

INSTRUCTION MANUAL

VIBRATION METER UNIT

UV-05A



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Organization of this manual

This manual describes the features and operation of the Vibration Meter Unit UV-05A. For information regarding the operation of other equipment in the case of incorporating the UV-05A into a measurement system with other equipment, always make sure refer to the documentation of the other equipment. The following pages contain important information on safety. Be sure to read this part.

This manual contains the following sections.

Outline

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

Controls and Features

Briefly identifies and explains all parts of the unit.

Connections and Setup

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

Measurement

Describes the steps for measurement.

RS-232-C Interface

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

Specifications

Lists the technical specifications of the unit.

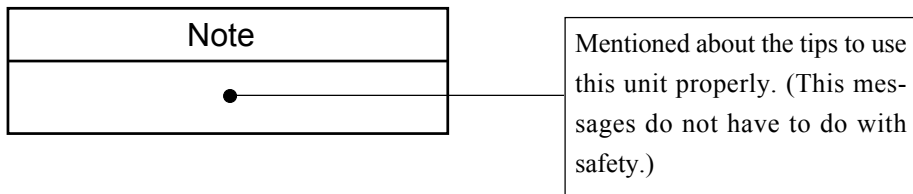
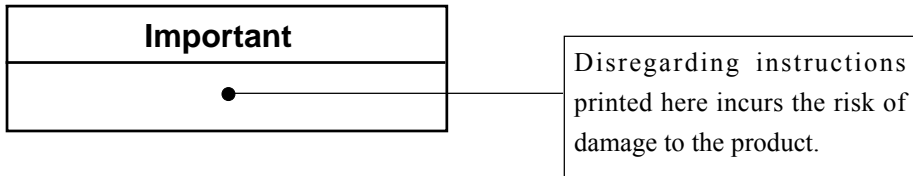
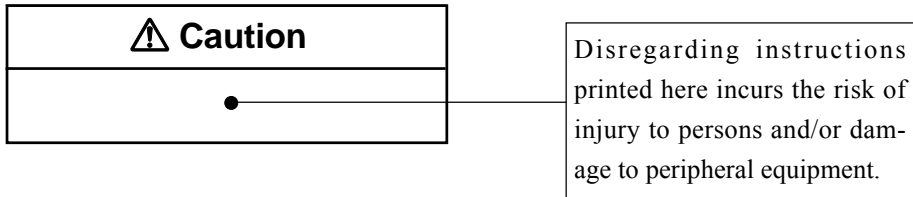
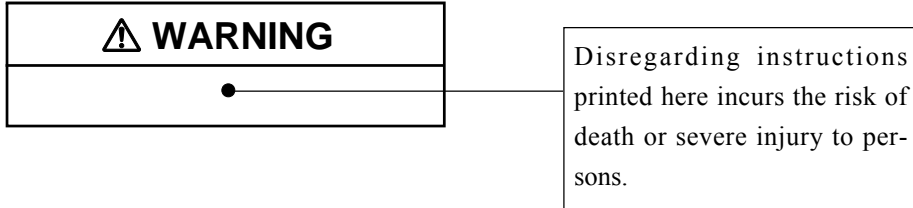
Technical Information

Provides additional information that is helpful for using the unit.

- * All company names and product names mentioned in this manual are 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 as described in this manual.
- Do not disassemble the unit or attempt internal alterations.
- Observe the following precautions before using the unit:
 - 1) Make sure that all connections are properly established.
 - 2) Check the setting of all switches and controls, and make sure that the unit is operating normally.
- The permissible ambient temperature range for operation of the unit is -10 to +50°C. Relative humidity must be below 90%.
- Do not store or use the unit in locations which
 - 1) may be subject to strong magnetic fields or strong radiation, or
 - 2) may be subject to high levels of dust or splashes of water, or
 - 3) may be subject to gases or air with high salt or sulphur content, or are in the vicinity of stored chemicals, or
 - 4) may be subject to high temperature, humidity, or to direct sunlight, or
 - 5) may be subject to vibrations or shock.
- Always switch off the power after using the unit.
- When disconnecting cables, always hold the plug and do not pull the cable.
- Use the specified AC adapter.
- In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.

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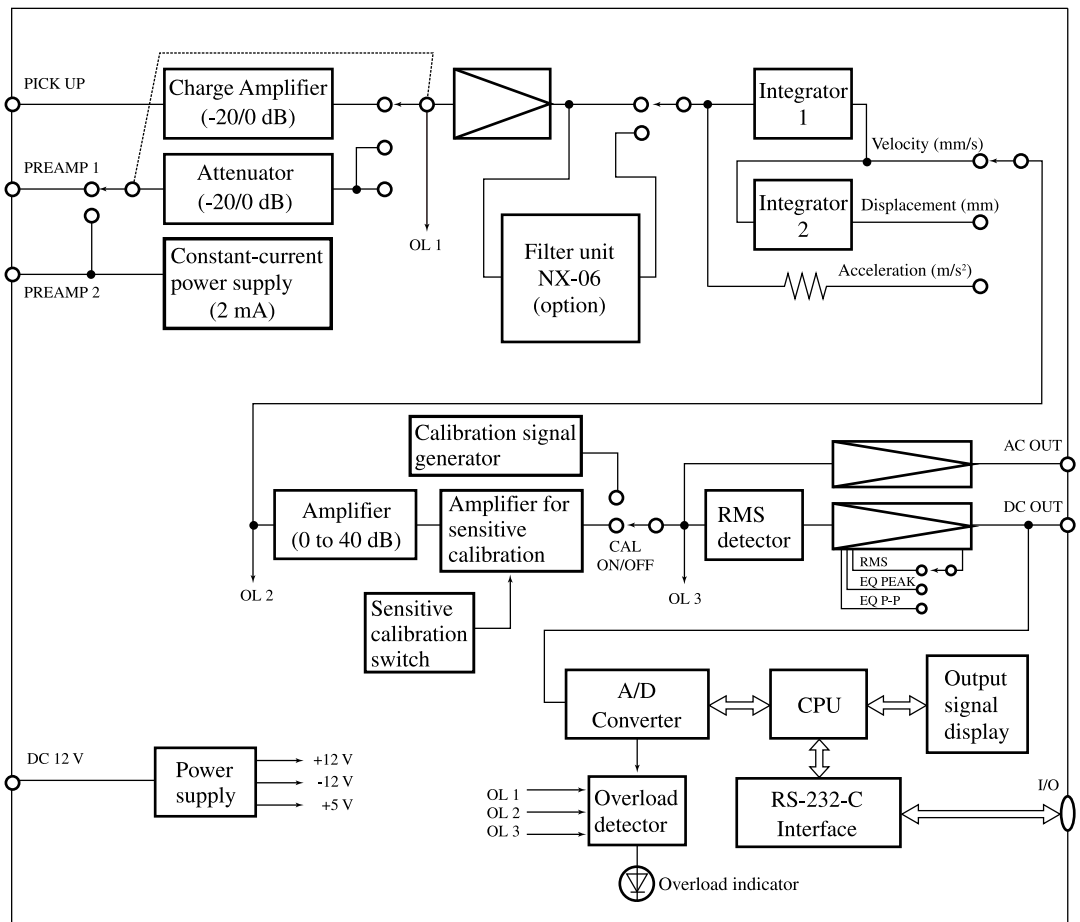
Outline

The UV-05A is a vibration meter unit suitable for a wide range of applications. It has three inputs, optimized respectively for connection of a piezoelectric accelerometer, an accelerometer preamplifier, and an accelerometer with integrated preamplifier. An AC output and DC output allow the use of equipment such as a data recorder or analyzer, and a separate I / O connector serves for connection to the printer DPU-414 (option) or to a computer for data transfer and external measurement control (RS-232-C interface).

The built-in integrator and detector circuitry of the UV-05A performs conversion of the vibration acceleration signal into vibration velocity and vibration displacement signals. The optional add-on units listed below can be used to create a measurement system tailor-made for specific needs.

- AC adapter NC-11 / NC-97 (option), battery unit BP-07 (option)
The UV-05A can be powered from the AC adapter NC-11 / NC-79 or the battery unit BP-07. It is also possible to use an AC adapter and the battery unit together, so that power is normally provided by the adapter while the battery unit acts as a backup power supply.
- Filter unit NX-06 (option)
By incorporating the filter unit in the UV-05A, the vibration frequency range can be set for various measurements.
- Printer DPU-414 (option)
Can be used to produce a record of measurement results every five seconds.

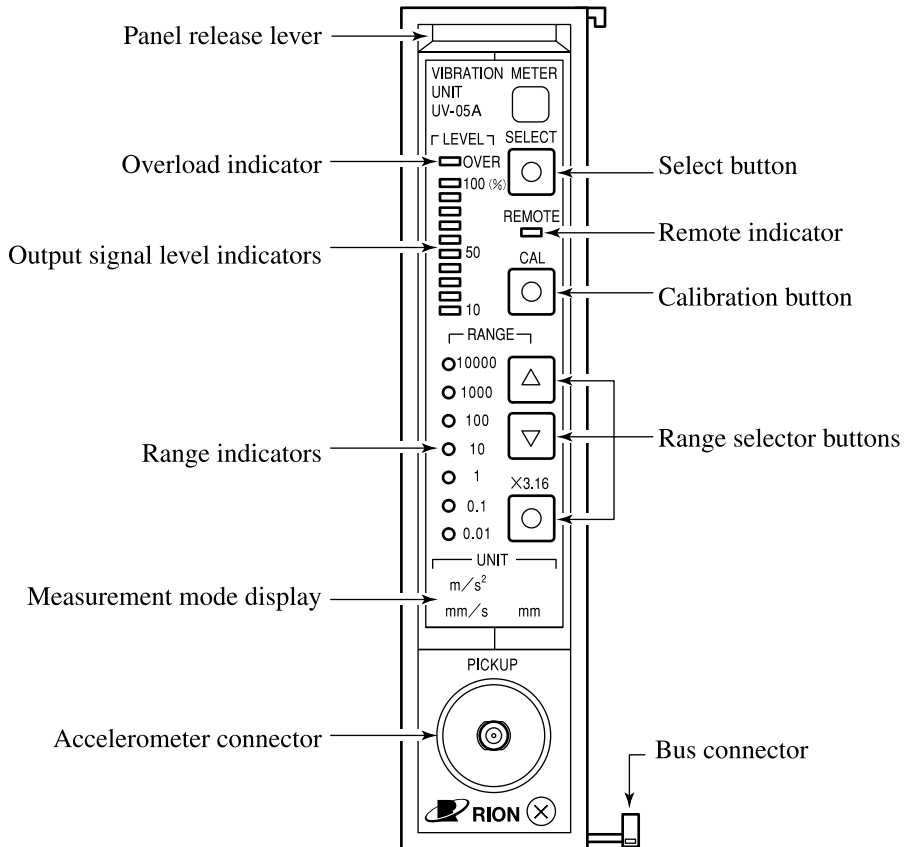
- Display unit UV-12 / UV-12A (option)
Up to ten UV-05A units can be connected to a UV-12 / UV-12A, and the display can be switched to show the measurement results of any desired vibration meter unit. You can combine UV-05 and UV-05A units without problems. The UV-12 / UV-12A incorporates a GP-IB and an RS-232-C interface, allowing the use of a computer to control measurement operation of connected UV-05A units and to gather measurement data.
- Rack-mount base UV-05-091 (option)
Several UV-05A units can be linked, and standard rack mounting is possible using the rack-mount base UV-05-091. A single base supports up to twelve UV-05A units.



