtraction correction</td></tr>
<tr><td colspan="2">6 dB or less
↓
Subtract 1.3 dB from receiving room measurement data</td><td colspan="3">Less than 6 dB
↓
No correction</td></tr>
</table>

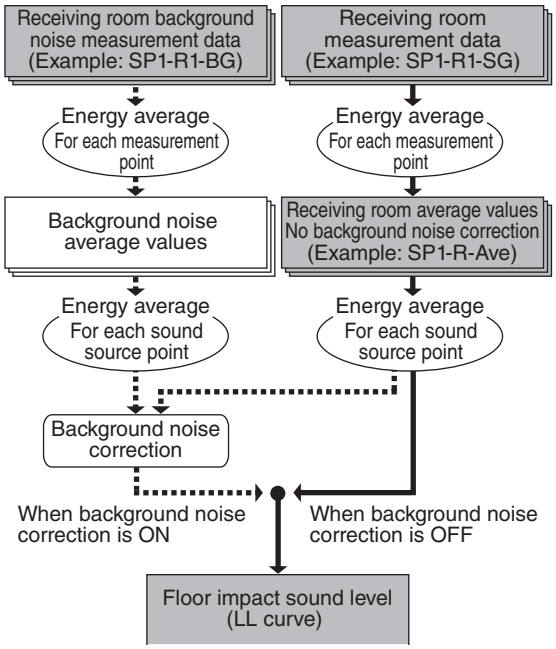
"Airborne sound insulation between rooms"
(averaging method: ISO140)



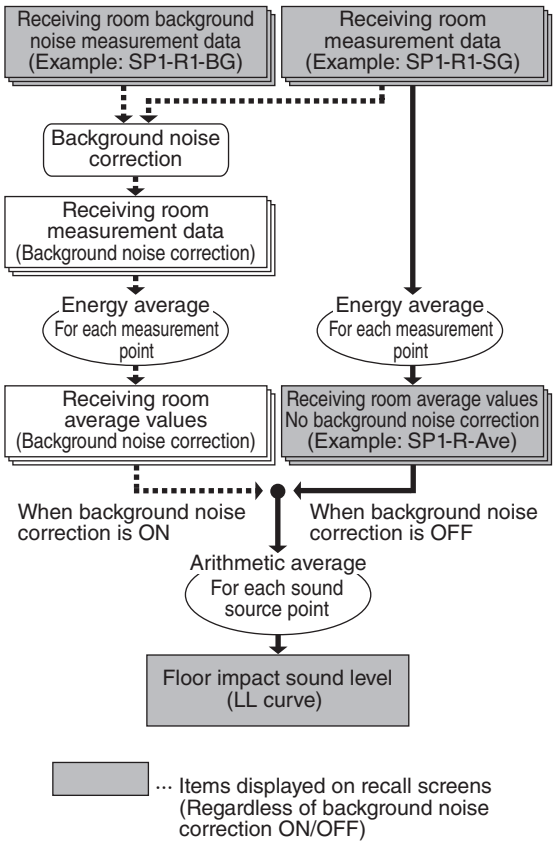
"Airborne sound insulation between rooms"
(averaging method: Arithmetic)



