INSTRUCTION MANUAL

Sound Level Measuring Amplifier

NA-42

RION CO., LTD.

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

Organization of this manual

This manual describes the features and operation of the Sound Level Measuring Amplifier NA-42.

The manual contains the following sections.

Outline

Gives basic information on the configuration and features of the unit, and contains a block diagram.

Controls and Features

Briefly identifies and explains all parts of the unit.

Preparations

Describes installation, connections, inserting batteries, pre-use checks and other steps.

Measurement

Describes the steps for measurement.

Comparator

Describes how to use the comparator function.

Serial Interface

Describes how to use the serial interface for connection to a computer.

Technical Reference

Provides additional information that is helpful for using the unit.

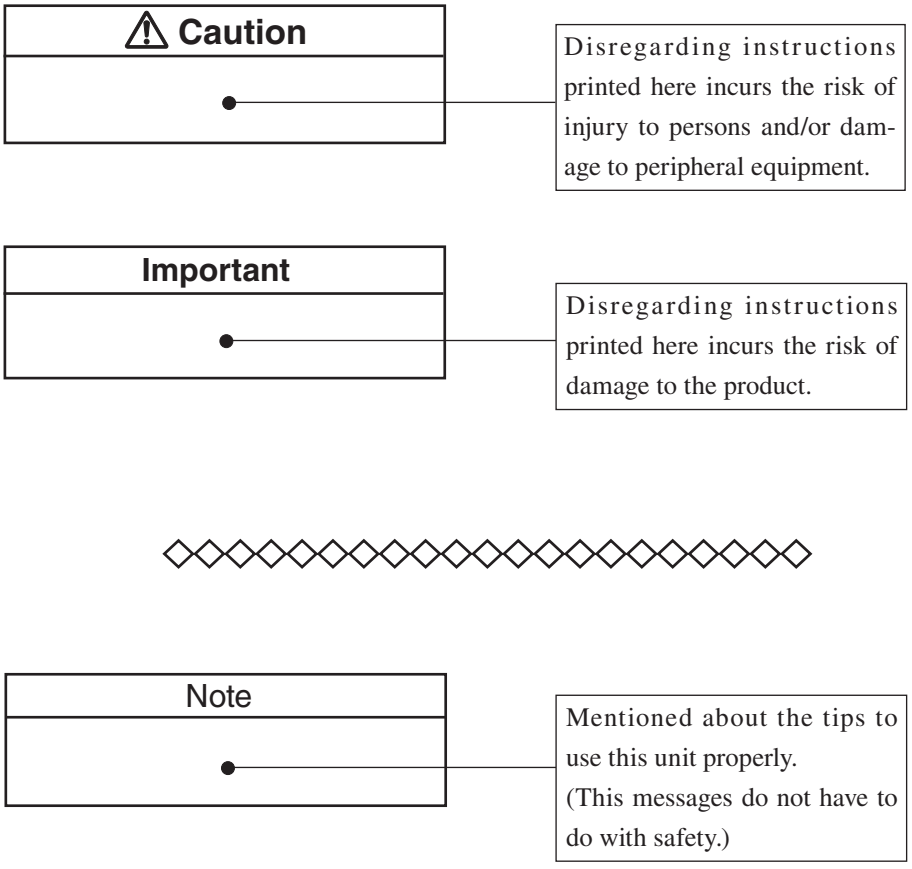
Specifications

Lists the technical specifications of the unit.

* 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 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.



Precautions

- Operate the unit only as described in this manual.
- Protect the unit from shocks and vibration. Be especially careful not to touch the microphone membrane to avoid damage. The membrane is an extremely thin metal film which can be damaged easily.
- Ambient conditions for operation of the unit are as follows: temperature range -10 to +50°C, relative humidity 10 to 90%.
  Protect the unit from water, dust, extreme temperatures, humidity, and direct sunlight during storage and use. Also keep the unit away from air with high salt or sulphur content, gases, and stored chemicals.
- Always turn the unit off after use. Remove the batteries from the unit if it is not to be used for a long time. When disconnecting cables, always grasp the plug and do not pull the cable.
- Before using the microphone and before putting it away, always check that the microphone grid has not become loose. If this has happened, refasten the microphone grid firmly and then use or store the microphone.
- Clean the unit only by wiping it with a soft, dry cloth or, when necessary, with a cloth lightly moistened with water. Do not use any solvents, cleaning alcohol or cleaning agents.
- Do not try to disassemble the unit or attempt internal alterations.
  In case of an apparent malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.
- To ensure continued precision, have the unit checked and serviced at regular intervals.
- Dispose of batteries in accordance with local laws and regulations.
- Do not tap the LCD panel for example with your finger or a pen, to prevent possible malfunction or damage.

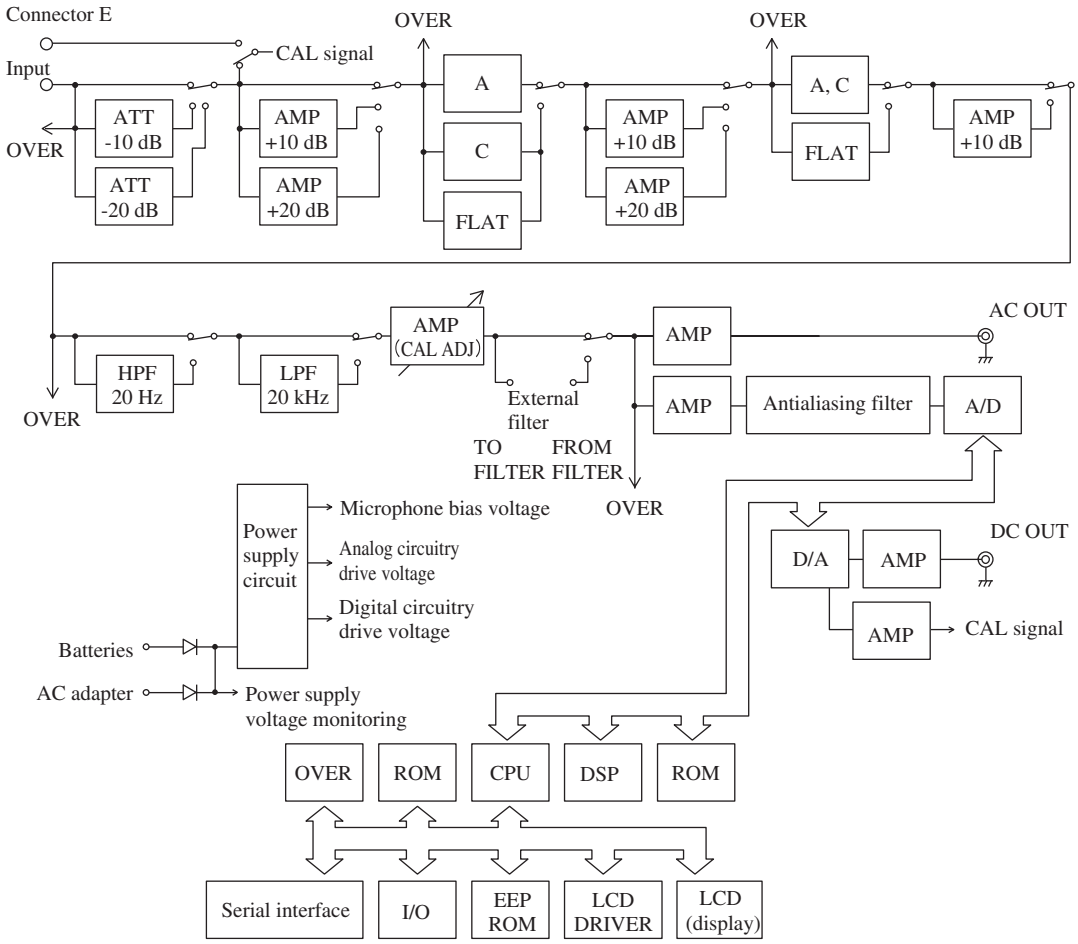
⚠ Caution
Some pins of the INPUT connector carry a high voltage. To prevent the risk of electric shock, never insert a metal clip or any other pointed object into the input connector.

Contents

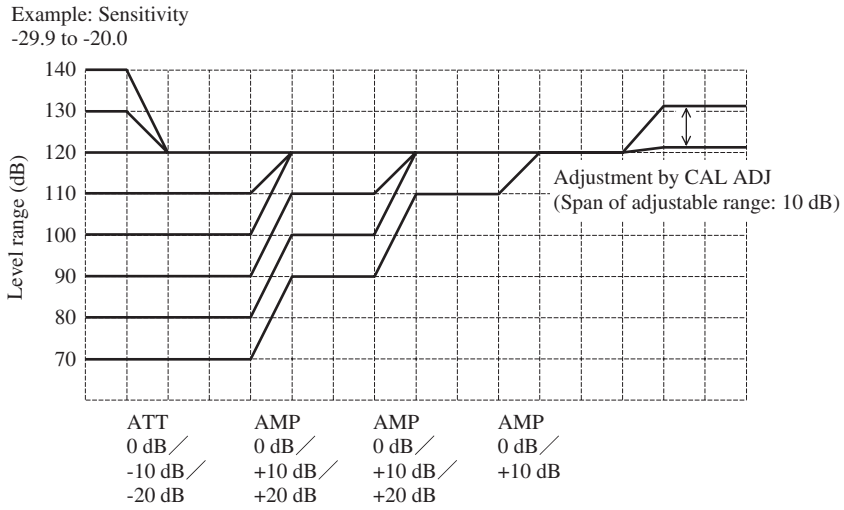
Outline

The NA-42 is a sound level measuring amplifier covering a wide frequency range and level range. It allows connection of various types of microphones such as the low-noise microphone UC-34P or the 100-kHz range microphone UC-29.
For general acoustic measurements and for environmental measurements, selectable frequency weightings (A, C, and FLAT) and time weightings (FAST, SLOW, IMPULSE) are provided. Other measurement modes allow determining maximum values for sound level, as well as peak sound level.
Measurement result readout resolution can be switched to one or two decimal points, and the large LCD panel shows setting information as well.
The choice of outputs includes AC, DC, serial interface, as well as a comparator output, making the unit suitable for use in a wide range of measurement and monitoring applications.

The unit uses a box-type design that makes it easily portable. Because it can be powered from the supplied AC adapter or from batteries, it is suitable for use in the field or in research facilities.



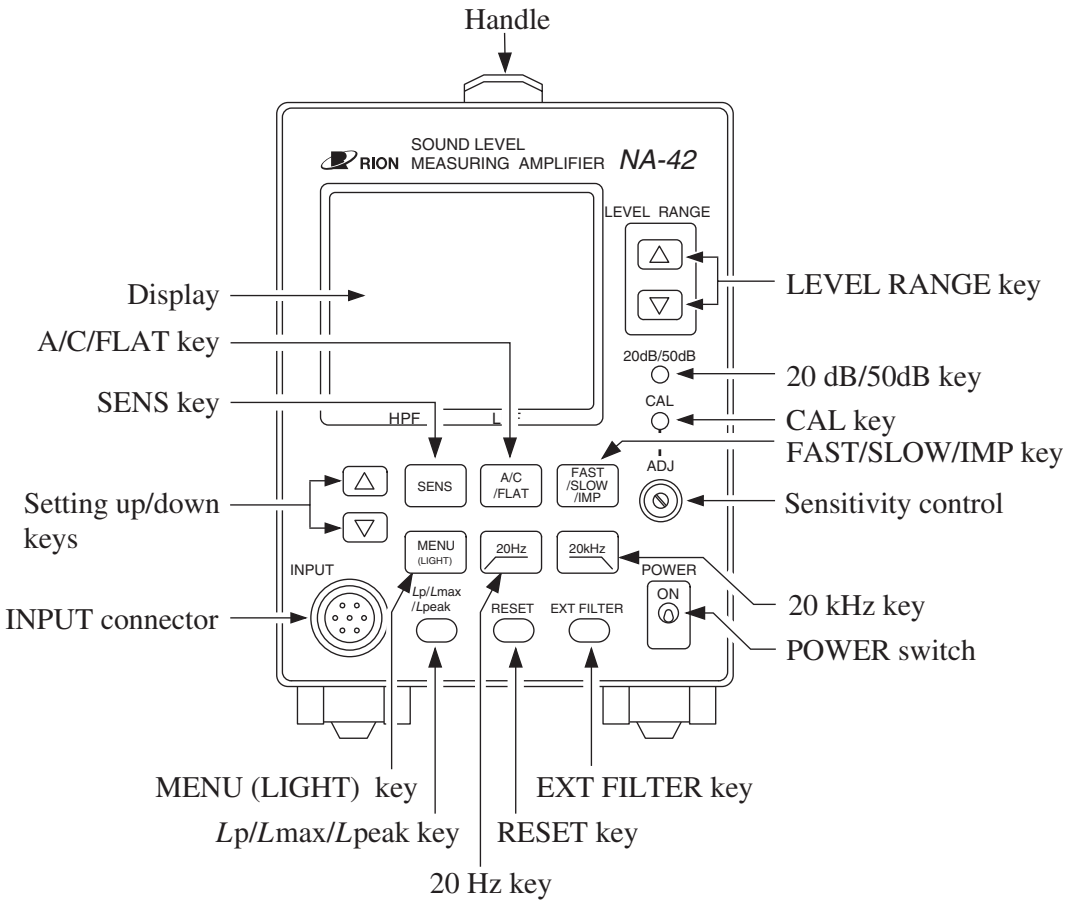
Main Unit Block Diagram



Main Unit Gain Diagram

Controls and Features

Front Panel



LEVEL RANGE keys

Serve to shift the range up or down. The △ key switches the range up, and the ▽ key switches the range down. When the PREAMP power selector on the rear panel of the unit is set to ±45V, these keys are disabled (page 38).

20 dB/50 dB key

Toggles the bar graph display range between 20 and 50 dB.

CAL key

Activates the built-in oscillator for electrical calibration.

FAST/SLOW/IMP key

Selects the time weightings. Available settings are FAST, SLOW, and IMP (IMPULSE).

Sensitivity control

Serves to adjust the unit to match the microphone sensitivity.

20 kHz key

Switches the low-pass filter (LPF) on and off. When the filter is on, signal components above 20 kHz are sharply attenuated.

POWER switch

Turns the unit on and off.

EXT FILTER key

Switches an external filter on and off.

RESET key

The function of this key depends on the current operation mode of the unit.

- When set to maximum sound level (L_{max})

  Resets the currently held measurement value.
- When set to peak sound level (L_{peak})

  Resets the currently held measurement value.
- During remote operation via serial interface

  Terminates remote operation and switches the unit to local mode.
- When power is off

  Switching power on while holding down the RESET key returns the unit to the factory default settings (except for the setting of the PREAMP power selector on the rear panel and the microphone sensitivity setting).

20 Hz key

Switches the high-pass filter (HPF) on and off. When the filter is on, signal components below 20 Hz are sharply attenuated.

*L*p/*L*max/*L*peak key

Switches the measurement mode to sound level L_p, maximum sound level L_{max}, or peak sound level L_{peak}.

MENU (LIGHT) key

Pressing this key brings up the menu. Use the setting up/down keys to make a selection.

Holding down the MENU (LIGHT) key for at least 2 seconds switches the display backlight on or off. When the unit is running on batteries, the backlight is automatically turned off after 10 minutes.

Switching power on while holding down the MENU (LIGHT) key calls up the software version.

INPUT connector

The microphone preamplifier is connected here. The sensitivity of the unit must be adjusted to match the microphone sensitivity.

The connector is a 7-pin connector (TAJIMI ELECTRONICS CO., LTD.).

A:	Preamplifier power supply +12 V or +45 V	
B:	Ground	
C:	Signal input	
D:	Preamplifier power supply -12 V or -45 V	
E:	30 V DC	Microphone bias voltage (when preamplifier gain is set to 20 dB)
	Ground	When preamplifier gain is set to 0 dB
	Calibration signal output	When INSERT CAL is selected
F:	60 V DC	Microphone bias voltage
G:	200 V DC	Microphone bias voltage

> **⚠ Caution**
>
> To prevent the risk of electric shock, never insert a metal clip or any other pointed object into the input connector.

Setting up/down keys

These keys are used for setting the microphone sensitivity or for making a selection from a menu.

SENS key

Pressing this key activates the mode for setting the microphone sensitivity. The setting range is -69.99 to -10.00 dB. Use the setting up/down keys to adjust the setting.

The setting resolution is one decimal point when the readout resolution is set to 0.1 dB and two decimal points when the readout resolution is set to 0.01 dB.

A/C/FLAT key

This key selects the frequency weightings. Available settings are A weighting, C weighting, and flat response.

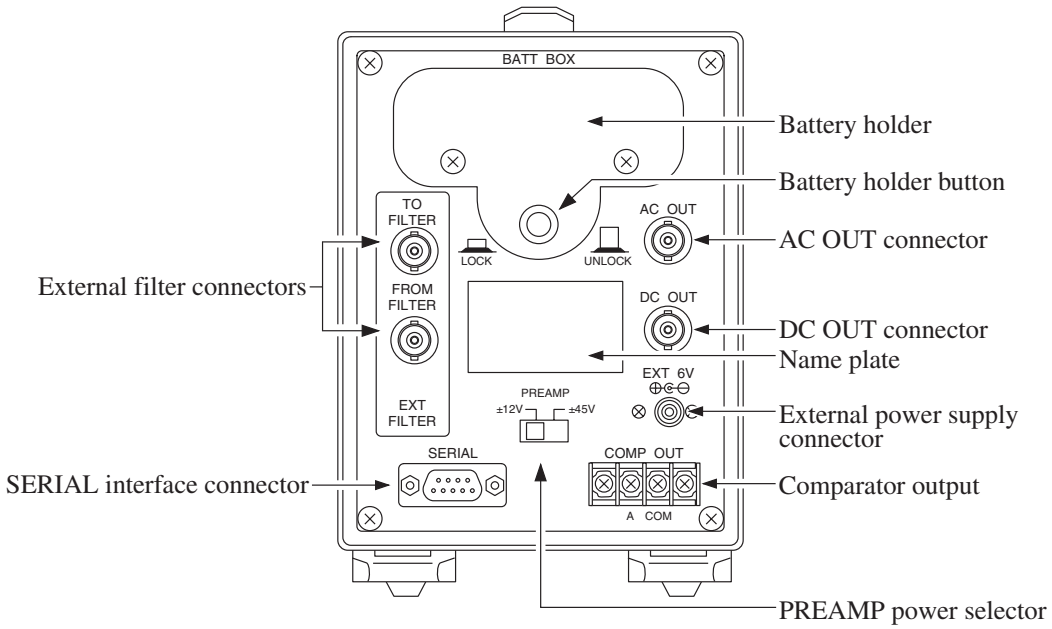
Display

Shows measurement values and key setting information.

Handle

Serves for carrying the unit. Allowable weight is 250 N.

Rear Panel



Battery holder

Four IEC R14 (size "C") batteries can be inserted here.

Battery holder button

Pressing this button sets the lid lock to on or off.

AC OUT connector

An AC signal corresponding to the measured value is supplied at this connector.

The scale range is 1 Vrms, and output impedance is 600 Ω.

DC OUT connector

A DC signal corresponding to the measured value is supplied at this connector.

The scale range is 6 V (1 V/10 dB), and output impedance is 50 Ω.

Name plate

The serial number of the unit is shown here.

External power supply connector

The dedicated AC adapter NC-98A is connected here.

Comparator output

This is an open-collector output with an A contact and COM contact.

PREAMP power selector

Selects ±12 V or ±45 V as power supply voltage for a connected preamplifier. The default setting is ±12 V.

Preamplifiers compatible with both ±12 V and ±45 V

NH-01, NH-04, NH-05, NH-11, NH-12, NH-14, NH-16, NH-17, NH-17A, NH-19, NH-20, NH-28

Preamplifiers compatible only with ±12 V (do not set to ±45 V)

UC-34P (NH-34), UC-24, UC-91, UC-92

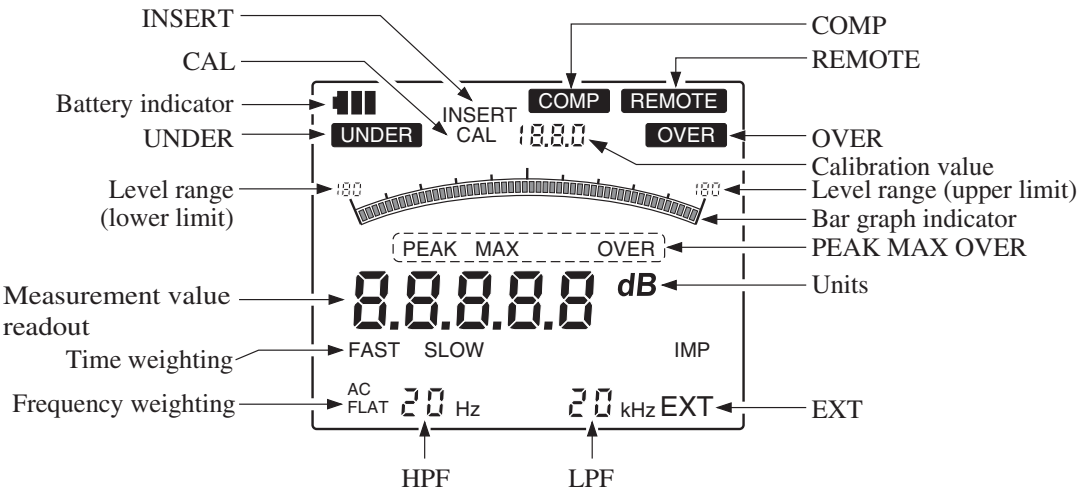
SERIAL interface connector

This D-sub 9-pin male connector is for the built-in serial interface.

External filter connectors

Allow connection of an external filter to the unit.

Display



COMP

Appears when the comparator function is activated.

The comparator function can be selected from a menu.

REMOTE

Appears when the unit is in the remote mode (page 59).

OVER

Appears when the input signal has exceeded the overload threshold. When this happens, correct measurement is not possible.

Calibration value

During calibration, the calibration value is shown here. The value is 6 dB below the level range maximum. In other operation modes, the indication "P20" is shown here if preamplifier gain was set to 20 dB with a menu selection (Using UC-34P).

Level range

Shows the selected level range.

Bar graph indicator

Corresponds to the level of the input signal.

PEAK MAX OVER

"MAX" is shown here if the L_{max} function is selected. When the L_{peak} function is selected, "PEAK" is shown.

If an overload condition has occurred for either L_{max} or L_{peak}, the indication "OVER" appears and remains on until hold data are reset.

Units

"dB" is shown here.

EXT

Appears when an external filter is used.

LPF

"20 kHz" is shown here if the low-pass filter is activated.

HPF

"20 Hz" is shown here if the high-pass filter is activated.

Frequency weighting

The selected frequency weightings are indicated here.

Time weighting

The selected time weightings are indicated here.

Measurement value readout

The current measurement value is shown here. The readout resolution of the display can be set to 0.1 dB or 0.01 dB with menu 3. During sensitivity adjustment, the sensitivity is shown. During use of the menus, the current setting item is shown here.

Level range (lower limit)

The lower limit of the level range is shown here.