Block diagram

Controls and Features

Front panel



Select button [SELECT]

When the UV-05A is connected to the display unit UV-12 / UV-12A (optional), pressing this button will cause the measurement data from this UV-05A to be shown on the display unit. In this case, the indicator of the button lights up. If the UV-05A is not connected to a display unit, this button has no effect.

Remote indicator [REMOTE]

Lights up when the UV-05A is set to the remote mode via the RS-232-C interface. In remote mode, the controls on the panel of the UV-05A are inactive.

Calibration button [CAL]

Activates the internal signal generator for calibration of equipment connected to the AC or DC output. The indicator lights up when the button is pressed.

Range selector buttons [RANGE Δ / ∇ / \times 3.16]

Set the full-scale point. Pushing the [Δ] button increases the range, and pushing the [∇] button decreases it. When the [\times 3.16] button is pressed, the indicator of the button lights up and the range is increased by a factor of 3.16. To return the range to the normal setting, press the button again so that the indicator goes out.

Range indicators [RANGE 0.01 to 10000]

The range selector buttons serve to set the full-scale point, and the range indicators show which range is selected.

Bus connector

Serves for connection to the display unit UV-12 / UV-12A. The connector also serves to supply power when several UV-05A units are linked.

Accelerometer connector [PICKUP]

Serves for connection of a piezoelectric accelerometer.

Measurement mode display [UNIT]

Shows the unit of the selected measurement: m / s^2 for acceleration, mm / s for velocity, and mm for displacement. The measurement mode setting can be changed on the inner panel (\Rightarrow p. 7).

Output signal level indicators [LEVEL 10 to 100 (%)]

Show the level of the output signal in 10-percent steps, with a full-scale point of 100 percent.

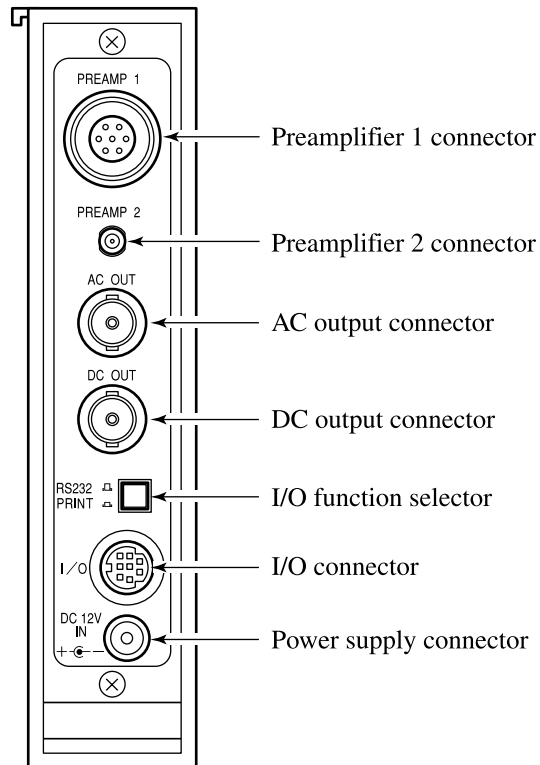
Overload indicator [LEVEL OVER]

Lights up when the input signal exceeds the currently selected range, causing amplifier saturation.

Panel release lever

Push this lever down and pull it out to gain access to the inner panel for changing various measurement settings (\Rightarrow p. 7).

Rear Panel



Preamplifier 1 connector [PREAMP 1]

Serves for connection of a piezoelectric accelerometer via an external preamplifier. The output signal of the preamplifier must be routed to this connector.

Preamplifier 2 connector [PREAMP 2]

Serves for connection of a piezoelectric accelerometer with integrated preamplifier.

AC output connector [AC OUT]

AC signals corresponding to the measurement result are supplied here.

DC output connector [DC OUT]

DC signals corresponding to the measurement result are supplied here.

I / O function selector [RS232 / PRINT]

This selector must be set to the appropriate position, depending on which type of equipment is connected to the I / O connector.

RS232: RS-232-C interface for connection of a computer

PRINT: Data output to the printer DPU-414 (option)

I / O connector [I / O]

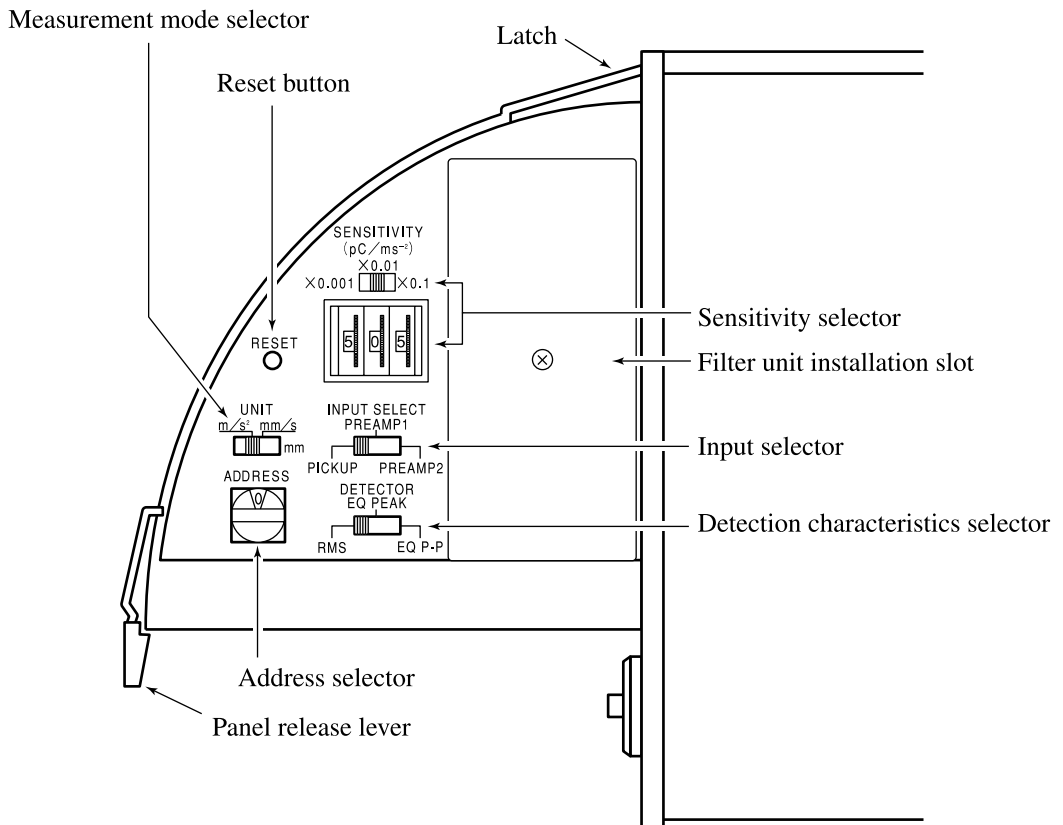
Serves either as output for connection of the printer DPU-414 / CP-11 / CP-10, or as RS-232-C interface for data transfer to and input of control signals from a computer. The I / O function selector must be set to the desired position.

Note
When the UV-05A is connected to the display unit UV-12 / UV-12A, this connector is inactive.

Power supply connector [DC 12 V IN]

The output from an AC adapter is connected here.

Inner Panel



Inner panel flipped open (side view)

Measurement mode selector [UNIT]

Serves to select the measurement type: acceleration (m / s^2), velocity (mm / s), or displacement (mm).

Reset button [RESET]

Serves to reset the CPU of the unit.

Latch

This latch secures the inner panel when it is open. To close the inner panel, press the top section of the latch to release it, and push the panel in.

Sensitivity selector [SENSITIVITY]

Serves to set the sensitivity of the unit to match the charge sensitivity or voltage sensitivity of the accelerometer. The three-digit digital switch sets the value and the slide selector sets the multiplication factor.

Filter unit installation slot

The optional filter unit NX-06 (option) can be installed here.

Input selector [INPUT SELECT]

Serves to select the input that is to be used.

PICKUP: Signal from accelerometer connector on the front panel

PREAMP1: Signal from preamplifier 1 connector on the rear panel

PREAMP2: Signal from preamplifier 2 connector on the rear panel

Detection characteristics selector [DETECTOR]

Serves to set the detection characteristics.

RMS: RMS value display

EQ PEAK: Equivalent peak value display ($\text{RMS} \times \sqrt{2}$)

EQ P-P: Equivalent peak-to-peak value display ($\text{EQ PEAK} \times 2$)

Address selector [ADDRESS]

Serves to set the unit address when the UV-05A is connected to the display unit UV-12 / UV-12A. Up to ten UV-05A units can be connected to a UV-12 / UV-12A, and the address serves to distinguish between the connected units. When the UV-05A is not connected to a UV-12 / UV-12A, there is no need to set the address, and the address selector may be left at any position.

Panel release lever

To open the inner panel, press down this lever and pull it out.

Connections and Setup

Power Supply Connections

The UV-05A can be powered from the AC adapter NC-11 (100 V AC), NC-11A (120 V AC), NC-11B (220 V AC), NC-11D (240 V AC), NC-97 (100 to 240 V AC) (option), or from the battery unit BP-07 (option).

Important

The UV-05A does not have a power switch. Consequently, you should plug the AC adapter into an AC outlet only after the accelerometer and all other equipment connections are completed. When using the battery unit BP-07, set the power switch on the battery unit to "Off" before making connections.