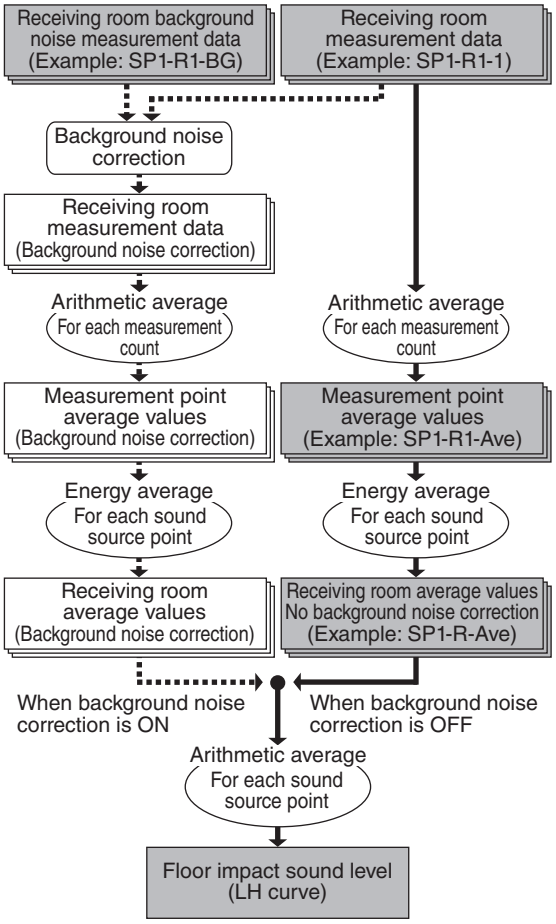
"Floor impact sound insulation (light impact source)"
(averaging method: ISO140)



"Floor impact sound insulation (light impact source)"
(averaging method: Arithmetic)



"Floor impact sound insulation (heavy impact source)")
(averaging method: Arithmetic)



Energy average calculation equation

$$EnergyAve = 10 \log \left(\frac{10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + \cdots + 10^{\frac{L_n}{10}}}{n} \right)$$

Arithmetic average calculation equation

$$ArithmeticAve = \frac{L_1 + L_2 + \cdots + L_n}{n}$$

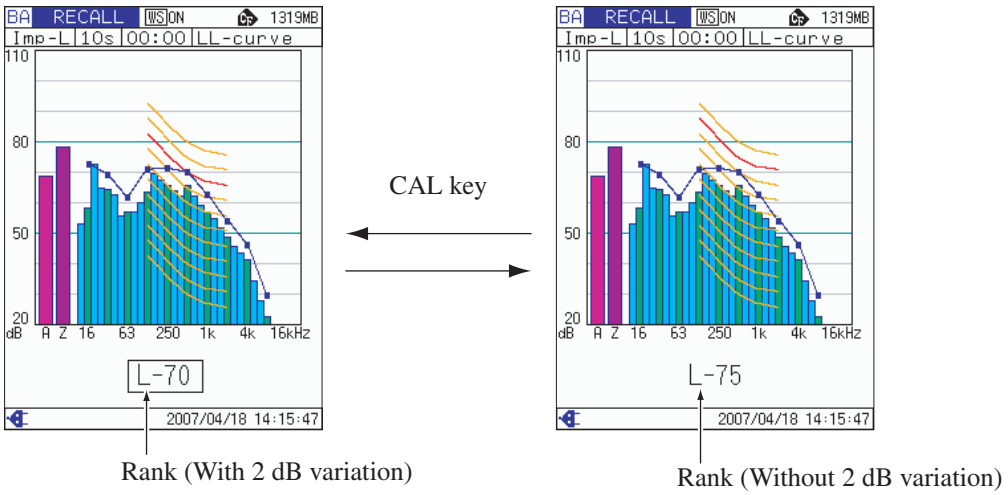
Energy subtract calculation equation

$$EnergySub = 10 \log \left(10^{\frac{L_1}{10}} - 10^{\frac{L_2}{10}}\right)$$

L_n: Sound pressure level at measurement point n

2 dB variation used in ranking value calculation

When calculating the D value, L value, and N value, this program applies a permissible variation of 2 dB. To eliminate this, press the CAL key at the ranking recall screen. The square frame around the ranking value disappears, and the display no longer reflects the 2 dB variation.



Evaluation standards for D, L, N, NC values

The reference standards and calculation rules used by this program when calculating the respective ranking values are listed below.

