

INSTRUCTION MANUAL

LEVEL RECORDER

LR-07



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

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

Organization of This Manual

This manual describes the features and operation of the Level Recorder LR-07. The following pages contain important information about safety. Be sure to read and observe these in full.

The manual contains the following sections.

Outline

Gives basic information about the unit.

Controls and Functions

Briefly identifies and explains the switches, controls, side panel connectors and other parts of the unit. Also contains information about the calibration position stickers.

Preparations

Provides information about consumables, batteries, and the AC adapter. Also explains how to load paper and set up the recording pen, and how to connect the unit to a sound level meter or vibration level meter.

Power-On, Power-Off

Explains how to turn the unit on and off and how to use the battery meter.

Basic Operation and Display Functions

Explains the general measurement principles.

Level Recording (with AC signal and 50, 25, 10 dB range)

Explains how to make settings for sound pressure level and vibration level recording, how to perform the recording, and how to calibrate the measuring equipment and level recorder.

Paper Speed Control Measurement

Provides information about conserving recording paper.

Frequency Analysis

Explains how to record the results of a frequency analysis operation.

Operation with Sound and Vibration Level Analyzer SV-76

Explains how to use the LR-07 in conjunction with the Sound and Vibration Level Analyzer SV-76.

AC Signal Linear Recording

Explains how to perform linear signal recording.

DC Signal Recording

Explains how to perform direct-current (DC) signal recording.

External Control

Explains the connection and operation principles for controlling the LR-07 from external equipment.

Service and Maintenance

Provides maintenance information about the recording pen and dry-cell batteries.

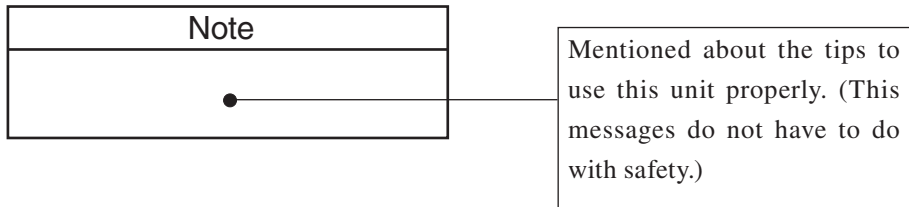
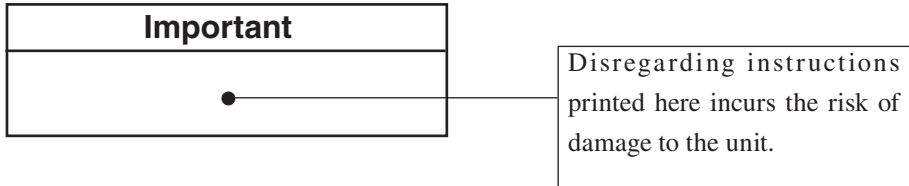
Specifications

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 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.
- Do not disassemble the unit or attempt internal alterations.
- Observe the following precautions before using the unit:
 - Make sure that connections to the measuring equipment (sound level meter, vibration level meter or similar) are properly established.
 - Make sure that the measuring equipment and the LR-07 are operating normally.
 - Verify that recording paper is loaded correctly into the LR-07.
(The LR-07 has a paper detection function. If no paper is detected, paper feed and pen operation are stopped automatically.)
- The permissible ambient temperature and humidity range for operation of the unit is as follows. Make sure that this range is not exceeded.
When used with AC adapter or rechargeable battery pack: -10 to +50°C, max. 90% RH
When used with dry-cell batteries: 0 to +50°C, max. 90% RH
- Do not use or store the unit in locations which may be subject to:
 - High levels of dust
 - Air with high salt or sulphur content, gases or chemicals
 - Direct sunlight, high temperature, or high humidity
 - Vibrations or shock
- Observe the following precautions after using the unit:
 - Always switch the power off.
 - Cover the tip of the recording pen with the cap and place the pen in the spare pen holder.
 - When disconnecting cables, always hold the plug and do not pull the cable.
- In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.
- When disposing of the unit or batteries, be sure to observe all applicable legal regulations and guidelines in your country and community.

Precautions for using the unit with dry-cell batteries

- Battery life

Battery life will differ, depending on the type and brand of the batteries as well as the usage conditions of the level recorder. Under normal conditions at an ambient temperature of 25°C, a set of manganese batteries will last for about 7 hours and a set of alkaline batteries for about 16 hours (when the light is not used). At an ambient temperature of 0°C, the battery life will be reduced to two-thirds or one-half as compared to 25°C.

- Battery replacement

When the indicator of the battery meter moves out of the green area, replace all batteries with fresh ones as soon as possible. For information on battery voltage indication, please refer to page 22.

- Make sure to insert batteries with correct +– orientation

If batteries are inserted with wrong polarity, the unit may be damaged.

Precautions for handling the recording pen

- Storage

- Put a pen cap onto the pen when it is not in use.
- The maximum storage period for a recording pen in unused and unopened condition is 18 months at room temperature.
- Do not subject stored recording pens to high temperatures and protect them especially from direct sunlight.

- Usage

- Please make sure that ink of the pen is flowing properly before using it.
- When the ink starts to run out, recording may become faint or irregular. In such a case, replace the pen with a new one as soon as possible.
- The maximum recording life with normal recording paper (RP-01D) is about 500 m (straight line) for the LB-25A.

Recording paper speed and pen amplitude

- Depending on the amplitude of pen movement, problems such as ink clogging, paper staining or tearing can occur. In such cases, try increasing the paper feed rate. Please refer to page 32 to 33.

Contents

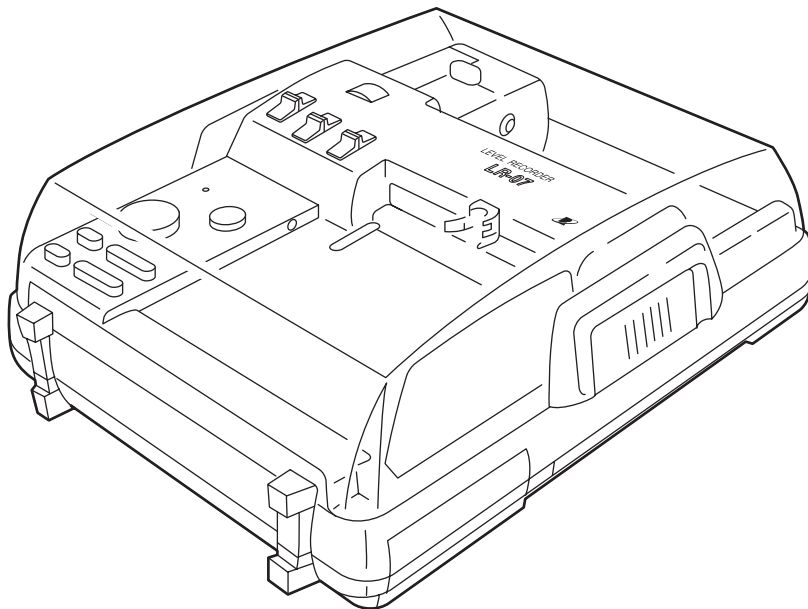
FOR SAFETY.....	iii
Outline.....	1
Controls and Functions	2
Overview	2
Operation panel	4
Input controls.....	7
Paper section.....	8
Calibration position sticker	9
Side panel connectors	11
Preparations	12
Consumables.....	12
Power supply.....	13
Recording paper.....	16
Recording pen.....	18
Connections	19
Power-On, Power-Off.....	22
Power supply voltage indication	22
Basic Operation and Display Functions	23
Keys and switches.....	23
Level Recording (with AC signal and 50, 25, 10 dB range)	27
Setting and recording procedure	27
Calibration of measuring equipment and level recorder	34
Paper Speed Control Measurement.....	36
Outline.....	36
Example.....	37
Frequency Analysis	38
With 1/3 octave band analyzer SA-59A.....	38
With sound level meter NL-04, NL-14.....	42
Example.....	44

Operation with Sound and Vibration Level Analyzer SV-76.....	45
AC Signal Linear Recording	46
DC Signal Recording	48
External Control.....	50
Service and Maintenance	52
Specifications	53

Outline

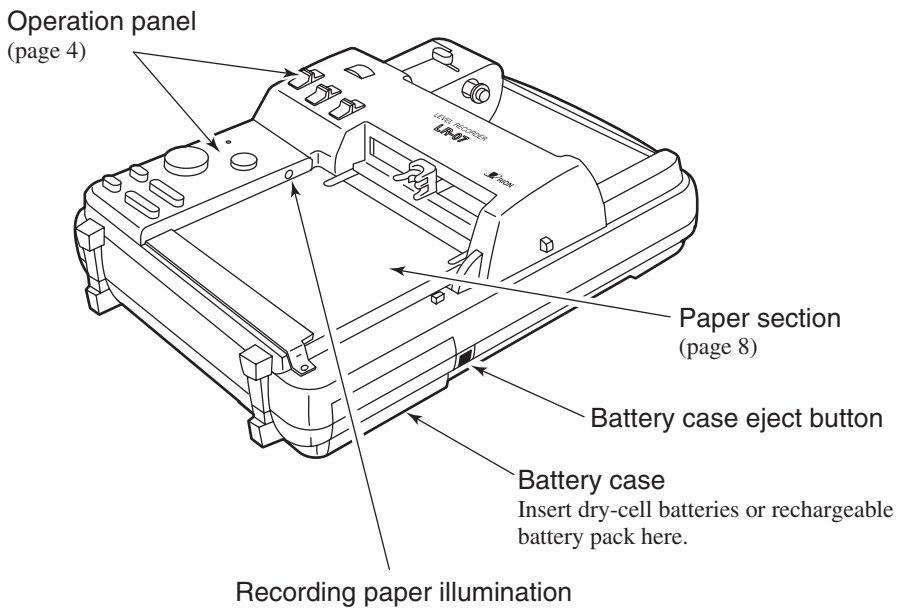
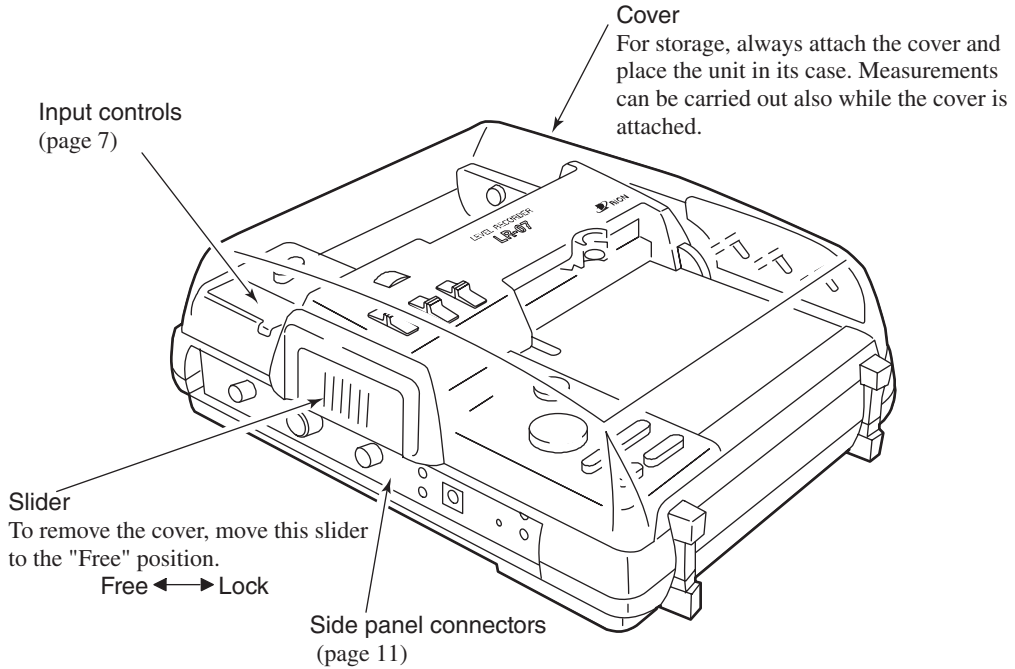
The LR-07 is a sophisticated level recorder designed for use with sound level meters or vibration level meters. It complies to the JIS C 1512:1996 (Level recorders for recording sound level and/or vibration level).

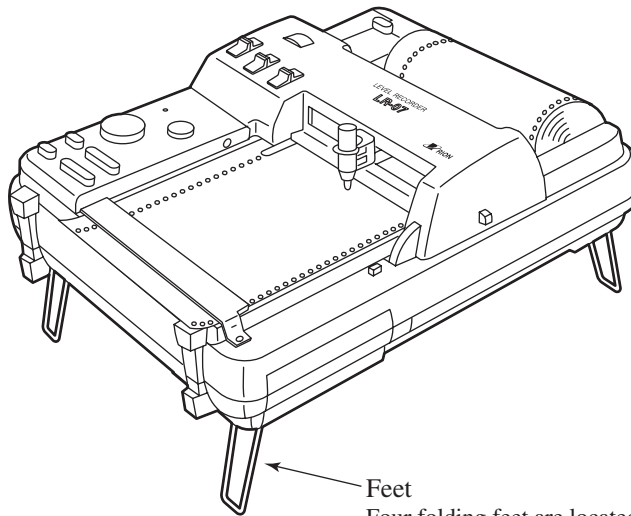
The LR-07 can also be used for synchronized frequency analysis, for measurements of electroacoustic equipment and transducers, and as a conventional DC signal level recorder.



