INSTRUCTION MANUAL

Sound Calibrator

NC-74

RION CO., LTD.

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http://www.rion.co.jp/english/

Organization of this manual

This manual describes the features and operation principles of the sound calibrator NC-74.
The contents of this instruction manual is based on IEC60942:2003.
The manual contains the following sections.

Outline

Gives basic information on the unit.

Controls and Features

Briefly identifies and explains all parts of the unit.

Preparations

Describes how to insert batteries and use the adapter.

Measurement

Describes the basic steps and procedures for measurement.

Reference

Describes the calibration values for sound level meter and sound calibrator. Also describes effects of exposure to radiofrequency fields.

Specifications

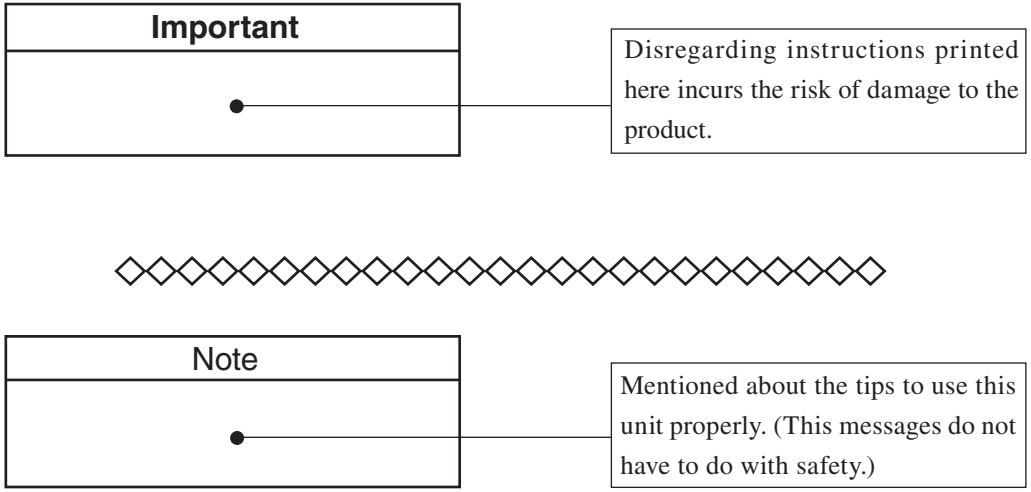
Lists the technical specifications of the unit.

To conform to the EU requirement of the Directive 2002/96/EC on Waste Electrical and Electronic Equipment, the symbol mark on the right is shown on the instrument.

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

FOR SAFETY

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



Precautions

- Operate the unit only as described in this manual.
- Do not use or store the unit in locations which may be
  - subject to splashes of water
  - subject to high levels of dust
  - subject to direct sunlight
  - subject to vibrations or shock
  - subject to air with high salt or sulphur content, or to gases, or are in the vicinity of stored chemicals
  - outside of the specified temperature and humidity range
  - subject to drastic temperature changes and to condensation
- Store the unit in the desiccator in locations subject to high temperatures and high humidity.
- Do not use the unit for any purpose other than calibrating sound level meters or microphones.

- Do not hold the active coupler to the ear for a long time.
- Be sure to use only the specified batteries.
- Remove the batteries from the unit when not using it.
- Do not try to disassemble or alter the unit.
- Never insert any foreign object into the coupler.
- The NC-74 is a precision product. Always handle it carefully and do not subject it to shocks.
- When not using the unit, always store it in its soft case for protection.
- In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.
- Dispose of the unit and of used batteries in accordance with local laws and regulations. The unit does not contain any substances harmful to the environment. Treat the unit as non-combustible waste.
- In order to maintain continued precision, have the unit checked and serviced once per year. Contact the supplier.