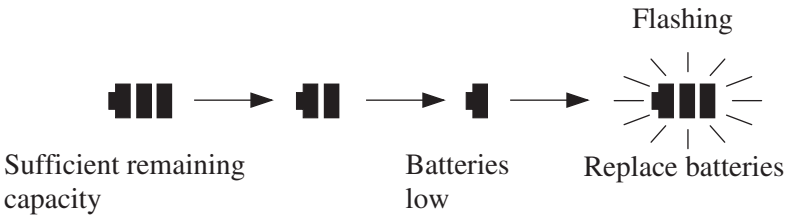
When the bar graph range is 50 dB, the value shown here corresponds to (level range -50 dB). When the bar graph range is 20 dB, the value shown here corresponds to (level range -20 dB).

UNDER

Appears when the input signal has fallen to more than 50.5 dB below the selected level range value.

Battery indicator

Shows the remaining battery capacity.



CAL

Appears during calibration.

INSERT

Appears when the insert preamplifier function is used. This setting is available from a menu.

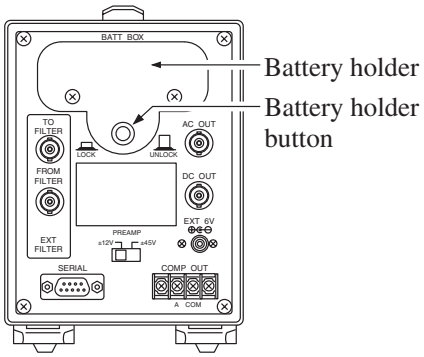
Preparations

Power Supply

This unit can be operated either on four IEC R14 (size C) batteries or an AC adapter (supplied accessories).

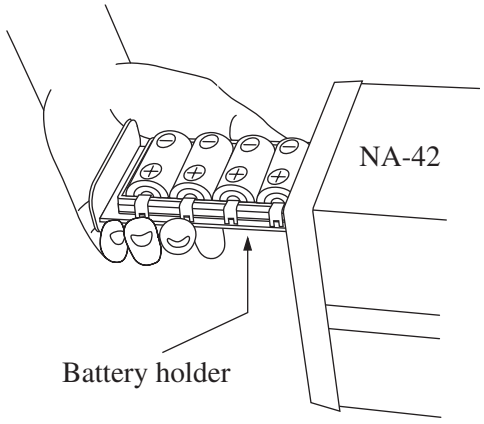
Inserting Batteries

Unlock the battery holder by pressing the battery holder button and pull out the battery holder. After replacing the batteries, push the battery holder back into the unit. Be sure to lock the holder by pressing the battery holder button again.



Important

- While inserting or removing batteries, support the battery holder by hand.



- Take care not to insert batteries with wrong polarity.
- While not using the unit, the batteries should be removed.
- When opening the battery holder, take care that no foreign objects or dirt get deposited in the holder.
- Do not mix old and new batteries, or different types of batteries.

Battery life

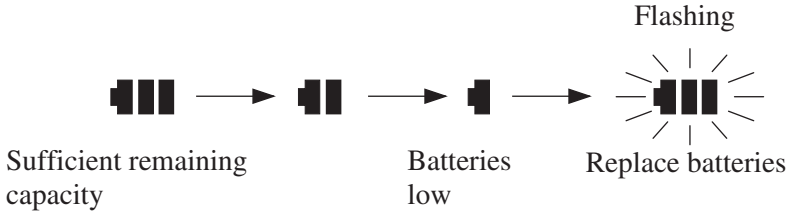
Alkaline batteries LR14 approx. 14 hours
Manganese batteries R14P approx. 6 hours

- The above values were determined under the following conditions. 20°C 50% RH, microphone UC-53A, preamplifier NH-17, power supply for preamplifier ±12 V, backlight OFF, communications OFF, continuous operation.
- The actual battery life will differ, depending on the microphone, preamplifier, settings, ambient conditions, and battery type.

When the backlight is used, current consumption will be about 15% higher. When the preamplifier power supply voltage is set to ±45 V, current consumption increases by 70%. During use of the serial interface, current consumption increases by 5%.

Remaining battery capacity indication

The following indication appears on the display, depending on the battery status.



Note
When the battery indicator start to flash, replace the batteries immediately. While the indicator is flashing, the measurement will not be accurate.

AC Adapter

The unit can be powered from the supplied AC adapter NC-98A (100 to 240 VAC, 50/60 Hz).

Connect the cable from the AC adapter to the external power supply connector on the rear panel.

Important
To prevent the risk of damage, do not use any AC adapter other than the NC-98A.

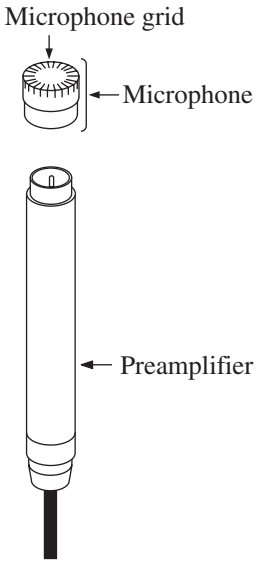
Microphone and Preamplifier Connection

The proper selection of microphone and preamplifier depends on various factors, such as the level to be measured, frequency range, purpose of the measurement, etc. (For details, see the section "Technical Reference" starting on page 81.)

Connect the microphone/preamplifier to the INPUT connector. For preamplifiers without cables and for extending existing cables, the condenser microphone extension cable series EC-04 is available as an option.

Condenser microphone extension cable series EC-04

Model	Length	Model	Length
EC-04	2 m	EC-04C	30 m (reel section) + 5 m (link section)
EC-04A	5 m	EC-04D	50 m (reel section) + 5 m (link section)
EC-04B	10 m	EC-04E	100 m (reel section) + 5 m (link section)



Important

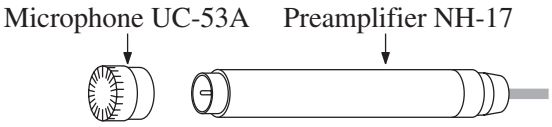
Preamplifier power supply
Normally, the PREAMP power selector on the rear panel should be set to ±12 V. If wishing to set the selector to ±45 V, first make sure that the preamplifier (microphone) is compatible with this voltage.
Preamplifiers compatible with both ±12 V and ±45 V
NH-01, NH-04, NH-05, NH-11, NH-12, NH-14, NH-16, NH-17, NH-17A, NH-19, NH-20, NH-28
Preamplifiers compatible only with ±12 V
UC-34P (NH-34), UC-24, UC-91, UC-92

Before using the microphone and before putting it away, always check that the microphone grid has not become loose. If this has happened, refasten the microphone grid firmly and then use or store the microphone.

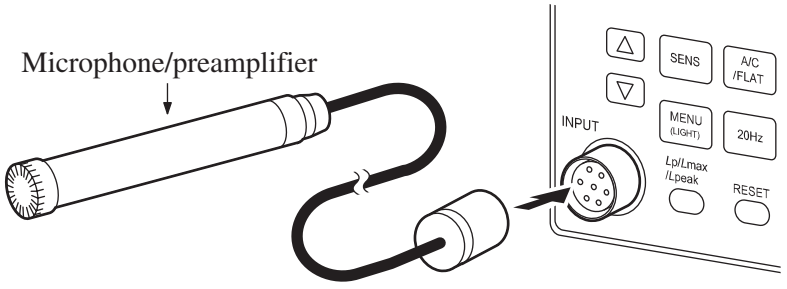
1) Using the microphone UC-53A and preamplifier NH-17

1. Mount the microphone UC-53A on the preamplifier NH-17.

Important
The microphone is a precision instrument that must be protected from shocks. If the microphone is accidentally dropped, sensitivity and frequency response may be impaired.



2. Confirm that the NA-42 is turned off. Then connect the preamplifier to the NA-42 with the cable of the preamplifier.



If you want to extend the cable, use the optional condenser microphone extension cable series EC-04.

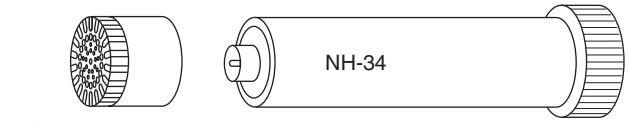
Condenser microphone extension cable series EC-04

Model	Length	Model	Length
EC-04	2 m	EC-04C	30 m (reel section) + 5 m (link section)
EC-04A	5 m	EC-04D	50 m (reel section) + 5 m (link section)
EC-04B	10 m	EC-04E	100 m (reel section) + 5 m (link section)

3. Turn power to the NA-42 on and proceed to "Calibration" on page 20.

2) Using the UC-34P (microphone UC-34, preamplifier NH-34)

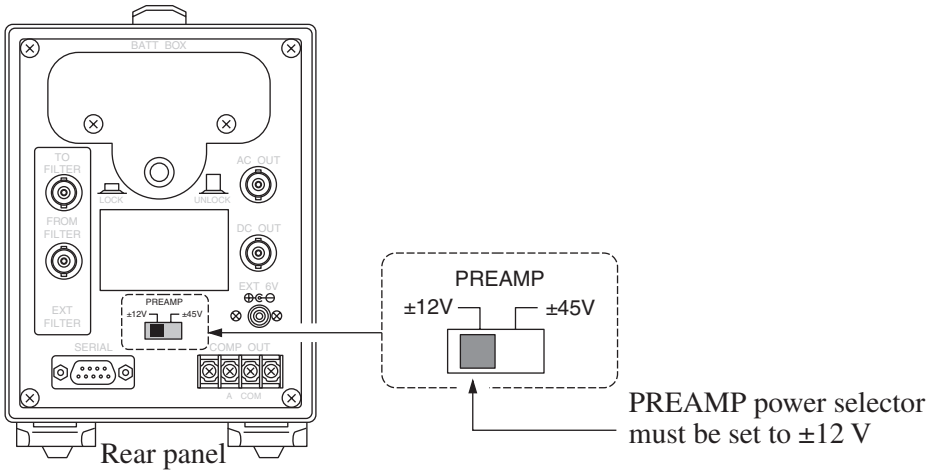
1. Mount the microphone UC-34 on the preamplifier NH-34.



Microphone UC-34 Preamplifier NH-34

Important
The microphone is a precision instrument that must be protected from shocks. If the microphone is accidentally dropped, sensitivity and frequency response may be impaired.

2. Confirm that the NA-42 is turned off and that the PREAMP power selector on the rear panel is set to ±12 V.



Important
The preamplifier (NH-34) is not compatible with ±45 V. Make sure that the PREAMP power selector is set to ±12 V.

3. Using the optional condenser microphone extension cable series EC-04, connect the preamplifier to the NA-42.

Condenser microphone extension cable series EC-04

Model	Length	Model	Length
EC-04	2 m	EC-04C	30 m (reel section) + 5 m (link section)
EC-04A	5 m	EC-04D	50 m (reel section) + 5 m (link section)
EC-04B	10 m	EC-04E	100 m (reel section) + 5 m (link section)

4. Turn the unit on and activate menu 1.

Note
Menu 1 serves to set the preamplifier gain. When preamplifier gain is set to 20 dB, the lower measurement limit will be 20 dB less than for the 0 dB setting, allowing measurement of lower levels (only when using UC-34P).

5. Proceed to "Calibration" on page 20.

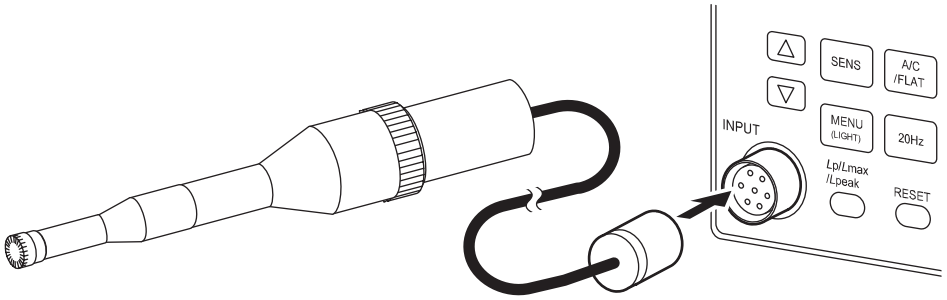
3) Using the microphone UC-29 and preamplifier NH-05

1. Mount the microphone UC-29 on the adapter UA-12, and then mount the assembly on the preamplifier NH-05.

Important
The microphone is a precision instrument that must be protected from shocks. If the microphone is accidentally dropped, sensitivity and frequency response may be impaired.

Microphone UC-29 Adapter UA-12 Preamplifier NH-05

2. Confirm that the NA-42 is turned off. Then connect the preamplifier to the NA-42 with the cable of the preamplifier.



If you want to extend the cable, use the optional condenser microphone extension cable series EC-04.

Condenser microphone extension cable series EC-04

Model	Length	Model	Length
EC-04	2 m	EC-04C	30 m (reel section) + 5 m (link section)
EC-04A	5 m	EC-04D	50 m (reel section) + 5 m (link section)
EC-04B	10 m	EC-04E	100 m (reel section) + 5 m (link section)

3. Turn power to the NA-42 on and proceed to "Calibration" on page 20.

Calibration

Before starting a measurement, the unit must be calibrated.
There are three types of calibration.

1) Electrical calibration with a tone from a built-in signal generator
2) Calibration with a pistonphone or a sound calibrator
3) Insert CAL calibration

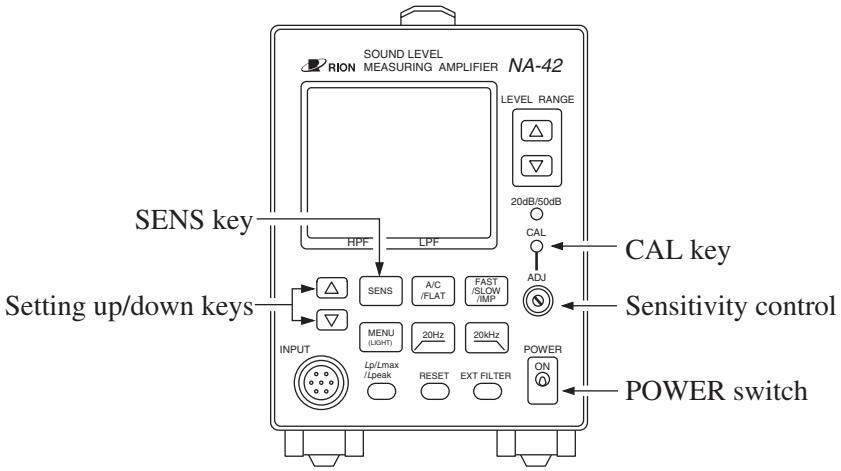
After turning on the unit, wait at least 2 minutes to let the circuits stabilize.

1) Electrical calibration

The unit can be calibrated using the built-in signal generator (1 kHz, sinusoidal wave signal).

Microphone sensitivity adjustment

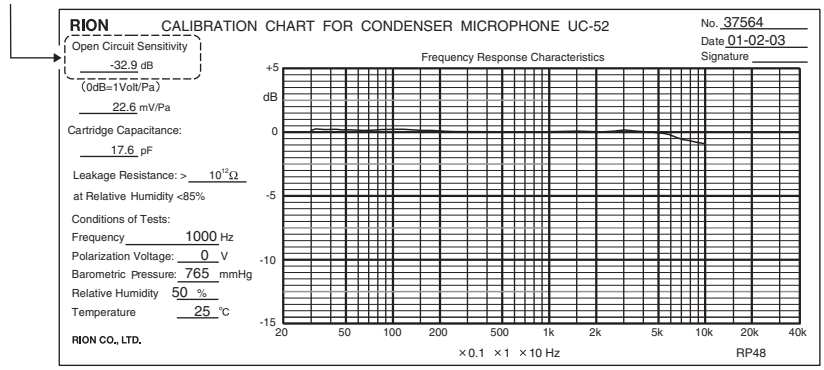
1. Turn the unit on.
2. Press the SENS key.
3. Use the setting (△, ▽) keys to set the value for the microphone (preamplifier).



The sensitivity setting is the microphone sensitivity plus the preamplifier loss.

The microphone sensitivity is the value given on the calibration chart attached with the microphone (see below).

The microphone sensitivity



Calibration chart

The preamplifier loss (caused by static capacitance of microphone and preamplifier) is as shown in the table below for various combinations of microphone and preamplifier.

Microphone / Preamplifier	1 inch	1/2 inch			1/4 inch
	UC-27 UC-32P	UC-30 UC-31 UC-33P	UC-26 UC-28	UC-52 UC-53A	UC-29
NH-04 NH-12	-0.1	-0.4	—	—	—
NH-06	-0.3	—	—	—	—
NH-01 NH-11	—	—	-0.4	—	—
NH-17 NH-17A	—	—	—	-0.3	—
NH-05	—	—	—	—	-0.9

Unit: dB

Example

1/2-inch condenser microphone UC-52 (sensitivity -32.9 dB) and preamplifier NH-17A (loss -0.3):

(-32.9) + (-0.3) = -33.2

The setting is -33.2 (-33.20).

Note
When the 0.1 dB readout resolution has been chosen with menu 3, the sensitivity setting range extends to first decimal place. When the 0.01 dB readout resolution has been chosen, the sensitivity setting range extends to second decimal place. If the sensitivity has been set with second decimal place and the readout resolution is then switched back to 0.1 dB, the second decimal place sensitivity setting still remains active until changed.

4. Press the SENS key on the front panel to return to the measurement screen.
5. Set the level range according to the sensitivity setting, as shown in the table below.

Conditions		Level range (dB)							
Preamplifier gain 0 dB / 20 dB	Microphone sensitivity (dB)								
0 dB	-19.99 to -10.00	60	70	80	90	100	110	120	130
	-29.99 to -20.00	70	80	90	100	110	120	130	140
	-39.99 to -30.00	80	90	100	110	120	130	140	150
	-49.99 to -40.00	90	100	110	120	130	140	150	160
	-59.99 to -50.00	100	110	120	130	140	150	160	170
	-69.99 to -60.00	110	120	130	140	150	160	170	180
20 dB *	-19.99 to -10.00	40	50	60	70	80	90	100	–
	-29.99 to -20.00	50	60	70	80	90	100	110	–

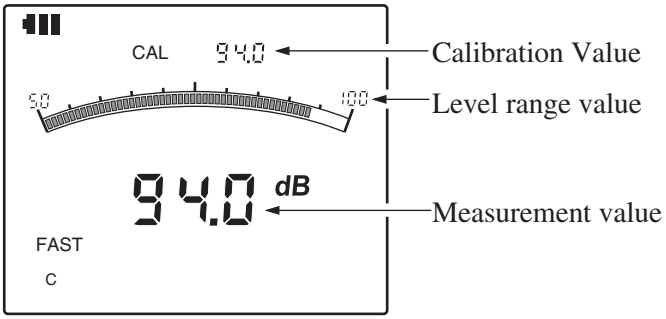
When the preamplifier power supply voltage is set to ±12 V, choose this level range.

When the preamplifier power supply voltage is set to ±45 V, only the underlined settings are available and the LEVEL RANGE keys are disabled.

* The preamplifier gain setting of 20 dB is available only when the UC-34P (UC-34, NH-34) is connected.

6. Press the CAL key to activate the calibration mode. Measurement parameters are automatically set to C weighting and FAST.

7. Use the supplied screwdriver to adjust the sensitivity control on the front panel to the calibration value (under 6 dB of the level range value).



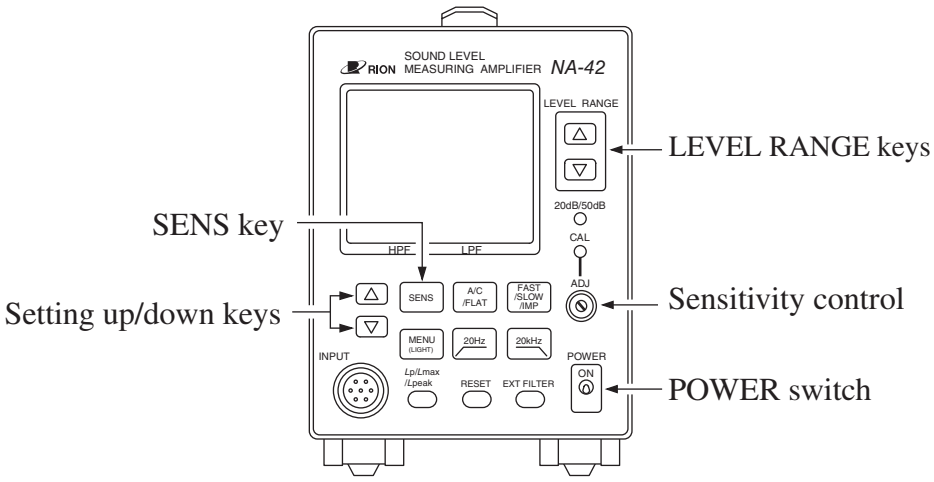
Calibration example for level range 100

2) Calibration with pistonphone NC-72A or sound calibrator NC-74

For this type of calibration, the pistonphone NC-72A or sound calibrator NC-74 is mounted on the microphone and the sensitivity control is adjusted so that the sound level indication matches the sound level in the coupler.

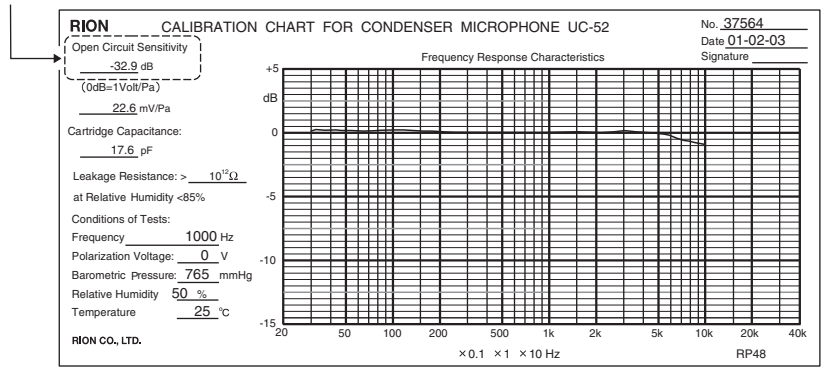
Important
Insert and remove the microphone into and from the pistonphone NC-72A or sound calibrator NC-74 very slowly and carefully, since the pressure change could otherwise damage the diaphragm of the microphone.

1. Turn power to the pistonphone NC-72A or sound calibrator NC-74 off.
2. Turn power to the NA-42 on.
3. Press the SENS key on the front panel.



4. Use the setting (△, ▽) keys to adjust the sensitivity.
   The microphone sensitivity is the value given on the calibration chart accompanying the microphone (see below).

The microphone sensitivity



Calibration chart

The preamplifier loss (caused by static capacitance of microphone and preamplifier) is as shown in the table below for various combinations of microphone and preamplifier.