Controls and Functions

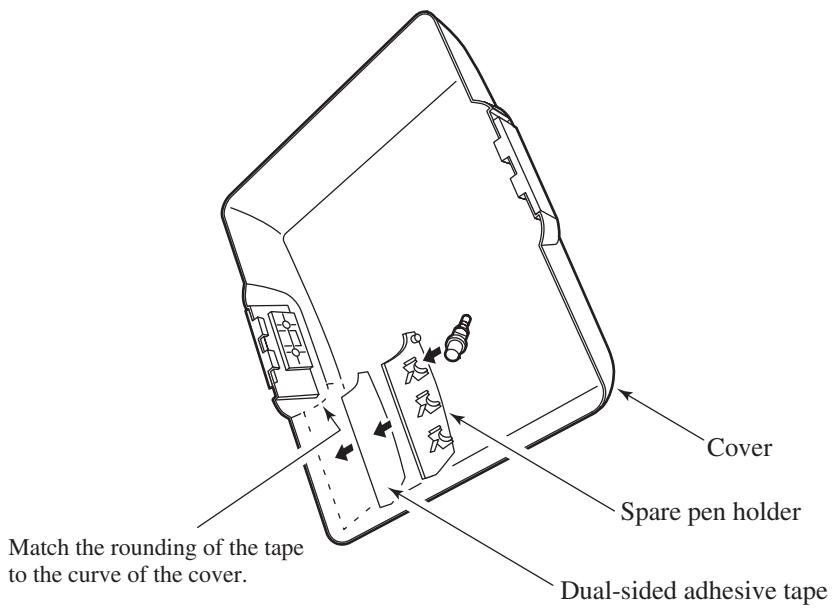
Overview



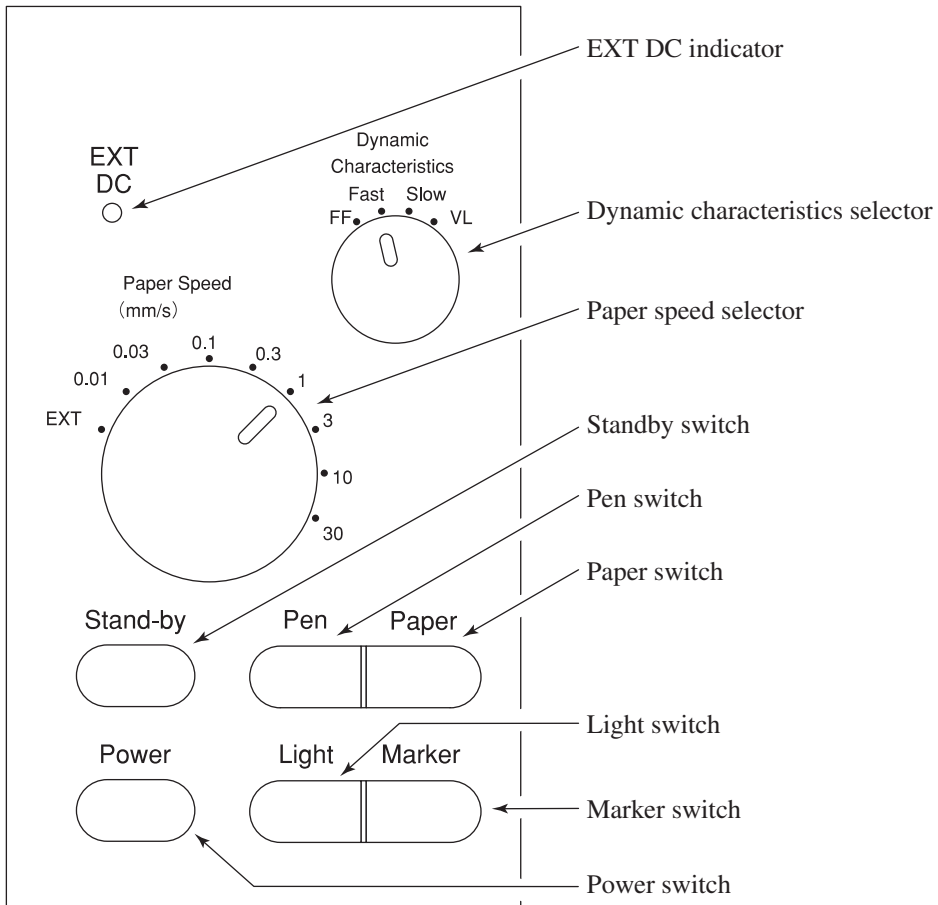


Feet
Four folding feet are located on the bottom of the unit and can be used if needed.

Use the supplied dual-sided adhesive tape to attach the spare pen holder inside the cover.



Operation panel



Operation panel

EXT DC indicator

Lights up when an external power supply is used.

Dynamic characteristics selector

Serves to select the dynamic characteristics for the recording pen (→ p. 26).

Paper speed selector

Serves to select the paper feed rate. When wishing to control paper speed by means of an external pulse, use the EXT setting (→ p. 26).

Depending on the pen movement, ink clogging, paper staining or tearing can occur. In such cases, try increasing the paper feed rate.

Standby switch

When the switch is released (■), the pen and paper switches are in the standby condition. When the standby switch is depressed (▬), the pen and paper switches are operative (→ p. 23).

Pen switch

When the switch is depressed (▬), the pen is in the operating condition, and when the switch is released (■), the pen is in the stop condition. This switch is only active when the standby switch is depressed (→ p. 23).

Paper switch

When the switch is depressed (▬), the paper transport is in the operating condition, and when the switch is released (■), the paper transport is in the stop condition. This switch is only active when the standby switch is depressed (→ p. 23).

Power switch

Serves to turn the unit on (▬) and off (■) (→ p. 22).

Light switch

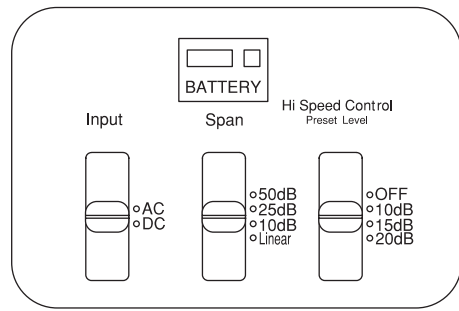
When this switch is depressed (▬), the recording paper illumination turned on (→ p. 24).

Marker switch

When this switch is pressed, the recording pen briefly swings to the scale minimum mark and then returns to its original position (→ p. 25).

Battery meter

Shows the power supply voltage. When the indicator is in the red area, replace the batteries with fresh ones.



Operation panel

Input selector

Set this selector to the appropriate position, depending on whether the input signal is an AC or DC signal.

Span (recording range) selector

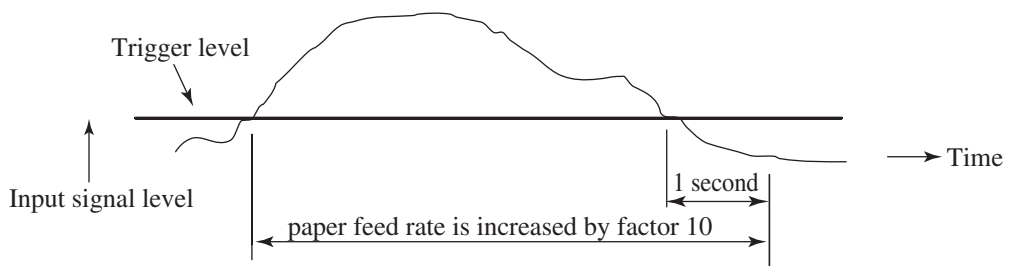
- 50 dB: Logarithmic recording with 1 dB scale units
- 25 dB: Logarithmic recording with 0.5 dB scale units
- 10 dB: Logarithmic recording with 0.2 dB scale units
- Linear: Linear recording similar to conventional voltmeter

Hi Speed Control selector

When the signal exceeds the trigger level set with this selector, the paper feed rate is increased by a factor of 10. This applies only if the span selector is set to “50 dB” and is the paper speed selector is not set to “EXT”, “30 mm/s”, “10 mm/s”, or “3 mm/s”.

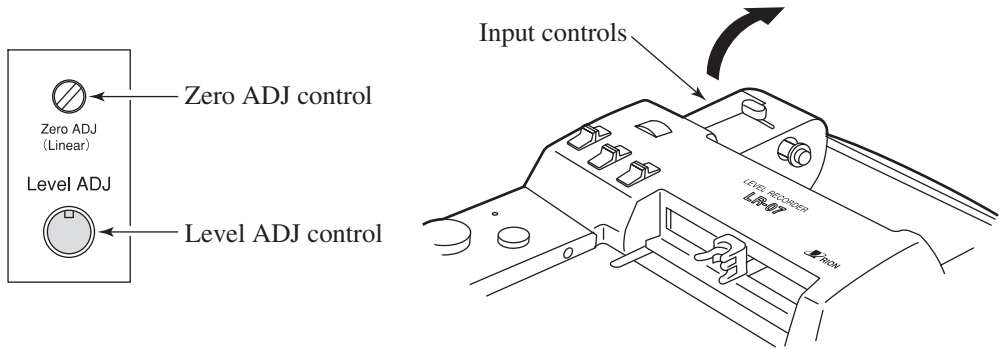
- OFF: No increase in paper feed rate
- 10 dB: Trigger level is 10 dB above lower measurement limit
- 15 dB: Trigger level is 15 dB above lower measurement limit
- 20 dB: Trigger level is 20 dB above lower measurement limit

Operation principle



Input controls

To protect against unintentionally disturbing the control settings, this section is located under a cover. Open the cover to make an adjustment.



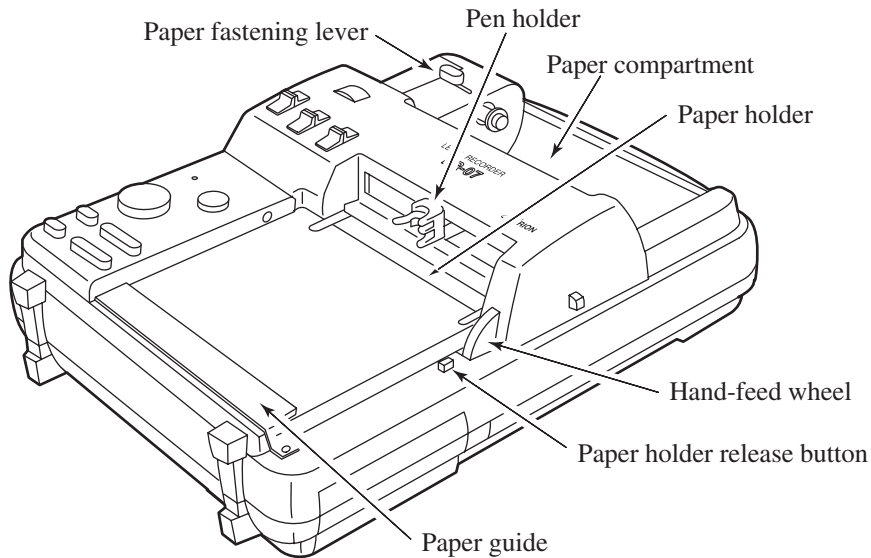
Zero ADJ control

Serves to adjust the zero point for linear recording.

Level ADJ control

Serves to adjust the input level.

Paper section



Paper fastening lever

Serves to secure the paper roll in the paper compartment.

Pen holder

The recording pen is inserted into this holder.

Paper compartment

The recording paper roll is inserted into this compartment (→ P. 16).

Paper holder

Serves to keep the recording paper in place.

Hand-feed wheel

Serves to advance the recording paper by hand.

Paper holder release button

Pressing this button will cause the paper holder to rise, so that the recording paper becomes free.

Paper guide

Passing the recording paper through this guide is recommended especially when using the unit outdoors in windy locations, since it will keep the paper steady. The guide also serves as a paper cutter.

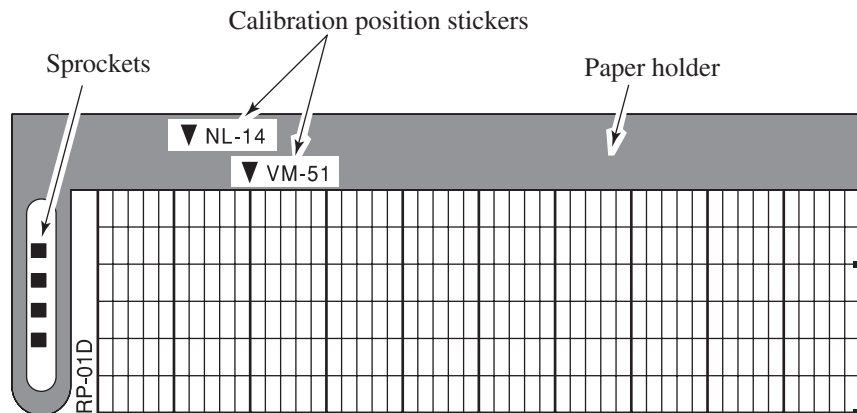
Calibration position sticker

Before recording the results of sound level and vibration level measurements, calibration must be performed to match the output of the sound level meter or vibration level meter to the input of the level recorder. When several different measuring instruments are used, performing renewed calibration each time is a time-consuming and error-prone process.

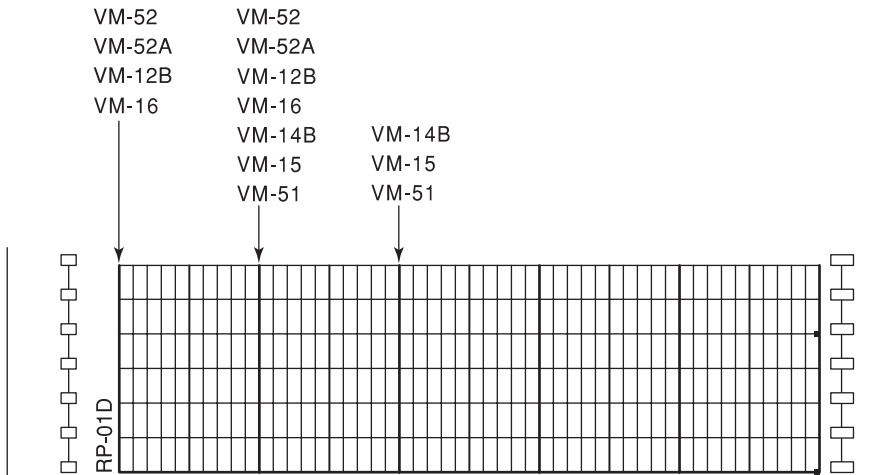
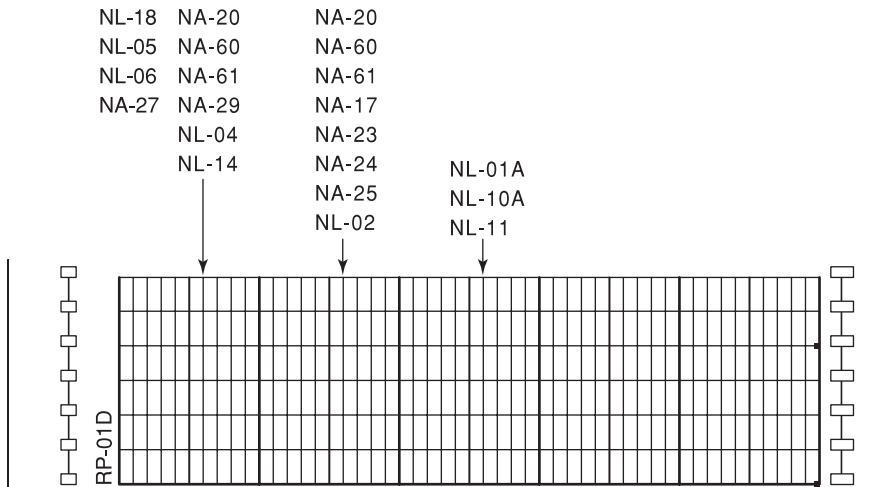
To facilitate the adjustment, calibration position stickers are provided for various measuring devices. By performing calibration once and attaching a suitable sticker on the paper holder, subsequent adjustments can be made easily and quickly.