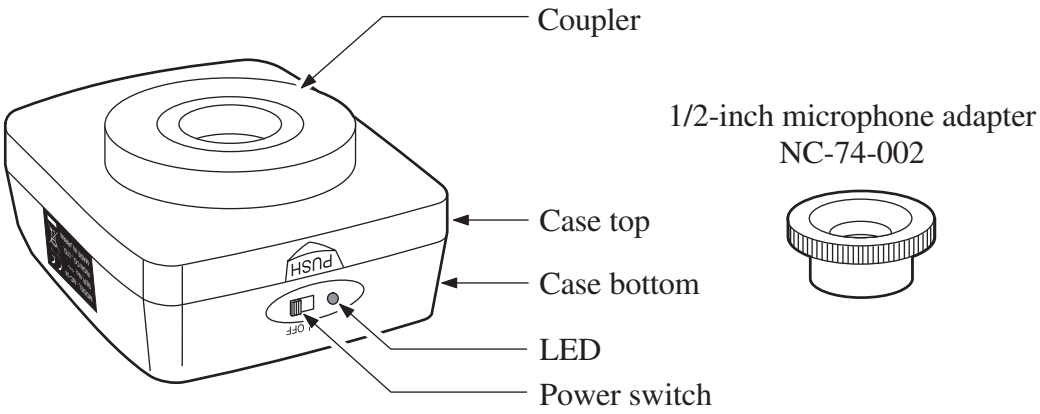
- To clean the unit, use only a dry cloth or a cloth lightly moistened with lukewarm water. Do not use solvents or alcohol-based cleaners.
- When mounting and dismounting the microphone and sound calibrator, do not rotate the sound level meter or sound calibrator. Otherwise the protective grid of the microphone may become loose or detached, causing damage to the microphone diaphragm.

Contents

Outline

The NC-74 is a compact, lightweight, easy-to-use sound calibrator. It conforms to IEC 60942:2003 Class 1 specifications and can be used to calibrate class 1 and class 2 sound level meters.

Controls and Features



Coupler

The microphone of the sound level meter to be calibrated is inserted here.

Case top

Separate from the case bottom by simultaneously pressing the two sections marked PUSH. (See illustration on page 4.)

Case bottom

Two IEC LR6 (size AA) alkaline batteries are inserted here.

LED

Lights up when the power switch is set to ON.

Power switch

Serves to turn the unit on and off.

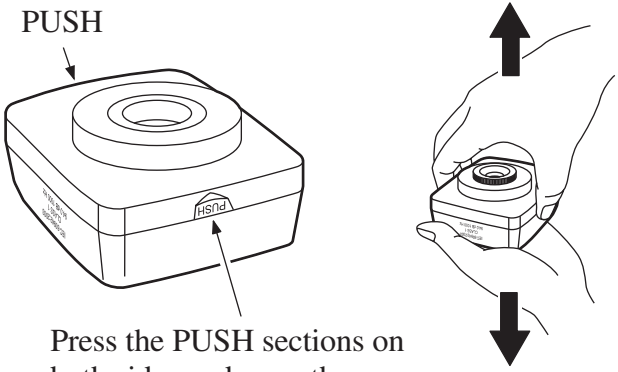
1/2-inch microphone adapter NC-74-002

Use this adapter when the outer diameter of the microphone is 1/2 inch.

Preparations

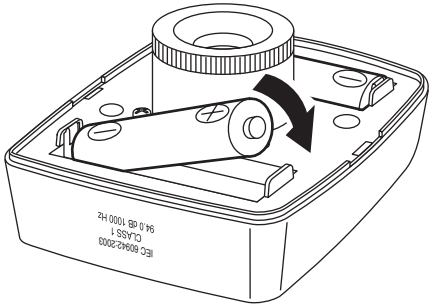
Inserting the Batteries

1. Open the case by pressing the sections marked PUSH and pulling the case top off the case bottom.



Press the PUSH sections on both sides and open the case.

2. Insert two IEC LR6 (size AA) alkaline batteries with correct polarity.
3. Snap the case top onto the case bottom again.