Microphone / Preamplifier	1 inch	1/2 inch			1/4 inch
	UC-27 UC-32P	UC-30 UC-31 UC-33P	UC-26 UC-28	UC-52 UC-53A	UC-29
NH-04 NH-12	-0.1	-0.4	—	—	—
NH-06	-0.3	—	—	—	—
NH-01 NH-11	—	—	-0.4	—	—
NH-17 NH-17A	—	—	—	-0.3	—
NH-05	—	—	—	—	-0.9

Unit: dB

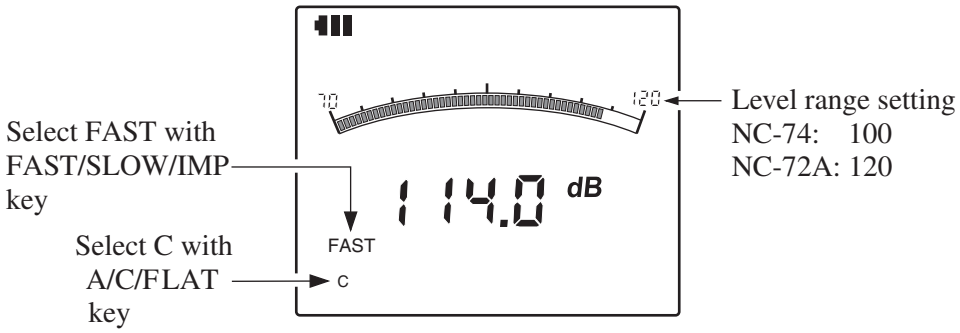
Example

1/2-inch condenser microphone UC-52 (sensitivity -32.9 dB) and preamplifier NH-17A (loss -0.3):

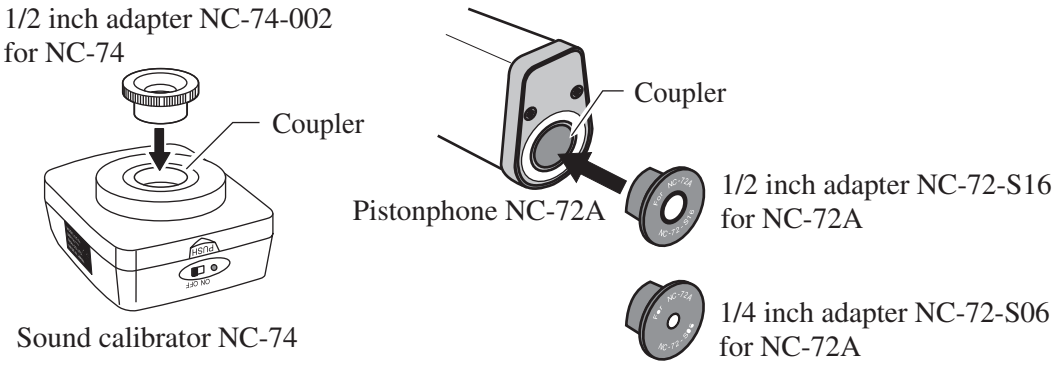
(-32.9) + (-0.3) = -33.2

The setting is -33.2 (-33.20).

5. Press the SENS key on the front panel to return to the measurement screen.
6. Use the LEVEL RANGE keys to set the level range to "100" if the NC-74 is used, or to "120" if the NC-72A is used.



7. When a 1/2-inch condenser microphone is used for calibration, mount the 1/2-inch adapter to the pistonphone NC-72A or sound calibrator NC-74.
   For 1-inch condenser microphones, the adapter is not required.



Note
For 1/4-inch microphones, the pistonphone NC-72A comes with a 1/4-inch adapter. There is no 1/4-inch adapter for the NC-74.

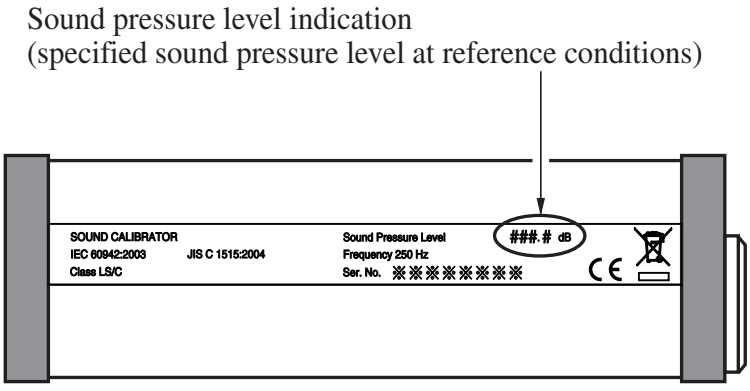
8. Insert the microphone **very carefully and slowly** all the way into the coupler.
9. Set the power switch of the sound calibrator or the pistonphone to ON.

10. Use the supplied screwdriver to adjust the sensitivity control to the specified value.

    When using the sound calibrator NC-74, the calibration values are as follows.

Nominal outer diameter	Designation	Calibration value (dB)
1 inch	UC-11	93.8
	UC-27	93.8
	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

    When using the pistonphone NC-72A, adjust the control to the output sound pressure level value shown on the pistonphone.



11. Turn power to the NA-42 and pistonphone NC-72A or sound calibrator NC-74 off.

12. Remove the microphone **very carefully and slowly** from the coupler.

Note

For details on operation of the NC-74 or NC-72A, please refer to the instruction manual for them. For information about compensation for atmospheric pressure, please refer to the documentation of the pistonphone NC-72A.

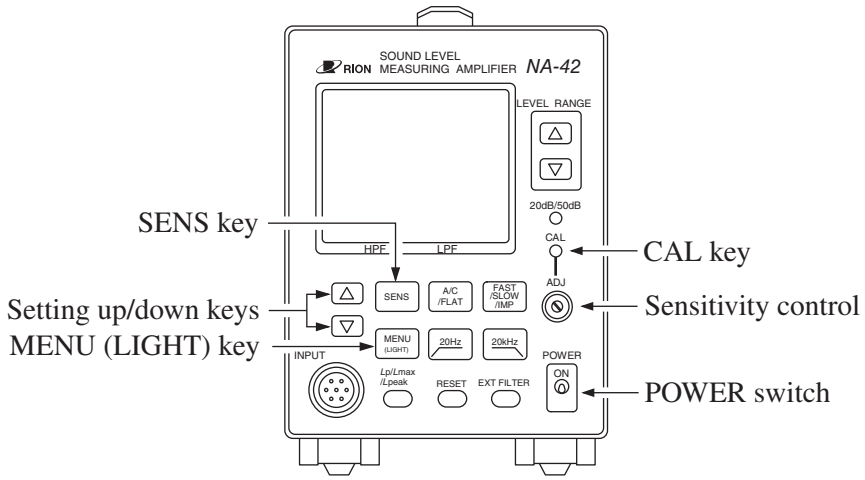
The NC-74 is designed to produce 94.0 dB under its rated conditions, but in actual calibration, the sound field compensation value which depends on the sound level meter must be taken into consideration.
Adjust the NA-42 as follows, depending on the microphone in use.

Nominal outer diameter	Designation	Calibration value (dB)
1 inch	UC-11	93.8
	UC-27	93.8
	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

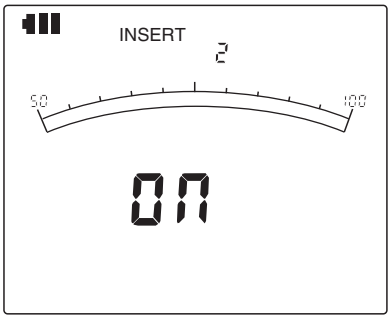
3) Insert CAL calibration

The NA-42 allows calibration using the "Insert CAL" method. For this method, a dedicated preamplifier is used.

1. Turn power to the NA-42 off and connect the Insert CAL preamplifier NH-08 and the microphone.
2. Turn power to the NA-42 on.

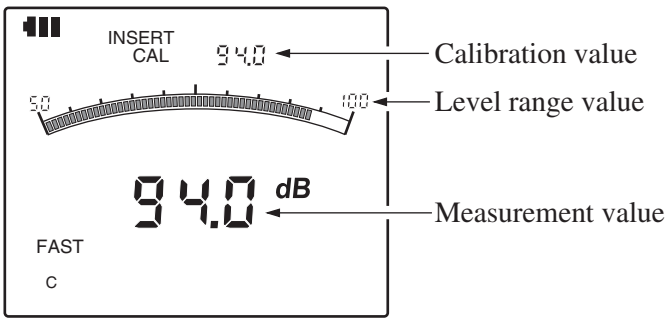


3. Press the MENU (LIGHT) key to call up the menu screen (→ p. 47).



4. On menu 3, select the setting "ON" with the setting up/down keys.
5. Press the MENU (LIGHT) key several times to return to the measurement screen.
6. Press the SENS key on the front panel.
7. Use the setting (△, ▽) keys to set the microphone sensitivity.

8. Press the CAL key to activate the calibration mode.



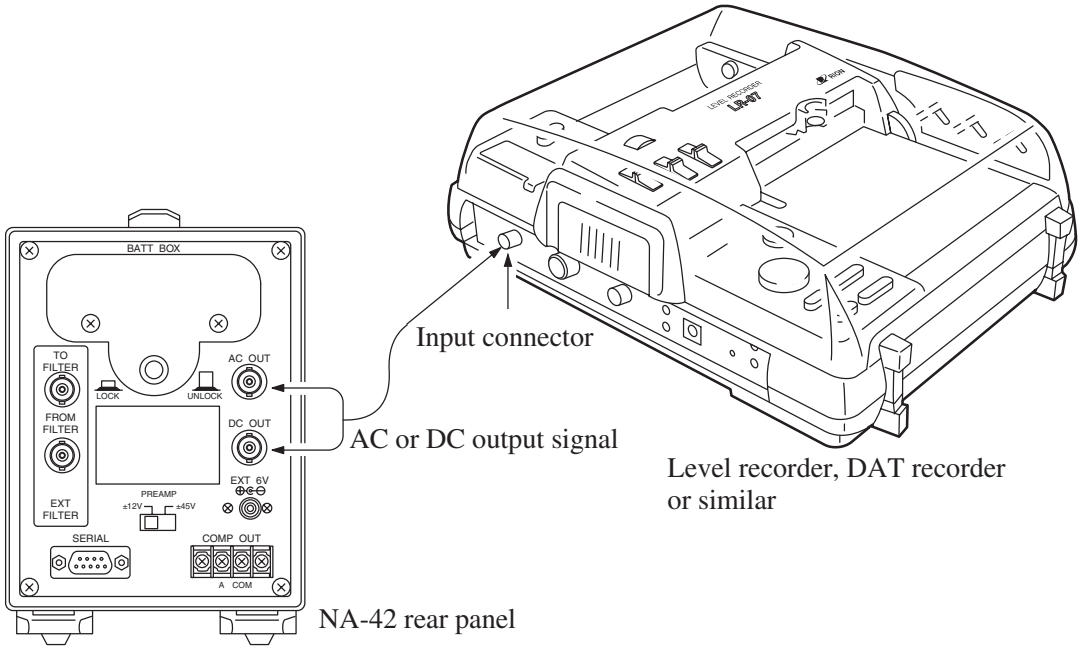
Calibration example for level range 100

Measurement parameters are automatically set to C weighting and FAST.

9. Use the supplied screwdriver to adjust the sensitivity control on the front panel to the calibration value (94.0 dB in the example shown above).

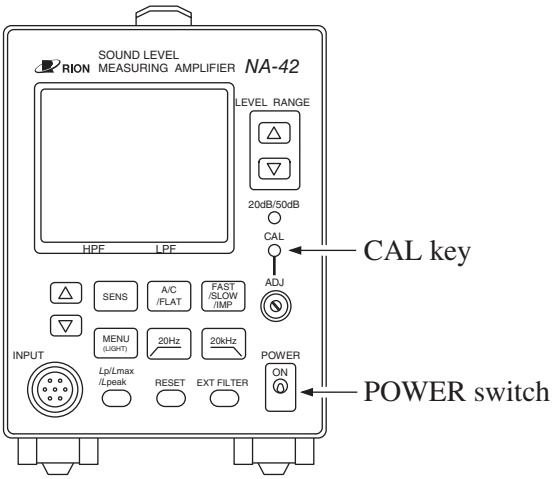
Signal output for calibrating external devices

To enable calibration of external devices, a calibration signal can be output also for level ranges other than the range selected during calibration. Before calibrating external devices, calibration of the NA-42 as described in the section starting on page 20 must be completed first.

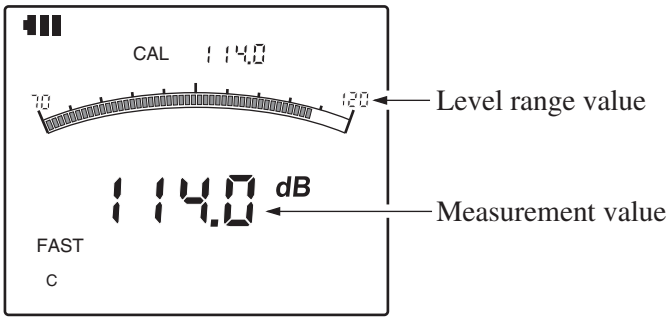


This is an example for the level range 120 dB.

1. Before making any connections, turn power to the NA-42 and to the external device off. Then connect the device and turn power on.



2. Set the level range to 120 and press the CAL key.

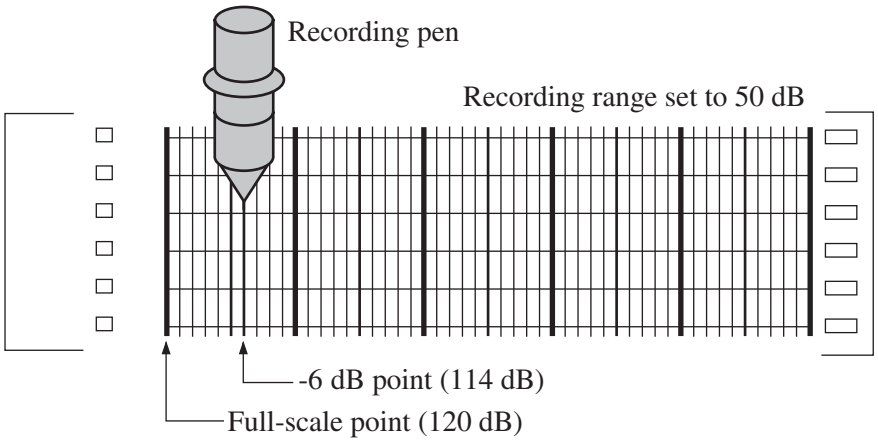


3. The AC OUT and DC OUT connectors carry a signal that corresponds to the displayed measurement value. (The AC output signal is a 1 kHz sinusoidal wave signal.)
   Use this signal to calibrate the external device.

Using the level recorder LR-04, LR-06, LR-07, LR-20A

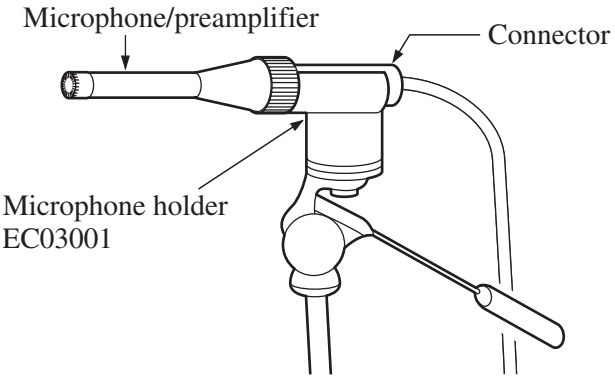
Use the level control on the level recorder to adjust the pen position.

In this example, the level range is 120 dB and the measurement value 114 dB. Therefore the pen position should be adjusted to -6 dB under the upper scale limit of 120 dB.



Using a Tripod

When mounting the microphone on the optional tripod, first fasten the microphone holder to the tripod.

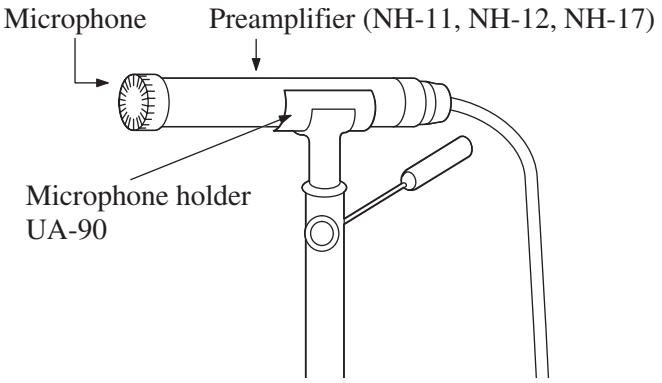


All-weather windscreen tripod ST-81

Microphone holder

UA-90	NH-17, NH-11, NH-12
EC03001	NH-01, NH-04, NH-05, NH-06, NH-34

The EC03001 is supplied with the condenser microphones EC-04, EC-04A, and EC-04B.

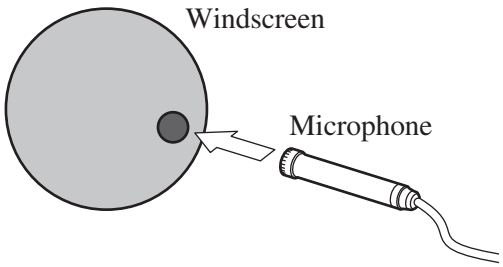


All-weather windscreen tripod ST-81

Using a Windscreen

When making outdoor measurements in windy weather or when measuring air conditioning equipment or similar, wind noise at the microphone can cause measurement errors. To prevent this, an optional windscreen can be mounted to the microphone.

For details on the effect of the windscreen upon the measurement, please refer to "Technical Reference" (page 92).



Available windscreens

WS-01 For 1-inch microphones
UC-34P, UC-27, UC-32P

WS-02 For 1/2-inch microphones
UC-53A, UC-28, UC-30, UC-31, UC-33P, UC-52

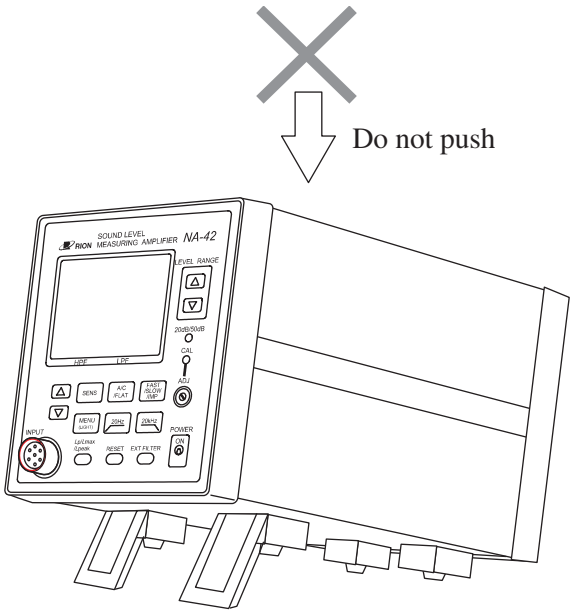
WS-03 For 1/4-inch microphones
UC-29

Using the Prop-up Feet

The unit can be tilted by flipping out the prop-up feet. Tilt the feet until they snap in place.

Important

When using the prop-up feet, do not place objects on top of the NA-42 and do not push down on the unit.



Prop-up feet

Measurement

Power-On

Important
Preamplifier power supply Normally, the PREAMP power selector on the rear panel should be set to ±12 V. If wishing to set the selector to ±45 V, first make sure that the preamplifier (microphone) is compatible with this voltage. Preamplifiers compatible with both ±12 V and ±45 V NH-01, NH-04, NH-05, NH-11, NH-12, NH-14, NH-16, NH-17, NH-17A, NH-19, NH-20, NH-28 Preamplifiers compatible only with ±12 V UC-34P (NH-34), UC-24, UC-91, UC-92

When the unit is turned on, the same settings as used before the unit was turned off are reestablished (resume function), and measurement starts.

Settings memorized by resume function	Settings not memorized by resume function
Level range	Calibration
High-pass filter	Backlight status
Low-pass filter	Microphone sensitivity setting status
Microphone sensitivity	Menu setting status
Menu 1 contents	Comparator status
Menu 3 to 5 contents	Remote status
Bar graph display range (20 dB/50 dB)	L_{max} function
Frequency weighting	L_{peak} function
Time weighting	
External filter	

After turning on the unit, wait at least 2 minutes to let the circuits stabilize, and start measurement only after calibration was completed.

Level Range Setting

Setting procedure

Use the LEVEL RANGE keys to select an appropriate setting, where the OVER or UNDER indication does not appear in normal operation.
If the input signal level is too high for the selected range, the indication OVER appears. In this condition, correct measurement is not possible.

Available level range settings
The available level range settings depend on the preamplifier gain, microphone sensitivity, and preamplifier power supply setting.

Conditions		Level range (dB)							
Preamplifier gain 0 dB/20 dB	Microphone sensitivity (dB)								
0 dB	-19.99 to -10.00	60	70	80	90	100	110	120	130
	-29.99 to -20.00	70	80	90	100	110	120	130	140
	-39.99 to -30.00	80	90	100	110	120	130	140	150
	-49.99 to -40.00	90	100	110	120	130	140	150	160
	-59.99 to -50.00	100	110	120	130	140	150	160	170
	-69.99 to -60.00	110	120	130	140	150	160	170	180
20 dB*	-19.99 to -10.00	40	50	60	70	80	90	100	–
	-29.99 to -20.00	50	60	70	80	90	100	110	–

When the preamplifier power supply voltage is set to ±12 V, these level range settings are available.

When the preamplifier power supply voltage is set to ±45 V, only the underlined settings are available and the LEVEL RANGE keys are disabled.

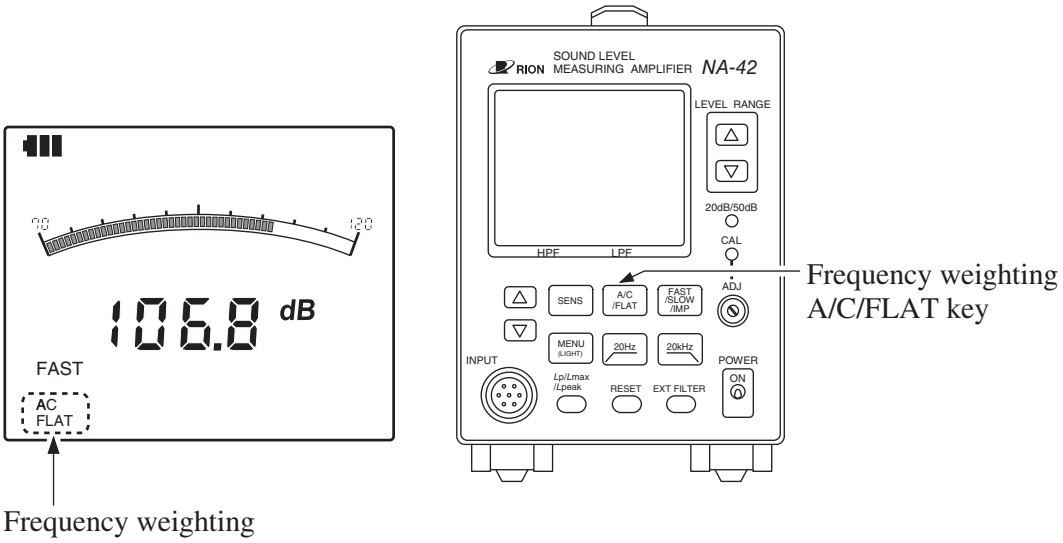
* The 20 dB setting for the preamplifier gain is available only when the UC-34P (UC-34, NH-34) is used.

Frequency Weighting Setting

Available frequency weighting settings are A weighting, C weighting, and FLAT.

Setting procedure

Press the A/C/FLAT key to select the desired setting. Each push of the key cycles through the following settings: A → C → FLAT → A.



For noise measurements, the "A" setting should be normally used. When you want to measure sound pressure level as a physical quantity, select the "FLAT" setting.

Depending on the microphone in use, frequencies up to 100 kHz can be measured.

With the "C" setting, frequency response is almost flat, but the influence of frequency components below 31.5 Hz and above 8 kHz is reduced.