▼ VM-12B	▼ NL-01A	▼ NA-17	▼ NA-60
▼ VM-14B	▼ NL-02	▼ NA-20	▼ NA-61
▼ VM-15	▼ NL-04	▼ NA-23	▼
▼ VM-16	▼ NL-10A	▼ NA-24	▼
▼ VM-51	▼ NL-11	▼ NA-25	▼
▼	▼ NL-14	▼ NA-29	▼

Calibration position stickers

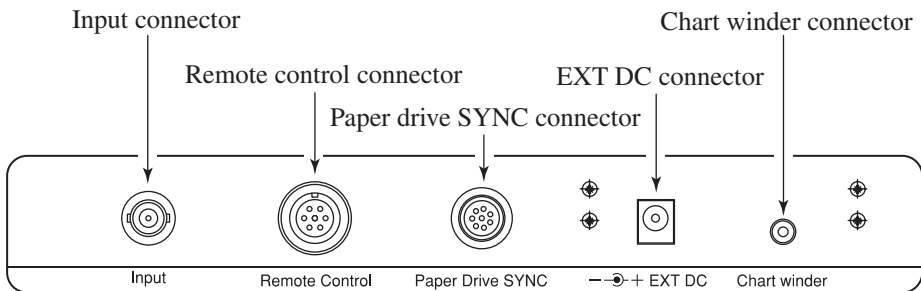


The standard calibration positions for Rion measuring instruments are shown below, for a recording range of 50 dB.



Positions for “25 dB”, “10 dB” and “Linear” are not shown, because these settings are not often used.

Side panel connectors



Input connector

The output signal of the sound level meter, vibration level meter or similar equipment is connected here.

Remote control connector

When performing frequency analysis, this connector serves to connect the frequency analyzer (→ p. 20, 21).

Paper drive SYNC connector

This connector serves for external control of paper feed, recording pen and marker operation, and paper speed setting (→ p. 50).

EXT DC connector

The optional AC adapter NC-97 (for 100 to 240 V AC), cigarette lighter adapter CC-82, or battery pack DP-1240 can be connected here (→ p. 14).

Chart winder connector

Power supply connector for a Rion chart winder LB-23.

Preparations

Before starting a measurement, prepare the unit as described in this section.

Make sure that the power switch is set to OFF (■).

Consumables

Recording paper

Provide enough recording paper, taking factors such as the intended measurement duration and paper speed setting into consideration. Rion provides recording papers: regular paper RP-01D, RP-03, RP-29, RP-33, RP-41 and TP-30. Two RP-01D rolls are supplied with the LR-07.

The length of one recording paper roll is about 50 meters.

Recording pen

Recording pen LB-25A (red) is used with LR-07. Six red LB-25A pens are supplied with the unit.

The maximum recording life is about 500 m (straight line) for the LB-25A (red).

Batteries

Provide enough batteries, taking factors such as the intended measurement duration and the ambient temperature into consideration. When dry cells (non-rechargeable batteries) are used, the temperature range for operation of the unit is 0 to 50°C. When wishing to use the LR-07 at temperatures below 0°C, the unit must be powered from the AC adapter or the rechargeable battery pack. Dry-cell batteries must be size “D” (IEC R20). You can use either manganese batteries (R20P) or alkaline batteries (LR20).

All six batteries must be of an identical type. Mixing different battery types or old and new batteries can damage the unit.

The life of the batteries depends on various factors including battery type and measurement conditions. The average life expectancy with manganese batteries is about 7 hours of continuous operation, and with alkaline batteries about 16 hours of continuous operation (at an ambient temperature of 25°C). At an ambient temperature of 0°C, the battery life will be reduced to two-thirds or one-half as compared to 25°C.

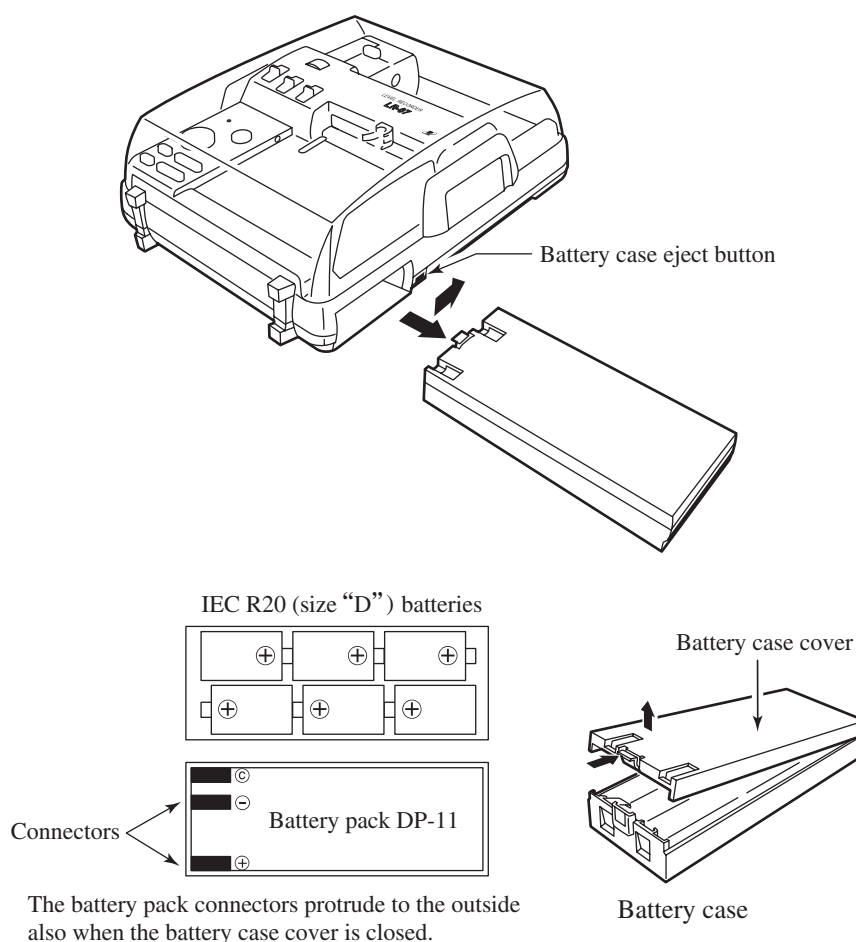
Even when an AC adapter is used, batteries can serve as backup in case of a power outage (→ p. 15).

Power supply

The LR-07 can be powered from AC current, dry-cell batteries, rechargeable batteries, or a car battery.

Dry-cell batteries

To remove the battery case, slide the battery case eject button on the right side of the unit in the direction shown by the arrow. Open the cover of the battery case and insert six IEC R20 (size “D”) batteries, taking care to observe correct polarity as shown inside the case.



Important

Use only fresh batteries.

Mixing old and new batteries or different battery types can damage the unit.

Rechargeable batteries

The optional battery pack DP-11 or DP-1240 contains rechargeable batteries. The battery pack DP-11 is designed for insertion in the battery case in the same way as dry-cell batteries. The battery pack DP-1240 is designed for external use. It must be connected to the LR-07 via the EXT DC connector on the left side panel. The average battery life with one charge is about 5.5 hours of continuous operation for the DP-11 and about 14 hours of continuous operation for the DP-1240. To charge the rechargeable battery packs, the separate battery charger KD-11A (option) is required. The battery charger can charge four DP-11 or four DP-1240 simultaneously.

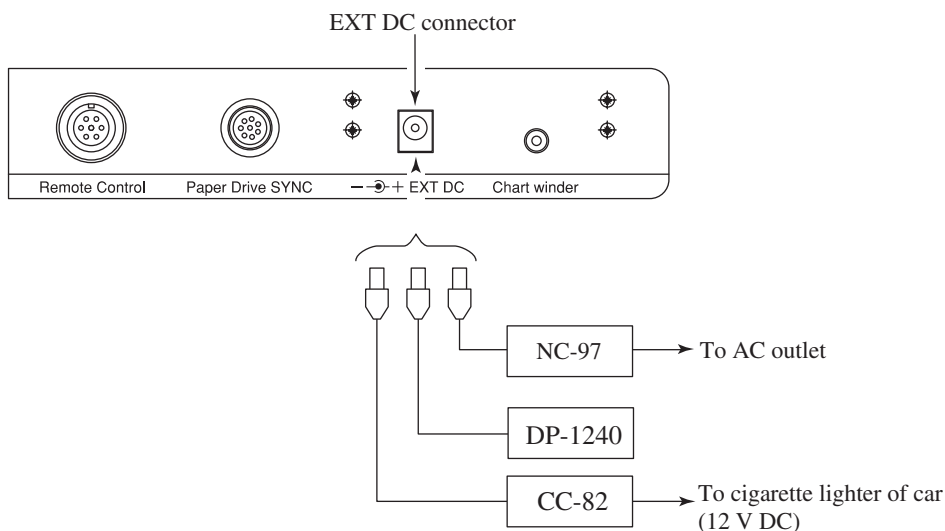
AC

The optional AC adapter NC-97 (for 100 to 240 V AC) can be connected to the EXT DC connector on the left side panel of the LR-07, for operation from regular AC current.

Car battery

By using the optional car battery adapter CC-82 (designed to plug into the cigarette lighter of the car and the EXT DC connector on the left side panel of the LR-07), the unit can be powered from a car battery.

Some cars have different voltages, such as 24 V. Before using the adapter, double-check that the voltage of the car's system is 12 V.



Important

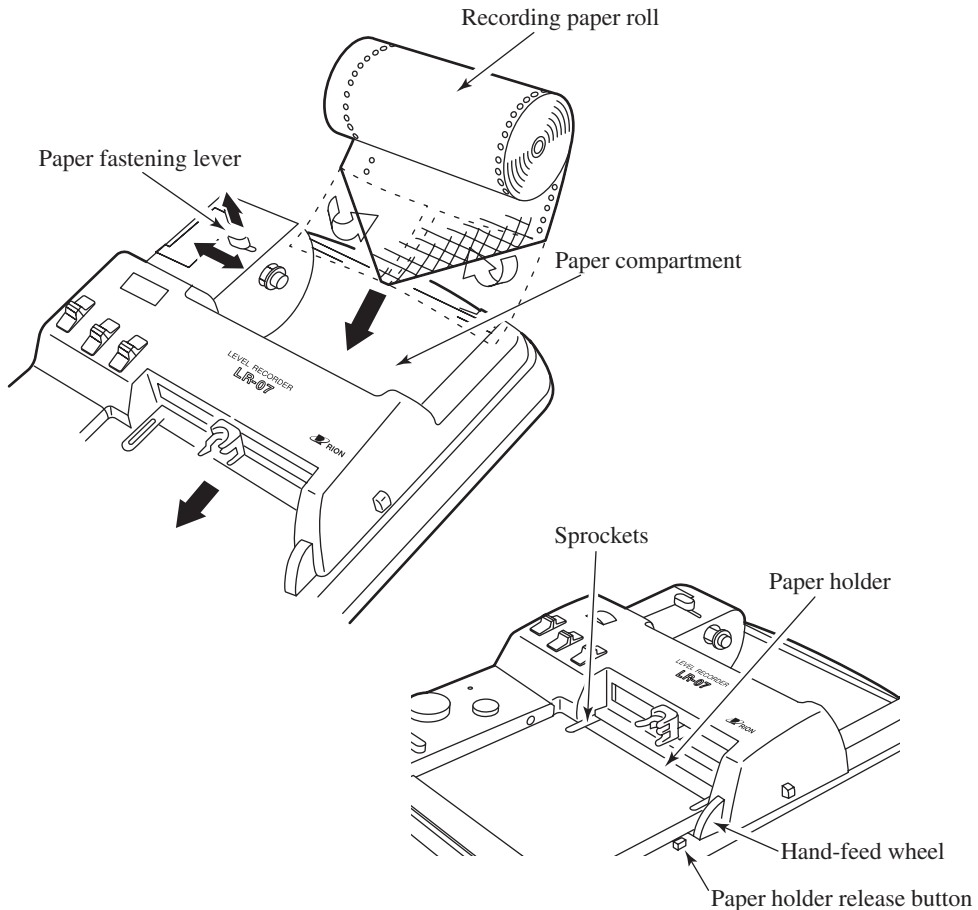
The allowable voltage range for the external power supply is 11 to 20 V. Supplying voltages of more than 20 V can damage the unit.

Backup power supply

By keeping fresh dry-cell batteries or a charged battery pack DP-11 in the battery compartment and running the unit from the AC adapter (which has priority), protection against power outages can be provided. If the AC power is cut or if the AC adapter is disconnected from the EXT DC connector, the unit automatically switches to the batteries, allowing the measurement to continue without interruption.

Recording paper

1. Press the paper holder release button and lift the paper holder.
2. Pull the paper fastening lever up and move it to the left.