	Lowest digit of measurement value applied to estimation curve	Standard used as basis for effective digits shown at left
D value	One digit after decimal point, rounded on second digit after decimal point	JIS A 1417: 2000
L value	One digit after decimal point, rounded on second digit after decimal point	JIS A 1418-1: 2000 JIS A 1418-2: 2000
N value	Integer value, rounded on first digit after decimal point	Building Performance Standards and Design Guidelines (2nd Edition), Architectural Institute of Japan
NC value	Integer value, rounded on first digit after decimal point	L. L. Beranek (ed.): Noise and Vibration Control McGraw-Hill Book Company, New York, 1971

Note on single-number quantities calculation

When performing single-number quantities calculation, be sure to select reverberation time data on the recall processing menu. Otherwise, correct calculation will not be performed.

When selecting reverberation time data, be sure to select only data of the same analysis mode. If the data are from a different analysis mode, correct calculation will not be performed.

For example, when the measured sound pressure level data are for simultaneous octave and 1/3 octave analysis, the selected reverberation time data must also be for simultaneous octave and 1/3 octave analysis.

Handling of measurement surface area for measurement of sound insulation between rooms

The measurement surface area is used when calculating the single-number quantities R'_{w}, $D_{nT,A,k}$, $I_{lu,k}$ for measurement of sound insulation between rooms.

However, the definition of the surface area differs depending on the entered value, as shown in the table below.

Single-number quantity	R'_{w}		$D_{nT,A,k}$, $I_{lu,k}$
Measurement surface area	Less than 10 m^2		Less than 7 m^2
Language setting	Japanese	Other than Japanese	Any setting
Handling of measurement surface area	Measurement room volume (m^3)/7.5 is taken as surface area.	Entered surface area (m^2) or measurement room volume (m^3)/7.5, whichever is greater, is taken as measurement surface area.	Value S calculated according to formula below is taken as surface area (m^2).
Applicable standard	JIS A 1417	ISO 140-4	NEN 5077

Formula: S = (0.16 × measurement room volume (m^3))/(2.5 × T_0) (T_0 = 0.5)

Specifications

Applicable standards

ISO 140-4:1998 (JIS A 1417:2000)

Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 4: Field measurements of airborne sound insulation between rooms

ISO 140-7:1998 (JIS A 1418-1:2000)

Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 7: Field measurements of impact sound insulation of floors

JIS A 1418-2:2000

Acoustics -- Measurement of floor impact sound insulation of buildings -- Part 2: Method using standard heavy impact sources

ISO 717-1:1996 (JIS A 1419-1:2000)

Acoustics -- Rating of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation

ISO 717-2:1996 (JIS A 1419-2:2000)

Acoustics -- Rating of sound insulation in buildings and of building elements -- Part 2: Impact sound insulation

ISO 140-5:1998*1

Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 5: Field measurements of airborne sound insulation of façade elements and façades

ISO 16032:2004*1

Acoustics -- Measurement of sound pressure level from service equipment in buildings -- Engineering method

*1 NA-28 with this program performs measurement only. Rating index calculation performed by excel macro.

Available sound level meter

Sound Level Meter (with 1/3 octave analysis function)
NA-28

Function specifications

Analysis modes
Real-time octave analysis
Real-time 1/3 octave analysis
Simultaneous real-time octave and 1/3 octave analysis
(Switching to sound level meter mode not available)

Measurement values

Time-weighted sound level	L_p
Time-averaged sound level	L_{eq}
Time-weighted sound level maximum	L_{max}

Measurement values differ according to acoustic performance measurement mode.

Measurement of airborne sound insulation between rooms

Parameter setting

Measurement time	1 to 60 seconds
Start delay	0 to 10 seconds
Sound source positions	1 to 8

Source room measurement position number
1 to 10

Receiving room measurement position number
1 to 10

Volume of measurement room
0.1 to 999.9 m^3

Area of measurement surface
0.0 to 999.9 m^2

Background noise measurement modes
None, Once (1 point), Before (1 to 10 points*2), During (1 to 10 points*2)

*2 Same as receiving room measurement position number

Overlay background level

On/Off

Background noise level S/N caution indication

On/Off

Measurement

Measurement values

L_{eq} (Background noise sound pressure level, source room sound pressure level, receiving room sound pressure level)