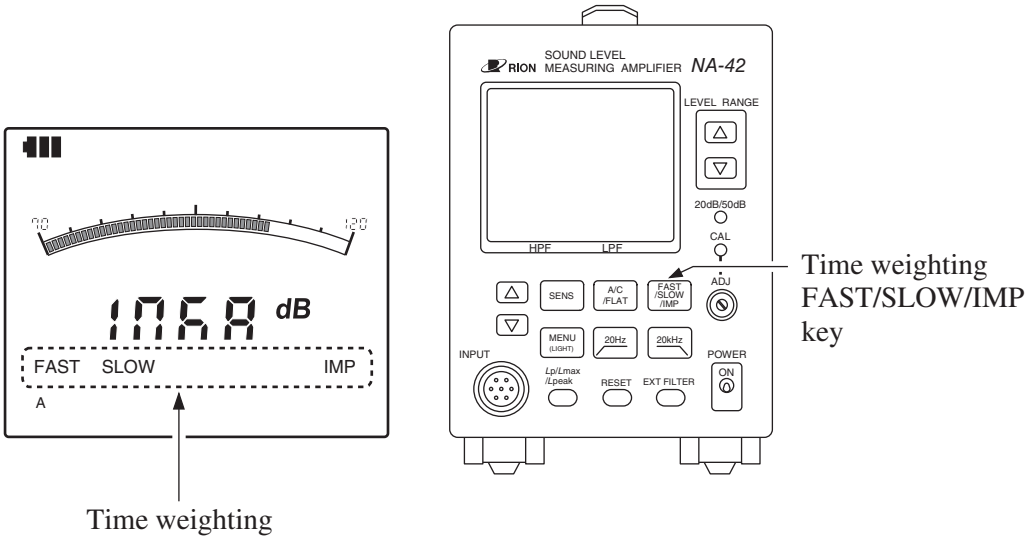
For details on frequency weightings, please refer to "Technical Reference" (page 95).

Time Weighting Setting

Available time weighting settings are FAST, SLOW, and IMP (impulse).

Setting procedure

Press the FAST/SLOW/IMP key to select the desired setting. Each push of the key cycles through the following settings: FAST → SLOW → IMP → FAST.



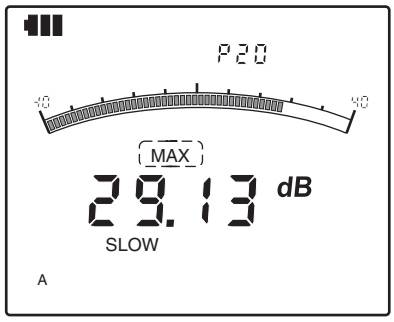
For normal measurements, the "FAST" setting should be used.

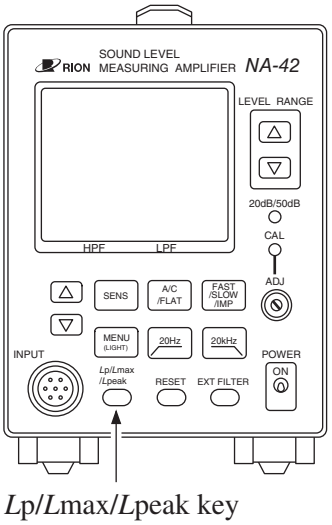
L_p / L_{max} / L_{peak} Setting

The measurement mode can be set to L_p (sound level), L_{max} (maximum sound level) or L_{peak} (peak sound level)

L_{max} (maximum sound level)

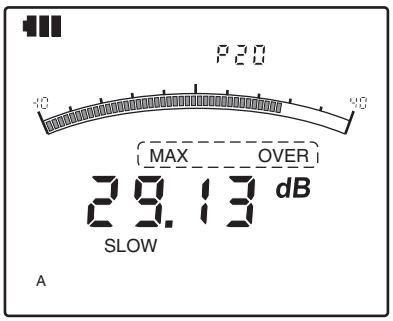
1. Press the *L*p/*L*max/*L*peak key to select the L_{max} setting. The indication "MAX" appears on the display.



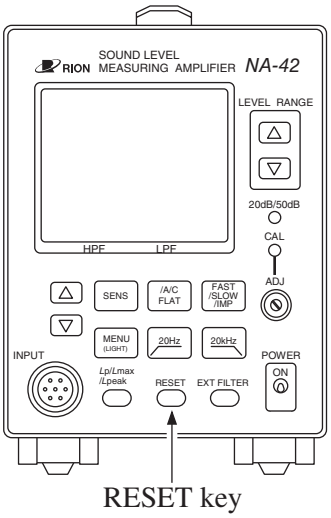


*L*p/*L*max/*L*peak key

2. When the L_{max} function is selected, the maximum sound level is held on the display. When a higher level is input, the display is updated.
3. When overload has occurred, the indication "MAX OVER" is shown, and the "OVER" indication is also held.

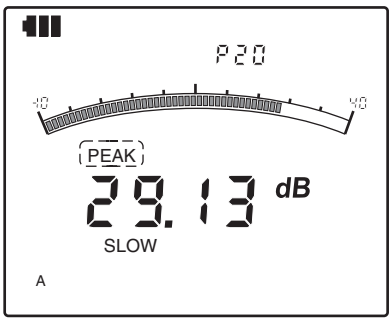


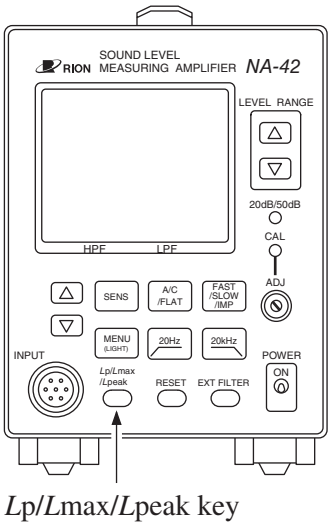
4. The RESET key can be used to reset the hold value.



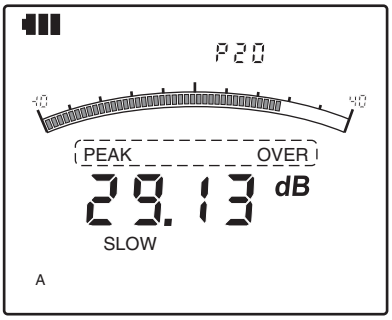
L_{peak} (peak sound level)

1. Press the *L*p/*L*max/*L*peak key to select the L_{peak} setting. The indication "PEAK" appears on the display. The input waveform peak value is held, using 250 kHz sampling.

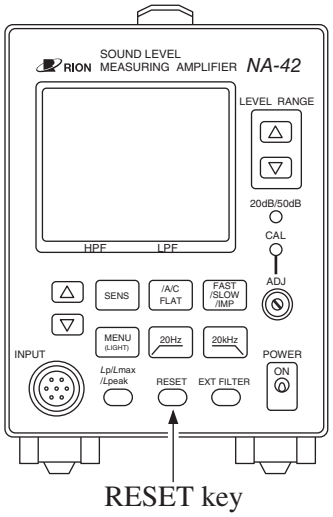




2. When the L_{peak} function is selected, the peak sound level of the measurement value is held. The display is updated whenever a higher value is input.
3. If the hold value has caused overload, PEAK OVER is shown.



4. The RESET key can be used to reset the hold value.

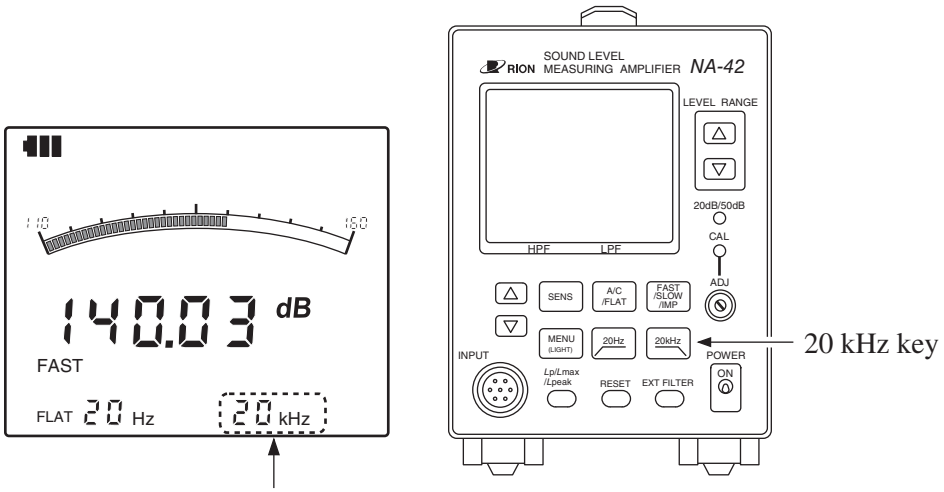


Low-Pass Filter Setting

The low-pass filter has a cutoff frequency of 20 kHz.

Setting procedure

Press the 20 kHz key to toggle the 20 kHz low-pass filter between ON and OFF. When the setting is ON, signal components above 20 kHz are sharply attenuated.



"20 kHz" indication appears when low-pass filter is set to ON. No indication is shown when filter is OFF.

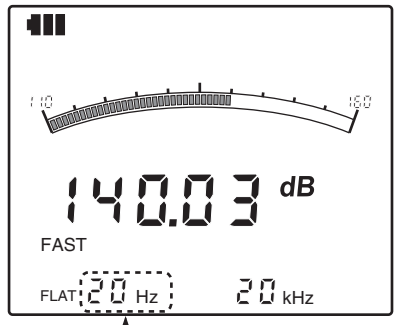
For details on low-pass filter characteristics, please refer to "Technical Reference" (page 95).

High-Pass Filter Setting

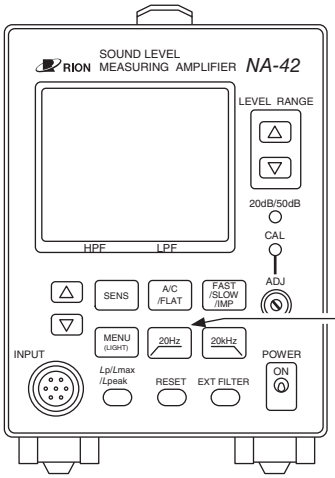
The high-pass filter has a cutoff frequency of 20 Hz.

Setting procedure

Press the 20 Hz key to toggle the 20 Hz high-pass filter between ON and OFF. When the setting is ON, signal components below 20 Hz are sharply attenuated.



"20 Hz" indication appears when high-pass filter is set to ON. No indication is shown when filter is OFF.



20 Hz key

For details on high-pass filter characteristics, please refer to "Technical Reference" (page 95).

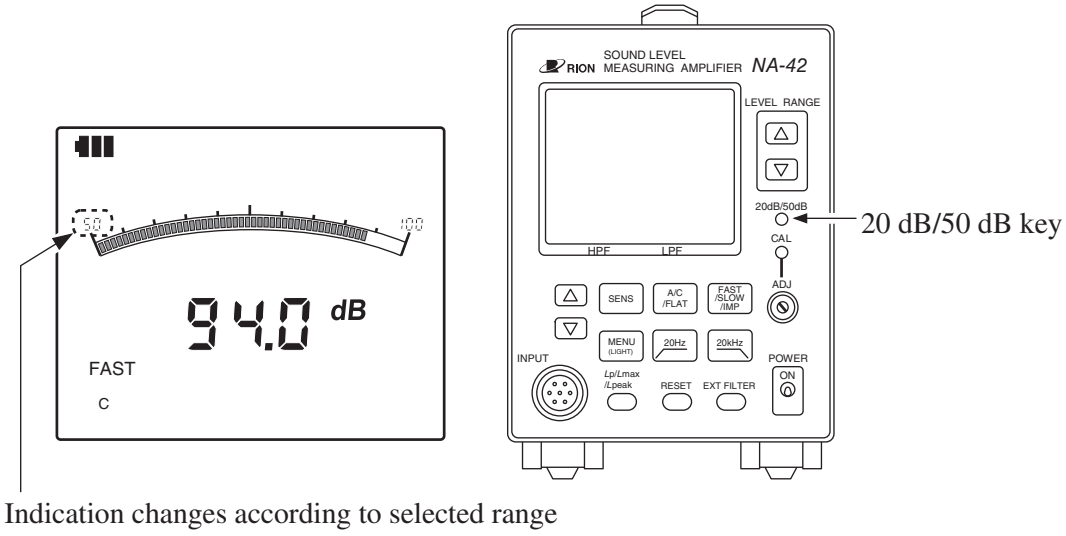
Bar Graph Display Range (20 dB/50 dB) Setting

The bar graph display range can be set to 20 dB or 50 dB.

Setting procedure

Press the 20 dB/50 dB key to toggle between the two settings.

Each push of the key switches between the following settings: 20 dB → 50 dB → 20 dB etc.



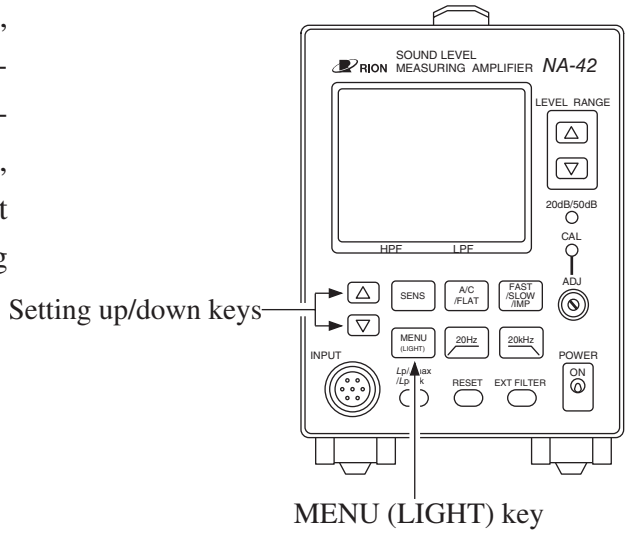
20 dB range: bar graph display resolution is 0.4 dB

50 dB range: bar graph display resolution is 1 dB

The bar graph update interval is 100 ms.

Menu Settings

Settings for preamplifier gain, insert ON/OFF, measurement value readout resolution, serial communication, and comparator measurement conditions are made using menus.

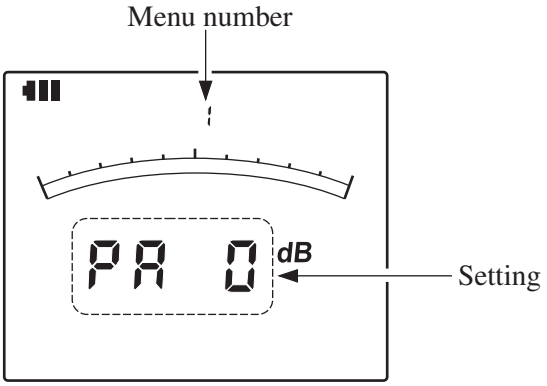


Setting procedure

1. Press the MENU (LIGHT) key.

Note
Pressing the MENU (LIGHT) key will not bring up the menu when the unit is in calibration mode, microphone sensitivity setting mode, L_{max} measurement mode, L_{peak} measurement mode, or remote mode.

2. When the menu is activated, the following screen appears.



Menu 1 example

Each push of the MENU (LIGHT) key cycles through the following menu numbers:
1 → 2 → 3 → 4.0 (4.1 → 4.2)*1 → 5.0 (5.1 → 5.2 → 5.3 → 5.4)*2 → measurement screen

*1 Appear when 9600 or 19200 was set with menu 4.0.

*2 Appear when menu 5.0 is set to ON.

3. Select the desired menu with the MENU (LIGHT) key, and change the flashing setting with the setting (△, ▽) keys.

Note
The selected settings become effective when switching back from the menu screens to the measurement screen.

Menu setting contents

Menu 1

Preamplifier gain 0 dB/20 dB

When set to 20 dB, pin E of the INPUT connector carries a microphone bias voltage of 30 V.

0 dB:	This setting should be selected normally.
20 dB:	Select this setting if the UC-34P (UC-34, NH-34) is connected and low-level measurement is to be carried out. When this setting is selected, the lower measurement limit is 20 dB below the threshold for 0 dB, allowing measurement of low-level sounds.

Menu 2

This menu is selected when the dedicated preamplifier for Insert CAL is connected.

ON:	Dedicated preamplifier for Insert CAL is used.
OFF:	Preamplifier other than dedicated preamplifier for Insert CAL is used. This is the normal setting.

About Insert CAL
When Insert CAL is set to ON, a calibration signal is output from pin E of the INPUT connector, allowing calibration that includes the microphone and preamplifier, for enhanced measurement precision.

Menu 3

Serves to set the measurement value readout resolution.

0.1 dB:	Measurement values are displayed down to first decimal place (0.1 dB readout resolution). The update interval is 1 second.
0.01 dB:	Measurement values are displayed down to second decimal place (0.01 dB readout resolution). The update interval is 200 milliseconds.

Note
The sensitivity setting range also changes with the 0.1 dB/0.01 dB setting.

Menu 4.0

Controls the setting for serial communication.

OFF: Serial communication is not used.

9600: Serial communication is used, and transfer rate is set to 9600 bps.

19200: Serial communication is used, and transfer rate is set to 19200 bps.

Important
When the Multi-Channel Adapter SC-31M or SC-31S is used, select the 19200 setting.

Note
When serial communication is not used, a setting of 9600 or 19200 will not affect the measurement, but current consumption will increase by 5%.

Menu 4.1

Allows setting the ID number for serial communication. The setting range is 00 to 15.

Menu 4.2

Sets the Multi-Channel Adapter SC-31M or SC-31S to ON or OFF.

SCOF: SC-31M/SC-31S is not used. Communication between a computer and a single NA-42 can be carried out.

SC31: SC-31M/SC-31S is used. Communication between a computer and multiple NA-42 units can be carried out.

Important
When the SC-31M or SC-31S is used, select the 19200 setting at menu 4.0.

Note
When menu 4.0 is set to OFF, menus 4.1 and 4.2 are not shown.

Menu 5.0

Sets the comparator to ON or OFF.

OFF: Comparator function is disabled.

ON: Comparator function is enabled.

Menu 5.1

Sets the comparator level.

The comparator level setting range is 0 to 180 dB, in 1-dB steps.

Menu 5.2

Sets the comparator delay time.

The comparator delay time setting range is 0 to 9 seconds, in 1-second steps.

Menu 5.3

Sets the comparator auto reset function to ON or OFF.

OFF: Comparator auto reset function is disabled.

ON: Comparator auto reset function is enabled.

Menu 5.4

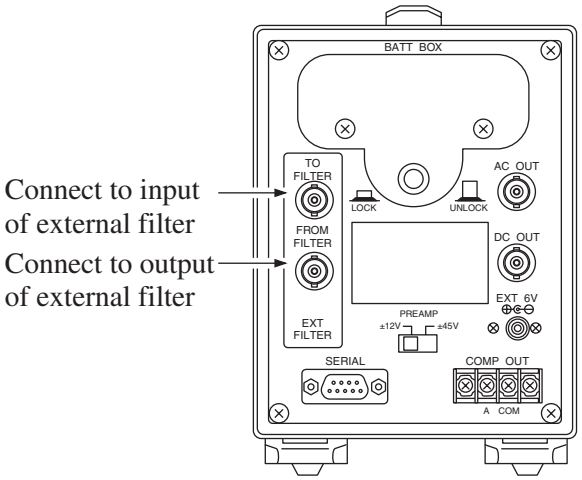
Sets the comparator auto reset time. The setting range is 0 seconds (indication A - 0) to 90 seconds (indication A - 90) in 1-second steps.

Note
When menu 5.0 is set to OFF, menus 5.1 to 5.4 are not shown.

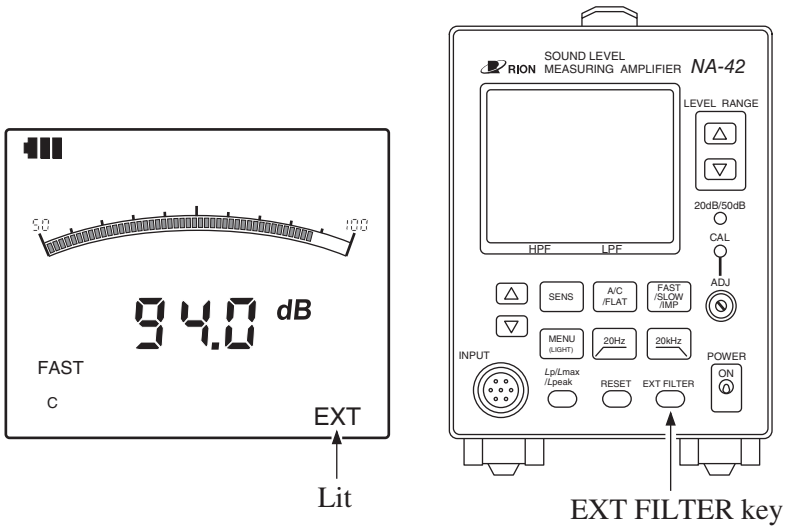
External Filter Setting

To use an externally connected filter, press the EXT FILTER key.

1. Connect the external filter or similar component to the connectors on the rear panel.



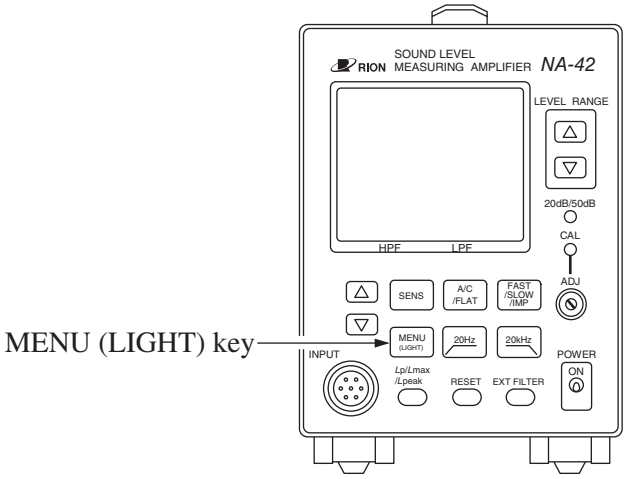
2. Press the EXT FILTER key to route the signal through the external filter.



Backlight On/Off

Press and hold the MENU (LIGHT) key for at least 2 seconds to set the LCD backlight to ON or OFF.

When set to ON, the backlight will make the screen easy to read also in dark locations.



Note
When the unit is running on batteries, the backlight is automatically turned off after 10 minutes.
When the batteries are nearly exhausted, the brightness of the backlight will decrease.