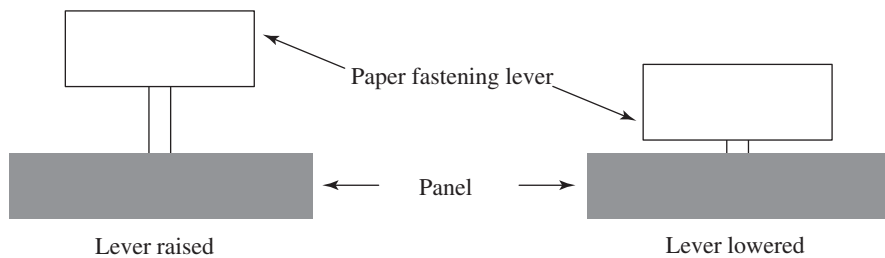


3. Insert the recording paper roll into the paper compartment so that the printing side of the paper faces up. (Fold the tip edges down, as shown in the illustration.)
4. Pull the paper fastening lever up and move it to the right to secure the paper roll.

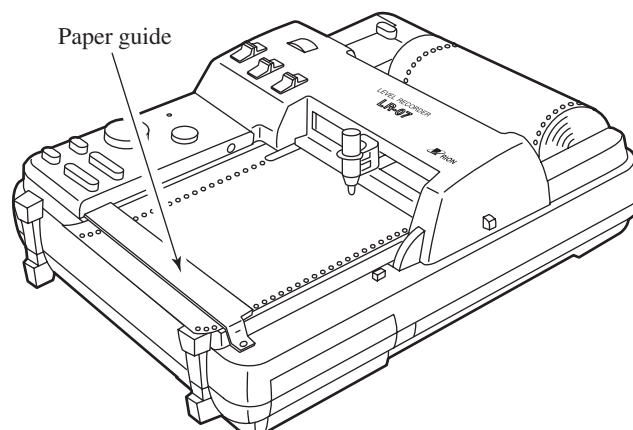
Open <Pull>

Fastening <Pull>

When the lever is at the correct position, it will lower itself onto the panel. Make sure that the lever is properly lowered, otherwise correct paper transport is not possible.

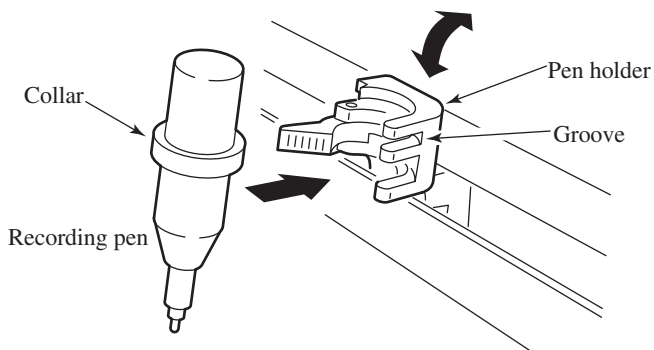


5. Pass the recording paper through the slot under the display section and pull it out from the side of the paper holder.
6. Make sure that the sprockets are properly engaged in the guiding holes on both sides of the paper. Then pull the paper holder release button out to lower the paper holder.
7. Turn the hand-feed wheel and check whether the paper advances properly in a straight path.
8. Pass the recording paper through the paper guide.

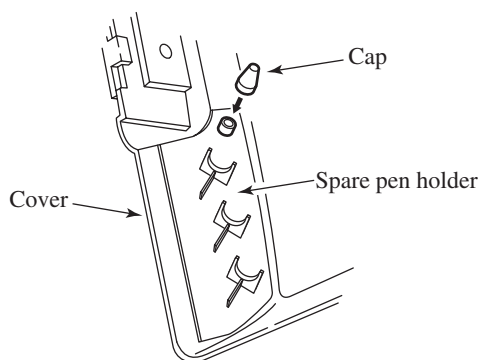


Recording pen

1. Flip up the pen holder.
2. Remove the pen cap. (Attach the cap to the spare pen holder.)



3. Snap the recording pen into the pen holder, so that the collar of the pen fits into the groove on the holder.
4. Carefully lower the pen holder.



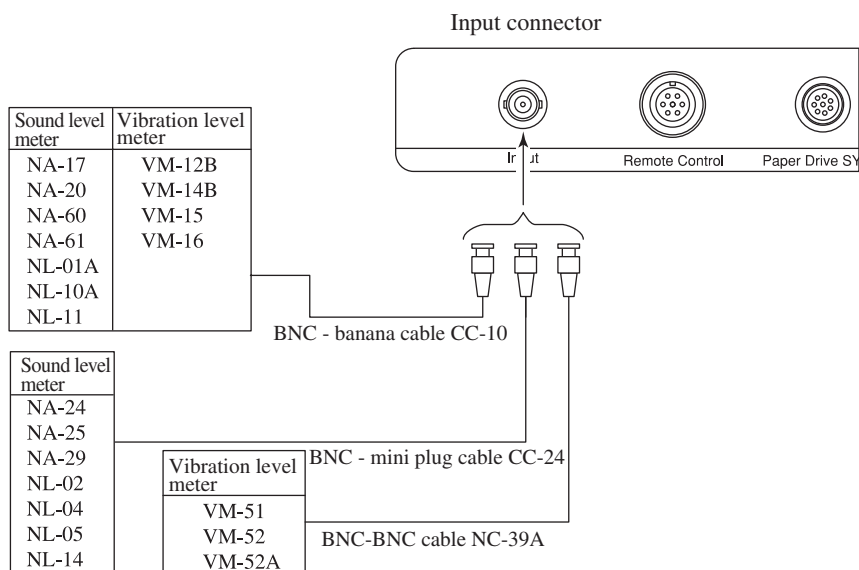
Connections

For sound level or vibration level measurements

Turn the sound level meter or vibration level meter and the LR-07 off.

Use the supplied BNC - BNC cable NC-39A to connect the input connector on the left side panel of the LR-07 to the AC output of the sound level meter or vibration level meter.

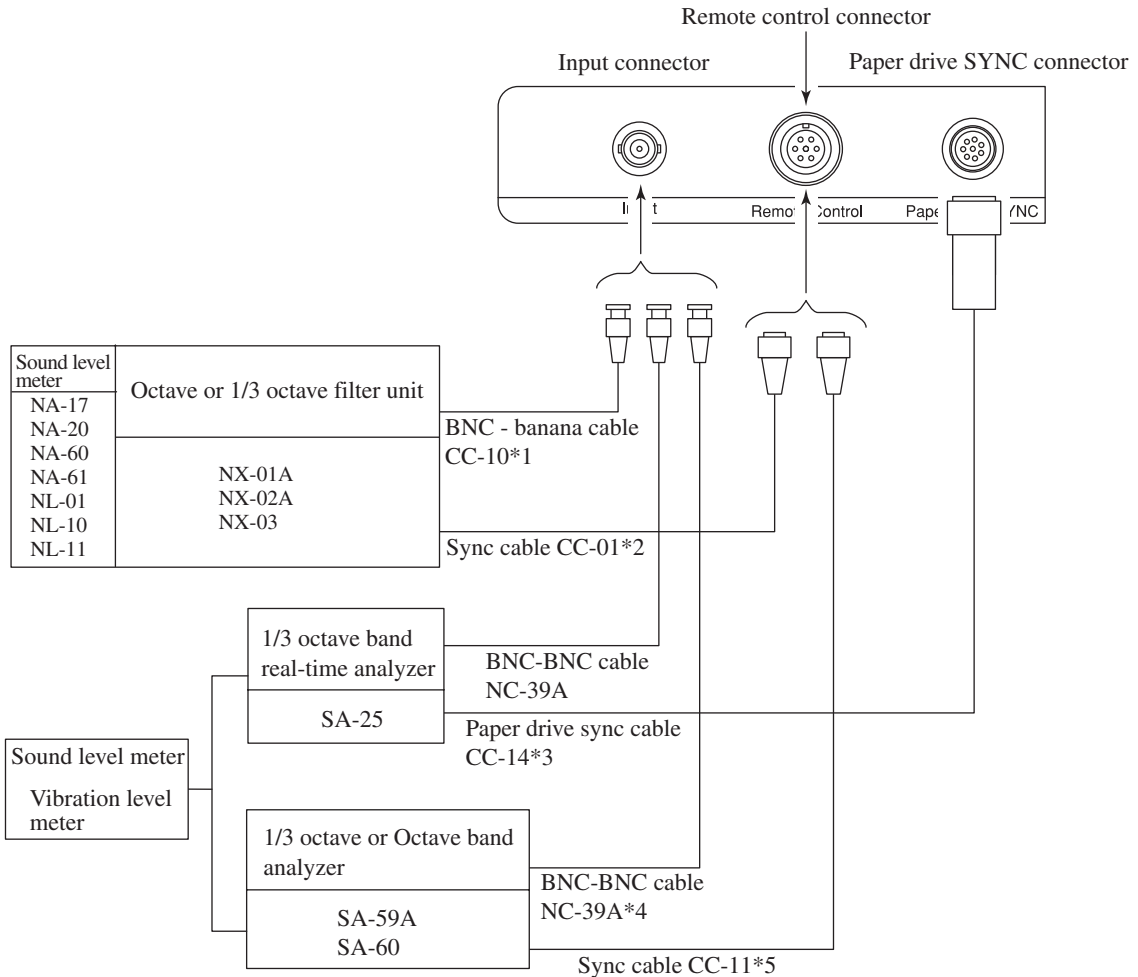
For some sound level meters or vibration level meters, the BNC - mini plug cable CC-24 supplied with the meter or optional BNC - banana cable CC-10 should be used.



For frequency analysis

Turn the frequency analyzer and the LR-07 off.

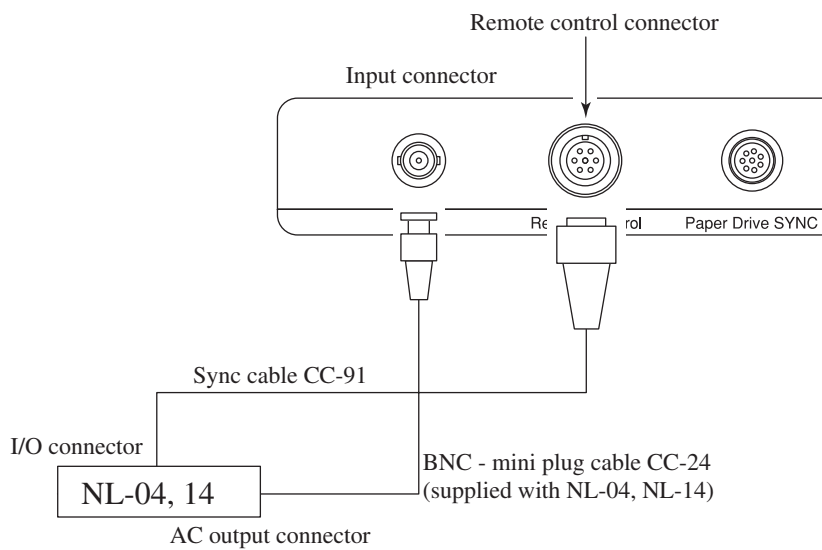
Use the supplied cables to connect the equipment as shown in the diagram below.



- *1: Connect to AC output connector of filter unit (CC-10 is optional).
- *2: Connect to external control connector of filter unit (CC-01 is optional).
- *3: Connect to level recorder connector of real-time analyzer. (CC-14 is supplied with SA-25.)
- *4: Connect to output connector of analyzer.
- *5: Connect to level recorder connector of analyzer. (Sync cable is supplied with analyzer.)

For frequency analysis with sound level meter NL-04 or NL-14

Connect the optional sync cable CC-91 as shown in the diagram below.

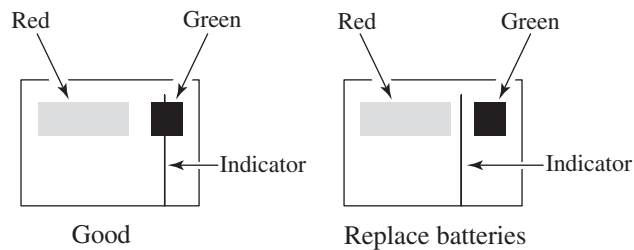


Power-On, Power-Off

The power switch serves to turn the unit on and off. Engage the switch (➔) to turn power on and disengage the switch (➑) to turn power off.

Power supply voltage indication

The voltage for the power supply is shown by the battery meter. Verify that the meter indicator is in the green range. This is especially important when using dry-cell batteries or the rechargeable battery back. Replace all batteries with fresh ones if the indicator of the battery meter moves out of the green area.



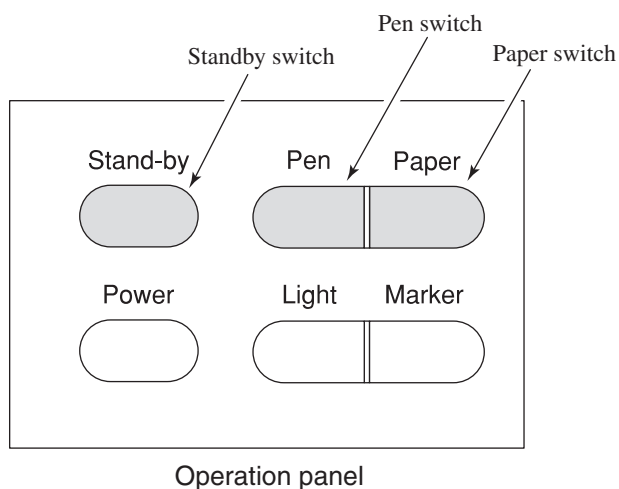
Basic Operation and Display Functions

Keys and switches

Standby, Pen, Paper switches


These three switches control the condition of the recording pen, paper transport, as shown in the table below.

If the standby switch is released (■), the recording pen and paper transport are in the stop condition, regardless of the position of the pen switch and paper switch.