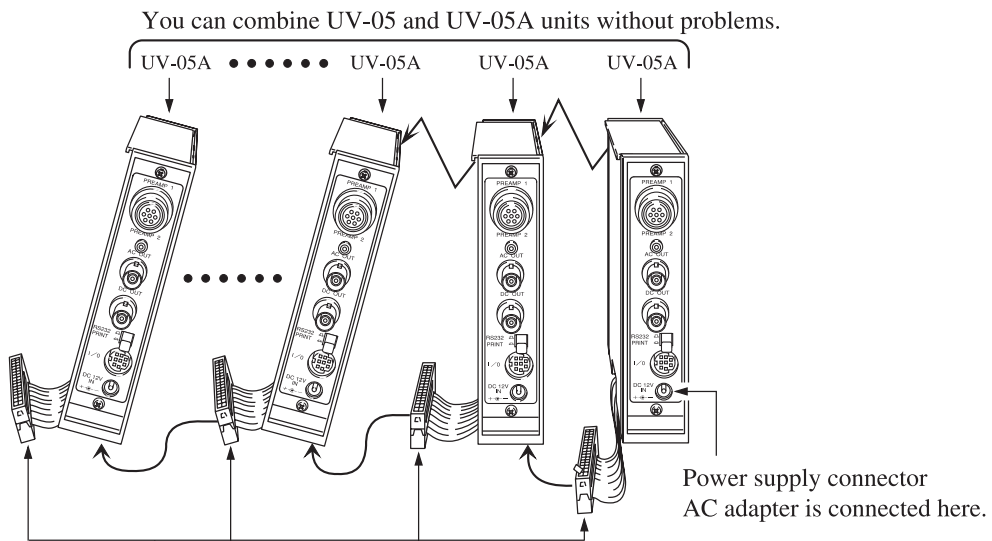
Note

AC Adapter models NC-79 (100 to 250 VAC), NC-79U (100 to 240 VAC) and NC-95 (100 to 240 VAC), can also be used with UV-05A, although they already became discontinuous for sale.

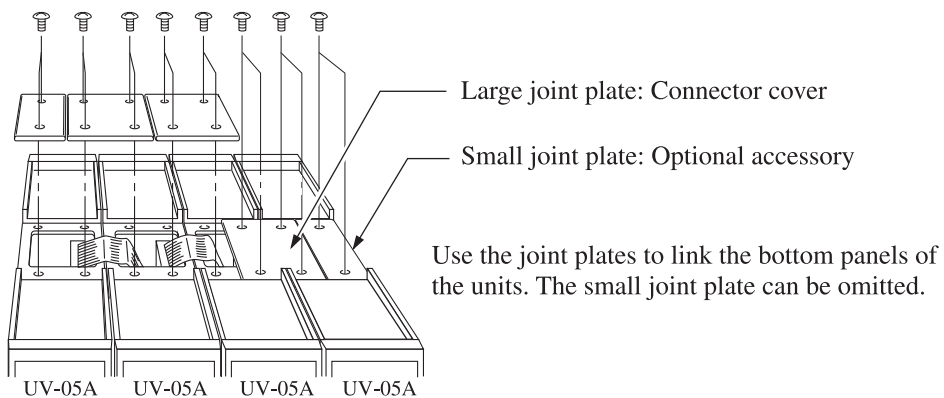
AC Adapter

Connect the AC adapter to the power supply connector. When using several UV-05A units in a linked arrangement, connect the AC adapter to the first unit, and use the bus connector located in the bottom panel for subsequent units. Up to two units can be powered by the AC adapter NC-11 series, and up to twelve units by the AC adapter NC-79 / NC-95 / NC-97 which has a higher current capacity rating.

Linking several UV-05A units



Bus connector
Remove the four screws of the connector cover, pull the connector out and plug it into the next UV-05A.



Important

Use only the specified AC adapter. Using a different adapter may cause malfunction or damage.

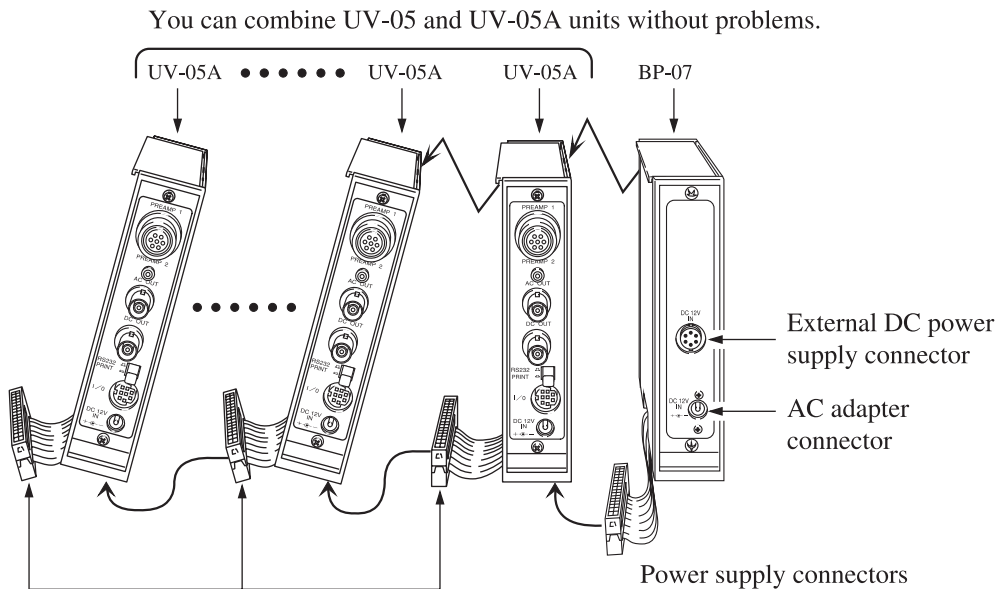
Battery Unit

When using the battery unit BP-07, establish connections as shown below. If several UV-05A units are used in a linked arrangement, connect the battery unit to the first unit and use the bus connector for subsequent units.

The battery unit BP-07 holds eight size "C" batteries (IEC R14). When using alkaline batteries, the BP-07 can power three UV-05A units for about 15 hours (25°C). When the voltage meter on the battery unit enters the red zone, replace all batteries as soon as possible.

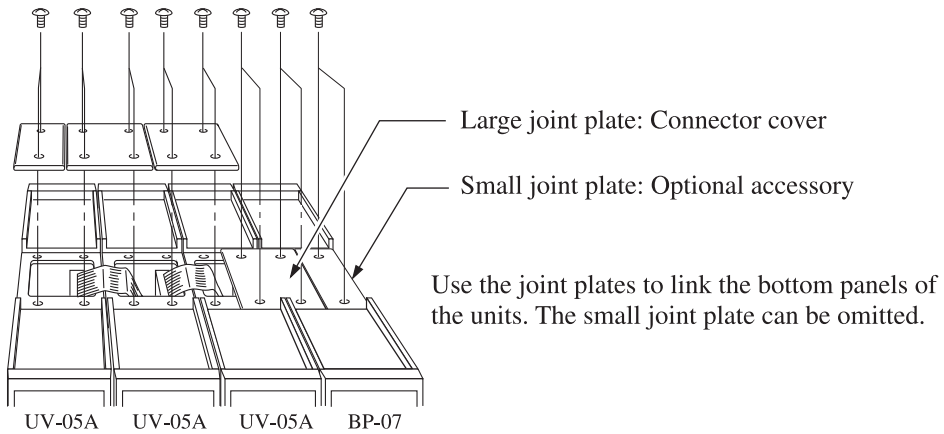
It is also possible to connect the AC adapter NC-11 or NC-97 to the battery unit. In this case, power is normally provided by the adapter, but in case of a power failure the battery unit serves as a back-up power supply.

Linking several UV-05A units with the battery unit



Bus connector

Remove the four screws of the connector cover, pull the connector out and plug it into the next UV-05A.



Important

The UV-05A does not have a power switch. Consequently, you should plug the AC adapter into an AC outlet only after the accelerometer and all other equipment connections are completed. When using the battery unit, set the power switch on the battery unit to "Off" before making connections.

Note

When powering three UV-05A units from a single battery unit BP-07 (for eight IEC R14, size "C" batteries), operation time will be about 15 hours with one set of fresh alkaline batteries. (25°C)
Dispose of used batteries in accordance with local laws and regulations.

Accelerometer Selection and Mounting Method

The UV-05A vibration meter unit is used with optional piezoelectric accelerometers or amplifier built-in type optional accelerometers. Dynamic type or other types of accelerometers cannot be used with this unit. Choose a piezoelectric accelerometer suited for the type of measurement that is to be carried out, taking into account factors such as measurement range, frequency range, environmental conditions, etc.

Some major piezoelectric accelerometers made by Rion (representative values)

	General	High-output	Lightweight	Heat-resistant	3-axis	General (amplifier built-in type)
Model	PV-85	PV-87	PV-90B	PV-65	PV-93	PV-41
Charge sensitivity [pC/(m/s ²)]	6	40	0.15	7	0.7	Voltage sensitivity [mV/(m/s ²)] 1.0
Mounting resonance frequency (kHz) *1	24	9	70	25	30*2	50
Frequency range (Hz)	1 to 7000	1 to 3000	1 to 25000	1 to 9000	1 to 8000*2	3 to 10000
Temperature range (°C)	-50 to +160	-50 to +160	-50 to +160	-50 to +260	-50 to +160	-20 to +100
Mass (g)	23	115	1.2	26	28	23
Construction principle	Shear type	Shear type	Shear type	Shear type	Shear type	Shear type

*1: When mounted with specified screws at specified torque

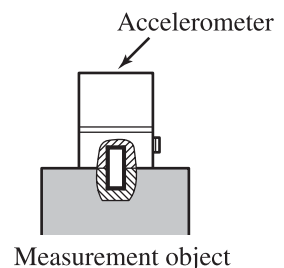
*2: Vertical direction value

Accelerometer installation

Proper selection and mounting of the accelerometer is vital to obtain reliable measurement results. The accelerometer mounting method greatly affects the contact resonance frequency. The advantages and disadvantages of various methods are outlined below, to assist you in choosing the proper method.

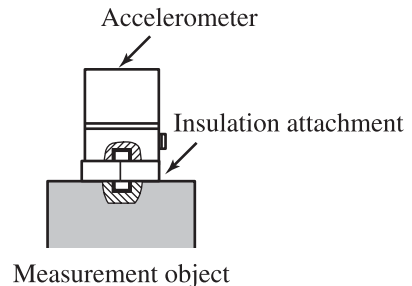
- **Rigid screw mounting**

This mounting principle assures optimum frequency response characteristics. The mounting surface should be perfectly smooth, and the screw holes must be drilled in such a way as to assure perfect perpendicularity of the accelerometer.