Comparator

The various settings for the comparator function are made via menu screens (see "Menu Settings" on page 51)

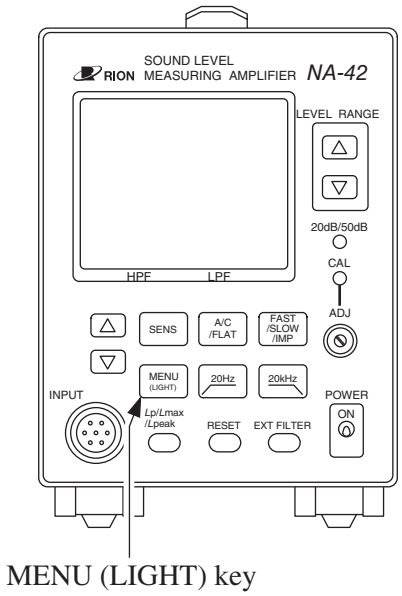
Setting items

- Comparator level 0 to 180 dB in 1 dB steps
- Delay time 0 to 9 seconds in 1 s steps
- Auto reset function
- Auto reset time 0 to 90 seconds in 1 s steps

Comparator operation

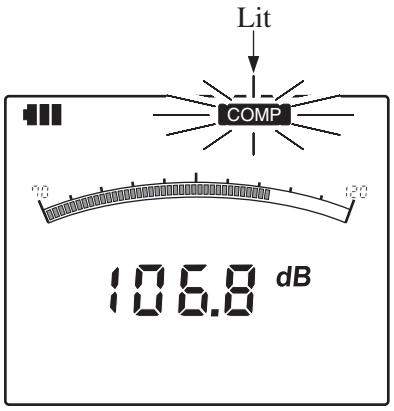
The comparator function serves to monitor the sound level picked up by the microphone by comparing it with a preset level. When the preset level is exceeded, the comparator output becomes active.

Note
The comparator function is based on the sound level L_p, not on the peak sound level L_{peak}.



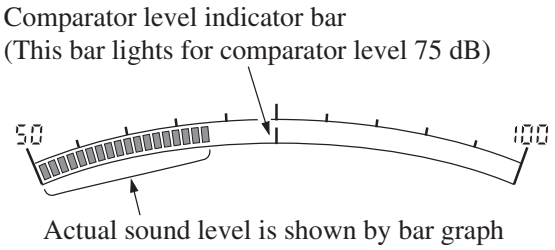
MENU (LIGHT) key

To turn the comparator function ON or OFF, use menu 5.0.



While comparator function is operating, the indication COMP is shown. In the bar graph indication, the bar corresponding to the comparator reference level remains constantly on.

For example, when the comparator level is set to 75 dB, the 75 dB point on the bar graph scale lights up.



Note
Set the comparator level between the upper limit of the selected level range and -50 dB. If the comparator level is set to a value outside of this range, correct operation is not assured.
While the comparator function is ON, all controls except the MENU (LIGHT) key, RESET key, 20 dB/50 dB key, and POWER switch are inactive.

Auto reset function

The auto reset function is set with menu 5.3 (→ "Menu Settings", p. 51).

When set to ON, the comparator output, once triggered, will be reset after the time set with menu 5.4 when the sound level remains below the comparator level for an extended time. When set to OFF, the comparator output, once triggered, will remain on until the RESET key is pressed or until the comparator function is turned off.

Auto reset time

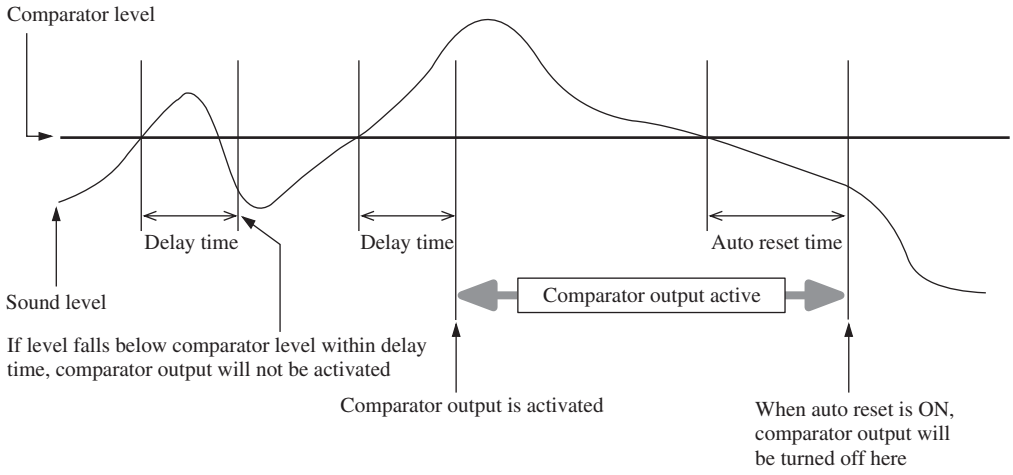
The auto reset time is set with menu 5.4 (→ "Menu Settings", p. 51).

This is the time between triggering of the comparator output and automatic reset.

The setting range is 0 to 90 seconds in 1-second steps.

This setting is valid when auto reset is set to ON.

Operation



Reset operation

When the comparator output was activated, it can be reset in three ways.

(1) Auto reset

As described above, when auto reset is ON, the comparator output will be reset automatically after activation when the auto reset time has elapsed.

(2) RESET key

Pressing the RESET key on the front panel immediately resets the comparator output. This function is independent of the auto reset ON/OFF setting.

(3) Setting the comparator function to OFF with menu 5.0

With this method, the comparator output is reset by setting the comparator function to OFF.

* With methods (1) and (2), the comparator function stays ON, while method (3) returns the unit to the normal measurement mode.

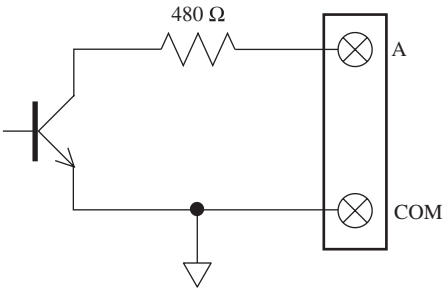
Comparator output

The comparator output has two elements.

(1) LCD display flashes.

Measurement value indicator section flashes in 0.5 second intervals.

(2) Open collector circuit operates, causing the comparator output terminals on the rear panel to close.



Circuit block diagram

Maximum applied voltage: 24 V

Maximum drive current: 12.5 mA (when impressive volume is 24 V)
25 mA (when impressive volume is 12 V)
60 mA (when impressive volume is 5 V)

Serial Interface

The NA-42 incorporates a serial interface that can be used to set measurement parameters and control measurement using commands sent from a computer. Measurement results can also be sent to the computer.
Using SC-31M or SC-31S adapters (option), a single computer can be used to control up to 16 NA-42 units.

Transfer Protocol

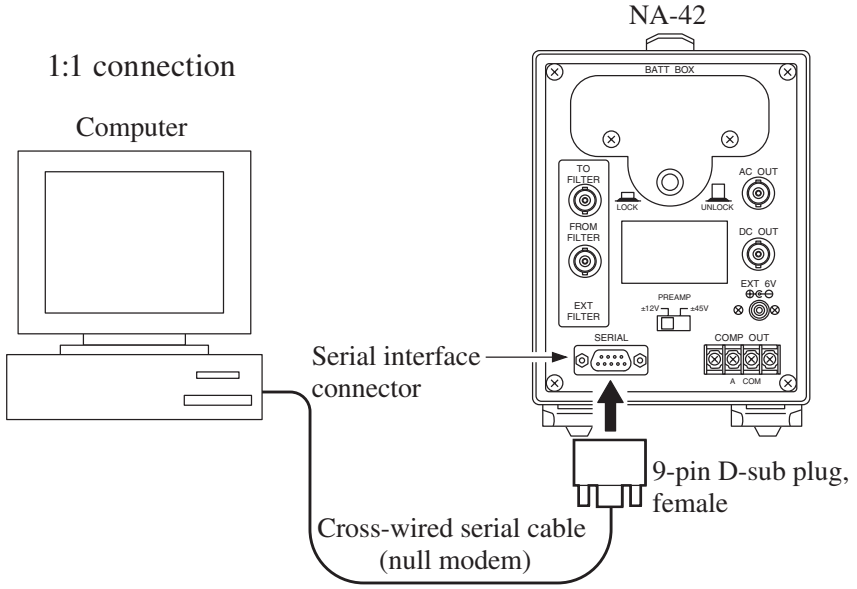
Transfer principle:	asynchronous, half-duplex
Data word length:	8 bit
Stop bits:	2
Parity:	none
Baud rate:	9600 bps, 19200 bps
Cable type:	Generic cross-wired serial cable (null modem) Connector on NA-42 9-pin D-sub, male (When using SC-31M or SC-31S adapters, cross-wired cable is not required.)

Local Mode/Remote Mode

- Local mode
  In this mode, the controls on the panel of the NA-42 are used to operate the unit. Immediately after being turned on, the unit is always in local mode.
- Remote mode
  In this mode, the NA-42 operates in response to commands sent from a computer. Only the MENU (LIGHT) key and RESET key on the NA-42 are active, and cannot be operated by all other keys. The indication REMOTE appears on the display of the NA-42 when the unit is in remote mode.
- Switching between local mode and remote mode
  The RMT command is used to switch between local mode and remote mode.

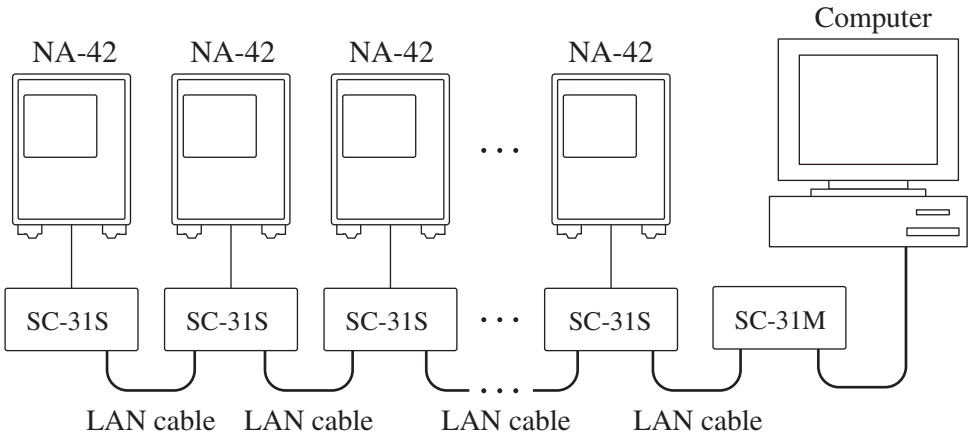
Preparation

1. Turn power to the NA-42 and the computer off.
2. Use a generic cable to connect the serial interface connector on the rear panel of the NA-42 to the computer.
   Cable: Generic cross-wired serial cable (null modem)
   Connector type on NA-42: 9-pin D-sub, male



1:N connection

When connecting multiple NA-42 units (up to 16) to one computer, the optional SC-31M/SC-31S adapters and LAN cables (generic 10Base-T cable) are required.



Connection example

Maximum allowable wiring distance: 400 m

3. Set the power switch of the NA-42 to ON.
4. Make the required menu settings at the NA-42.
   For details, please refer to "Menu Settings" on page 50.
   - Menu 4.0 Deactivates serial communication or selects one of two speeds
   - Menu 4.1 Sets the ID number.
   - Menu 4.2 Sets the use status of SC-31M/SC-31S.

Note
ID number The ID number serves to identify the NA-42 unit when multiple units are connected to one computer. In such a setup, the ID number must be set to a unique setting for each NA-42. Even if only one NA-42 unit is connected to the computer, the ID number must be set.
When SC-31M/SC-31S are used for communication, set the transfer rate to 19200.

Transfer Sequence

Sending of commands

In order to control the NA-42 from a computer or to retrieve measurement data, certain commands must be sent to the NA-42. The data exchange must be performed according to certain rules, to ensure that both the NA-42 and the computer recognize the commands and data properly.

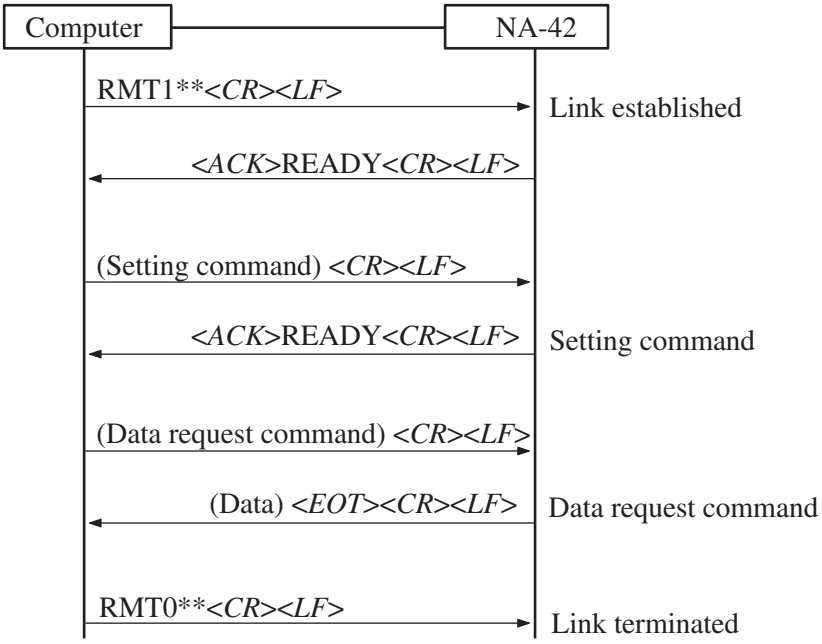
To send commands to the NA-42, the following procedure must be observed.

The following explanation assumes that the preparations described on page 13 have been completed.

** stands for the ID number.

Example: If the ID number 0 is set, ** stands for 00.

1. The computer sends RMT1**<*CR*><*LF*> to the NA-42.
2. When RMT1**<*CR*><*LF*> has been received, the NA-42 returns <*ACK*>READY<*CR*><*LF*> to the computer. The link is now established, and the indication REMOTE appears on the display of the NA-42.
3. To change a setting at the NA-42, the computer sends (setting command) <*CR*><*LF*> to the NA-42.
4. When a valid setting command is received by the NA-42, it carries out the respective processing steps. When these are completed successfully, the NA-42 returns an <*ACK*>READY<*CR*><*LF*> to the computer.
5. To receive data, the computer sends (data request command) <*CR*><*LF*> to the NA-42.
6. When the NA-42 receives a command which requests data, it carries out the respective processing steps and sends (data) <*EOT*><*CR*><*LF*> to the computer.
7. To terminate the link, the computer sends RMT0**<*CR*><*LF*> to the NA-42.



** is the ID number.

<*ACK*>: Control code 06H (acknowledge)
<*CR*>: Control code 0DH (carriage return)
<*LF*>: Control code 0AH (line feed)
<*EOT*>: Control code 04H (end of transfer)
READY: ASCII string
(command): ASCII string (command and parameters)
(data): ASCII string (data requested by command)

Error Processing

In order to ensure correct data exchange between the NA-42 and the computer, the rules described above must be observed. If an error occurs, the following steps should be taken.

- The computer has sent RMT1**<*CR*><*LF*> but the REMOTE indicator on the NA-42 does not light.

  Send RMT1**<*CR*><*LF*> again after about 4 seconds. Repeat this 2 or 3 times. If the REMOTE indicator still does not light, one of the following conditions may exist:

  ** stands for ID number.

- Transfer parameters do not match. (Check settings made with menu screens.)
- Interface cable is defective or not properly connected.
- NA-42 is not powered.
- ID number setting does not match.

When the computer has sent a wrong command or the parameter is out of range, the NA-42 disregards that command, and also when the ID number is other than FF, the NA-42 returns <*NAK*>READY<*CR*><*LF*> . If the NA-42 is in receiving mode but there is no command from the computer for 4 seconds or more, the receive mode times out.

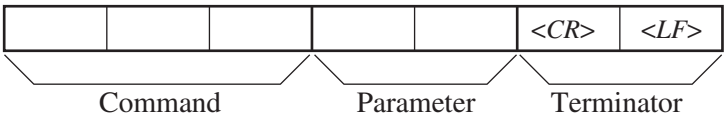
<*NAK*>: Control code 15H

Control Operation in Remote Mode

While the NA-42 is in remote mode, only the MENU (LIGHT) key and RESET key are active. The MENU (LIGHT) key allows turning the display backlight on and off, and the RESET key in remote mode serves for switching back to local mode. This allows manual override of remote mode at any time.

Command Format

Commands that can be used by the NA-42 consist of 3 characters (3 bytes), usually followed by a parameter which specifies the action range of the command.



There are two types of parameters:

- Parameters for changing function settings
- Parameter for requesting data

The parameters for changing function settings are numerals, and the parameter for requesting data is "?". In the following command description, the function setting parameters are denoted by "n". The data output by the NA-42 in response to the data requesting parameter are denoted by "p".

Note
The NA-42 cannot process multiple commands sent together.

Command List

Command	Function	See Page
RMTn1n2n3	Select local mode/remote mode	67
RMT?	Get ID number and remote mode status	67
RNGn	Set level range	67
RNG?	Get level range status	67
TMCn	Set time weighting	68
TMC?	Get time weighting setting	68
WGTn	Set frequency weighting	68
WGT?	Get frequency weighting setting	68
SNSn1n2n3n4n5	Set sensitivity	68
SNS?	Get sensitivity setting	69
LPFn	Set low-pass filter setting	69
LPF?	Get low-pass filter setting	69
HPFn	Set high-pass filter setting	69
HPF?	Get high-pass filter setting	69
EXTn	Set EXT FILTER setting	69
EXT?	Get EXT FILTER setting	69
CALn	Set calibration mode	70
CAL?	Get calibration mode status	70
BAT?	Get battery capacity status	70
DOD?	Get measurement data	70
DOFn	Output instantaneous value every 0.1 second in non-protocol mode	71
<SUB>	Stop request block	71
MAXn	Set L_{max} function to On/Off	72
MAX?	Get L_{max} function status	72
PEKn	Set L_{peak} function to On/Off	72
PEK?	Get L_{peak} function status	72
RST	Reset hold value	72

Command	Function	See Page
CMPn	Set comparator function to On/Off	72
CMP?	Get comparator function status	72
CMSn1n2n3n4n5n6n7	Make comparator function settings	73
CMS?	Get comparator function settings	73
VER?	Get version information	73
PREn	Set preamplifier gain to 0 dB/20 dB	73
PRE?	Get preamplifier gain and setting of rear-panel PREAMP power selector	74
INSn	Set Insert CAL	74
INS?	Get Insert CAL setting	74
BARn	Set bar graph display width	74
BAR?	Get bar graph display width	74
DCTn	Set measurement value readout resolution to one or two decimal points	74
DCT?	Get measurement value readout resolution	74

Commands

RMT n1 n2 n3 — Select local mode/remote mode

n1 = 0 Local mode

n1 = 1 Remote mode

n2 n3 = 00 to 15, FF

Set ID number. NA-42 specified by ID number receives the command. FF specifies all connected NA-42. To send a setting command to all connected NA-42 units when using the SC-31M/SC-31S, use "n2n3=FF".

RMT? — Get ID number and remote mode status

Output data format

p1 p2 p3<*EOT*><*CR*><*LF*>

p1, p2 is ID number

p3 = 1 Remote mode

RNG n — Set level range

	Value of level range
n=04	40 dB
n=05	50 dB
n=06	60 dB
:	:
:	:
n=17	170 dB
n=18	180 dB

RNG ? — Get level range setting

Output data format

p<*EOF*><*CR*><*LF*>

p corresponds to n of RNG

TMC n — Set time weighting for main processing

n=0	FAST
n=1	SLOW
n=2	IMP

TMC? — Get time weighting setting

Output data format

p<*EOT*><*CR*><*LF*>

p corresponds to n of TMC

WGT n — Set time frequency weighting

n=0	A weighting
n=1	C weighting
n=2	FLAT response

WGT? — Get time frequency weighting setting

Output data format

p<*EOT*><*CR*><*LF*>

p corresponds to n of WGT

SNS n1 n2 n3 n4 n5

Set sensitivity

n1, n2, n4, n5: Setting range 1000 to 6999

When readout resolution is set to one decimal point, any information sent as n5 is taken as 0.

n3: Taken as "."

Example

To set the sensitivity to -26.95, send "SNS26.95". To set the sensitivity to -26.9, send "SNS26.90".

SNS? Get sensitivity setting
Output data format
p1p2p3p4p5<*EOT*><*CR*><*LF*>
For setting the sensitivity down to one decimal point when the readout resolution is set to one decimal point, p5 becomes "0".

LPF n Set low-pass filter setting
n = 0 OFF
n = 1 20 kHz

LPF ? Get low-pass filter setting
Output data format
p<*EOT*><*CR*><*LF*>
p corresponds to n of LPF

HPF n Set high-pass filter setting
n = 0 OFF
n = 1 20 Hz

HPF? Get high-pass filter setting
Output data format
p<*EOT*><*CR*><*LF*>
p corresponds to n of HPF

EXT n Set EXT FILTER setting
n = 0 OFF
n = 1 ON

EXT? Get EXT FILTER setting
Output data format
p<*EOT*><*CR*><*LF*>
p corresponds to n of EXT

CAL n — Set calibration mode

- n = 0 Calibration OFF
- n = 1 Calibration ON

CAL? — Get calibration mode status

Output data format

p<*EOT*><*CR*><*LF*>

- p = 0 Calibration OFF
- p = 1 Calibration ON

BAT? — Get battery capacity status

Output corresponds to status of battery capacity indicator on display.

Output data format

p<*EOT*><*CR*><*LF*>

- p = 0 Flashing
- p = 1 1 segment lit
- p = 2 2 segments lit
- p = 3 3 segments lit

DOD? — Get measurement data

Returns a value corresponding to the display indication.

Output data format

· When readout resolution is set to one decimal point

p1p2p3p4p5,p7<*EOT*><*CR*><*LF*>

p1 to p5 : Indicated measurement value

p4 : Taken as "."

When the integer is 1 or 2 digits, the empty p1 and/or p2 part is padded with spaces.

When there is no displayed measurement value and this command is received, the output will be p1 to p5=000.0.

· When readout resolution is set to two decimal points

p1 p2 p3 p4 p5 p6,p7 <*EOT*><*CR*><*LF*>

p1 to p6 : Indicated measurement value

p4 : Taken as "."

When the integer is 1 or 2 digits, the empty p1 and/or p2 part is padded with spaces.

When there is no displayed measurement value and this command is received, the output will be p1 to p6 = 000.00.

p7 = O Overload occurred

p7 = _ No overload or underload (_ represents a space)

p7 = U Underload occurred

p7 = W Overload and underload occurred

* When operating in L_{max} mode, the L_{max} value is returned. The same applies for L_{peak}.

DOF n

Output instantaneous value every 0.1 seconds in non-protocol mode

n = 0 Instantaneous value output OFF
(This carried out the same processing as for the following <*SUB*>.)

n = 1 Instantaneous value output ON

Output data format is the same as for DOD? command.

For information on the transfer sequence, see page 61.

Data will be output every 0.1 seconds. When DOF0 or <*SUB*> is received, non-protocol mode output is terminated.

<*SUB*>

Stop instantaneous value output every 0.1 s

<*SUB*> 1AH

For information on the transfer sequence, see page 61.

No terminator (<*CR*><*LF*>) added when sending <*SUB*>

MAX n — Set L_{max} (maximum sound level) function to On/Off

- n = 0 Maximum hold OFF
- n = 1 Maximum hold ON

MAX? — Get L_{max} function status

Output data format

p<*EOT*><*CR*><*LF*>

- p = 0 L_{max} OFF
- p = 1 L_{max} active

PEK n — Set L_{peak} (peak sound level) function to On/Off

- n = 0 L_{peak} OFF
- n = 1 L_{peak} ON

PEK? — Get L_{peak} function status

Output data format

p<*EOT*><*CR*><*LF*>

- p = 0 L_{peak} OFF
- p = 1 L_{peak} active

RST — Reset hold value

This command is active during L_{max}, L_{peak}, and comparator operation.