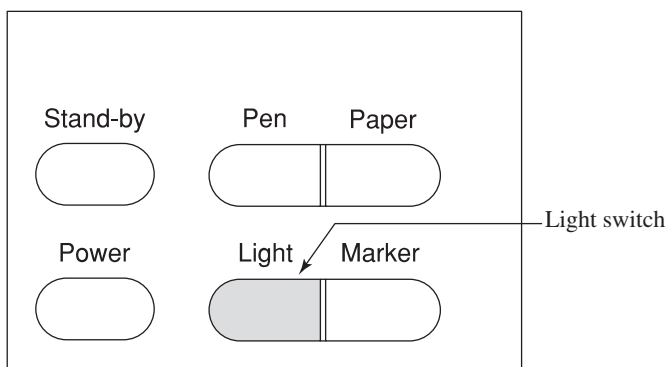
Standby switch	Pen switch	Paper switch	Operation status
■	—	—	Off
■	■	■	Off
■	■	■	Pen only operative
■	■	■	Paper transport only operative
■	■	■	Pen and paper transport operative

Light switch

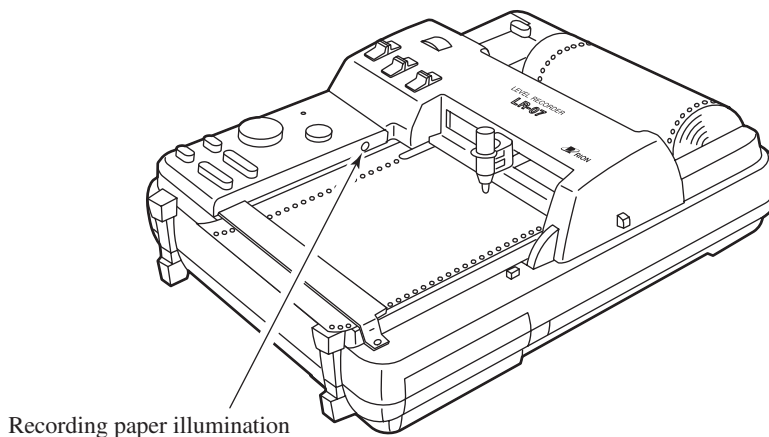
When using the unit in dark locations, press this switch () to turn on the recording paper illumination, making the recording easier to read.

Because this consumes additional power, the life of the batteries will be shortened when the light switch is turned on.

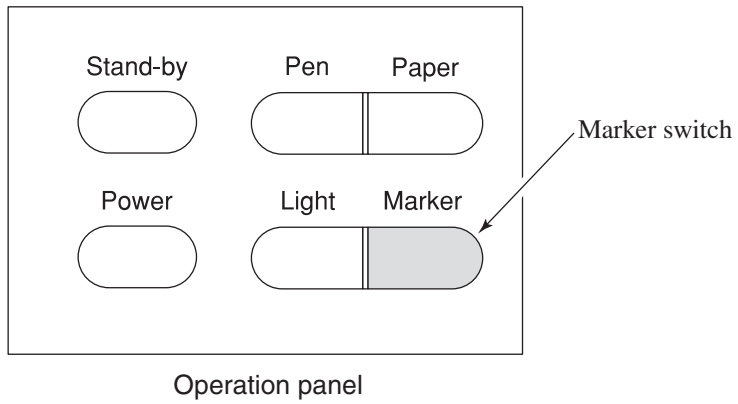
-  : Light on
-  : Light off



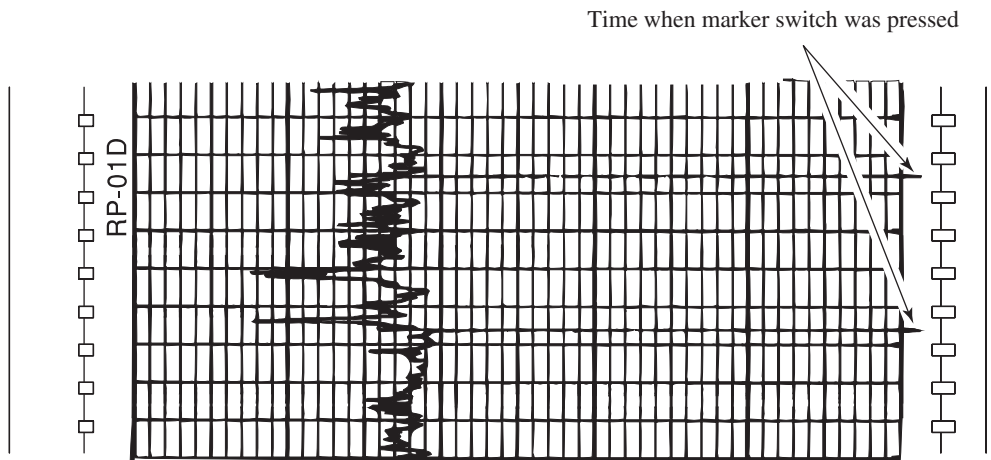
Operation panel



Marker switch

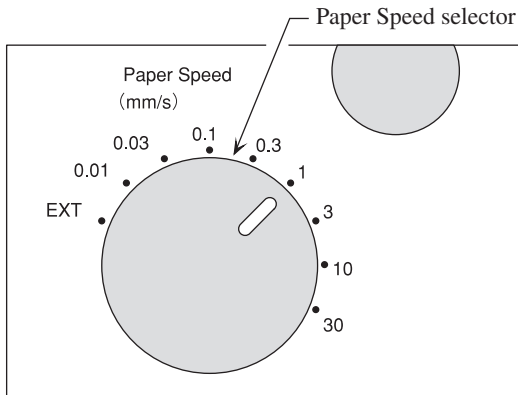


Press this switch whenever you wish to place a mark on the paper.
The recording pen briefly swings to the scale minimum mark and then return to its original position. It is advisable to enter the time by hand.



Paper Speed selector

This selector sets the paper feed rate. The available settings are 30, 10, 3, 1, 0.3, 0.1, 0.03, and 0.01 mm/s. At the EXT position, the paper speed can be controlled via an external pulse (→ p. 50, 51).



Operation panel

Note

Depending on the pen movement, ink clogging, paper staining or tearing can occur. In such cases, try increasing the paper feed rate (→ p. 32 to 33).

Dynamic Characteristics selector

This selector sets the time constant for sound level or vibration level recording.

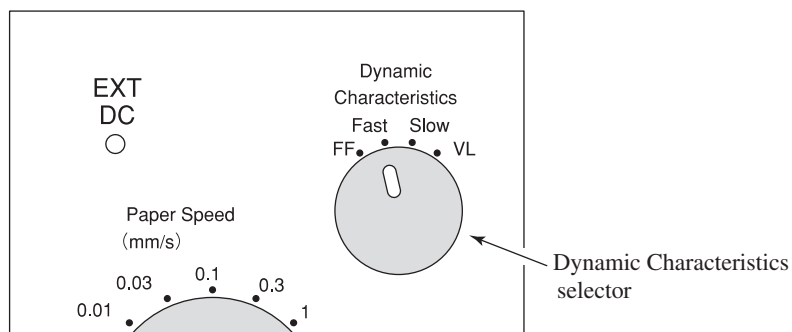
FF: Averaging time constant is 10 ms.

Fast: Corresponds to the FAST setting in sound level meter specifications. Averaging time constant is 0.125 s.

Slow: Corresponds to the SLOW setting in sound level meter specifications. Averaging time constant is 1 s.

VL: Corresponds to vibration level meter specifications. Averaging time constant is 0.63 s.

For DC signal recording (input coupling set to DC), this selector has no effect.



Operation panel

Level Recording (with AC signal and 50, 25, 10 dB range)

Setting and recording procedure

The procedure for recording sound level or vibration level measurements is as follows.

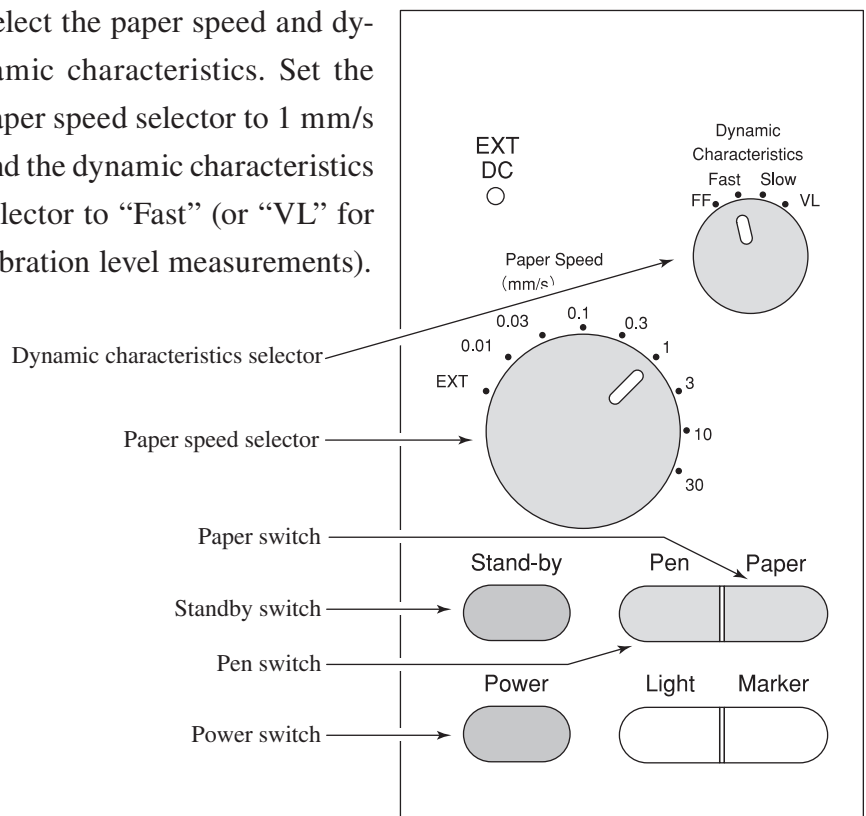
Preparation

Provide all required items, such as batteries, recording paper, recording pens, etc. and connect the measuring equipment to the LR-07 (→ p. 12 to 21).

Release the standby switch (■).

Power-on

1. Turn on the measuring equipment and the LR-07.
2. Select the paper speed and dynamic characteristics. Set the paper speed selector to 1 mm/s and the dynamic characteristics selector to “Fast” (or “VL” for vibration level measurements).



Operation panel

3. Set the LR-07 up as follows. The setting procedure is explained on page 6.

Input selector: AC
Span: 50 dB

Calibration

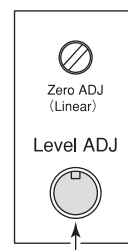
1. Set the measuring equipment to the calibration mode.
2. Set the pen switch and paper switch to ON (■) and depress the standby switch (■).

The recording paper is advanced and a line is drawn on the paper.

3. Use the LR-07 to set the full-scale point to the same value as the maximum value of the measuring equipment level range.
Calibration values for Rion measuring instruments are shown on page 34.

4. Open the cover of the input control section and adjust the level ADJ control so that the parameter display on the LR-07 becomes equal to the calibration value of the measuring equipment.

After calibration, do not disturb the position of the level ADJ control. Close the cover to prevent unintentional altering of the control setting.



Level ADJ control

5. Release the standby switch (■).

Measurement parameter setting

1. Select the dynamic characteristics.
 - For normal sound level measurements (road-side noise, factory noise, etc.), use the FAST setting.
 - For measurements where slow characteristics are prescribed (such as measurements of aircraft noise or train noise according to environmental regulations), use the SLOW setting. This setting may also be used to facilitate readings for regular sound level measurements with relatively little fluctuation or for background noise measurements.

The dynamic characteristics setting of the LR-07 (not of the measuring equipment) determines how the LR-07 will register the measured level. If for example the measuring equipment is set to SLOW and the LR-07 to FAST, the recorded level will correspond to the FAST dynamic characteristics and may differ from the reading on the measuring equipment.

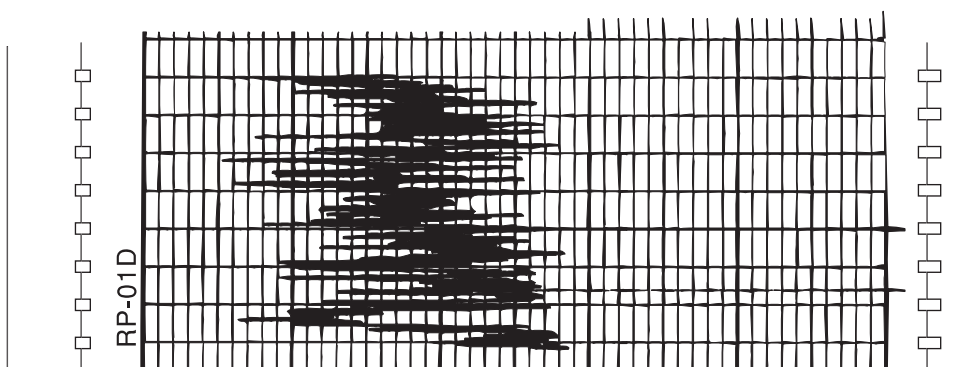
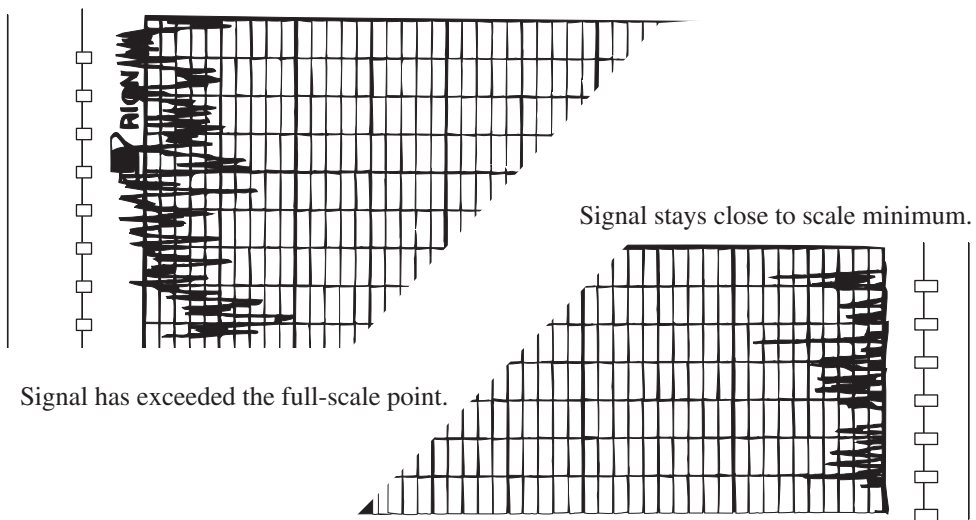
For vibration level measurements, use the VL setting.