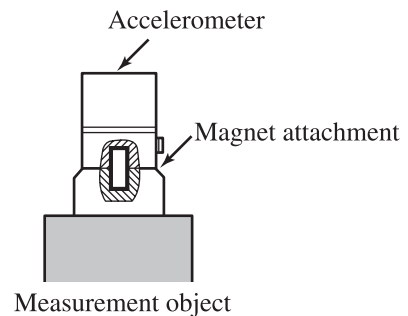
- **Insulation attachment mounting**

This mounting principle is used when electrical insulation between accelerometer and measurement object is required. The contact resonance frequency will be lower than with rigid screw mounting. Regarding the screw holes, the same precautions as for rigid screw mounting apply.



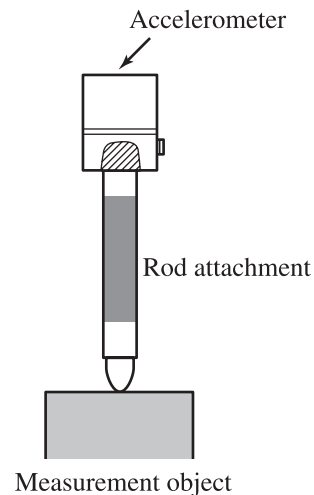
- **Magnet attachment mounting**

Because the contact resonance frequency will be quite low, this principle is mainly suited for vibration measurements in the medium to low frequency range. The maximum acceleration that can be measured depends on the accelerometer mass.



- **Rod attachment mounting**

Pressing the accelerometer against the measurement object with a rod is the simplest method, but it is only suitable for measurements below 500 Hz, because contact resonance frequency will be very low. This method should only be used if none of the other three mounting methods are feasible.



⚠ WARNING

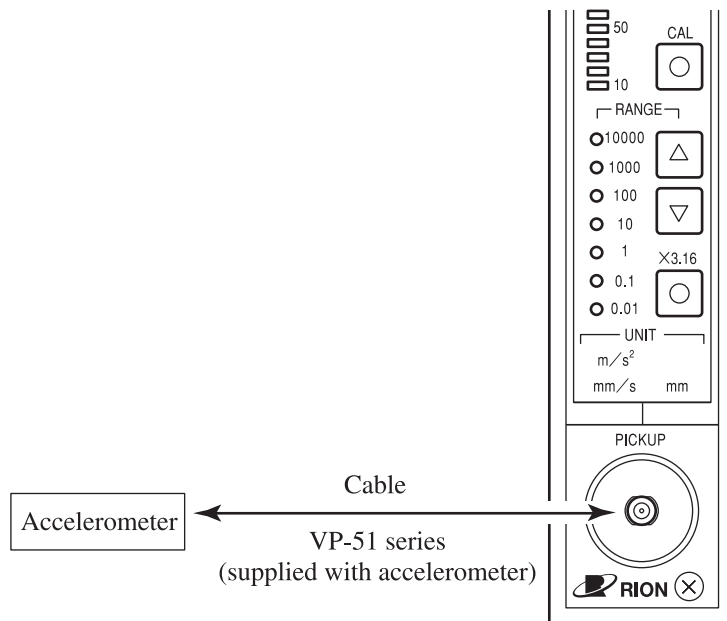
When making measurements on exposed rotating parts or power train parts of machinery, proceed with utmost care to prevent accidents due to getting caught in the machinery.

Accelerometer Connection

Direct connection

Connect the accelerometer to the accelerometer connector on the front panel, as shown in the illustration.

The input circuit for this connector operates as a charge amplifier. Therefore the accelerometer cable length will normally not affect sensitivity. However, you should keep the connection as short as possible, because long cable runs will lead to an increase in inherent noise. If the accelerometer has to be mounted at a distance from the unit, you should use a preamplifier as described next page.



Note

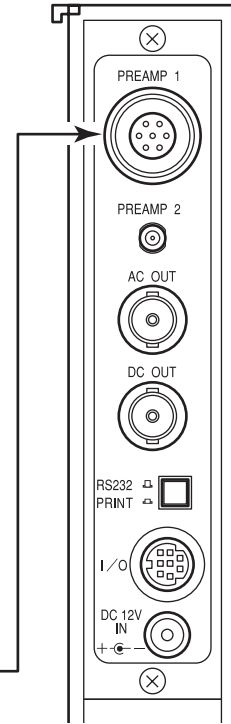
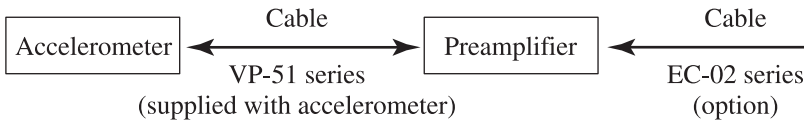
If the cable length exceeds 5 meters, the use of a preamplifier is recommended.

Connection via a preamplifier

If the accelerometer is to be mounted at a considerable distance from the unit, a preamplifier (such as the VP-26A (option)) should be used to reduce the influence of internal and external noise.

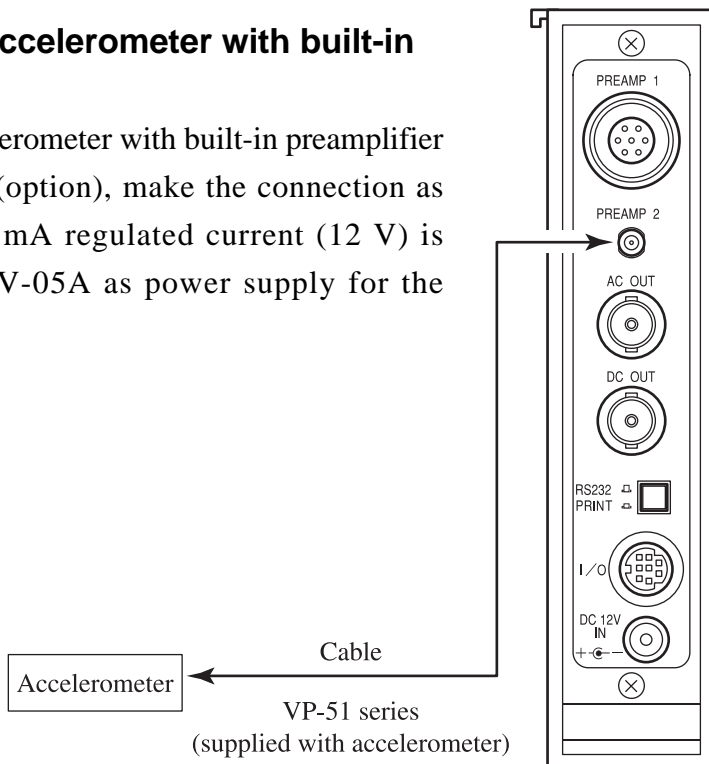
Connect the accelerometer and preamplifier as shown in the illustration, and connect the output terminal of the preamplifier to the preamplifier 1 connector on the rear panel of the UV-05A. The EC-02 cable series (option) comprises five different types, as shown in the table below.

Type	Cable length	Type	Cable length
EC-02A	5 m	EC-02C	30 m (with reel)
EC-02B	10 m	EC-02D	50 m (with reel)
		EC-02E	100 m (with reel)



Connection of an accelerometer with built-in preamplifier

When using an accelerometer with built-in preamplifier such as the PV-41 (option), make the connection as shown below. A 2 mA regulated current (12 V) is provided by the UV-05A as power supply for the preamplifier.



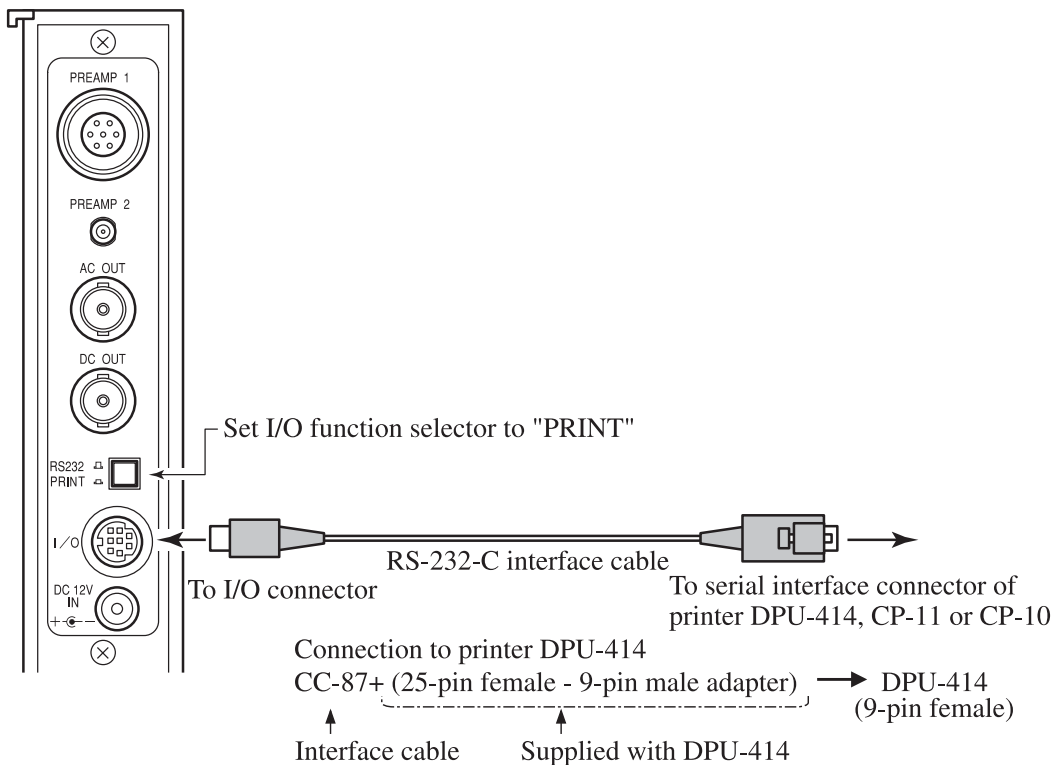
Output Connections

Output connections of the UV-05A include data output to the printer DPU-414 / CP-11 / CP-10 (option), communication with a computer, AC and DC output to other equipment, and data output to the display unit UV-12 / UV-12A. This section describes the printer connection and the AC and DC output connection. Regarding connection to a computer, please refer to the chapter starting on page 32, and regarding connection of the display unit UV-12 / UV-12A, please refer to the instruction manual of the UV-12 / UV-12A.