CMP n — Set comparator function to On/Off

- n = 0 Comparator OFF
- n = 1 Comparator ON

CMP ? — Get comparator status

Output data format

p<*EOT*><*CR*><*LF*>

- p = 0 Comparator OFF
- p = 1 Comparator active

CMS n1 n2 n3 n4 n5 n6 n7

Make comparator function setting

n1 to n3:	Set comparator level to 000 to 180 n1 is the first digit, n2 the second digit and n3 the third digit. When the setting value is only 1 or 2 digits, the empty part is padded with zeros. Make comparator function settings
n4 :	Delay time 0 to 9
n5 = 0:	Auto reset OFF
n5 = 1:	Auto reset ON
n6 to n7:	Auto reset time 00 to 90 (steps of 1)

For items that are not to be changed, send _ (space).

CMS? Get comparator function settings

Output data format

p1 p2 p3 p4 p5 p6 p7<*EOT*><*CR*><*LF*>

p1 to p3:	Comparator level
p4:	Delay time 0 to 9
p5:	0 (auto reset OFF) 1 (auto reset ON)
p6 to p7:	Auto reset time

VER? Get version information

Output data format

p1p2p3<*EOT*><*CR*><*LF*>

p2: Taken as "."

PREn Set preamplifier gain to 0 dB or 20 dB

n = 0	0 dB
n = 1	20 dB

PRE? Get preamplifier gain and setting of rear-panel PREAMP power selector

p1p2<*EOT*><*CR*><*LF*>

p1 corresponds to n of PREn

p2 = 0 ±12 V

p2 = 1 ±45 V

INSn Set Insert CAL

n = 0 OFF

n = 1 ON

INS? Get Insert CAL setting

Output data format

p<*EOT*><*CR*><*LF*>

p corresponds to n of INS

BARn Set bar graph display width

n = 0 50 dB

n = 1 20 dB

BAR? Get bar graph display width

Output data format

p<*EOT*><*CR*><*LF*>

p corresponds to n of BAR

DCTn Set measurement value readout resolution to one or two decimal points

n=0 One decimal point

n=1 Two decimal points

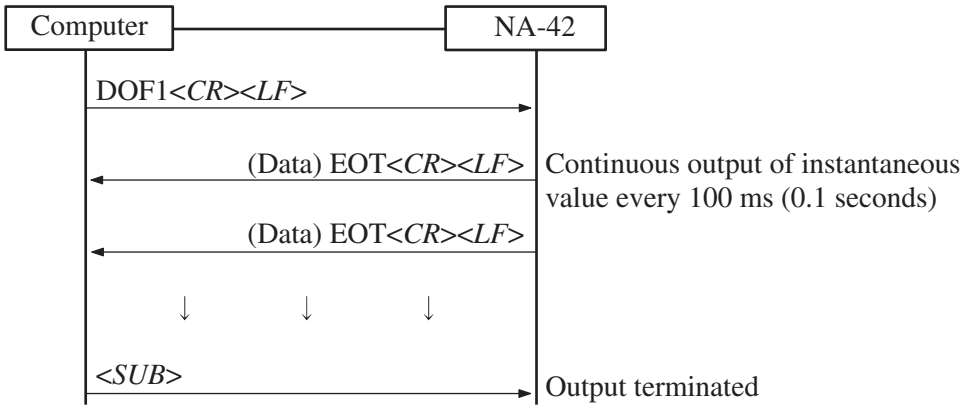
DCT? Get measurement value readout resolution

Output data format

p<*EOT*><*CR*><*LF*>

p corresponds to n of DCT

DOF Transfer Sequence



The instantaneous value sound level output updated every 0.1 seconds stops when <*SUB*> or DOF0<*CR*><*LF*> is input. Normally <*SUB*> should be used, because the chance for communication errors is lower.

<*SUB*> : control code 1AH

Note
Because this unit supports only half-duplex communication, it cannot receive and send data at the same time. When sending the <*SUB*> or DOF0 command to the unit, the computer must use timing which ensures that the command does not collide with the instantaneous value data that are being output by the unit.

Allowable remote mode commands in various operation conditions

○ indicates that command is allowed (valid).

× indicates that command is not allowed (invalid).

Command	Normal measurement	Calibration	Comparator	L_{max}	L_{peak}	DOF operation
Content: Others related commands						
RMT0n2n3	○	○	○	○	○	○
DCL	○	○	○	○	○	×
Content: Data related commands						
DOD?	○	○	○	○	○	×
DOFn	○	×	○	○	○	○
<*SUB*>	×	×	×	×	×	○
Content: Front panel key related commands						
RNGn	○	×	×	○	○	×
TMCn	○	×	×	○	○	×
WGTn	○	×	×	○	○	×
LPFn	○	×	×	○	○	×
HPFn	○	×	×	○	○	×
EXTn	○	×	×	○	○	×
MAXn	○	×	×	○	○	×
PEKn	○	×	×	○	○	×
CALn	○	○	×	×	×	×
SNSn1 to n5	○	×	×	×	×	×
RST	×	×	○	○	○	×
BARn	○	○	○	○	○	×
Content: Menu related commands						
CMPn	○	×	○	×	×	×
CMSn1 to n7	○	×	×	×	×	×
DCTn	○	×	×	×	×	×
INSn	○	×	×	×	×	×
PREn	○	×	×	×	×	×

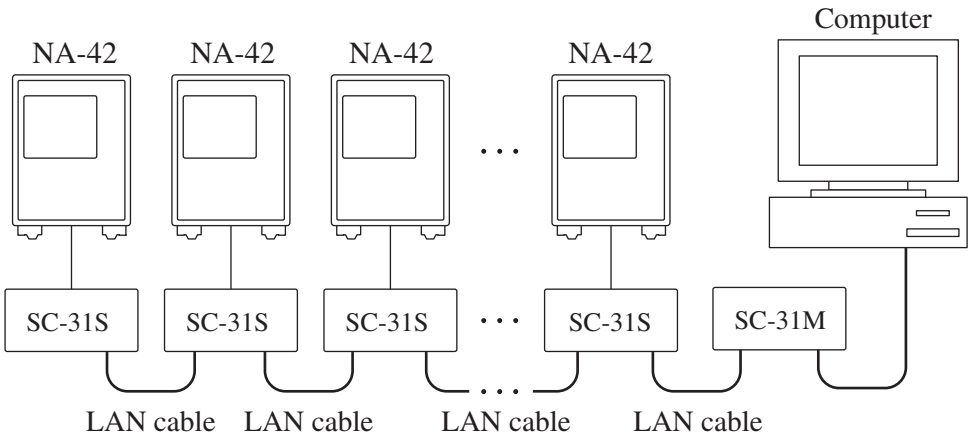
Command	Normal measurement	Calibration	Comparator	L_{max}	L_{peak}	DOF operation
Content: Others related commands (with ?)						
VER?	○	○	○	○	○	×
RMT?	○	○	○	○	○	×
BAT?	○	○	○	○	○	×
Content: Front panel key related commands (with ?)						
RNG?	○	○	○	○	○	×
TMC?	○	○	○	○	○	×
WGT?	○	○	○	○	○	×
LPF?	○	○	○	○	○	×
HPF?	○	○	○	○	○	×
EXT?	○	○	○	○	○	×
MAX?	○	○	○	○	○	×
PEK?	○	○	○	○	○	×
SNS?	○	○	○	○	○	×
CAL?	○	○	○	○	○	×
BAR?	○	○	○	○	○	×
Content: Menu related commands (with ?)						
CMP?	○	○	○	○	○	×
CMS?	○	○	○	○	○	×
DCT?	○	○	○	○	○	×
INS?	○	○	○	○	○	×
PRE?	○	○	○	○	○	×

Communication With Multiple Units Using SC-31

Using the optional SC-31M/SC-31S adapters, it is possible to connect up to 16 NA-42 units to a single computer.

Connecting multiple NA-42 units (max. 16) to a computer

Use SC-31M/SC-31S adapters (option) and LAN cables (generic 10BaseT cable)



Maximum allowable wiring distance: 400 m

Note
(1) When multiple units are connected, commands can be sent either to a single unit or all units. It is not possible to send for example a command to 3 out of 5 connected units.
(2) When sending commands to all units, only setting commands are valid. Commands for getting information (parameter "?") and the DOF command are invalid.

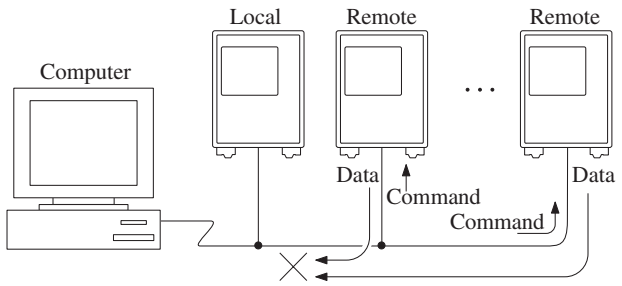
Sending commands to a single unit

When multiple units are connected, but you want to communicate only with a specific unit, proceed as follows. The procedure is the same as when communicating on a 1-on-1 basis.

1. Send the RMT0FF command from the computer to set all NA-42 units to local mode.
2. Send the RMT1** command from the computer (where ** is the ID number of the NA-42 unit that you want to control).
3. Use the necessary setting commands or data request commands to control the NA-42 unit whose ID number was specified in the previous step.
4. Send the RMT0** command from the computer to set the specified NA-42 unit to local mode.
5. Repeat steps 2 to 4 with the ID number for any other NA-42 unit, as necessary.

Note

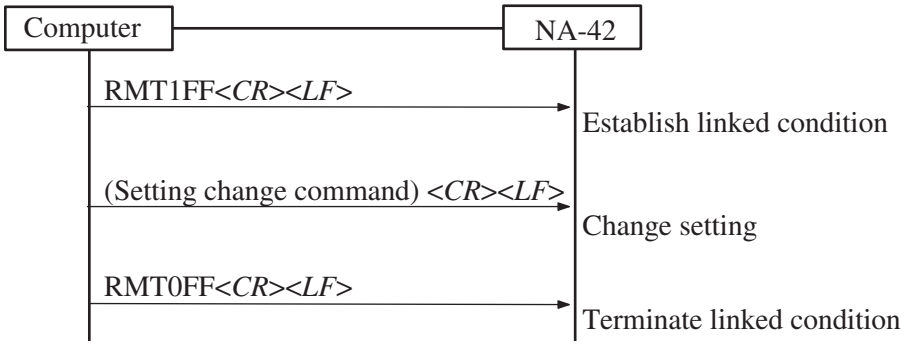
Before setting another NA-42 unit to remote mode, be sure to return the currently controlled NA-42 unit to local mode. If two or more units are set to remote mode at the same time, output data will be mixed.



Sending commands to all connected NA-42 units

When sending commands to all connected units, only commands for changing settings are allowed.

1. Send the RMT1FF command from the computer to set all NA-42 units to remote mode (link established).
2. Use the necessary setting commands to control all NA-42 units.
3. Send the RMT0FF command from the computer to set all NA-42 units to local mode (link terminated).
   To use data request commands or to change the settings of one unit only, follow the steps described in “Sending commands to a single unit” on the preceding page.



Note
When receiving the RMT1FF command, any NA-42 unit regardless of its ID number will go into remote mode.
In this case, no <*ACK*>READY<*CR*><*LF*> response is sent.

Technical Reference

Microphone and Preamplifier Selection

When making measurements using a condenser microphone and preamplifier combination, suitable models must be selected according to the measurement level, frequency range, and other factors.

Condenser microphones (sample listing)

Type	UC-53A	UC-52H	UC-34 (P)	UC-29	UC-27	UC-31
Linear operation range	28 to 145 dB	28 to 146 dB	10 to 112 dB	50 to 164 dB	20 to 145 dB	34 to 155 dB
Frequency range (Hz)	10 to 20 k	20 to 8 k	10 to 12.5 k	20 to 100 k	5 to 12.5 k	10 to 35 k
Nominal outer diameter	1/2 inch	1/2 inch	1 inch	1/4 inch	1 inch	1/2 inch
Sensitivity level (dB (re. 1 V/Pa)) (representative value)	-28	-33	-21	-47	-26.5	-37

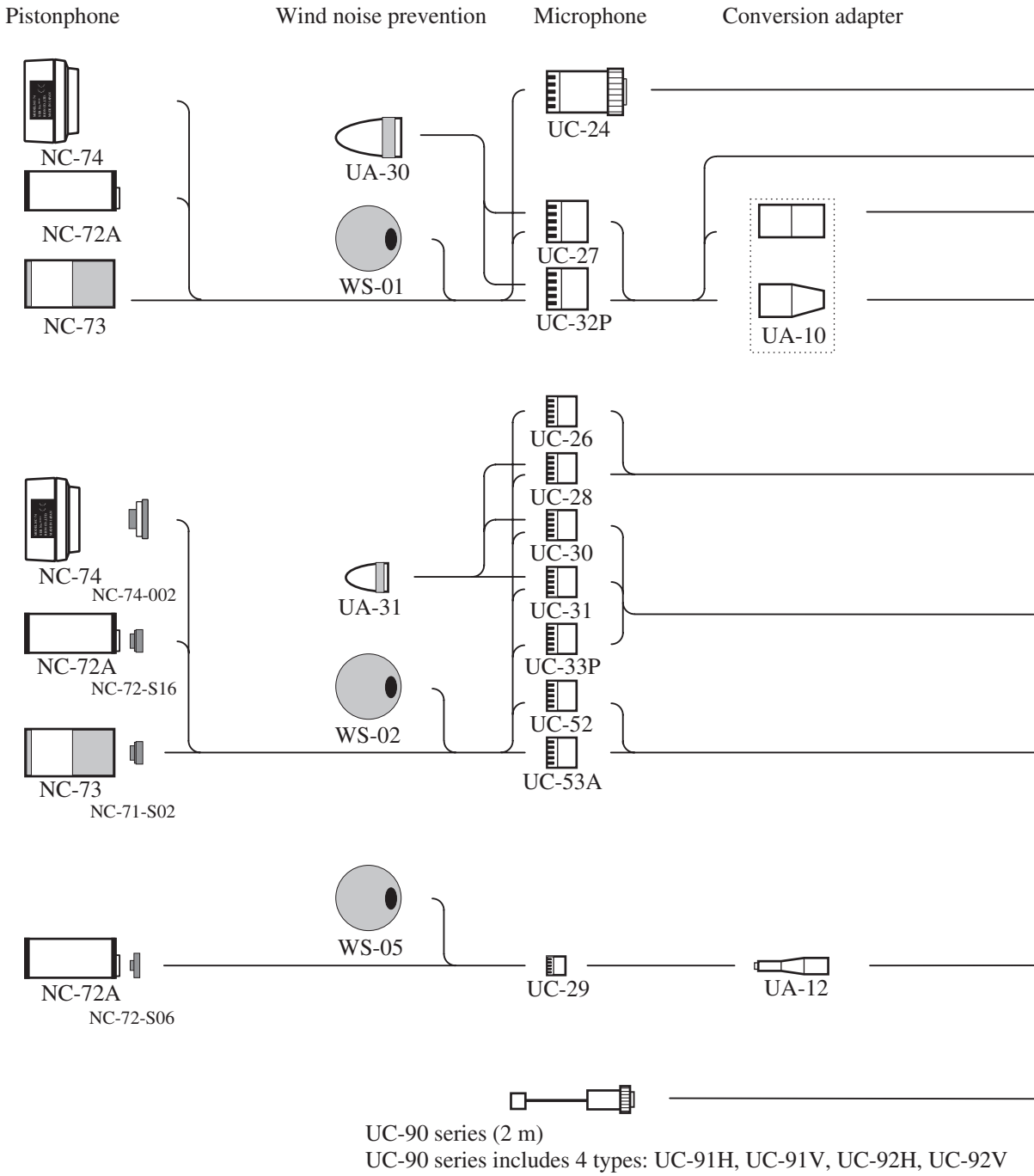
Linear operation range applies to A weighting without overload margin

Preamplifier (sample listing)

Type	NH-17	NH-34	NH-05	NH-04	NH-06	NH-12
Suitable microphone	UC-52H UC-53A	UC-34（P）	UC-29	(UC-27) UC-31	UC-27	UC-27 UC-31
Frequency (Hz)	20 to 100 k	20 to 100 k	10 to 200 k	10 to 200 k	5 to 100 k	10 to 100 k
Cable *	5 m supplied	None	None	None	None	2.5 m supplied
Preamplifier power supply ±45 V compatible	○	×	○	○	○	○

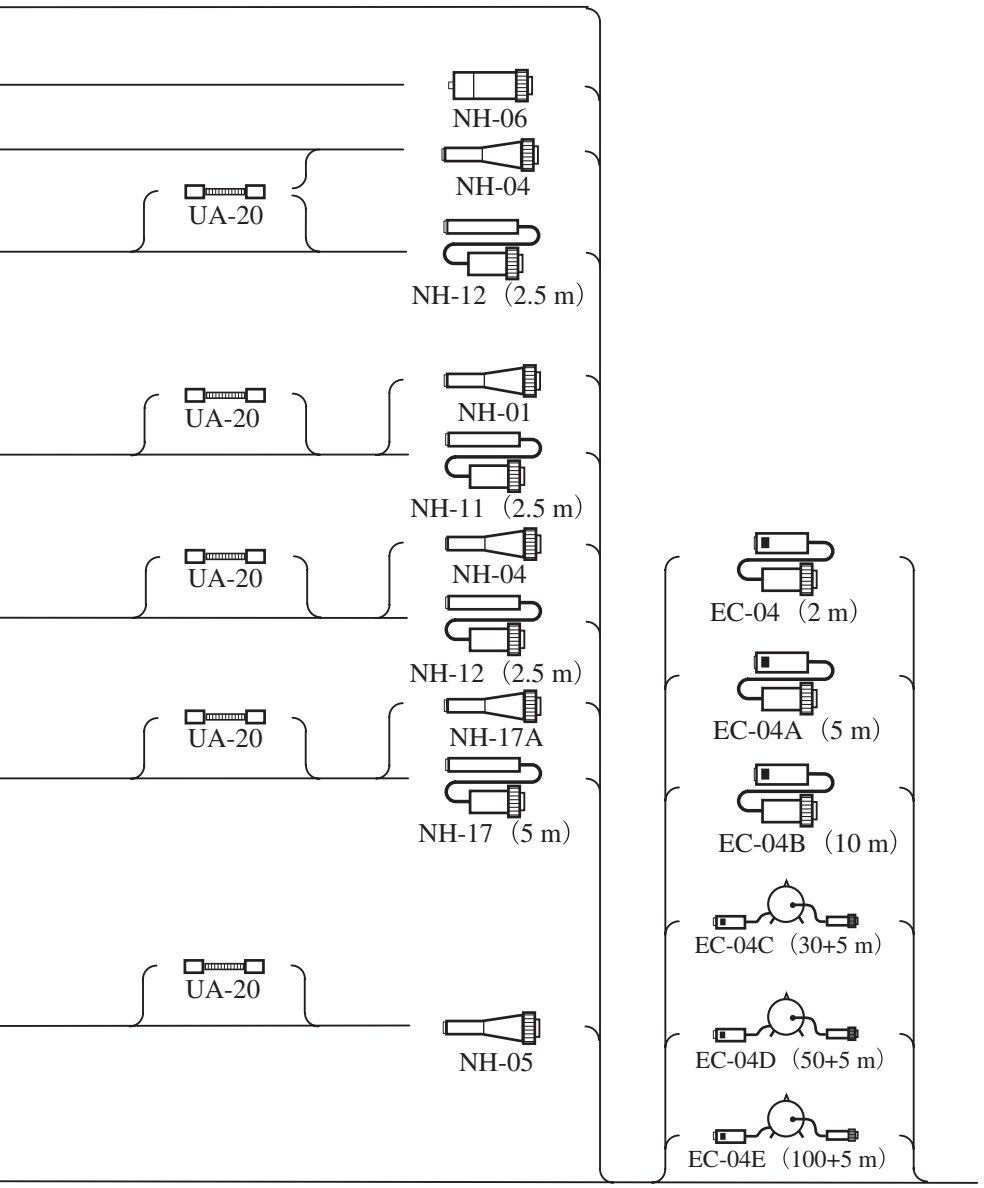
* For types supplied without cable, and for extending the cable, use the condenser microphone cable EC-04 series (option).

Microphone/preamplifier combinations

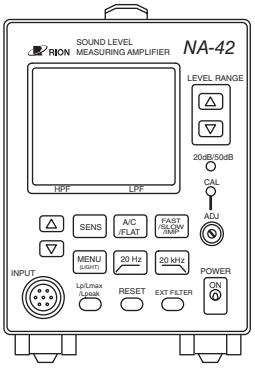


UC-90 series (2 m)
UC-90 series includes 4 types: UC-91H, UC-91V, UC-92H, UC-92V

Flexible rod　　Preamplifier　　Extension cable



NA-42



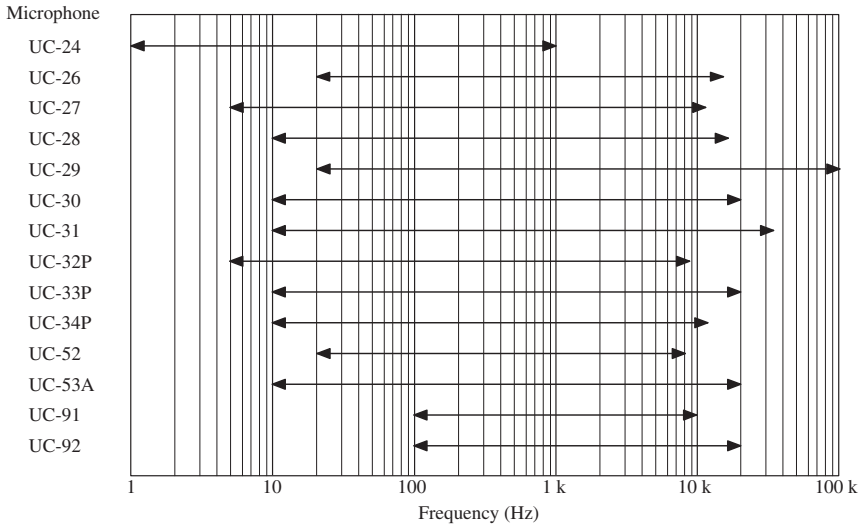
Multiple extension cables can be combined, up to a maximum total of 100 m.

Measurement range

The frequency range and linear operation range depend on the microphone and preamplifier.

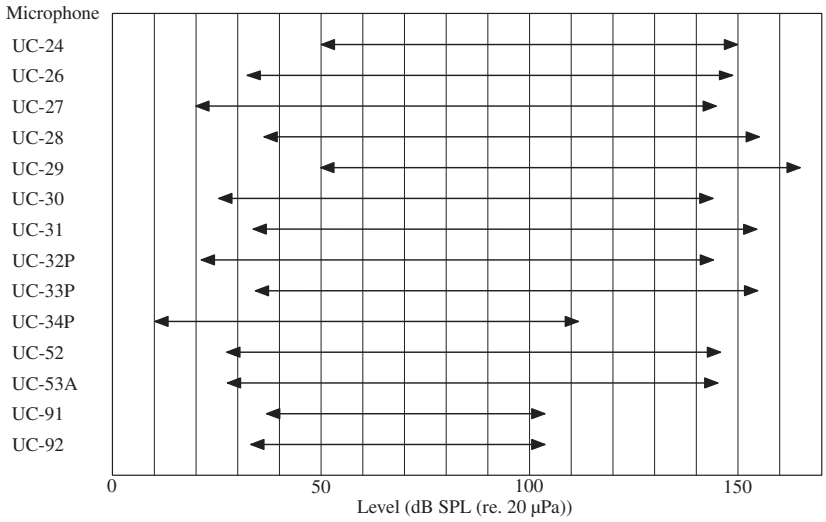
Frequency range

The frequency range that can be measured depends on the microphone, as shown in the graph below.