2. Select the paper speed.

Normally, a speed of 1 or 3 mm/s should be used. For special requirements, such as measurements with drastic level fluctuations, or measurements with very little level fluctuation, you should use appropriate other settings.

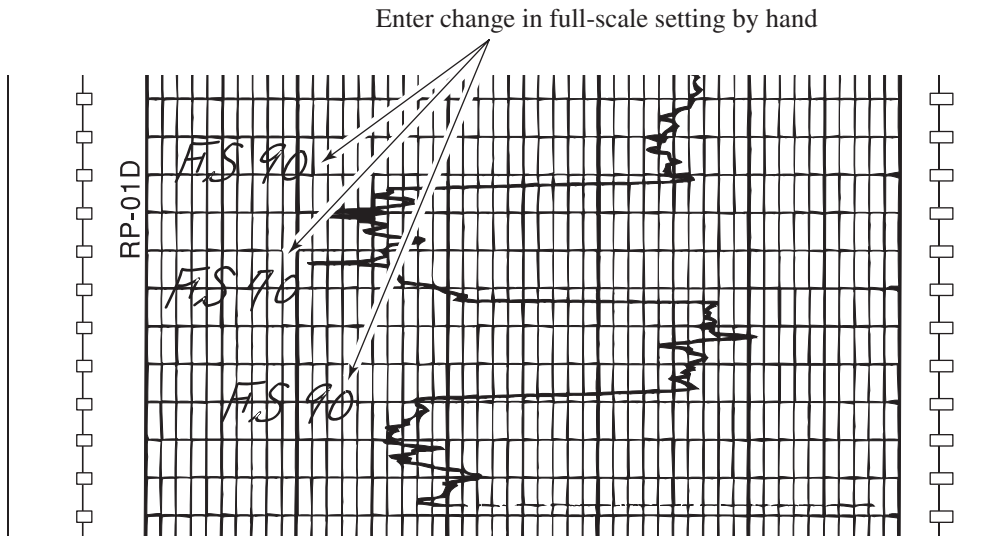
Measurement

1. Set the measuring equipment to the measurement mode.
2. Select the full-scale point of the LR-07 so that it matches the level range of the measuring equipment.
3. Depress the standby switch (**■**) and start the measurement.
If the recording pen remains most of the time near the scale minimum or if it exceeds the full-scale point, change the level range setting of the measuring equipment, so that the recording pen uses the entire recording range and stays within it.



Change setting so that recording pen covers recording range.

After changing the level range setting of the measuring equipment, you should also change the full-scale point setting on the LR-07, to avoid confusion. It is advisable to enter the full-scale value by hand.



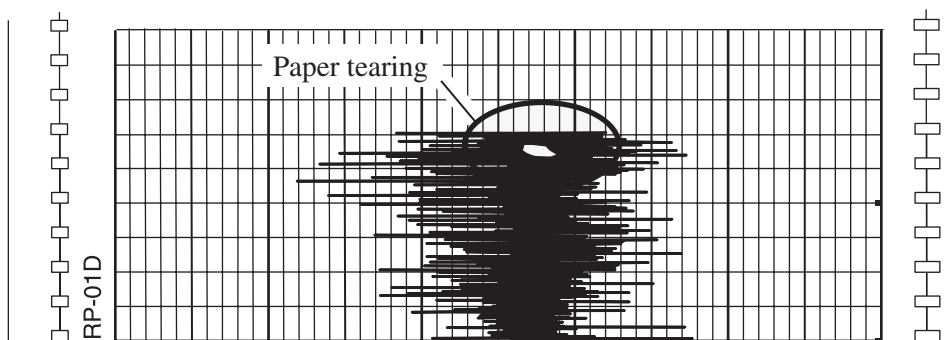
Measurement end

1. When the measurement is completed, release the standby switch (■).
2. Remove the recording pen from the pen holder and cover it with the cap.
3. Turn off the unit by setting the power switch to (■).

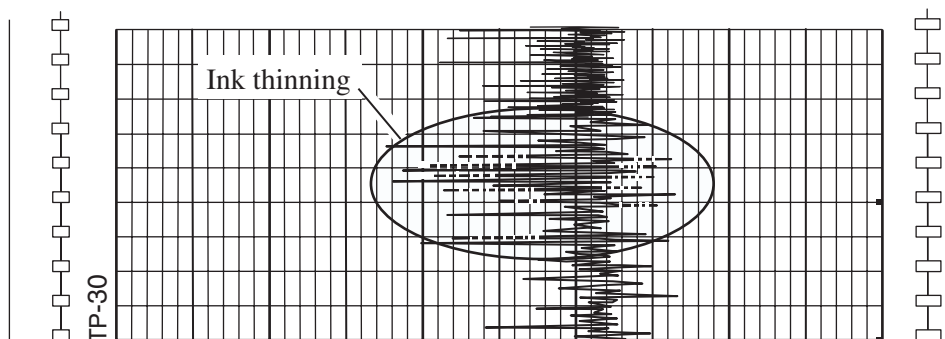
Paper feed rate precaution

When a very slow paper feed rate setting (0.1 mm/s or lower) is selected, problems such as paper tearing, ink thinning, or ink bleeding may occur if the recording pen oscillates rapidly on the same spot, or if there is very little pen oscillation.

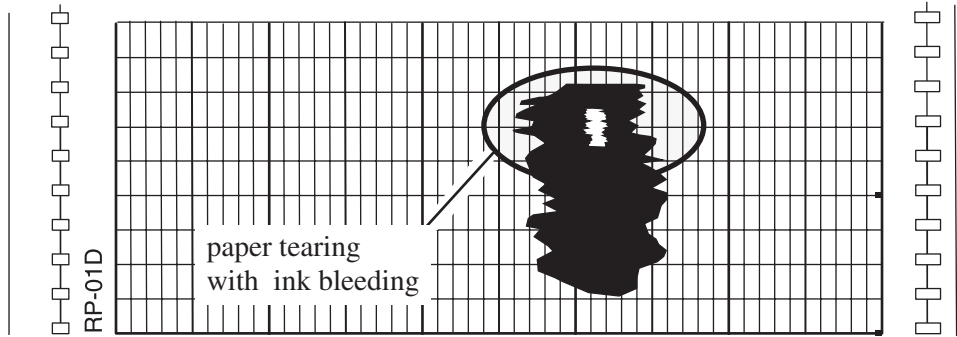
In such cases, you should select a higher paper feed rate setting to avoid these problems.



This problem may occur with the recording paper RP-01D.
Selecting a paper feed rate of 0.3 mm/s or higher is recommended.



This problem may occur with the recording paper TP-30.
Selecting a paper feed rate of 0.3 mm/s or higher is recommended.



This problem may occur with the recording paper RP-01D.
Selecting a paper feed rate of 0.3 mm/s or higher is recommended.

Note

Before starting a measurement, you should perform a test in the actual on-site environment to check for proper recording pen operation and to select an appropriate paper feed rate.

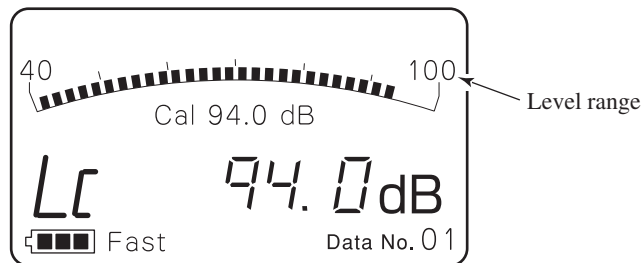
If unattended recording is performed, recording pen operation should be checked at regular intervals, and setting the paper feed rate one step higher is recommended.

Calibration of measuring equipment and level recorder

This section explains the calibration procedure when the Rion sound level meter NL-05 or NL-15 or the Rion vibration level meter VM-52 or VM-52A is used.

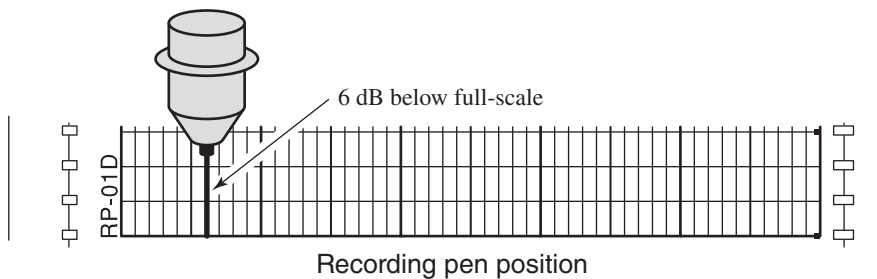
Sound level meter NL-05, NL-15

When the sound level meter is set to the calibration mode, the display is as follows.



Display of NL-05/NL-15

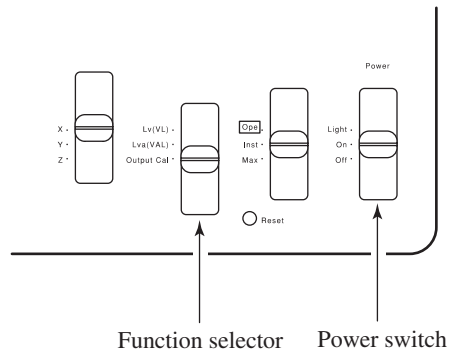
The recording pen position is as follows.



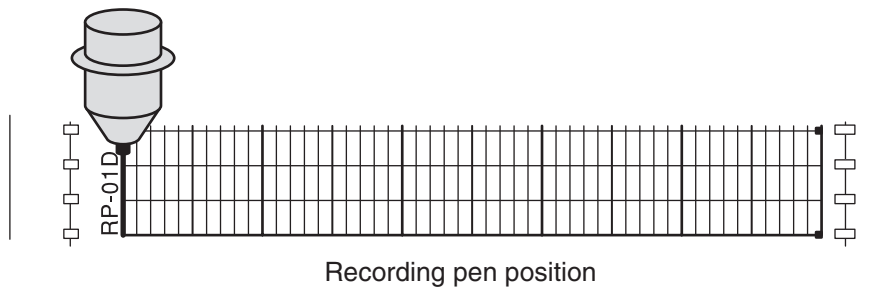
During measurement, set the full-scale point on the LR-07 to the same value as the level range setting on the sound level meter.

Vibration level meter VM-52 or VM-52A

When wishing to calibrate the vibration level meter, make the setting of the vibration level meter as follows. (For details, see the section “calibration” in the instruction manual of the vibration level meter VM-52/VM-52A.)



The recording pen position is as follows.

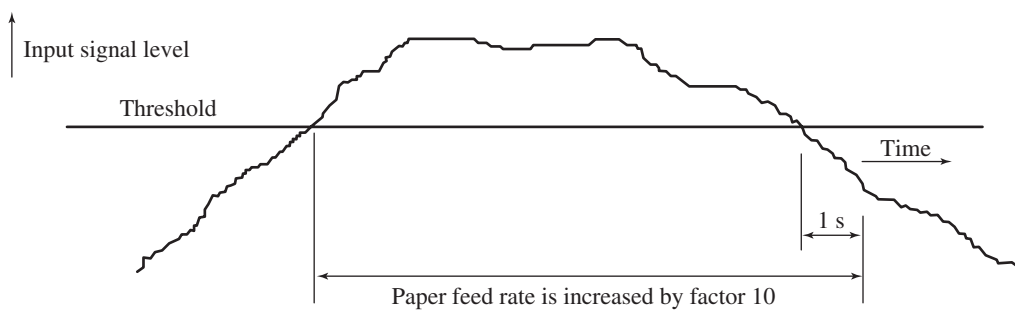


During measurement, set the full-scale point on the LR-07 to the same value as the level range setting on the vibration level meter.

Paper Speed Control Measurement

By using this function, the paper speed can be automatically increased when the measured sound level or vibration level exceeds a certain preset threshold. This can serve to conserve paper while ensuring readable results during measurements of irregular events such as train noise or aircraft noise.

Outline



While the input signal level remains below the threshold level, the paper speed as set by the paper speed selector is used.

When the signal level exceeds a preset trigger level, the paper speed rate is increased by a factor of 10.

About one second after the input signal falls below the threshold level, the paper speed reverts to the original speed.

This applies only if the span selector is set to “50 dB” and if the paper speed selector is not set to “EXT”, “30 mm/s”, “10 mm/s”, or “3 mm/s”.