Display L_p, L_{eq}, L_{max}

Overlay display with background noise level (during receiving room sound pressure level measurement)

S/N caution indication when difference to background noise level is small (during receiving room sound pressure level measurement)

Results

Recall processing parameter setting

Reverberation time file selection

Processing

Measurement value averaging

Single-number quantities

R'_w: Weighted apparent sound reduction index

$D_{nT,w}$: Weighted standardized level difference

$D_{n,w}$: Weighted normalized level difference

C: Spectrum adaptation term (spectrum No. 1)

C_{tr}: Spectrum adaptation term (spectrum No. 2)

$D_{nT,A,k}$: $D_{nT,A}$-10log(0.16V/T_0S)

($D_{nT,A}=D_{nT,w}+C$, $T_0=0.5$s)

V: volume of receiving room (m^3)

S: area of measurement surface (m^2)

$I_{lu,k}$: $D_{nT,A,k}$-52

Ranking of sound pressure level difference between rooms (D value)

Display — Overlay display of measurement value and background noise level (during receiving room sound pressure level indication)
S/N caution indication when difference to background noise level is small (during receiving room sound pressure level indication)
Measurement values and averaged values for source room/receiving room shown as graphical overlay
Single-number quantities
Inter-room sound pressure level difference and estimation curve shown as graphical overlay
Ranking of sound pressure level difference between rooms (D value)

Store data — Measurement values for source room and receiving room, background noise for receiving room

Measurement of floor impact sound insulation (light impact source)

Parameter settings

Measurement time: 1 to 60 seconds

Start delay: 0 to 10 seconds

Sound source positions: 1 to 8

Receiving room measurement position number: 1 to 10

Volume of measurement room: 0.1 to 999.9 m^3

Background noise measurement modes: None, Once (1 point), Before (1 to 10 points*2), During (1 to 10 points*2)

*2 Same as receiving room measurement position number

Overlay background level: On/Off

Background noise level S/N caution indication: On/Off

Estimation curve display: Two selected curves displayed simultaneously

Measurement

Measurement values

L_{eq} (Background noise sound pressure level, receiving room sound pressure level)

Display L_p, L_{eq}, L_{max}

Overlay display with selected estimation curve

Overlay display with background noise level (during receiving room sound pressure level measurement)

S/N caution indication when difference to background noise level is small (during receiving room sound pressure level measurement)

Results

Recall processing parameter setting

Reverberation time file selection

Processing

Measurement value averaging

Single-number quantities

$L'_{nT,w}$: Weighted standardized impact sound pressure level

$L'_{n,w}$: Weighted normalized impact sound pressure level

$L'_{nT,A}$: $L'_{nT,w}+C_I$

C_I: Spectrum adaptation term

I_{co}: $59-L'_{nT,A}$

Level ranking of impact sound insulation of floors (light source) (LL value)

Display Overlay display of measurement value and background noise level (during receiving room sound pressure level indication)

S/N caution indication when difference to background noise level is small (during receiving room sound pressure level indication)

Measurement values and averaged values for receiving room shown as graphical overlay

Single-number quantities

Impact sound level and estimation curve shown as graphical overlay
Level ranking of impact sound insulation of floors (light source) (LL value)

Store data: Measurement values for receiving room, background noise for receiving room

Measurement of floor impact sound insulation (heavy impact source)

Parameter settings

- Measurement time: 1 to 60 seconds
- Start delay: 0 to 10 seconds
- Sound source positions: 1 to 8
- Receiving room measurement position number: 1 to 10
- Measurement repeat count: 1 to 5
- Volume of measurement room: 0.1 to 999.9 m^3
- Background noise measurement modes: None, Once (1 point), Before (1 to 10 points*2), During (1 to 10 points*2)
  *2 Same as receiving room measurement position number
- Overlay background level: On/Off
- Background noise level S/N caution indication: On/Off
- Estimation curve display: Two selected curves displayed simultaneously

Measurement

Measurement values

L_{eq} (Background noise sound pressure level)
L_{max} (Receiving room sound pressure level)