Linear operation range

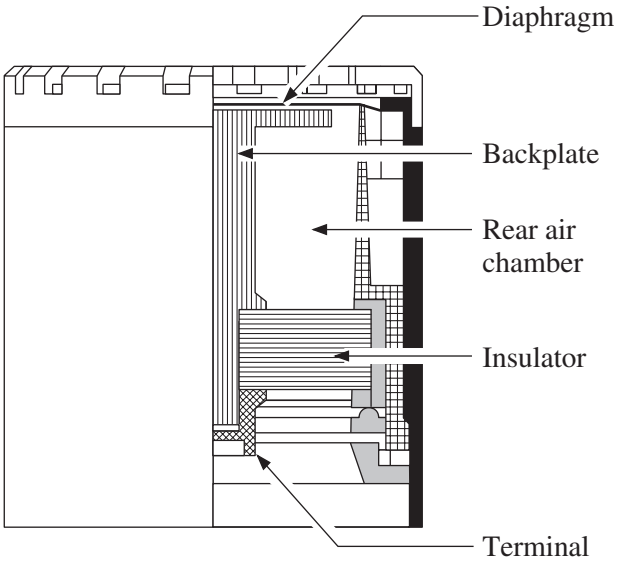
The linear operation range depends on the microphone, as shown in the graph below. The linear operation range applies to A weighting without overload margin.



Microphone

There are various ways to convert sound changes into electrical signals. For acoustic measurements, the condenser (electrostatic) microphone principle is widely used, because it offers high stability, flat frequency response, high sensitivity and allows compact dimensions. As an example, this manual describes the microphone UC-34.

The construction principle of a condenser microphone is shown at right. The microphone uses a movable electrode (diaphragm) and a fixed electrode (backplate), placed at a distance of several tens of microns from each other. This results in a capacitor (condenser) with a capacitance of several tens of picofarads. Sound pressure changes cause the diaphragm to vibrate which results in a change in capacitance. To convert this change into an electrical signal, a DC voltage (DC bias) of normally 200 V is supplied to the backplate via a high-value resistor, and the voltage difference between the two electrodes is extracted as a signal.



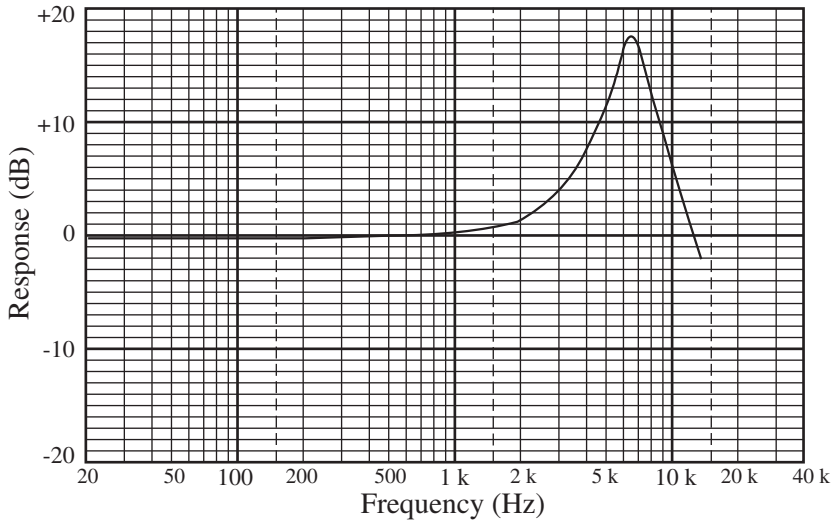
Condenser microphone construction principle

Using stiffness control, the condenser microphone is designed so that diaphragm displacement is proportional to the air pressure change, regardless of frequency. The effectiveness of this design depends on various factors, such as microphone sensitivity and the resonance frequency determined by diaphragm tension and rear air chamber volume (this chamber is the near-hermetically sealed air-filled cavity inside the microphone). In order to increase sensitivity, the resonance frequency must be lowered, but this means that the upper frequency limit of the microphone also becomes lower. Reversely, extending

the upper frequency limit means that sensitivity is decreased.
The tuning of microphone frequency response is achieved by opening a number of holes in the backplate in order to adjust the viscous resistance (damping characteristics) of the air that moves between the diaphragm and the backplate.

Since the UC-34 was specially designed to achieve low noise performance, it is suitable for measurement of low sound pressure. Noise in a microphone can be divided into two types: electrical noise which arises due to the capacitance of the microphone and the input impedance of the connected preamplifier, and internal noise in the microphone itself. Normally, electrical noise forms the largest share of the overall noise components, and internal noise does not pose a problem. But in combination with the high-impedance preamplifier NH-34, electrical noise in the UC-34 is greatly reduced, and internal noise of the microphone therefore forms the major part of the noise components.

Internal noise in a microphone is generated mostly by viscous resistance of the air between the diaphragm and the backplate, leading to mechanical thermal noise. In order to decrease this noise, it is desirable to reduce the viscous resistance. But this will in turn cause the microphone to lose flat frequency response and exhibit a sharp peak such as shown in the figure below. The preamplifier therefore incorporates a filter with exactly opposite characteristics, thus restoring flat frequency response.



Frequency response of Microphone UC-34

The microphone UC-34 is made out of the following materials: titanium (chassis), titanium alloy (diaphragm), and silicone-impregnated and quartz-coated steatite (insulators). The main specifications of the microphone are shown in the table below.

Main specifications of microphone UC-34

Bias voltage	200 V
Nominal outer diameter	1 inch
Sound field sensitivity level (at 250 Hz)	-21 dB ±1 dB (re. 1 V/Pa)
Static capacitance	35 pF ±8 pF
Peak frequency	6.7 kHz ±0.3 kHz
Peak level (referenced to 1 kHz)	16.5 dB ±1 dB
Temperature-dependent sensitivity change (at 250 Hz)	approx. -0.01 dB/°C (5 to 35°C)
Humidity-dependent sensitivity change	within 0.1 dB (under non-condensing conditions)

Important

In condenser microphones such as the UC-34, which use a bias voltage, a drop in surface resistance of the insulator material can lead to bias voltage leakage, causing very high-level noise spikes. Such a surface resistance drop is often due to contamination or humidity. Therefore the microphone should always be placed in its storage case when not in use, and prolonged use in environments with high humidity and drastic temperature changes should be avoided.

Preamplifier

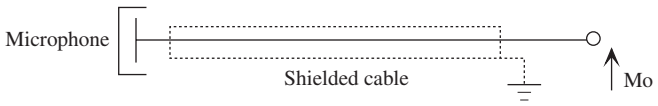
Since the capacitance of a condenser microphone is low (in the range of several picofarads to several tens of picofarads), its impedance is very high, especially at low frequencies. In order to achieve usable frequency response down to low frequencies, the load impedance as seen by the microphone must be very high (see equation 1). If a long shielded extension cable were used, the cable capacitance would cause a sharp drop in sensitivity. For this reason, the preamplifier is located directly after the microphone and is designed for high input impedance and low output impedance.

$$fo = \frac{1}{2\pi \cdot Zin \cdot Cm} \quad \text{------ Equation 1}$$

fo: Low-range cut-off frequency
Zin: Preamplifier input impedance
Cm: Microphone static capacitance

$$Mo = \left(\frac{Cm}{Cm + Cc}\right) Ms \quad \text{------ Equation 2}$$

Mo: Output voltage when microphone output is fed through a shielded cable



Ms: Microphone output voltage
Cm: Microphone static capacitance
Cc: Shielded cable capacitance

Main specifications of preamplifier NH-34

Input impedance	30 GΩ or higher
Output impedance	100 Ω or lower
Maximum output current	approx. 1 mA

Main specifications of preamplifier NH-17

Input impedance	approx. 3 GΩ
Output impedance	300 Ω or lower
Maximum output current	approx. 2 mA

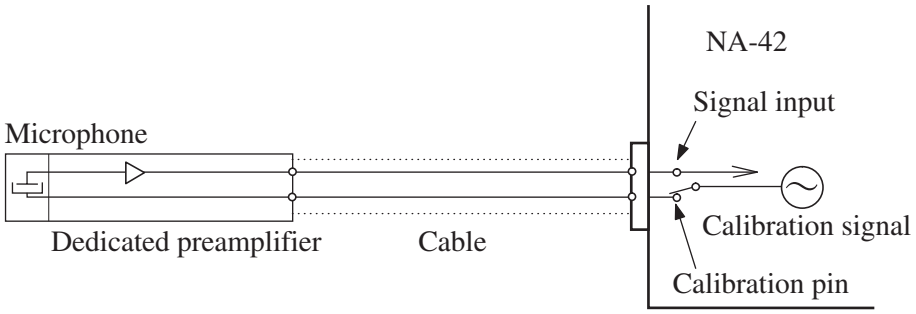
Insert CAL

By using the dedicated preamplifier NH-08, the NA-42 allows highly accurate calibration comprising the microphone and preamplifier (Insert CAL).

Insert CAL function

The microphone sensitivity is determined under the assumption that the microphone is connected to a preamplifier with infinitely large input impedance and input capacitance of 0.

When calibrating the unit with an electrical signal, the microphone sensitivity minus a representative value for preamplifier loss is taken as microphone sensitivity, and only the internal circuitry is calibrated. With Insert CAL on the other hand, a signal suitable for the microphone sensitivity is supplied directly to the microphone, and calibration takes into account the actual preamplifier loss.



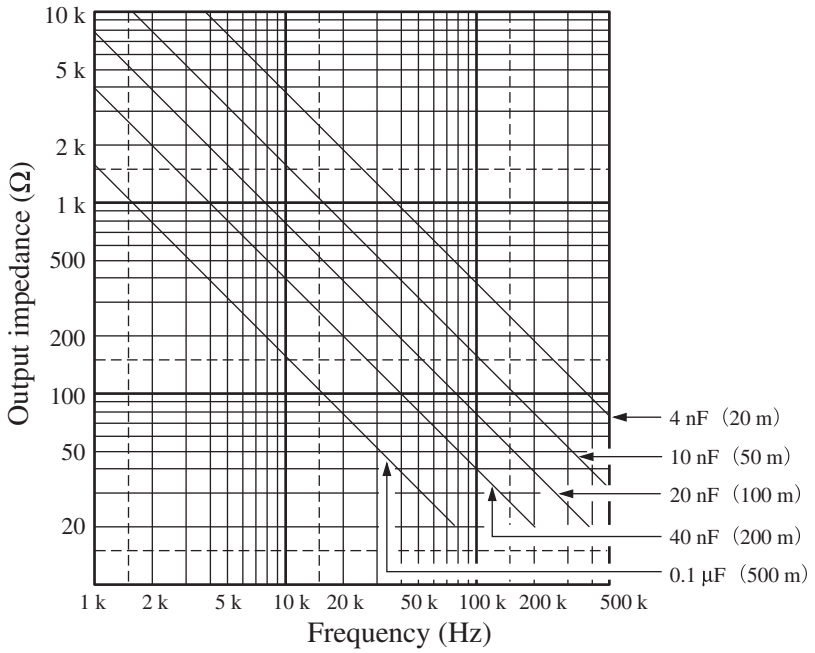
Extension Cable

After impedance conversion by the preamplifier, the signal from the microphone is fed through an extension cable to the sound level meter. The following extension cables are available as options.

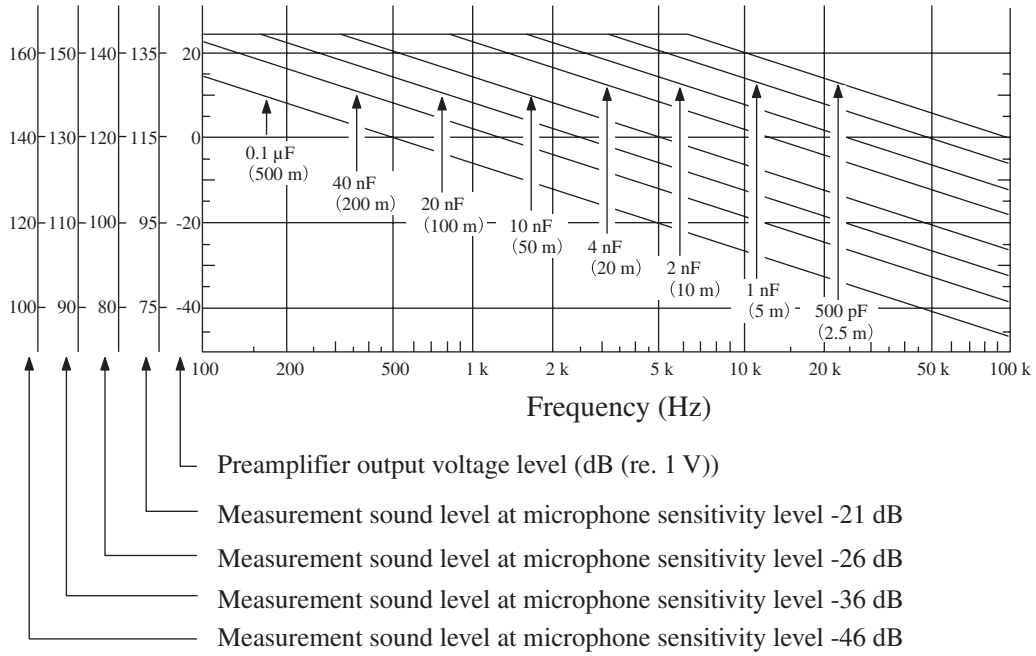
Condenser microphone extension cable series EC-04

Model	Length	Model	Length
EC-04	2 m	EC-04C	30 m (reel section) + 5 m (link section)
EC-04A	5 m	EC-04D	50 m (reel section) + 5 m (link section)
EC-04B	10 m	EC-04E	100 m (reel section) + 5 m (link section)

Although the output impedance of the preamplifier is low, the cable capacitance introduces an upper limit in measurement frequency and measurement level, which differs depending on the length of the extension cable.
The correlation between preamplifier output impedance and upper measurement frequency limit is shown in the figure below, and the correlation between cable capacitance and measurement sound level and measurement frequency is shown on the next page.



Preamplifier output impedance and upper measurement frequency limit



Measurement sound level and measurement frequency for extension cable capacitances

Example

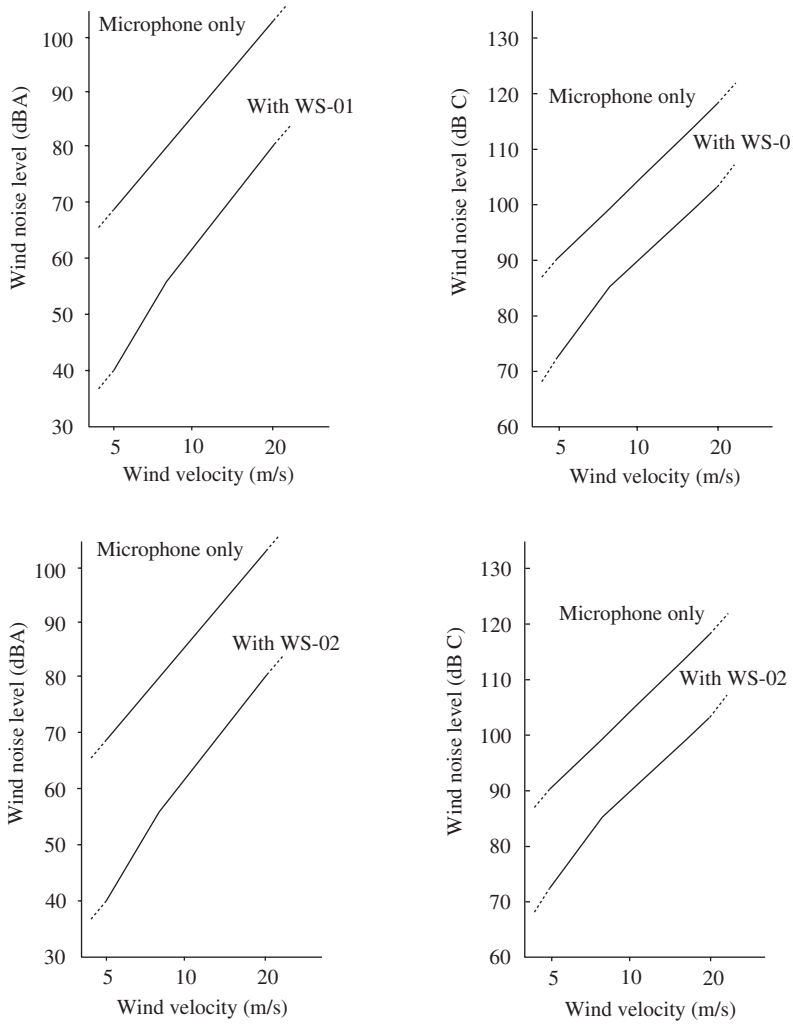
Using the microphone UC-34P with a sensitivity level of -21 dB to measure a sound pressure of 95 dB up to 10 kHz, the maximum allowable extension cable length is about 200 m.

Windscreen

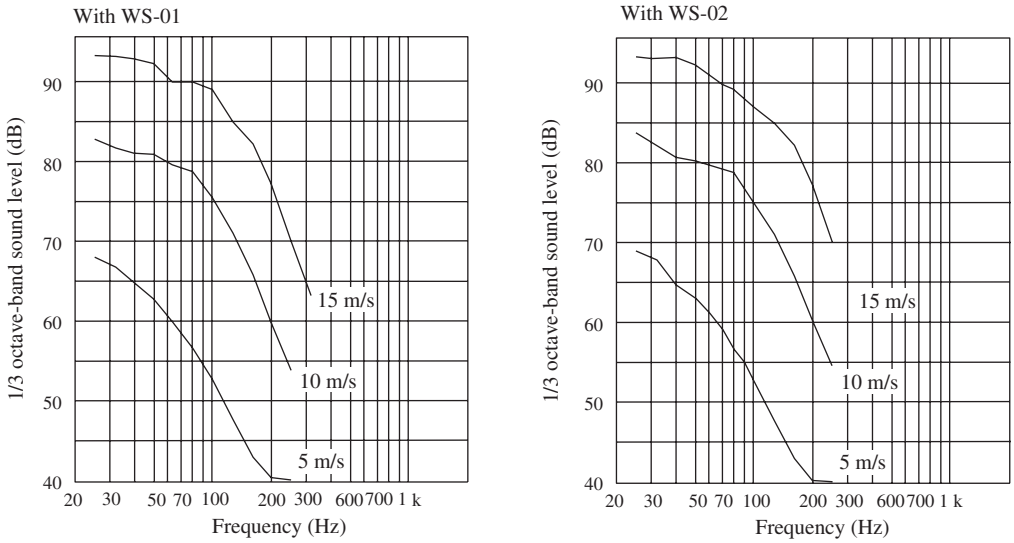
During outdoor measurements, wind noise can falsify measurement results. To counter such problems, an optional windscreen should be mounted on the microphone.

The characteristics of the windscreen WS-01 and WS-02 are shown in the figures below and on the next page. The attenuation of wind noise afforded by the windscreen is about 26 dB for sound level (A weighting) and 15 dB for sound level.

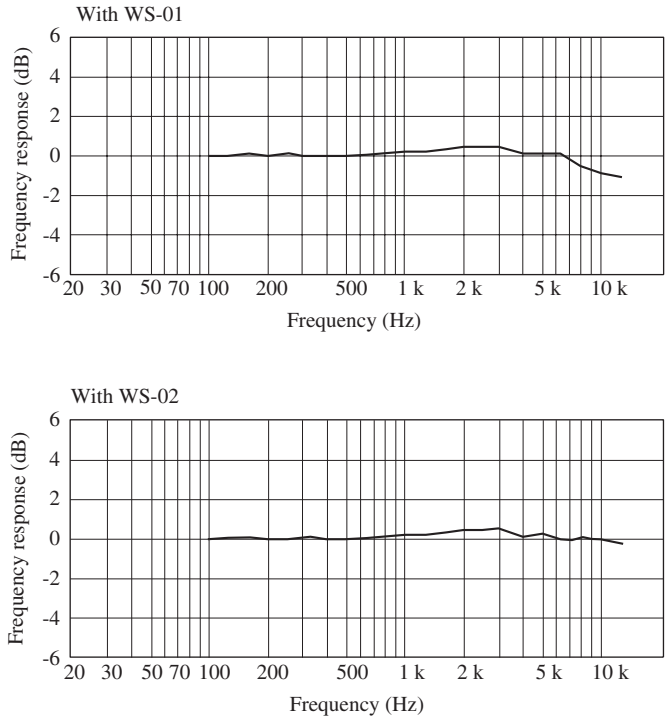
The influence of the windscreens on the acoustical properties of the microphone is within ±1.0 dB up to 12.5 kHz, as shown in the figures on the lower part of the next page.



Wind noise reduction with windscreen WS-01/WS-02



Frequency response of wind noise measured with windscreen WS-01/WS-02 mounted to microphone



Influence of windscreen WS-01/WS-02 on acoustical properties of microphone (referred to microphone response without windscreen)

Influence of Background Noise

When measuring a certain sound in a certain location, all other sound present at that location except the measurement target sound are background noise (also called background). Since the sound level meter will display the combination of target sound and background noise, the amount of background noise must be taken into consideration when determining the level of the target sound.

If the difference between the meter reading in absence of the target sound and the reading with the target sound is more than 10 dB, the influence of background noise is small and can be disregarded. If the difference is less than 10 dB, the values shown in the table below may be used for compensation, to estimate the level of the target sound.

Background noise compensation

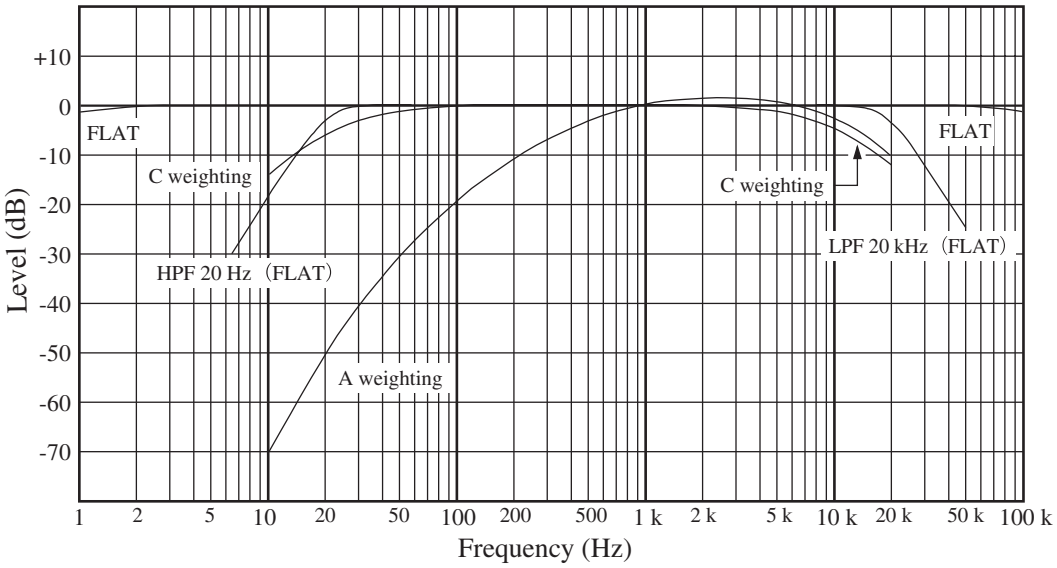
Display reading difference with and without target sound (dB)	4	5	6	7	8	9
Compensation value (dB)	-2		-1			

If for example the measured noise level when operating a machine is 70 dB, and the background noise level when the machine is not operating is 63 dB, the compensation value for the difference of 7 dB is -1 dB. Therefore the noise level of the machine can be taken to be 70 dB + (-1 dB) = 69 dB.