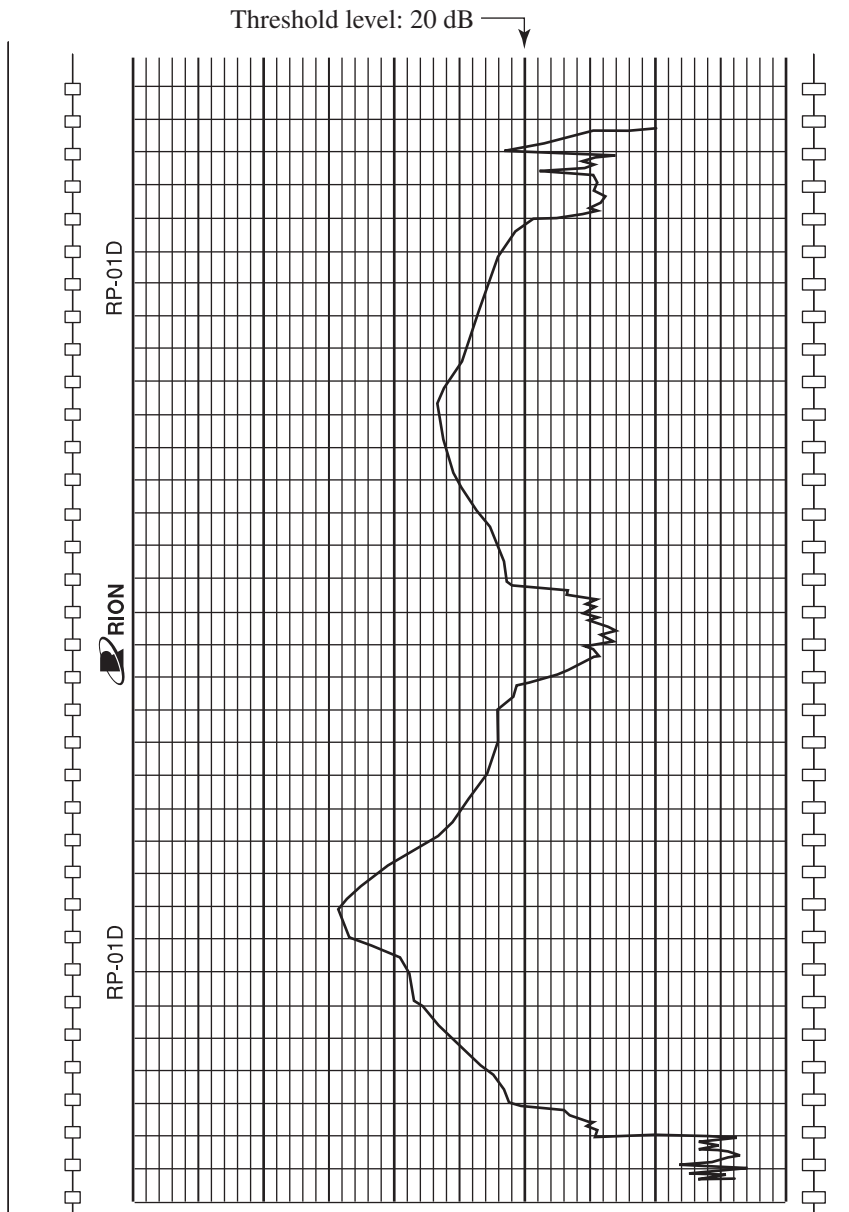
Note

Depending on the pen movement, ink clogging, paper staining or tearing can occur. In such cases, try increasing the paper feed rate (→ p. 32 to 33).

Example

The measurement settings for this example are as follows.

Preselected paper speed: 3
Normal paper speed: 0.3 mm/s
Dynamic characteristics: Slow



Frequency Analysis

For checking the frequency components of measured sound or vibration, a frequency analyzer is usually connected to a sound level meter or vibration level meter. The results of such a frequency analysis can be recorded on the LR-07. This section describes the use of the 1/3 octave band analyzer SA-59A, and the sound level meter NL-04 or NL-14. (The filter unit NX-04 or NX-05 must be installed in the NL-04/NL-14.)

With 1/3 octave band analyzer SA-59A

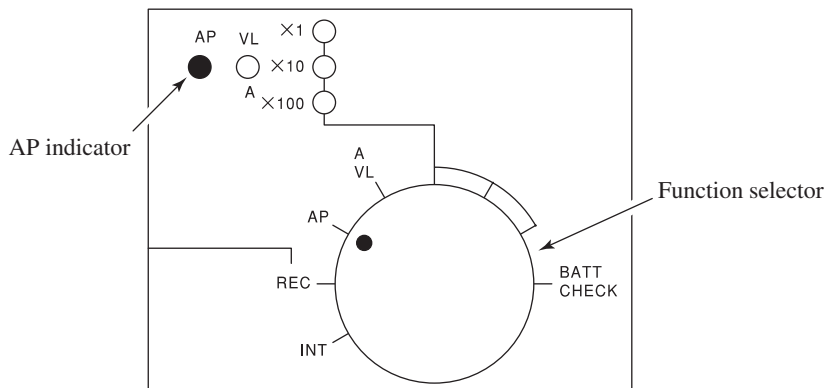
Carry out the following steps.

1. Provide all required items, such as batteries, recording paper, recording pens, etc. and connect the measuring equipment, SA-59A and LR-07 (→ p. 12).

As recording paper, use the type RP-33 (option) specially designed for frequency analysis.

2. Release the standby switch (■), and set the pen switch and paper switch to OFF (■).
3. Turn on the equipment.
4. Set the measuring equipment to the calibration mode.
5. Perform calibration of the measuring equipment and the SA-59A. (For details, please refer to the instruction manuals of the respective equipment.)

Set the function selector of the SA-59A to AP, so that the AP indicator lights up.



1/3 octave band analyzer SA-59A

6. Set the LR-07 up as follows.

Input selector: AC
 Span: 50 dB
 Dynamic characteristics: Fast
 Paper speed: 1 mm/s

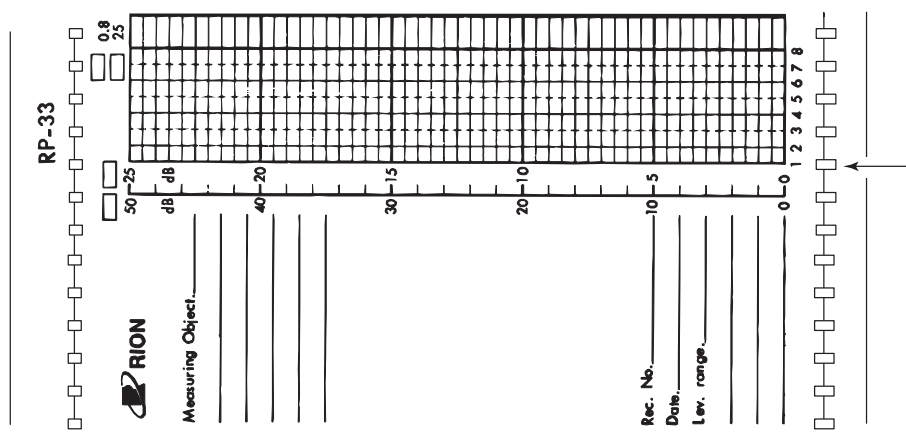
Select the full-scale point as explained in the section on calibrating the measuring equipment and level recorder, on page 34.

7. Set the pen switch and paper switch to ON (—), and depress the standby switch (—).
 8. Perform calibration by adjusting the level ADJ control of the LR-07.
 9. After calibration, set the paper switch to OFF (■) and release the standby switch (■).
 10. Set the measuring equipment to the measurement mode and start the actual measurement.

Select the FLAT or C frequency weighting for sound level meters. Vibration level meters should be set to VAL (“ACC” for the VM-12B or “Lva” for the VM-51, VM-52).

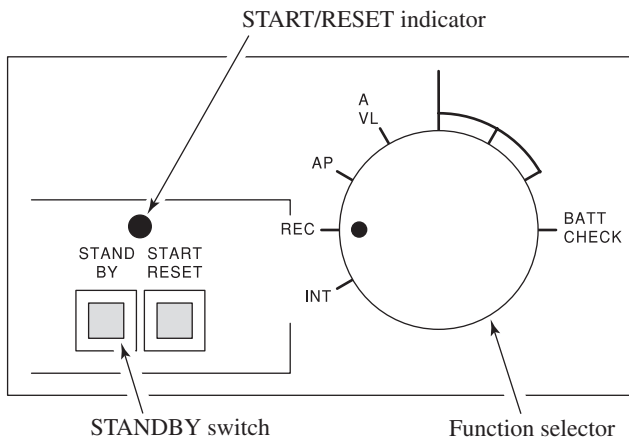
The measurement range of the measuring equipment should be adjusted so that the meter and the SA-59A register close to the full-scale point, but the overload indicator does not light.

11. Turn the hand-feed wheel to advance the recording paper so that the recording pen is at the first AP (all-pass) vertical line marked with the numeral “1”.



Recording pen start position

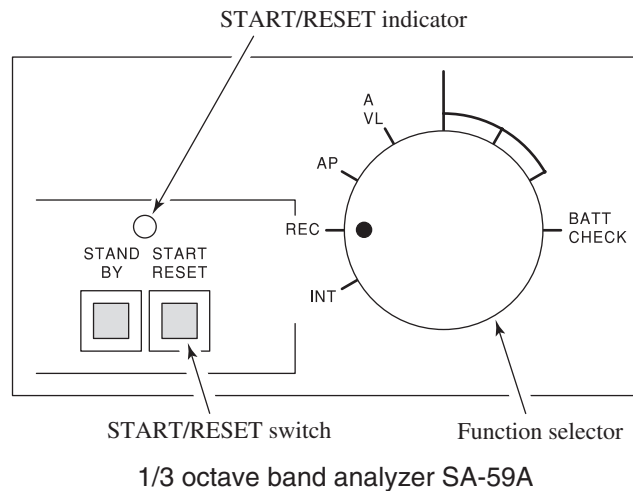
12. Enter the level range setting of the measuring equipment onto the recording paper, using the calibration value as a reference.
13. Set the function selector of the SA-59A to REC, and depress the STANDBY switch (■) of the SA-59A.
The START/RESET indicator lights up.



1/3 octave band analyzer SA-59A

14. Depress the standby switch (■) of the LR-07. The recording pen starts to operate. The paper switch should be set to OFF (■).

15. Press the START/RESET switch of the SA-59A. The START/RESET indicator goes out and frequency analysis is carried out automatically, starting with the all-pass band and proceeding sequentially to the other center frequencies. The LR-07 records the measurement for the all-pass band and the other frequency bands, using the center frequency scale.



When wishing to stop the frequency analysis before its full completion, press the START/RESET switch of the SA-59A. The START/RESET indicator lights up, the analysis is stopped and the LR-07 also stops.

To subsequently perform another frequency analysis, move the recording paper with the hand-feed wheel so that the recording pen is at the next start position, and then press the START/RESET switch of the SA-59A.

With sound level meter NL-04, NL-14

1. Provide all required items, such as batteries, recording paper, recording pens, etc. and connect the NL-04/NL-14 and the LR-07 (→ p. 12).

(The filter unit NX-04 or NX-05 must be installed in the NL-04/NL-14.)

As recording paper, use the type RP-33 (option) specially designed for frequency analysis.

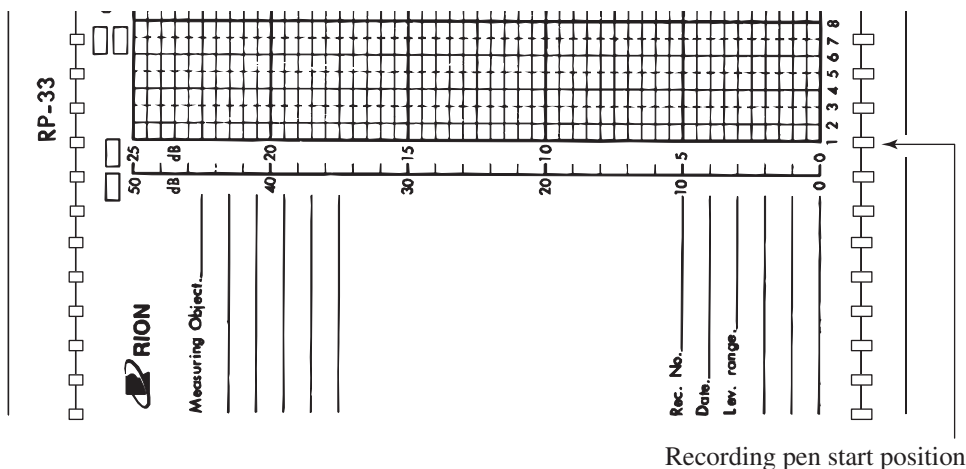
2. Release the standby switch of the LR-07 (■).
3. Turn on the sound level meter and LR-07.
4. Activate the filter unit with the filter switch. If the octave filter NX-04 is used, set the filter switch to ON. If the 1/1, 1/3 octave filter NX-05 is used, set the filter switch to 1/1 or 1/3.
5. Set the LR-07 up as follows (→ p. 6, 26).

Input selector:	AC
Span:	50 dB
Dynamic characteristics:	Fast or Slow
Paper speed:	1 mm/s

6. Set the sound level meter to the calibration mode and perform level calibration.

Adjust the level ADJ control of the LR-07 so that the level indication reads 94.0 dB.

7. Bring down slowly the recording pen on the recording paper.
Turn the hand-feed wheel to advance the recording paper so that the recording pen is at the first AP (all-pass) vertical line marked with the numeral "1".

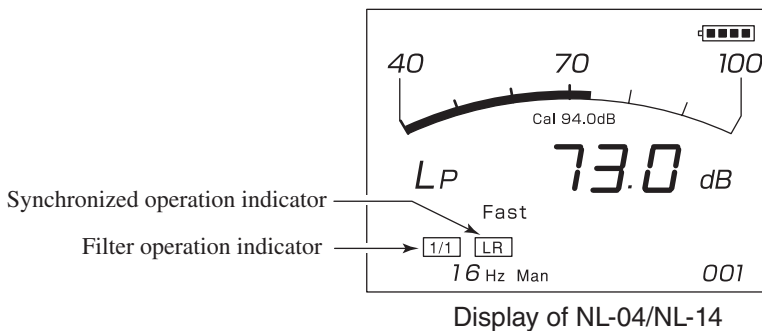


8. Set up the sound level meter as follows.

Display mode:	Instantaneous value (L_p)
Frequency weighting:	Flat or C
Level range:	Select a setting so that the meter registers close to the full-scale point, but the overload indicator does not light.

The dynamic characteristics (time weighting) are set at the LR-07. The setting of the sound level meter has no effect. The full-scale point setting of the LR-07 and the level range setting of the sound level meter must match.

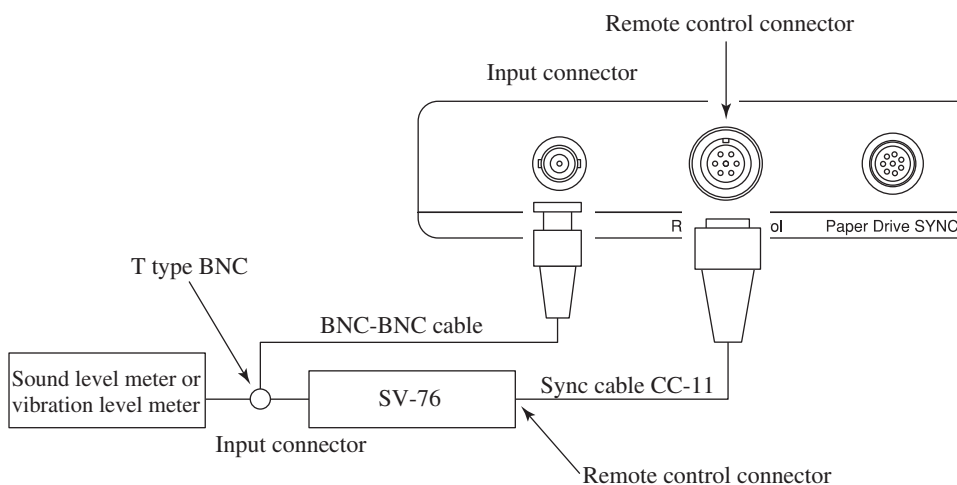
9. Press the filter key on the sound level meter.
The display indication of the sound level meter becomes as follows.