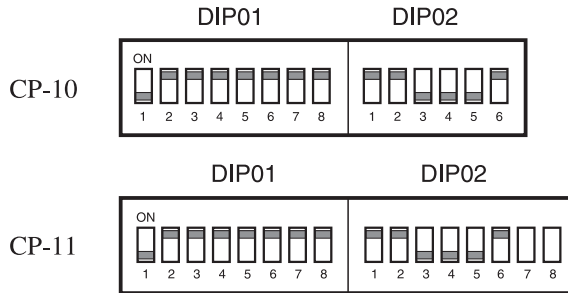
Printer DPU-414 / CP-11 / CP-10

1. Connect the printer to the I / O connector on the UV-05A, using the RS-232-C interface cable CC-87.
2. Set the I / O function selector on the UV-05A to "PRINT"

The setting of the I / O function selector is checked only once when the UV-05A is turned on. If you are already using the UV-05A and want to change the setting, choose the new position, turn the power supply off and then on again.



- Set the dipswitches DIP01 and DIP02 of the CP-11 / CP-10 as follows.



Note

As for the settings of DPU-414, please refer to the instruction manual for DPU-414.

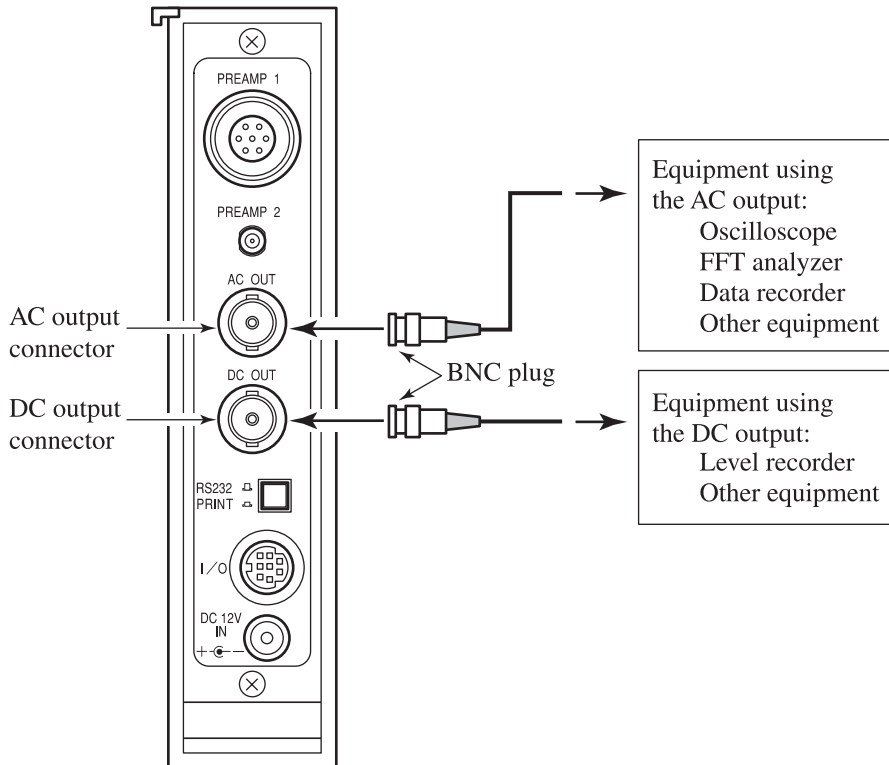
Printer models CP-10 and CP-11 already became discontinuous for sale. Currently DPU-414 is only available for sale as a printer.

Important

Switches 7 and 8 of DIP switch bank 2 of printer CP-11 are set at the factory and should not be changed. Otherwise, correct printing may not be possible.

AC Output and DC Output

The AC output and DC output connectors provide a signal corresponding to the measured vibration. This signal can be supplied for example to an oscilloscope for waveform observation, or to a data recorder or FFT analyzer.

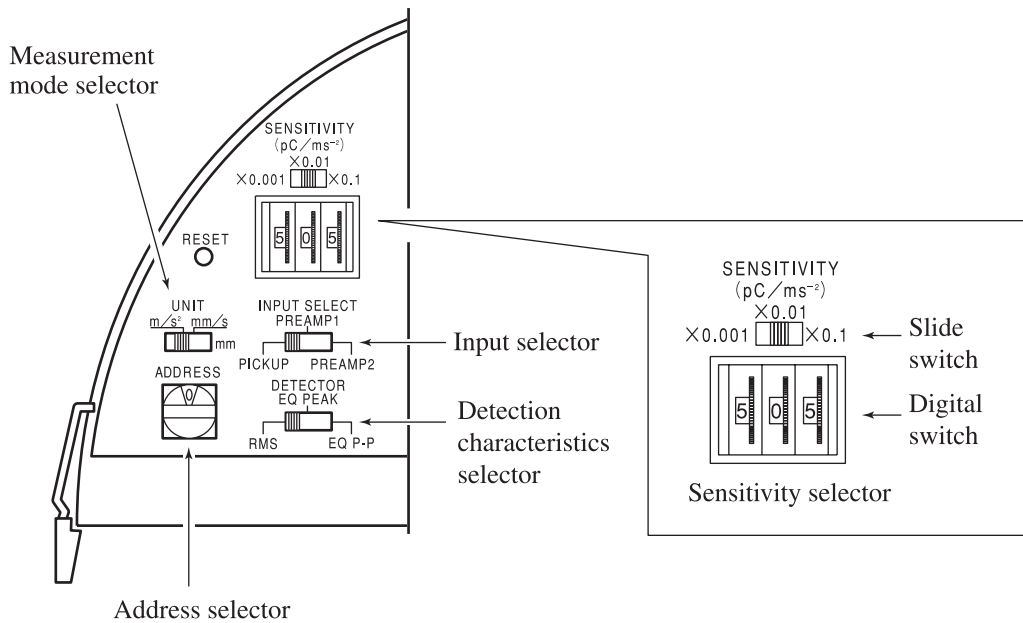


AC output and DC output specifications

	AC output	DC output
Connector type	BNC	BNC
Output impedance	Approx. 50 Ω	Approx. 50 Ω
Output voltage (Full-scale)	1 V rms (RMS mode) 1 V peak (EQ PEAK mode) 1 V p-p (EQ P-P mode)	+1 V
Maximum output voltage	± 10 V peak (no overload)	10 V peak (no overload)
Load impedance	10 k Ω or more	10 k Ω or more

Setup

The controls for accelerometer settings are located on the inner panel. To access this panel, push down the panel release lever and pull the panel out. Set the controls as shown below, and then push the panel into the unit.



Input selector

Set this selector to the appropriate position, depending on which input is to be used.

PICKUP: Accelerometer connector on front panel

PREAMP1: Preamplifier 1 connector on rear panel

PREAMP2: Preamplifier 2 connector on rear panel

Sensitivity selector

Use the sensitivity selector to set the gain of the UV-05A so that it matches the charge sensitivity of the accelerometer or the output voltage of the preamplifier. The sensitivity is determined by a combination of the digital switch setting (numeric value) and the position of the slide switch (multiplication factor). The setting range of the digital switch is 100 to 999.

Note
The hundred digit cannot be set to zero.

- Direct accelerometer connection (accelerometer connector on front panel)

Set the sensitivity selector to the charge sensitivity value ($\text{pC} / (\text{m} / \text{s}^2)$) listed in the "Calibration Certificate for Piezoelectric Accelerometer" supplied with the accelerometer. If the charge sensitivity is listed as pC / G , convert the value into $\text{pC} / (\text{m} / \text{s}^2)$ by dividing it by 9.8.

For example, if the charge sensitivity of the accelerometer is $5.05 \text{ pC} / (\text{m} / \text{s}^2)$, set the digital switch to "505" and the slide switch to " $\times 0.01$ "

The setting range is 0.1 to 99.9, but it is also possible to use accelerometers with a sensitivity between 0.01 and $0.0999 \text{ pC} / (\text{m} / \text{s}^2)$ by setting the selector to a value ten times the actual sensitivity and multiplying the reading by ten.

- Accelerometer with built-in preamplifier (preamplifier 2 connector on rear panel)

When using an accelerometer with built-in preamplifier such as the PV-41, set the sensitivity selector to a position matching the accelerometer voltage sensitivity ($\text{mV} / (\text{m} / \text{s}^2)$). If the voltage sensitivity is listed as mV / G , convert the value into $\text{mV} / (\text{m} / \text{s}^2)$ by dividing it by 9.8.

- Accelerometer with external preamplifier (preamplifier 1 connector on rear panel)

When using an external preamplifier, set the sensitivity selector to a position matching the output voltage of the preamplifier ($\text{mV} / (\text{m} / \text{s}^2)$).

For example, the preamplifier VP-26A is rated for a sensitivity of $1 \text{ mV} / \text{pC}$. When used with an accelerometer whose charge sensitivity is $X \text{ pC} / (\text{m} / \text{s}^2)$, the output voltage is $X \text{ mV} / (\text{m} / \text{s}^2)$. The sensitivity selector should therefore be set to X.

If the output voltage of the preamplifier is listed as mV / G , convert the value into $\text{mV} / (\text{m} / \text{s}^2)$ by dividing it by 9.8.

Measurement mode selector

This selector determines whether vibration acceleration, velocity, or displacement is measured.

m / s^2 : Acceleration (unit: m / s^2)

mm / s : Velocity (unit: mm / s)

mm : Displacement (unit: mm)

Detection characteristics selector

Determines the detection response.

RMS: RMS value

EQ PEAK: Equivalent peak value ($\text{RMS} \times \sqrt{2}$)

EQ P-P: Equivalent peak-to-peak value ($\text{EQ PEAK} \times 2$)

The time constant for each setting is 1 second.

Address selector

Set this selector to the desired position when the UV-05A is connected to a display unit UV-12 / UV-12A (option). Up to ten UV-05A units can be connected to one UV-12 / UV-12A, and the address setting serves to distinguish between the different units. When the display unit UV-12 / UV-12A is not used, the address selector has no effect and may be left at any position.

Measurement

Power-on

If an AC adapter is used to power the unit, plug the adapter into an AC outlet. If the battery unit BP-07 (optional) is used to power the unit, set the power switch on the battery unit to "On".

Next, turn on connected equipment such as the printer DPU-414 (optional) and equipment connected to the AC or DC output.

When the unit is turned on, the same settings as used before the unit was turned off are reestablished.