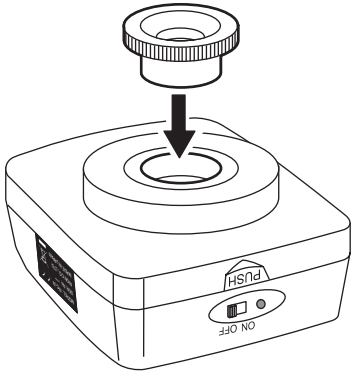


Note
- Before inserting the batteries, check the correct + and - orientation as shown on the preceding page. The polarity is also marked inside the battery wells. - Do not mix old and new batteries. - Do not mix different types of batteries. - Always remove the batteries when not using the unit. - Dispose of used batteries in accordance with local laws and regulations.

Using the 1/2-inch Microphone Adapter NC-74-002

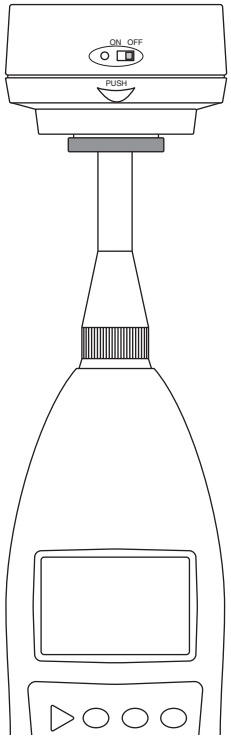
If the outer diameter of the microphone is 1 inch, remove the 1/2-inch microphone adapter NC-74-002.
When the microphone diameter is 1/2 inches, the adapter must be in place.

1/2-inch microphone adapter NC-74-002



Important
Insert the 1/2-inch microphone adapter NC-74-002 fully into the coupler. Otherwise correct calibration is not possible.

Measurement



To make the measurement, place the units in a perpendicular position, as shown in the illustration at left.

1. Make sure that the power switch of the NC-74 is OFF.
2. Carefully insert the microphone of the sound level meter all the way into the coupler of the sound calibrator.

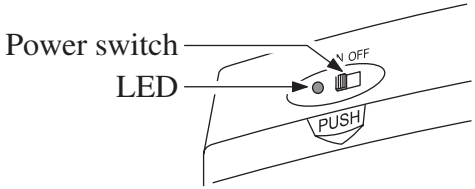
Important
The microphone of the sound level meter must always be inserted or removed slowly and carefully, to avoid the possibility of damage to the microphone diaphragm caused by abrupt changes in air pressure.
When mounting and dismounting the microphone and sound calibrator, do not rotate the sound level meter or sound calibrator. Otherwise the protective grid of the microphone may become loose or detached, causing damage to the microphone diaphragm.

3. After inserting the microphone, wait at least 30 seconds before reading the level indication on the sound level meter. Make a note of the reading, because this will be used in step 6.

Note
Immediately after inserting the microphone, the change in air pressure inside the sound calibrator will lead to false readings, thereby preventing correct calibration. The time required until the air pressure inside the sound calibrator stabilizes is 30 seconds or less.
The time required until the air pressure inside the microphone itself stabilizes depends on the microphone type. Check the documentation of the microphone or the sound level meter.

4. Select the measurement range of the sound level meter so that 94 dB can be measured.

5. Set the power switch of the NC-74 to ON. If the battery voltage of the NC-74 is normal, the LED lights up. If the voltage is too low, the LED flashes. In such a case, replace both batteries with fresh ones. If the batteries are totally exhausted, the LED will not light at all. The batteries must be replaced immediately.



6. Wait until the sound level meter reading has stabilized. Then read the indicated value. Verify that this reading is at least 20 dB higher than the reading obtained in step 3.

Important
If the difference is less than 20 dB, ambient noise has too much influence on the measurement, and correct calibration will not be possible.

7. Adjust the sound level meter so that its level reading is 94 dB (calibration value, see Note below).

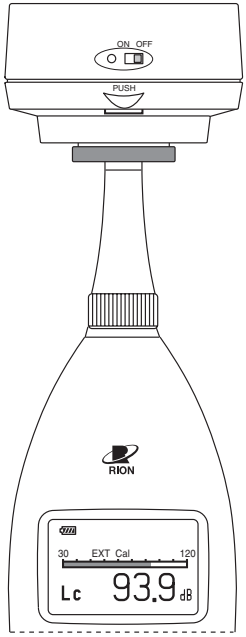
Note
Depending on sound level meter model and type, there may be deviation of 0.1 to 0.5 dB, due to the influence of case reflections and the microphone diffraction effect. For details on precise calibration values, please refer to the "Reference" section on page 11 or to the documentation of the sound level meter.