The above principle for compensating the influence of the background noise assumes that both the background noise and the target sound are approximately constant. If the background noise fluctuates, and especially if it is close in level to the target sound, compensation is difficult and will often be meaningless.

Frequency Weighting

The NA-42 provides a choice between A and C weighting and FLAT frequency response. The electrical characteristics of the weighting circuitry are as shown below.



Frequency weightings

The volume impression (loudness) of a sound depends not only on the sound level, but also on the frequency. At high or low frequencies, a sound is felt to be less loud than a sound of equal level in the midrange. The A weighting curve compensates for this effect and produces measurement results which are close to the actual impression of loudness. For this reason, this type of frequency weighting is widely used for purposes such as noise level evaluation.

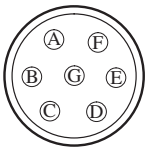
With the FLAT weighting, frequency response is linear, which is suitable for straight sound level measurements and for using the noise level meter output for frequency analysis.

The C weighting curve produces almost flat response, but with a rolloff below 31.5 Hz and above 8 kHz. This is suitable for sound level measurements in situations with unwanted low-frequency or high-frequency components.

INPUT Connector

The INPUT connector is a Tajimi Electronics 7-p connector (1008-23A10-7F). The pin assignment is as follows.

A: Preamplifier power supply +12 V / +45 V
B: Ground
C: Signal input
D: Preamplifier power supply -12 V / -45 V
E: 30 V DC / ground / calibration signal
F: 60 V DC (microphone bias voltage)
G: 200 V DC (microphone bias voltage)



INPUT connector as seen from the front

The function of pin E depends on the setup of the unit.

Insert CAL (menu 2 selection)	Preamplifier gain (menu 1 selection)	CAL	Pin E function
ON	0 dB	ON	Calibration signal output
		OFF	Ground
	20 dB	ON	Calibration signal output
		OFF	Ground
OFF	0 dB	ON	Calibration signal output
		OFF	Ground
	20 dB	ON	30 V DC
		OFF	30 V DC

⚠ Caution

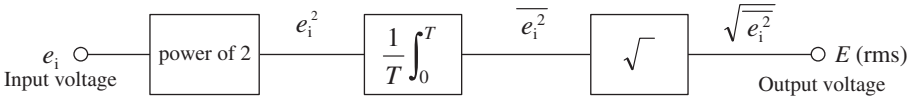
To prevent the risk of electric shock, never insert a metal clip or any other pointed object into the input connector.

RMS Detection Circuit and Time Weightings

The noise level meter uses rms detection. The effective value E (rms) is defined by the following equation.

$$E\ (\mathrm{rms}) = \sqrt{\frac{1}{T}\int_0^T e_i^2 dt}$$

The voltage e which changes over time is raised to the power of 2, and integration for the time interval T is performed. The result is divided by T and the square root is extracted. The circuit configuration for performing the above mathematical operation looks as follows.



The NA-42 uses digital processing to calculate the rms value.

During noise level measurements, the level often fluctuates drastically, which would make it difficult to evaluate readings without some kind of averaging. Sound level meters therefore provide the capability for index weighting (index averaging) using the rms circuit. The parameters of this weighting process are called the time weightings, determined by the time constant (see next page).

Noise level meters usually have a FAST and SLOW setting for the time constant. The time range that is considered for averaging is narrow in the FAST setting and wide in the SLOW setting. In the FAST setting, the instantaneous level has a larger bearing on the displayed value than in the slow setting. From the point of view of the measurement objective, the FAST setting is more suitable to situations with swiftly changing noise level, whereas the SLOW setting yields a more broadly averaged picture.

The FAST setting is more commonly used, and A-weighted sound level or sound level values given without other indication are usually made with FAST weighting.

The SLOW time constant setting is suitable for measuring the average of noise with fairly constant levels. Aircraft noise and high-speed train noise is usually transient noise with high fluctuation, but here the SLOW setting is used to determine the maximum level for each noise event.

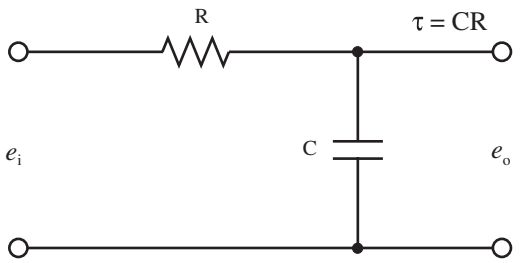
The IMP (impulse) setting enables the meter to track noise bursts of very short duration.

In the L_{peak} mode, no averaging is carried out, and the peak value of the frequency-weighted sound pressure waveform is displayed.

Time weightings and time constant

Time weightings	Time constant	
	Rise time	Fall time
FAST	125 ms	125 ms
SLOW	1 s	1 s
IMP	35 ms	1.5 s

The time weighting circuit of the noise level meter performs index averaging on the square of the sound pressure signal. The equivalent circuit is shown at right. τ is the time constant, which equals CR.

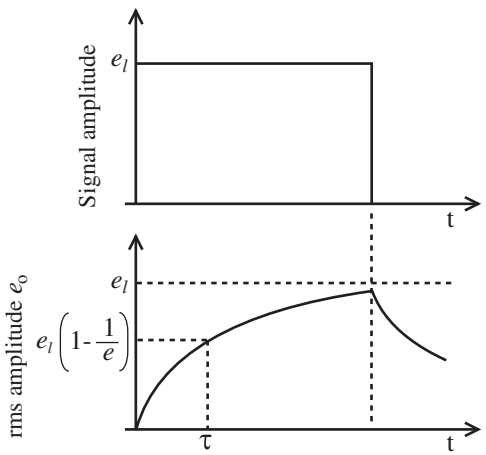


Equivalent electrical circuit

e_i : Input voltage (proportional to square of sound pressure)

e_o : Output voltage

The response of the index averaging circuit to a single burst signal is shown below.



Burst signal response

e_l : Burst signal voltage

e : Logarithm base

τ : Time constant

t : Time

Factory Default Settings

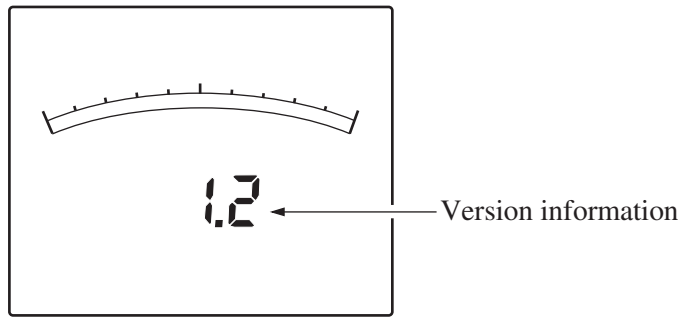
The factory default settings are listed below.
To reset the unit to these settings, turn the unit off, and then hold down the RESET key while turning the power on. (The rear-panel PREAMP power selector setting and the microphone sensitivity setting are not reset.)

Factory default settings

Level range (upper limit)		120 dB
Frequency weighting		A
Time weighting		FAST
Microphone sensitivity		-29.9 dB
Bar graph display range		50 dB
HPF 20 Hz		OFF
LPF 20 kHz		OFF
External filter		OFF
Menu 1	Preamplifier gain	0 dB
Menu 2	Insert	OFF
Menu 3	Measurement value readout resolution	0.1 dB
Menu 4.0	Serial communication	OFF
Menu 4.1	ID number	0
Menu 4.2	SC-31	OFF
Menu 5.0	Comparator function	OFF
Menu 5.1	Comparator level	100 dB
Menu 5.2	Delay Time	0 s
Menu 5.3	Auto reset function	OFF
Menu 5.4	Auto reset time	30 s

Displaying the Software Version

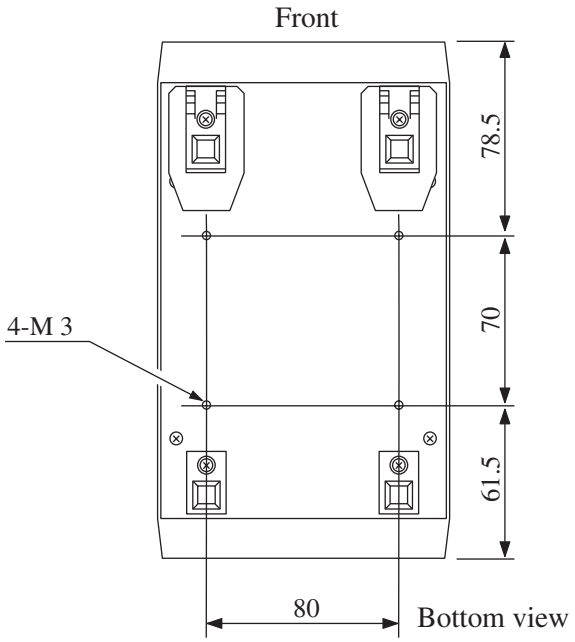
To display the software version, turn the unit off, and then hold down the MENU (LIGHT) key while turning the power on. The software version is shown in the measurement value field.



Software version display example

Rack Mounting

The unit can be mounted in a rack, using the four screw holes on the bottom.

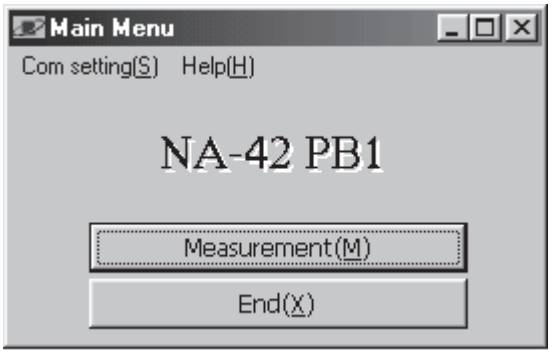


Unit: mm

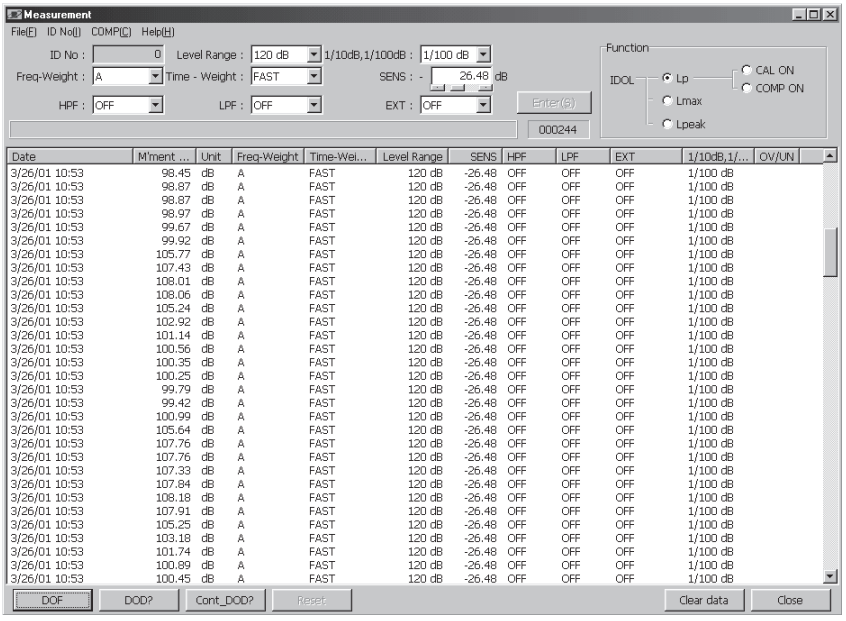
NA-42PB1

The NA-42 Management Software NA-42PB1 is designed for use with the sound level measuring amplifier NA-42. The software allows setting measurement parameters and controlling measurement operation by means of commands sent from the computer. Measurement result data can be read into the computer for display, and the software also allows storing measurement data in CSV format suitable for further processing for example with a spreadsheet application. In conjunction with the optional adapter SC-31M or SC-31S, the software can control up to 16 NA-42 units connected to a single computer.

The Software NA-42PB1 is designed to run under Microsoft Windows 95, or Microsoft Windows 98, Microsoft Windows 98SE, Microsoft Windows NT (Ver.4.0), Microsoft Windows Me, Microsoft Windows 2000, Microsoft Windows XP.



Main menu screen



Measurement screen

Specifications

Measurement functions

Sound level L_p

Maximum sound level L_{max}

Maximum sound level value is held on measurement value readout.

Peak sound level L_{peak}

Peak sound level value is held on measurement value readout.

Sampling frequency 250 kHz

Frequency range

1 Hz to 100 kHz (approx -2 dB at 1 Hz, approx -3 dB at 100 kHz)

Frequency weighting

A, C, FLAT

Linear operation range and applicable standards

Depending on microphone combination

(Linear operation range applies to A weighting without overload margin)

Designation	Linear operation range	Frequency range	JIS	IEC 60651
UC-53A	28 to 145 dB	10 Hz to 20 kHz	C1505	TYPE 1
UC-52	28 to 146 dB	20 Hz to 8 kHz	C1502	TYPE 2
UC-34P	10 to 112 dB	10 Hz to 12.5 kHz	C1505	TYPE 1
UC-29	50 to 164 dB	20 Hz to 100 kHz	C1505	TYPE 1
UC-27	20 to 145 dB	5 Hz to 12.5 kHz	C1505	TYPE 1
UC-31	34 to 155 dB	10 Hz to 35 kHz	C1505	TYPE 1

The Linearity range values given in the above table are guaranteed for all microphones of the indicated type.

When wider linear operation range is required, microphone selection can extend upper or lower limit by about 1 to 5 dB*.

* Depends on microphone type.

Residual noise

Input converted inherent noise

A weighting:	1.5 μV rms or less
C weighting:	1.5 μV rms or less
Flat weighting:	7 μV rms or less
Flat (HPF 20 Hz, LPF 20 kHz):	2.5 μV rms or less

Linearity range

60 dB

Level range switching

10 dB steps

Maximum 8 steps

Setting range depending on microphone sensitivity and preamplifier gain setting is shown below.

Conditions		Level range (dB)							
Preamplifier gain 0 dB/20 dB	Microphone sensitivity (dB)								
0 dB	-19.99 to -10.00	60	70	80	90	100	110	120	130
	-29.99 to -20.00	70	80	90	100	110	120	130	140
	-39.99 to -30.00	80	90	100	110	120	130	140	150
	-49.99 to -40.00	90	100	110	120	130	140	150	160
	-59.99 to -50.00	100	110	120	130	140	150	160	170
	-69.99 to -60.00	110	120	130	140	150	160	170	180
20 dB*	-19.99 to -10.00	40	50	60	70	80	90	100	–
	-29.99 to -20.00	50	60	70	80	90	100	110	–

When the preamplifier power supply voltage is set to ±12 V, these level range settings are available.

When the preamplifier power supply voltage is set to ±45 V, only the underlined settings are available and the LEVEL RANGE keys are disabled.

* The preamplifier gain setting of 20 dB is available only when the UC-34P (UC-34, NH-34) is connected.

Time weighting

FAST, SLOW, IMPULSE

RMS detection

By digital processing

Built-in filters

High-pass filter (HPF): 3rd-order Butterworth filter, 20 Hz (-3 dB)

Low-pass filter (LPF): 3rd-order Butterworth filter, 20 kHz (-3 dB)

Calibration

Electrical calibration using 1-kHz sinusoidal wave signal produced by internal oscillator

Insert CAL function possible with dedicated preamplifier NH-08

Microphone sensitivity

-69.99 dB to -10.00 dB

Polarizing voltage (microphone bias voltage)

200 V:	200 V ±0.5%	20ºC ±3ºC
	200 V ±1%	Entire temperature range
60 V:	60 V ±1.5%	
30 V:	30 V ±1.5%	

Outputs

AC output

BNC connector

Output voltage:	1 Vrms (at full-scale of range)
Output impedance:	600 Ω
Load impedance:	10 kΩ or more

DC output
- BNC connector
- Output voltage: 6 V (at full-scale of range), 1 V/10 dB
- Output impedance: 50 Ω
- Load impedance: 10 kΩ or more

External filter input
- BNC connector
- Output impedance: 600 Ω
- Input impedance: 100 kΩ

Serial communication
- For setting control from computer and data output
- D-sub 9-pin male connector
- Transfer principle
  - Transfer rate: 9600, 19200 bps
  - Transfer principle: asynchronous, half-duplex
  - Stop bits: 2
  - Parity: None

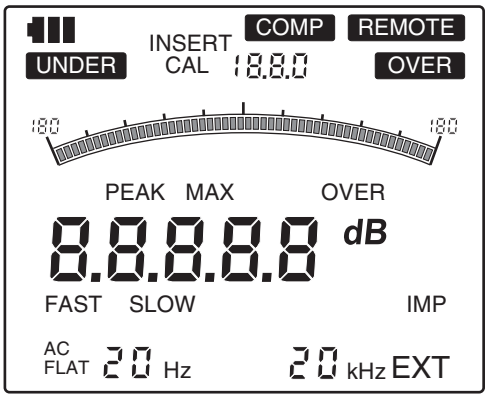
Multi-channel configuration using Multi-Channel Adapter SC-31M/SC-31S possible (up to 16 channels, maximum distance 400 m)

Comparator function
- Sound level evaluating comparator
- Comparator output
  - Open-collector output using M3 screw terminal strip
    - Maximum applied voltage: 24 V
    - Maximum drive current: 12.5 mA for applied voltage 24 V
      25 mA for applied voltage 12 V
      60 mA for applied voltage 5 V
  - LCD flashing
- Comparator settings
  - Comparator level: 0 to 180 dB in 1-dB steps
  - Delay time: 0 to 9 s in 1-second steps
  - Auto reset: On/off selectable
  - Auto reset time: 0 to 90 s in 1-second steps

Display

Backlit LCD

Numeric readout	5 digits, display range 70 dB second decimal place or first decimal place, switchable Display update interval 1 s for first decimal place readout resolution 0.2 s for second decimal place readout resolution
Bar graph	Scale range 50 dB or 20 dB, update interval 0.1 s
Warning indications	OVER (overload), triggered at about +10 dB from full-scale point UNDER (underload), triggered at about -50.5 dB from full-scale point
Battery indicator	Remaining capacity indicator (4 segments)
Other indicators	Various setting indicators



LCD display segments (all lit)

Power requirements

IEC R14 (size "C") batteries × 4 (R14P or LR14)

Battery life LR14: approx. 14 hours*

R14P: approx. 6 hours*

* Measurement conditions

Ambient temperature 23ºC, using microphone UC-53A and preamplifier NH-17, preamplifier power supply voltage ±12 V, backlight OFF, serial communication OFF

AC adapter

NC-98A AC outlet 100 V to 240 V, line frequency 50 to 60 Hz

Current consumption

With EXT DC 6 V

Approx. 220 mA*

* Measurement conditions

UC-53A/NH-17 connected, preamplifier power supply ±12 V, backlight OFF, serial communication OFF

When backlight is ON, current consumption increases by about 15%

For preamplifier power supply ±45 V, current consumption increases by about 70%

For serial communication, current consumption increases by about 5%

With AC adapter NC-98A

AC 100 V: approx. 6.5 VA*

AC 220 V: approx. 16 VA*

* Measurement conditions same as for EXT DC 6 V

Ambient conditions for use

-10ºC to 50ºC, 10% to 90% relative humidity (no condensation)

Dimensions

171 (H) × 120 (W) × 236 (D) mm

Weight

1.8 kg (without batteries)

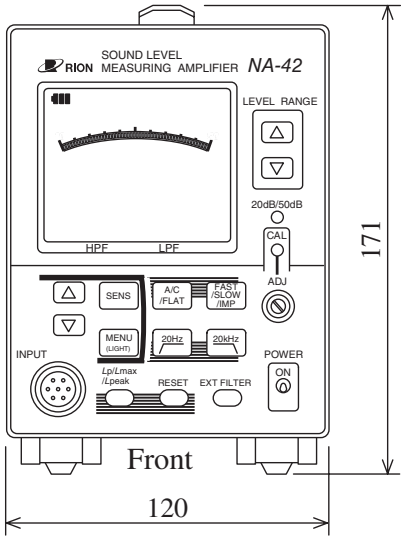
Supplied accessories

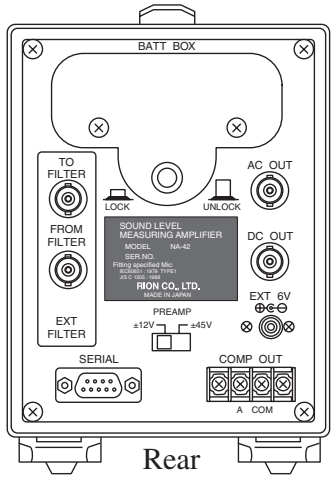
IEC R14 (size "C") batteries	R14P	4
AC adapter	NC-98A	1
Miniature screwdriver	D-62	1
Storage case	VM-83-031	1
Instruction manual		1
Inspection certificate		1

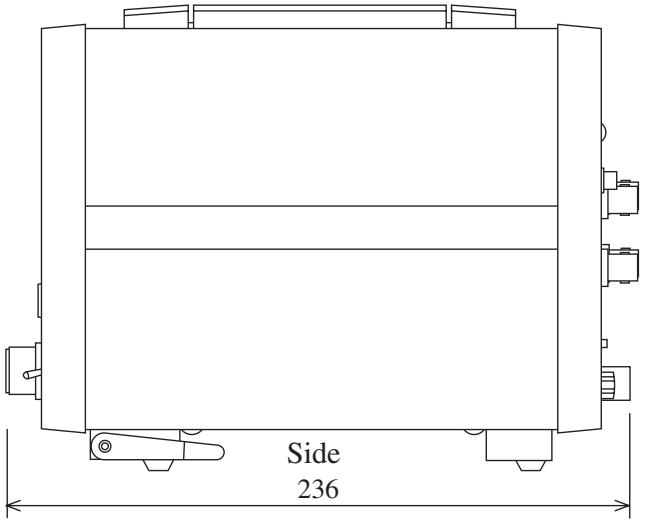
Optional accessories

External input adapter	UA-01
Condenser microphones	
Preamplifiers	
Condenser microphone cable	EC-04 series
Pistonphone	NC-72A
Sound calibrator	NC-74
Preamplifier	
(for vibration measurements)	VP-26C
NA-42 management software	NA-42PB1

(for Microsoft Windows 95, Microsoft Windows 98, Microsoft Windows 98SE, Microsoft Windows Me, Microsoft Windows 2000, Microsoft Windows XP and Microsoft Windows NT (Ver. 4.0))







Unit: mm

Dimensional Drawings

No. 32343 09-06