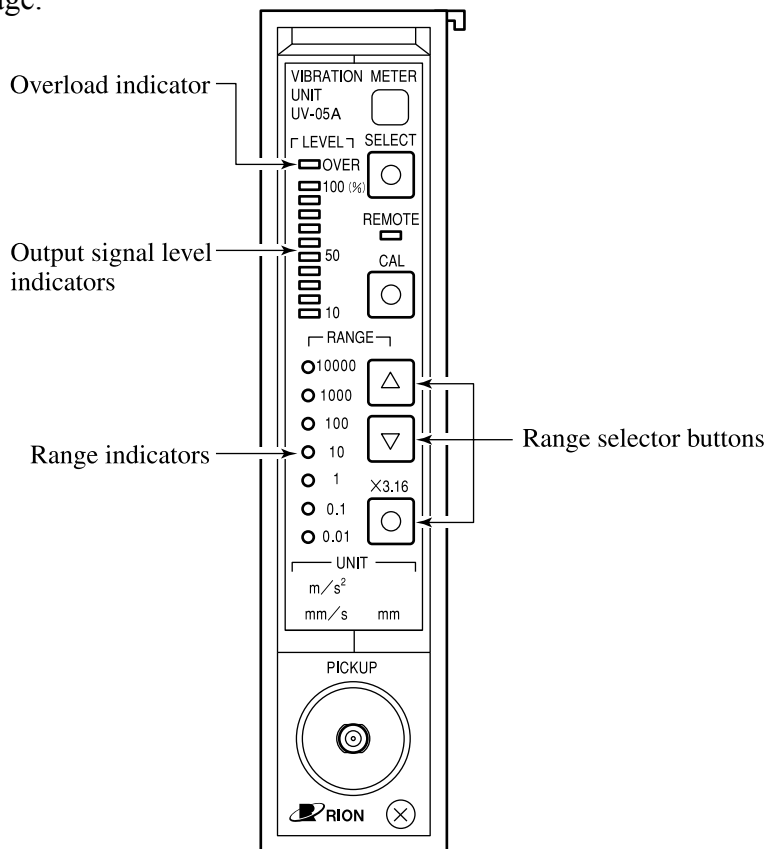
Range Selection

Select the measurement range (full-scale value) with the range selector buttons. The corresponding indicator lights up.

Pushing the [Δ] button increases the range, and pushing the [∇] button decreases it. When the [$\times 3.16$] button is pressed, the indicator of the button lights up and the range is increased by a factor of 3.16. In this case, two range indicators are lit at the same time. For example, if the "10" and "100" indicators are both lit, the actual range is "31.6". To return the range to the normal setting, press the [$\times 3.16$] button again so that the indicator of the button goes out.

Normally, you should select the range so that the overload indicator does not light. If the input signal is too high, causing amplifier saturation, the overload indicator lights up. In such a case, the measurement results will not be reliable.

The selectable range settings depend on the sensitivity setting (accelerometer sensitivity) and the measurement mode setting, as shown in the table on the next page.



Correlation between available range and sensitivity/measurement mode settings

Sensitivity (pC/(m/s ²))	Measurement mode	Available range
0.100 to 0.999	Acceleration (m/s ²)	10 to 10000
	Velocity (mm/s)	10 to 10000
	Displacement (mm)	1 to 1000
1.00 to 9.99	Acceleration (m/s ²)	1 to 1000
	Velocity (mm/s)	1 to 1000
	Displacement (mm)	0.1 to 100
10.0 to 99.9	Acceleration (m/s ²)	0.1 to 100
	Velocity (mm/s)	0.1 to 100
	Displacement (mm)	0.01 to 10

Recording Measurement Results on the Printer

Press the On / Off-line switch of the DPU-414 to set the printer to the on-line condition. The printer then will print out the measurement results every five seconds. The printout format is as follows.

nnn. nnnn, xx, yyyyy, zzzzzz

The items are defined as follows. An underline symbol () represents a space.

nnn. nnnn Measurement value

xx Overload indication

__ : No overload

OV: Overload has occurred

yyyyy Measurement mode (measurement unit)

m/s²: Acceleration (m / s²)

mm/s_ : Velocity (mm / s)

mm_ _ _ : Displacement (mm)

zzzzzz Detection characteristics

RMS_ _ _ _ : RMS value

EQ_PEAK: Equivalent peak value

EQ_P-P_ : Equivalent peak-to-peak value

Using Equipment Connected to the AC and DC Outputs

Calibration of Connected Equipment

After connecting the equipment to the AC output or DC output, carry out calibration as follows.

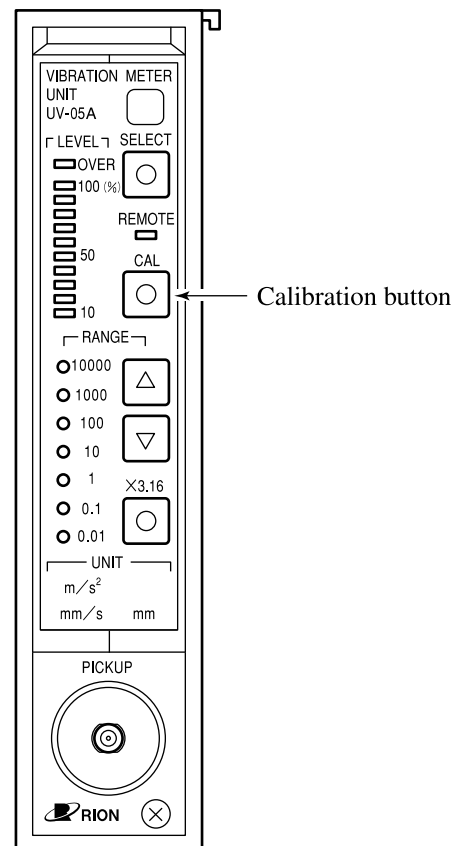
1. Press the calibration button.

The indicator of the button lights up. In this condition, a 1-V signal is supplied at the DC output and an 80-Hz signal at the AC output. The voltage of the AC signal depends on the selected detection characteristics, as shown in the table below.

AC calibration signal voltage

Detection characteristics	AC signal voltage
RMS (RMS value)	1 V rms $\pm 2\%$
EQ PEAK (equivalent peak value)	1 V peak $\pm 2\%$
EQ P-P (equivalent peak-to-peak value)	1 V p-p $\pm 2\%$

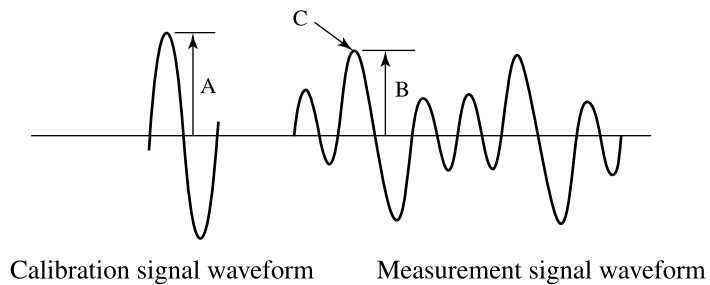
2. Use the calibration signal to calibrate the connected equipment. The signal corresponds to the full-scale condition during measurement. For example, the amplitude of a waveform can be determined by referencing it to the calibration amplitude, as shown in the illustration on the next page.
3. Press the calibration button once more to turn off the calibration signal. The indicator of the button goes out.



Measurement

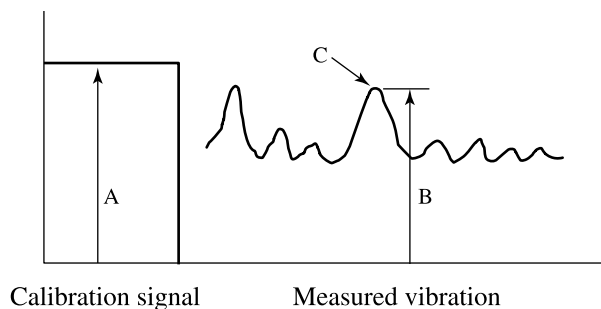
When the calibration mode is terminated, signals corresponding to the measured vibration are supplied at the AC output and DC output.

AC output: Depending on the measurement mode setting, an acceleration (m/s^2), velocity (mm/s) or displacement (mm) signal is supplied. The amplitude of the signal waveform can be referenced to the calibration signal waveform (full-scale value).



$$\text{Amplitude at point C} = (\text{Full-scale value}) \times B / A$$

DC output: Detection is carried with the selected detection characteristics, and the resulting AC signal is converted into a DC signal for output.



$$\text{Value at point C} = (\text{Full-scale value}) \times B / A$$

Measurement Range

The frequency range and measurement limits are determined by the accelerometer in use and the selected measurement mode.

The Overload indicator lights up when the input signal has exceeded the measurement maximum.

Vibration Frequency Range

The frequency range depends on the measurement mode, as shown below.

Measurement mode setting and vibration frequency range

Acceleration (m/s ²)	1 Hz to 15 kHz ($\pm 5\%$)
	0.5 Hz to 30 kHz ($\pm 10\%$)
Velocity (mm/s)	3 Hz to 3 kHz ($\pm 5\%$)
Displacement (mm)	3 Hz to 500 Hz ($\pm 10\%$)

Upper Measurement Limit

The upper measurement limit for acceleration measurements (maximum input acceleration) depends on the input sensitivity setting. If the preamplifier 1 or preamplifier 2 connector is used, the input conditions also affect the measurement limit.

- Direct accelerometer connection

Measurement is possible up to a value ten times the maximum range setting.

Sensitivity setting and upper measurement limit for acceleration

Sensitivity setting	Upper acceleration measurement limit
0.1 to 0.999 pC/(m/s ²)	100000 m/s ² peak
1 to 9.99 pC/(m/s ²)	10000 m/s ² peak
10 to 99.9 pC/(m/s ²)	1000 m/s ² peak

- Preamplifier 1 connector

The maximum input acceleration depends on the type of connected preamplifier. The maximum input voltage of the connector is ± 10 V peak.

- **Preamplifier 2 connector**

Because the maximum input voltage of this connector is ± 4 V peak (AC component), waveform saturation may occur already before the overload indicator lights up. For example, if the accelerometer PV-41 (voltage sensitivity approx. $1.0 \text{ mV} / (\text{m} / \text{s}^2)$) (option) is used, the maximum of 4 V peak is reached at an acceleration of $4000 \text{ m} / \text{s}^2$ peak, and measurements above this value will not be reliable.

- **Velocity and displacement upper measurement limit**

Because the velocity and displacement values are obtained by integration of the measured acceleration, the upper measurement limit is determined by the upper measurement limit for acceleration and by the vibration frequency.