8. When level adjustment is completed, set the power switch of the sound level meter and the NC-74 to OFF.
9. Carefully remove the microphone of the sound level meter from the NC-74 (see the “Important” on page 7).

Reference

Sound level meter and sound measurement system calibration value

When performing acoustic calibration with this unit for a sound level meter or a sound measurement system using a sound field type microphone, make the adjustment so that the meter or the device reading is as shown in the calibration value tables (Table 1 and 2). These values were derived taking into consideration the relationship between the sound pressure level at the microphone in the coupler (specified sound pressure level) and the influence of case reflections and the microphone refraction effect when placed in a sound field.



Example

For the sound level meter NL-21, the calibration value as shown in Table 1 is 93.9 dB. Set the NC-74 to the microphone and adjust the NL-21 so that it reads 93.9 dB. (See the illustration at right.)

Calibration Values for Sound Level Meters

Class 1 Sound level meter

Model	Microphone	Calibration value (dB)
NA-16	UC-53A	94.0
NA-16A	MS-10	93.9
NA-25	UC-53A	94.0
NA-27	UC-53A	94.0
NA-28	UC-59	94.0
NA-29E	UC-53A	94.0
NA-40	UC-27	93.8
NA-41	UC-34	93.8
NA-60	UC-26	93.9
NA-61	UC-26	93.9
NA-82A	MS-10	93.9
NL-10A	UC-26	93.9
NL-11	UC-26	93.9
NL-14	UC-53A	94.0
NL-15	UC-53A	94.0
NL-16	UC-53A	94.0
NL-18	UC-53A	94.0
NL-31	UC-53A	94.0
NL-32	UC-53A	94.0

Class 2 Sound level meter

Model	Microphone	Calibration value (dB)
NA-20	UC-25	93.5
NA-24	UC-52	93.9
NA-29	UC-52	93.9
NL-01A	UC-25	93.5
NL-02/02A	UC-52	93.9
NL-04	UC-52	93.9
NL-05/05A	UC-52	93.9
NL-06	UC-52	93.9
NL-20	UC-52	93.9
NL-21	UC-52	93.9
NL-22	UC-52	93.9

Table 1

Calibration Values for Microphones

Nominal outer diameter	Model	Calibration value (dB)
1 inch	UC-11	93.8
	UC-27	93.8
	UC-25	93.5
	UC-34	93.8
1/2 inch	UC-26	93.9
	UC-30	94.0
	UC-31	93.9
	UC-52	93.9
	UC-53A	94.0
	UC-57	94.1
	UC-59	94.0
	MS-10	93.9

Table 2

Depending on the microphone model, there will be a slight difference in sound pressure level inside the coupler. This is due to differences in the microphone front cavity volume and diaphragm equivalent volume, which cause a difference in the total volume of the coupler. For information on sound pressure level values for various microphone models (designated microphones), please refer to Table 3 (see page 15).

For microphones not listed in this table, you can calculate the sound pressure level from the load volume (front cavity volume + diaphragm equivalent volume), using the equation given below (approximate value).

1-inch microphone

Sound pressure level (dB) = $94.00 + (V_L - 1025) \times (- 0.00072)$

1/2-inch microphone

Sound pressure level (dB) = $94.00 + \{(V_L + 767) - 1025\} \times (- 0.00072)$

V_L (mm^3): Effective load volume of a microphone (front cavity volume + diaphragm equivalent volume)