Operation with Sound and Vibration Level Analyzer SV-76

By using the LR-07 in conjunction with the sound and vibration level analyzer SV-76, the signal level can be recorded in analog form while the SV-76 carries out a measurement.

1. Use a BNC-BNC cable to connect one end of the T type BNC connected to the input connector of the SV-76 to the input connector of the LR-07. The other end goes cable coming from the sound level meter or vibration level meter.
2. Connect the remote control connector of the SV-76 to the remote control connector of the LR-07, using the optional sync cable CC-11.
3. Set the pen switch and paper switch of the LR-07 to OFF (**■**) and depress the standby switch (**■**).



4. When the SV-76 begins with the measurement, the LR-07 automatically starts to record the level. When the measurement is terminated, the recording pen stops, and a few seconds later the paper drive also stops.

For details, please refer to the instruction manual of the SV-76.

AC Signal Linear Recording

The LR-07 can record the rms voltage of an AC signal. During level recording as described on page 27, the logarithmic level is recorded. In the “Linear” setting, the signal is recorded before logarithmic compression.

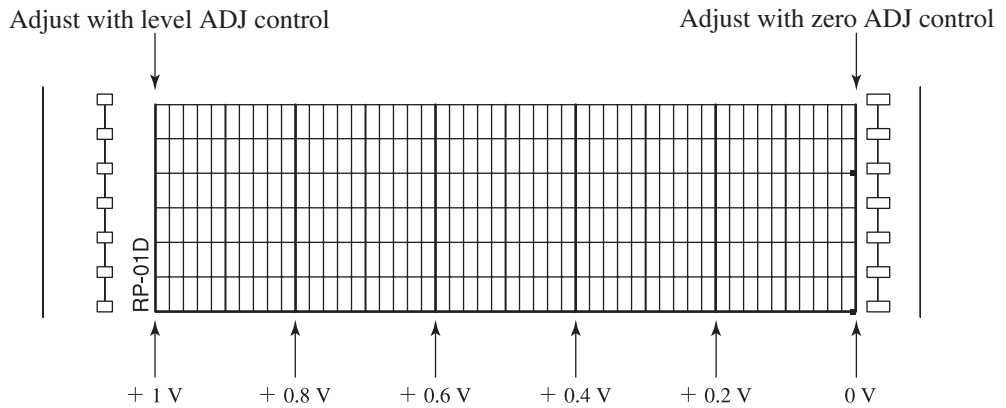
Carry out the following steps.

1. Set the LR-07 up as follows (→ p. 6, 26).

Input selector:	AC
Span:	Linear
Dynamic characteristics:	Any setting
2. Set the paper speed selector to a suitable setting.
3. Set the pen switch and paper switch to ON (■), and depress the standby switch (■).
4. Short-circuit the input so that the input voltage is 0 V. Then adjust the zero ADJ control to match the zero point on the recording paper.
5. Supply a known AC input voltage or use the meter indication of connected measuring equipment to adjust the level ADJ control so that the recording pen is at a position corresponding to the input signal voltage.

- Repeat steps 4 and 5 until the known voltage adjustment and the zero adjustment match.

Example: When the known input voltage is 1 V rms



- Start the measurement.

DC Signal Recording

The LR-07 can not only record the AC output of a sound level meter or vibration level meter, but also a DC signal.

Carry out the following steps.

1. Select the “DC” input coupling setting and the “Linear” recording range setting at the LR-07.

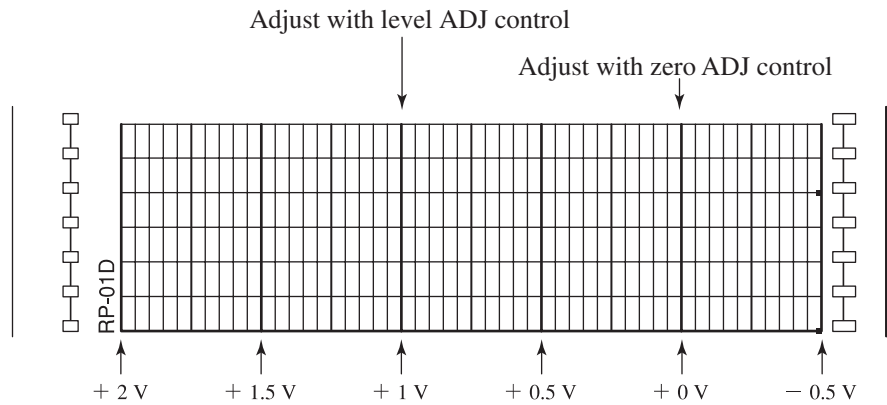
The dynamic characteristics may be set to any position.

For details on the setup procedure, please refer to page 6, 26.

2. Set the paper speed selector to a suitable setting.
3. Set the pen switch and paper switch to ON (—), and depress the standby switch (—).
4. Short-circuit the input so that the input voltage is 0 V. Then adjust the zero ADJ control to match the zero point on the recording paper.
5. Supply a known DC input voltage or use the meter indication of connected measuring equipment to adjust the level ADJ control so that the recording pen is at a position corresponding to the input signal voltage.

- Repeat steps 4 and 5 until the known voltage adjustment and the zero adjustment match.

Example: When the known input voltage is 1 V

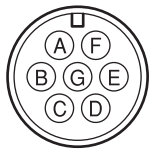


- Start the measurement.

External Control

The recording pen and paper feed start/stop as well as the paper speed of the LR-07 can be controlled from other equipment. You can use either the paper drive SYNC connector or the remote control connector for this purpose.

Remote control connector



Tajimi Electronics connector

PRC03-23A10-7F

Suitable plug:

PRC03-12A10-7M

- A: Pen drive control
- B: Ground
- C: Paper feed control
- D: Not connected
- E: Sync signal output
- F: Not connected
- G: Ground

Paper drive SYNC connector



Tajimi Electronics connector

R05-R8M

Suitable plug:



R05-P8F

- A: Clock pulse output
- B: Pen drive control
- C: Paper feed control
- D: External pulse input/output
- E: Ground
- F: Not connected
- G: +12 V 10 mA power supply *
- H: Marker drive control

* The power supply output does not have any protection circuitry. Overload or short circuiting may lead to damage.



Pen drive control

The pen is activated at Low level (0 to 1 V) and stops at High level (3.5 to 5 V). If used with a potential-free source, shorting the pin to ground activates the pen and leaving the pin open stops the pen.

To enable external control, the pen switch must be set to OFF () and the standby switch must be engaged ().

Paper feed control

The paper feed is activated at Low level (0 to 1 V) and stops at High level (3.5 to 5 V). If used with a potential-free source, shorting the pin to ground activates the paper feed and leaving the pin open stops the paper feed.

To enable external control, the paper switch must be set to OFF () and the standby switch must be engaged ().

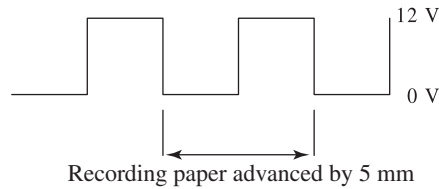
If a paper speed setting of 30 mm/s is selected at the LR-07, the paper feed control becomes inactive.

Marker drive control

Shorting pins H and E has the same effect as pressing the marker switch on the operation panel of the LR-07.

Sync signal output

One pulse is output for every 5 mm the recording paper advances.



External pulse input

When wishing to control the paper speed by means of an external pulse, set the paper speed selector to EXT. The voltage of the pulse is 0 to 5 V (CMOS), duty factor is $50\% \pm 5\%$. The frequency of the pulse should not exceed 432 Hz. The relation between the paper speed and the frequency of the pulse is as shown below.

$$\text{Paper speed (mm/s)} = \frac{30 \text{ (mm/s)}}{432 \text{ (Hz)}} \times \text{frequency of external pulse (Hz)}$$

Clock pulse output

A clock pulse (432 Hz, 0 to 5 V) is supplied at this pin.

Service and Maintenance

Recording pen

Cover the tip with the cap when the pen is not in use for a some time, to prevent drying out.

Dry-cell batteries

Remove the batteries from the battery case if the unit is not used for some time, to prevent possible damage caused by battery leakage.

Specifications

Applicable standards JIS C 1512 : 1996
(Level recorders for recording sound level and/or vibration level)

Input section

Input impedance 50 k Ω , unbalanced
Input voltage Voltage required for full-scale point
AC 0.2 V_{rms} to 10 V_{rms}
DC +0.5 V to +25 V
Maximum input voltage
AC 35 V_{rms}
DC 50 V

Recorder section

Recording principle

Automatic balance control

Frequency range

Span 25 dB or 10 dB

1 Hz to 100 kHz (tolerance ± 1 dB)

Span linear 1 Hz to 100 kHz ($\pm 10\%$, of full-scale point)

Span 50 dB 1 Hz to 20 kHz (tolerance ± 0.5 dB, ± 1 dB at 1 Hz)

Span 50 dB, 25 dB, 10 dB, Linear (selectable)

Rectification True rms

Dynamic characteristics

FAST, SLOW, VL (vibration level),

FF (time constant 10 ms)

Recording pen Fiber pen LB-25A (red)

Recording pen response

Exponential

Recording pen speed

400 mm/s or more

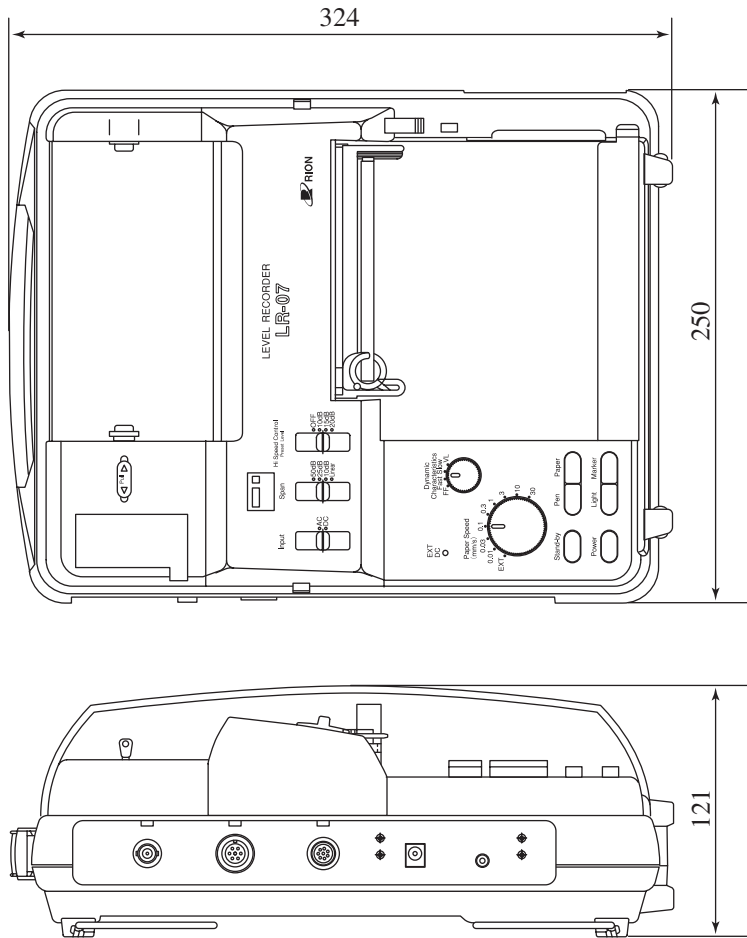
Recording paper	Regular paper (compatible with Rion LR-04, LR-06)
For level recording	RP-01D (paper width 127 mm, recording width 100 mm, length 50 m)
For frequency analysis	RP-03, RP-29, RP-33
Paper feed motor	Pulse motor
Paper speed	8 selectable steps: 0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30 mm/s or external control (pulse drive): tolerance $\pm 2\%$ or less
Other specifications	
Paper speed control measurement (available only when the span is 50 dB)	Paper feed rate increases by factor 10 when input signal exceeds a preset trigger level (not valid at 30 mm/s, 10 mm/s, 3 mm/s, and external control)
Trigger level settings	10, 15, or 20 dB above lower measurement limit
Power requirements	Dry-cell batteries (IEC R20, size "D") $\times 6$ AC with AC adapter NC-97 (for 100 V to 240 V AC) Rechargeable battery pack DP-11 or DP-1240 Car battery (12 V DC) with car battery adapter CC-82
Dimensions	Approx. 250 \times 324 \times 121 mm
Weight	Approx. 3 kg (not including batteries)
Ambient conditions	-10°C to +50°C (when operated with AC adapter or rechargeable battery pack) 0°C to +50°C (when operated with dry-cell batteries) 30% to 90% RH (no condensation)

Supplied accessories

BNC - BNC cable	NC-39A	1
Recording paper	RP-01D	2
Dry-cell batteries (IEC R20, size "D")		6
Carrying case	LR-06-117	1
Recording pen	LB-25A (red)	6
Spare pen holder		1
Dual-sided adhesive tape	LR-06-090	1
Miniature screwdriver	D-62	1
Calibration position sticker set		1
Instruction manual		1
Inspection certificate		1

Optional equipment

Recording paper	RP-01D, RP-03, RP-29, RP-33, RP-41, TP-30
Recording pen	LB-25A (red)
AC adapter	NC-97 (for 100 V to 240 V AC)
Rechargeable battery pack	DP-11, DP-1240
Battery charger	KD-11A (for battery packs DP-11, DP-1240)
BNC - banana cable	CC-10
Sync cable	CC-11, CC-91
Car battery adapter	CC-82
Chart winder	LB-23



Unit: mm

Dimensional Drawings