Lower Measurement Limit

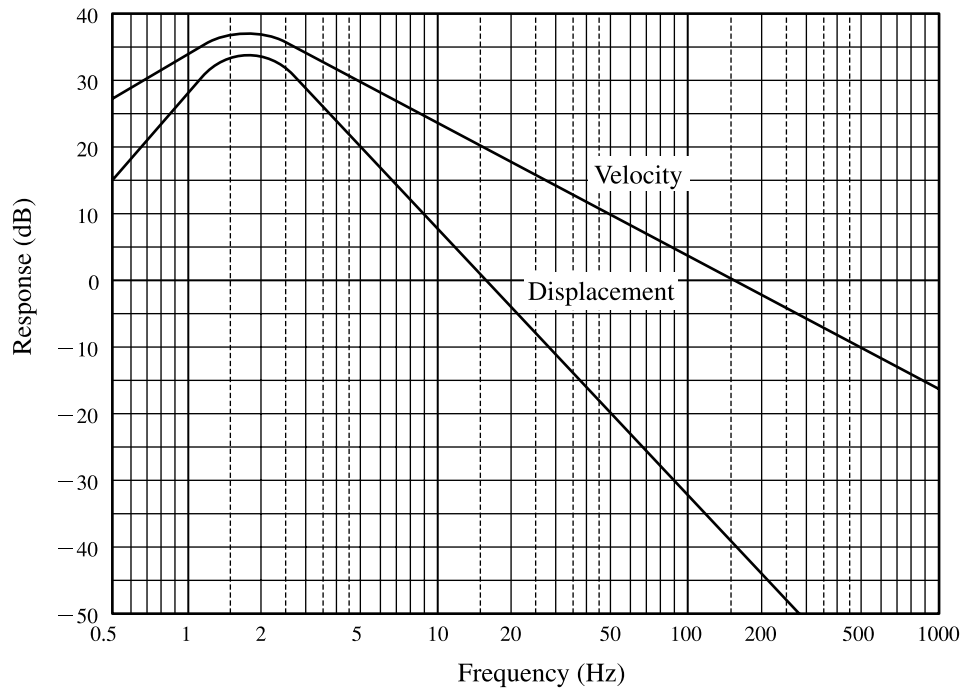
The lower measurement limit is determined by the residual noise level.

Noise levels when a dummy load of 1000 pF is connected to the accelerometer connector and a sensitivity setting of $5.00 \text{ pC} / (\text{m} / \text{s}^2)$ is selected are shown in the table below. To keep the influence on the measurement results within 1 dB (approx. 10%), the lower measurement limit should be twice as high as the noise level.

Measurement mode and noise level

Measurement mode	Noise level
Acceleration (m/s^2)	0.01 m/s^2 rms
Velocity (mm/s)	0.1 mm/s rms
Displacement (mm)	0.0015 mm rms

Vibration Frequency Response



UV-05A Velocity and displacement frequency response

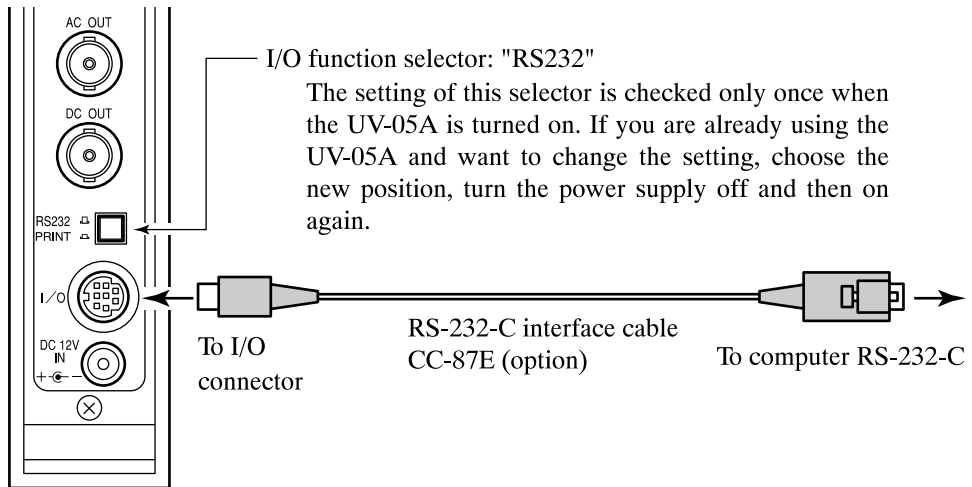
RS-232-C Interface

The built-in RS-232-C interface allows the use of a computer to control the measurement conditions of the UV-05A and to store measurement results and measurement settings. This section explains the following points.

- **Connection to a computer (⇒ p. 33)**
To connect the UV-05A to a computer, the RS-232-C interface cable CC-87E (option) is required. This section explains how to use the cable and gives information about the internal cable wiring.
- **Transfer protocol and transfer procedure (⇒ p. 34)**
This section describes the transfer protocol for the RS-232-C interface and explains the steps for sending command and receiving data.
- **Commands (⇒ p. 38)**
This section describes the commands that serve to control the UV-05A. The section is divided into an explanation of the command format and a listing of commands.
- **Output data format (⇒ p. 42)**
This section describes the format in which measurement data and setting data are output by the UV-05A.

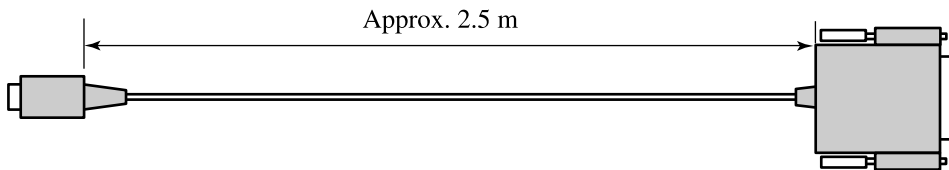
Connection to a Computer

Connect the UV-05A to a computer as shown below, and set the I / O function selector of the UV-05A to "RS232".



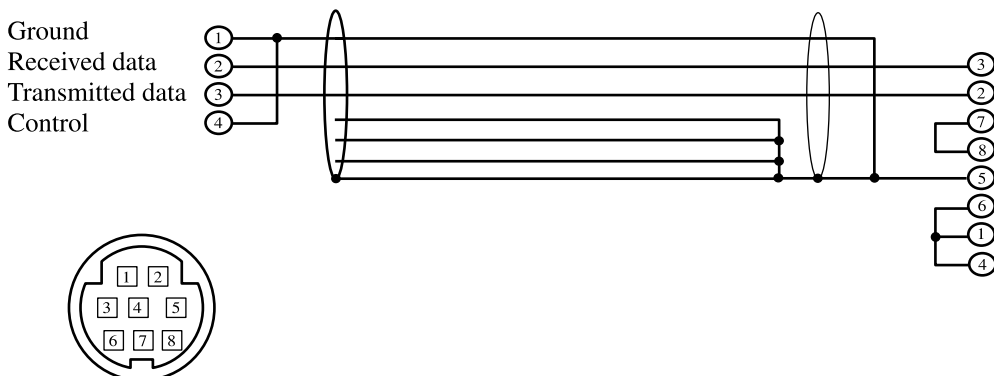
Hoshiden Electronics
TCP8080-01-020

Hirose Electric
HDE-CTH/HDEB-9S



UV-05A end

Computer end
9-pin female connector



I/O connector of UV-05A

Transfer Protocol and Transfer Procedure

Transfer Protocol

Flow control:	Yes
Transmission:	Asynchronous, half-duplex
Data word length:	8 bit
Stop bits:	2 bit
Parity:	None
Baud rate:	4800 bps

Remote Mode / Local Mode

- Remote mode

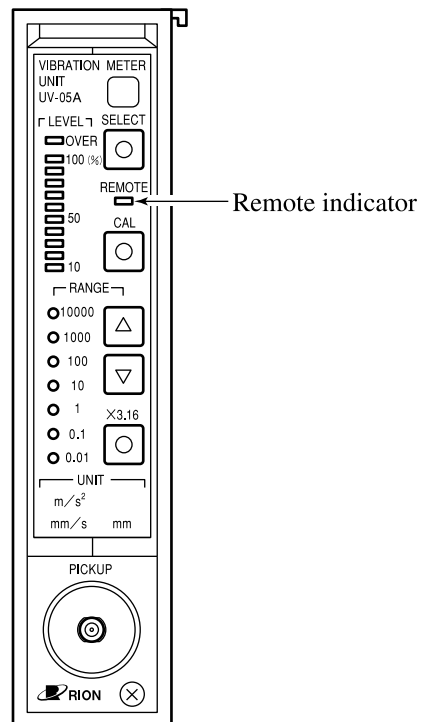
In this condition, the UV-05A receives commands from the computer and the panel buttons on the UV-05A are inactive. The remote indicator of the UV-05A is lit.

- Local mode

The UV-05A can be operated with the panel buttons and with commands from the computer. The remote indicator is out.

- Remote mode / local mode switching

The SLK command serves to switch between local mode and remote mode (⇒ p. 40).



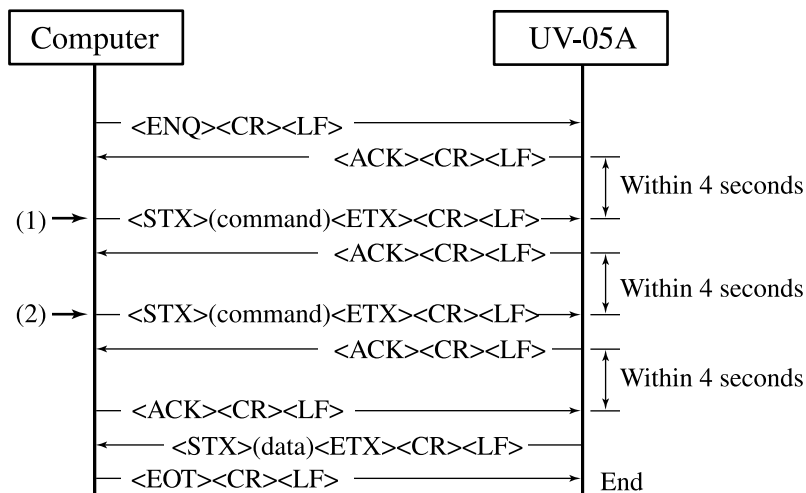
Transfer Procedure

In order to control the UV-05A from a computer or to retrieve measurement data, certain commands must be sent to the UV-05A. The data exchange must be performed according to certain rules, to ensure that both the UV-05A and the computer recognize the commands and data properly.

To send commands to the UV-05A, the following procedure must be observed.