Specified Microphones and Sound Pressure Levels

Specified Microphone		Specified Sound Pressure Level (dB)
1-inch microphones		
RION	UC-11 (with protective grid)	94.00
	UC-27 (with protective grid)	94.00
	UC-25 (with protective grid)	93.91
	UC-34 (with protective grid)	93.87
B&K	4160 (without protective grid)	94.25
TOKYO RIKO	MR-103 (without protective grid)	94.26
1/2-inch microphones *		
RION	UC-26 (with protective grid)	93.91
	UC-30 (with protective grid)	93.98
	UC-31 (with protective grid)	94.04
	UC-33P (with protective grid)	94.03
	UC-52 (with protective grid)	94.10
	UC-53A (with protective grid)	94.00
	UC-57 (with protective grid)	94.05
	UC-59 (with protective grid)	94.02
	MS-10 (with protective grid)	93.99
B&K	4180 (without protective grid)	94.16

* Using 1/2-inch microphone adapter NC-74-002

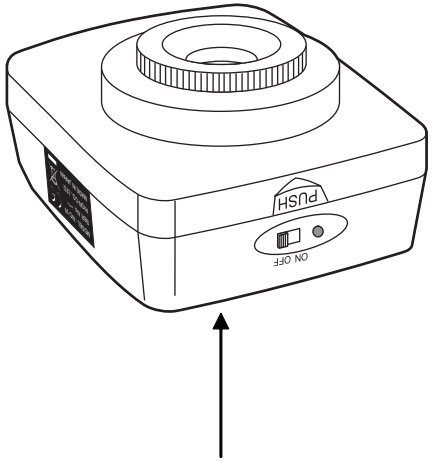
Table 3

Sound pressure level tolerance: ±0.3 dB

Electromagnetic Compatibility

Reference orientation for testing effects of exposure to radiofrequency fields:

Opposite side of microphone insertion opening (see illustration below)



Reference orientation for testing effects of exposure to radiofrequency fields

Radiofrequency emissions

Electromagnetic field strength of radiofrequency emissions produced by the unit (quasi-peak value at a distance of 10 m)

Frequency range 30 MHz to 230 MHz: 30 dB (reference 1 μV/m) or less

Frequency range 230 MHz to 1 GHz: 37 dB (reference 1 μV/m) or less

The configuration for greatest radiofrequency emissions: power ON

Immunity to electrostatic discharges

No malfunction after the following electrostatic discharge tests

- Contact discharge: up to ±4 kV (versus ground potential)
- Non-contact discharge: up to ±8 kV (versus ground potential)

Immunity to power-frequency magnetic fields and radiofrequency electromagnetic fields

Sound pressure level deviation when placed under the influence of power-frequency magnetic fields and radiofrequency electromagnetic fields as specified below:

within ±0.3 dB

- Electromagnetic field strength up to 10 V/m rms (non-modulated), frequency range 26 MHz to 1 GHz, 900 Hz sinusoidal wave, 80% amplitude modulation
- AC magnetic field strength up to 80 A/m rms, frequency 50 Hz and 60 Hz

The configuration that produce minimum immunity (maximum susceptibility) to power-frequency magnetic fields and radiofrequency electromagnetic fields:

power ON

Specifications

Applicable standards IEC 60942:2003 (Electroacoustics - Sound calibrators) Class 1

Specified microphones

1-inch microphones

IEC 61094-1 Type LS1P

UC-27, UC-11, UC-25, UC-34

1/2-inch microphones

IEC 61094-1 Type LS2aP

UC-53A, UC-52, UC-26, UC-30, UC-31, UC-33P, UC-57, UC-59

(Using 1/2-inch microphone adapter NC-74-002)

Reference conditions

Ambient temperature

23ºC

Static pressure 101.325 kPa

Relative humidity 50%

Effective load volume of a microphone

1025 mm^3 [total coupler volume 12004 mm^3 (typical value)]

Nominal sound pressure level
94 dB
Specified sound pressure level
94.0 dB (at reference conditions)
Sound pressure level tolerance
±0.3 dB
Sound pressure level stabilization duration
After power-on: 5 seconds or less
After microphone insertion:
30 seconds or less
Sound pressure level stability (short-term fluctuations)
±0.1 dB (within ambient conditions for operation)
[20 s, Time Weighting F (IEC 61672-1:2002)]
Nominal frequency 1000 Hz
Specified frequency 1000 Hz
Frequency tolerance ±1.0% (at reference conditions)
Frequency stabilization duration
After power-on: 5 seconds or less