Display

L_p, L_{eq} (Background noise sound pressure level)
L_p, L_{max} (Receiving room sound pressure level)
Overlay display with selected estimation curve
Overlay display with background noise level (during receiving room sound pressure level measurement)

S/N caution indication when difference to background noise level is small (during receiving room sound pressure level measurement)

Results

Processing

Level ranking of impact sound insulation of floors (heavy source) (LH value)

Display Overlay display of measurement value and background noise level (during receiving room sound pressure level indication)

S/N caution indication when difference to background noise level is small (during receiving room sound pressure level indication)

Measurement values and averaged values for each measurement point shown as graphical overlay

Measurement values and averaged values for receiving room shown as graphical overlay

Impact sound level and estimation curve shown as graphical overlay

Level ranking of impact sound insulation of floors (heavy source) (LH value)

Store data Measurement values for receiving room, background noise for receiving room

Measurement of room environmental sound level

Parameter settings

Measurement time 1 to 60 seconds

Start delay 0 to 10 seconds

Receiving room measurement position number 1 to 10

Estimation curve display Two selected curves displayed simultaneously

Measurement

Measurement values

L_{eq} (Sound pressure level in room)

Display L_p, L_{eq}, L_{max}

Results

Processing

Room environmental sound level ranking (N value or NC value)
N value: Guideline value according to Architectural Institute of Japan
NC value: According to the literature shown below
L. L. Beranek (ed.): Noise and vibration control.
(McGraw-Hill Book Company, New York, 1971)

Display — Measurement values and averaged values for receiving room shown as graphical overlay
Average value and room environmental sound level estimation curve shown as graphical overlay
Room environmental sound level ranking (N value or NC value)

Store data — Measurement values for receiving room, background noise for receiving room

Measurement of airborne sound insulation of façade elements and façades

Parameter settings

Measurement time	1 to 60 seconds
Start delay	0 to 10 seconds
Sound source positions	1 to 8
Outdoor measurement position number	1 to 10
Receiving room measurement position number	1 to 10
Volume of measurement room	0.1 to 999.9 m^3
Area of measurement surface	0.0 to 999.9 m^2
Background noise measurement modes	None, Once (1 point), Before (1 to 10 points*2), During (1 to 10 points*2)
Overlay background level	On/Off

*2 Same as receiving room measurement position number

Measurement

Measurement values

L_{eq} (Background noise sound pressure level, outdoor sound pressure level, receiving room sound pressure level)

Display L_p, L_{eq}, L_{max}

Overlay display with background noise level

Results

Display Overlay display of measurement value and background noise level

Measurement values for outdoor/receiving room

Store data Measurement values for outdoor and receiving room, background noise for receiving room

Measurement of sound level from service equipment

Parameter settings

Measurement time 1 to 60 seconds

Start delay 0 to 10 seconds

Sound source positions 1 to 8

Receiving room measurement position number

1 to 10

Volume of measurement room

0.1 to 999.9 m^3

Background noise measurement modes

None, Once (1 point), Before (1 to 10 points*2), During (1 to 10 points*2)

*2 Same as receiving room measurement position number

Overlay background level

On/Off

Measurement

Measurement values

L_{eq} (Background noise sound pressure level, receiving room sound pressure level)

L_{max}(receiving room sound pressure level)

Display L_p, L_{eq}, L_{max}

Overlay display with background noise level

Results

Display Overlay display of measurement value and background noise level

Measurement values for receiving room

Store data Measurement values for receiving room

Dedicated address display and automatic incrementing

Dedicated address for selected measurement parameters is shown, and address is automatically incremented when one set of data was stored.

User can also select previous address and repeat measurement.

Alarm indication

Signal over-range condition

Warning indication appears when signal over-range condition occurred (same as NA-28)

Signal under-range condition

Warning indication appears when signal under-range condition occurred (same as NA-28)

Background noise level S/N caution indication

Alarm indication shown when background noise level and receiving room sound pressure level difference during insulation measurement is less than 6 dB. Caution indication shown when difference is 6 dB or over and less than 15 dB.