Frequency stability ±0.5% (within ambient conditions for operation)
(20 s, average time 1 s)

Total distortion of generated sound pressure
3.0% max. (20 Hz to 20 kHz, within ambient conditions for operation)

Influence of static pressure, ambient temperature and humidity (at ambient ratings given below)

Sound pressure level (deviation from value for reference conditions)
within ±0.4 dB

Frequency (deviation from value for reference conditions)
within ±1.0%

Ambient ratings Ambient temperature: -10 to +50ºC
Static pressure: 65 to 108 kPa
Relative humidity: 25 to 90% RH

1/2-inch microphone adapter (supplied accessory)

Model designation
NC-74-002

Load volume 767 mm^3 (typical value)

Sound pressure level variation caused by effective microphone load volume variation

-0.00072 dB/mm^3 (typical value)

Power supply: Two IEC LR6 (size AA) alkaline batteries

Power supply voltage

Nominal 3.0 V, Maximum 3.3 V, Minimum 2.3 V

Specified sound pressure level deviation within power supply voltage range

Max. 0.1 dB from specified sound pressure level at nominal power supply voltage (reference conditions)

Battery life: 30 hours minimum (using two LR6 batteries, at reference conditions)

Ambient conditions for storage

-20 to +60ºC (no condensation)

Ambient conditions for operation

Ambient temperature

-10 to +50ºC

Static pressure: 65 to 108 kPa

Relative humidity

10 to 90% RH (no condensation)

Permissible ambient sound level
84 dB max.

Electromagnetic compatibility
EN60942:2003 (IEC 60942:2003), EN61326:1997 compliant

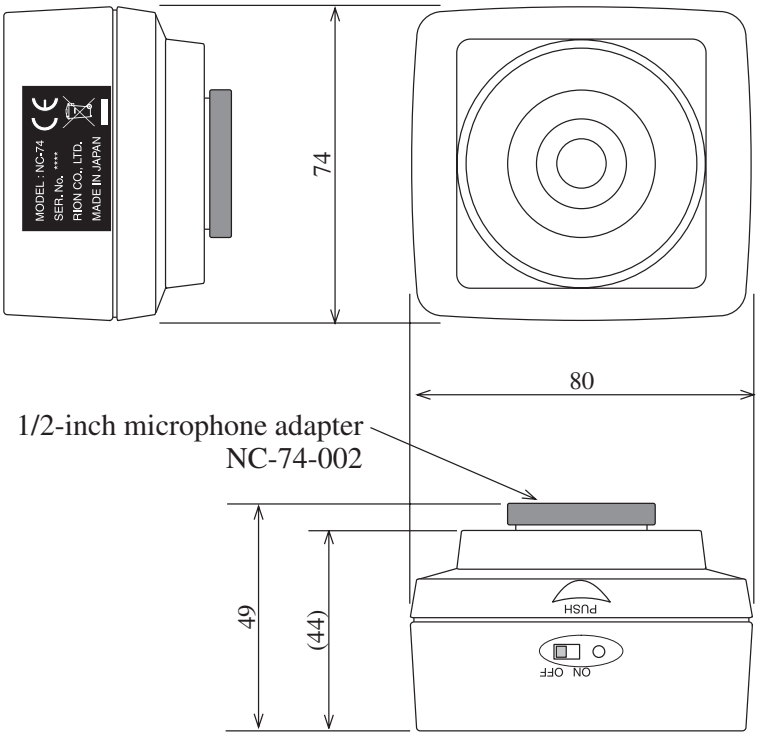
Dimensions: approx. 80 × 74 × 49 mm

Weight: approx. 200 g (including batteries)

Atmospheric pressure compensation
The NC-74 automatically compensates for sound pressure fluctuations caused by changes in static pressure. Sound pressure level deviation between 65 and 108 kPa is within ±0.3 dB from the value for 101.325 kPa.

Supplied accessories

Soft case	1
IEC LR6 (size AA) alkaline battery	2
1/2-inch microphone adapter NC-74-002	1
Instruction manual	1
Inspection certificate	1



Unit: mm

Dimensional Drawings

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