Measurement of reverberation time

Measurement method

Noise interruption method

Parameter settings

Measurement time — Sampling period 2 ms: 2 to 16 seconds
Sampling period 5 ms: 2 to 40 seconds
Sampling period 10 ms: 2 to 60 seconds

Measurement repeat count
1 to 10

Trigger level — 60 to 130 dB (1-dB steps)

Sampling period — 2 ms, 5 ms, 10 ms

Error rate — Off / 1 to 100%

Measurement

Measurement value
L_p (Sound pressure level decay curve)

Display — L_p (Sound pressure level sampling value)

Results

Processing
T20, T30 (least square method)
Error rate
Reverberation time calculated for specified interval
Reverberation time average

Display — T20, T30, error rate
Reverberation time calculated for specified interval
Reverberation time average
Reverberation decay curve (time vs. level display)

Setting monitor function

Loading a setup file at start up to establish settings causes a setting monitor mark to appear on the display which alerts the user when monitored settings are changed. (Mark disappears when settings are changed.)

Monitored items

Frequency weighting, time weighting, analysis mode, measurement mode, measurement time, windscreen correction, delay time, L_{max}/L_{min} type, diffuse field correction, sub channel on/off, AC output, DC output, background noise level S/N caution indication, overlay BGN

Waveform recording function

Combination with NX-28WR allows total sound recording during measurement.

Communication function

Only for parameter setting control

Store data transfer is not supported (possible via removable disc function)

Continuous transfer with DRD command not supported

Supplied accessories

Instruction Manual	1
Inspection Certificate	1

Excel Macro

English version

Evaluation of airborne sound insulation between rooms

Standard compliance: ISO 140-4:1998, ISO 717-1:1996

Calculates single-number quantities.

Evaluation of impact sound insulation of floors (standard lightweight floors)

Standard compliance: ISO 140-7:1998, ISO 717-2:1996

Calculates single-number quantities.

Evaluation of airborne sound insulation of façade elements and façades

Standard compliance: ISO 140-5:1998, ISO 717-1:1996

Calculates single-number quantities.

Evaluation of sound level from service equipment

Standard compliance: ISO 16032:2004

Japanese version

Evaluation of airborne sound insulation between rooms

Standard compliance: ISO 140-4:1998, ISO 717-1:1996

Calculates ranking (D-value) of sound pressure level difference between rooms and displays an estimation curve.

Evaluation of floor impact sound insulation (light impact source)

Standard compliance: ISO 140-7:1998, ISO 717-2:1996

Calculates ranking (LL-value) of impact sound level on lightweight floors and displays an estimation curve.

Evaluation of floor impact sound insulation (heavy impact source)

Standard compliance: JIS A 1418-2:2000, JIS A 1419-2:2000

Calculates ranking (LH-value) of impact sound level on heavyweight floors and displays an estimation curve.

Evaluation of room environmental sound level

Calculates N value and NC value and displays an estimation curve.

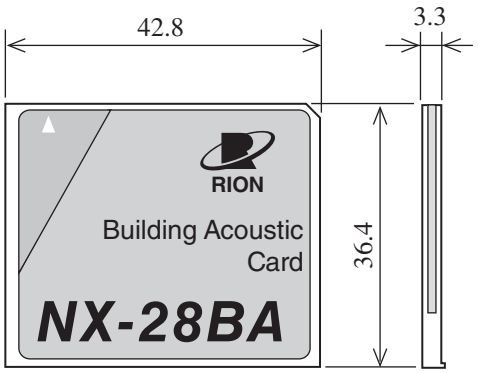
N value:

Guideline value according to Architectural Institute of Japan

NC value:

According to the literature shown below

L. L. Beranek (ed.): Noise and vibration control. (McGraw-Hill Book Company, New York, 1971)



Unit: mm

External view and dimensional drawing

No. 51773 08-06