1. The computer sends <ENQ><CR><LF> to the UV-05A.
2. When <ENQ><CR><LF> has been received, the UV-05A returns <ACK><CR><LF> to the computer.
3. The computer verifies receipt of <ACK><CR><LF> and sends a command within 4 seconds.
4. When a valid command is received by the UV-05A, it carries out the command. If it is a command which controls measurement settings, the appropriate setting is established, and an <ACK><CR><LF> is returned to the computer. If it is a command which requests data, the UV-05A returns <ACK><CR><LF> to the computer and waits for <ACK><CR><LF> from the computer. If, within 4 seconds, <ACK><CR><LF> is received by the UV-05A, it sends the appropriate data to the computer.
5. Within 4 seconds of sending the <ACK><CR><LF> or the data to the computer, the UV-05A can accept the next command. It is therefore possible to repeat steps 3 and 4, for continuous interaction with the computer. If no further commands are received within 4 seconds, time-out occurs. In this case, the procedure must be restarted from step 1.
6. When the computer sends an <EOT><CR><LF> to the UV-05A, data transfer is completed. To send new commands, the procedure must then be restarted from step 1.

Normal transfer sequence



- (1): Command which controls measurement setting
 (2): Command which requests data

<ENQ>: Control code 05H (enquire)

<ACK>: Control code 06H (acknowledge)

<NAK>: Control code 15H (not acknowledge)

<EOT>: Control code 04H (end of transfer)

<STX>: Control code 02H (start text)

<ETX>: Control code 03H (end text)

<CR>: Control code 0DH (carriage return)

<LF>: Control code 0AH (line feed)

(command): ASCII string (command and parameters for UV-05A)

(data): ASCII string (requested data from UV-05A)

Error Handling

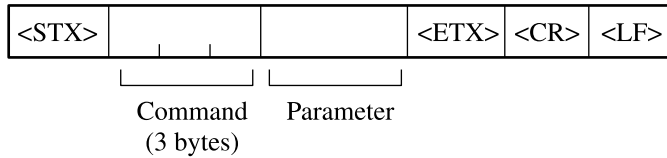
In order to ensure correct data exchange between the UV-05A and the computer, the rules described above must be observed. If an error occurs, the following steps should be taken.

- The computer has sent <ENQ><CR><LF> but no response is received from the UV-05A.
Send <ENQ><CR><LF> again after about 2 seconds. Repeat this several times. If there is still no response from the UV-05A, one of the following conditions may exist:
Transfer parameters do not match.
Interface cable is defective or not properly connected.
UV-05A is not powered.
I / O function selector on UV-05A is set to "PRINT", or the setting was changed to "RS232" without turning the UV-05A off and on.
- <ACK><CR><LF> from the UV-05A was received, but the computer has not completed the sending of commands within 4 seconds.
The UV-05A finishes the data transfer condition.
- A wrong command was sent.
When the computer has sent a wrong command (invalid string or parameter out of range), the UV-05A returns <NAK><CR><LF>. This can be repeated up to three times, but if the command is still invalid at the fourth try, the UV-05A sends <EOT><CR><LF> and finishes the data transfer condition.
- Data from UV-05A were not received properly.
When the computer returns a <NAK><CR><LF>, the UV-05A sends the immediately preceding data (including <ACK><CR><LF> and <NAK><CR><LF>) again. This can be repeated up to three times, but if the data are still not received at the fourth try, the UV-05A sends <EOT><CR><LF> and finishes the data transfer condition.

Commands

Command Format

Commands that can be used by the UV-05A consist of 3 characters (3 bytes), usually followed by a parameter which specifies the action range of the command. Some commands do not have parameters.



In the following command description, parameters are denoted by "n".

Note
The UV-05A cannot process multiple commands sent together.

Command List

ISLn Selects the input signal.

The action of this command corresponds to the input selector.

- n = 0: Accelerometer connector (PICKUP)
- n = 1: Preamplifier 1 connector (PREAMP 1)
- n = 2: Preamplifier 2 connector (PREAMP 2)

SNSn Selects the sensitivity numeric value.

The action of this command corresponds to the digital switch of the sensitivity selector.

- n = 100 to 999

Note
When parameter n is a value between 000 and 099, the sensitivity of the UV-05A is set as specified by n (command error does not occur). The measurement data, however, will not be reliable.

SNMn Selects the sensitivity multiplication factor.

The action of this command corresponds to the slide switch of the sensitivity selector.

- n = 0: × 0.001
- n = 1: × 0.01
- n = 2: × 0.1

UNtn Selects the measurement mode.

The action of this command corresponds to the measurement mode selector.

- n = 1: Acceleration (m / s^2)
- n = 2: Velocity (mm / s)
- n = 3: Displacement (mm)

DETh Selects the detection characteristics.

The action of this command corresponds to the detection characteristics selector.

n = 0: RMS (RMS value)

n = 1: EQ PEAK (equivalent peak value)

n = 2: EQ P-P (equivalent peak-to-peak value)

RNGn Selects the range.

The range specified by the parameter n depends on the sensitivity setting and the measurement mode setting, as shown below.

Sensitivity	Measurement mode	Parameter n and specified range						
		n = 0	n = 1	n = 2	n = 3	n = 4	n = 5	n = 6
0.100 to 0.999	Acceleration (m/s ²)	10	31.6	100	316	1000	3160	10000
	Velocity (mm/s)	10	31.6	100	316	1000	3160	10000
	Displacement (mm)	1	3.16	10	31.6	100	316	1000
1.00 to 9.99	Acceleration (m/s ²)	1	3.16	10	31.6	100	316	1000
	Velocity (mm/s)	1	3.16	10	31.6	100	316	1000
	Displacement (mm)	0.1	0.316	1	3.16	10	31.6	100
10.0 to 99.9	Acceleration (m/s ²)	0.1	0.316	1	3.16	10	31.6	100
	Velocity (mm/s)	0.1	0.316	1	3.16	10	31.6	100
	Displacement (mm)	0.01	0.0316	0.1	0.316	1	3.16	10

SLKn Enables remote mode or local mode.

n = 0: Local mode

n = 1: Remote mode

CALn Enables or disables the calibration mode.

The action of this command corresponds to the calibration button.

n = 0: Calibration mode disabled

n = 1: Calibration mode enabled

- DOD** Requests the current measurement data. (This command has no parameters.)
The format of the data output in response to this command is described on page 42.
- MOD** Requests the maximum value of the current measurement data. (This command has no parameters.)
The maximum value is defined as the maximum value encountered since the unit was turned on or since the last MRS (maximum value reset) command.
The format of the data output in response to this command is described on page 42.
- MRS** Resets the maximum value. (This command has no parameters.)
- STS** Requests the current measurement settings. (This command has no parameters.)
The format of the data output in response to this command is described on page 43.

Output Data Format

This section describes the format of the output data in response to the DOD, MOD, and STS commands.

Output Data in Response to DOD and MOD

The DOD command requests the current measurement value, and the MOD command the maximum measurement value. The output data format is as follows. An underline symbol () represents a space.

<STX>nn. nnE±m, xx<ETX><CR><LF>

nn. nn	Real number of measurement value (00.00 to 31.62)	} Actual measurement value is $nn.nn \times 10^{\pm m}$.
±m	Exponent of measurement value (-2 to +4)	
xx	Overload indication __ : No overload OV : Overload has occurred.	

Output Data in Response to STS

The current measurement settings are output by the UV-05A in the following format.

```
<STX>n1n2n2n2n3n4n5n6n7n8<ETX><CR><LF>
```

n1	Input signal
n1 = 0:	Accelerometer connector (PICKUP)
n1 = 1:	Preamplifier 1 connector (PREAMP 1)
n1 = 2:	Preamplifier 2 connector (PREAMP 2)
n2n2n2	Sensitivity numeric value
	100 to 999
n3	Sensitivity multiplication factor
n3 = 0:	×0.001
n3 = 1:	×0.01
n3 = 2:	×0.1
n4	Measurement mode
n4 = 1:	Acceleration (m / s^2)
n4 = 2:	Velocity (mm / s)
n4 = 3:	Displacement (mm)
n5	Detection characteristics
n5 = 0:	RMS (RMS value)
n5 = 1:	EQ PEAK (equivalent peak value)
n5 = 2:	EQ P-P (equivalent peak-to-peak value)

n6 Range

The range specified by n6 depends on the sensitivity setting and the measurement mode setting, as shown below.

Sensitivity	Measurement mode	n6 and specified range						
		n6 = 0	n6 = 1	n6 = 2	n6 = 3	n6 = 4	n6 = 5	n6 = 6
0.100 to 0.999	Acceleration (m/s ²)	10	31.6	100	316	1000	3160	10000
	Velocity (mm/s)	10	31.6	100	316	1000	3160	10000
	Displacement (mm)	1	3.16	10	31.6	100	316	1000
1.00 to 9.99	Acceleration (m/s ²)	1	3.16	10	31.6	100	316	1000
	Velocity (mm/s)	1	3.16	10	31.6	100	316	1000
	Displacement (mm)	0.1	0.316	1	3.16	10	31.6	100
10.0 to 99.9	Acceleration (m/s ²)	0.1	0.316	1	3.16	10	31.6	100
	Velocity (mm/s)	0.1	0.316	1	3.16	10	31.6	100
	Displacement (mm)	0.01	0.0316	0.1	0.316	1	3.16	10

n7 Remote mode / local mode setting

n7 = 0: Local mode

n7 = 1: Remote mode

n8 Calibration mode on / off setting

n8 = 0: Calibration mode disabled

n8 = 1: Calibration mode enabled

Specifications

Inputs

Accelerometer connector (for piezoelectric accelerometer)

Maximum input charge:

100000 pC

Connector type: Microdot

Preamplifier 1 connector (for preamplifier with input for accelerometer)

Input type: Unbalanced

Maximum input voltage:

± 10 V peak

Input impedance: 100 k Ω

Connector type: PRC-03 7-pin connector

Preamplifier 2 connector (for accelerometer with built-in preamplifier)

Input type: Unbalanced

Maximum input voltage:

± 4 V peak (AC component)

Input impedance: 100 k Ω

Preamplifier power supply:

2 mA regulated (12 V)

Connector type: Microdot

Measurement modes

Acceleration (m / s²), velocity (mm / s), displacement (mm), selectable

Measurement range

With accelerometer sensitivity between 0.100 and 0.999 pC / ms⁻²

Acceleration (m / s²):

10, 31.6, 100, 316, 1000, 3160, 10000 m / s²

Velocity (mm / s): 10, 31.6, 100, 316, 1000, 3160, 10000 mm / s

Displacement (mm):

1, 3.16, 10, 31.6, 100, 316, 1000 mm

With accelerometer sensitivity between 1.00 and 9.99 pC / ms⁻²

Acceleration (m / s²):

1, 3.16, 10, 31.6, 100, 316, 1000 m / s²

Velocity (mm / s): 1, 3.16, 10, 31.6, 100, 316, 1000 mm / s

Displacement (mm):

0.1, 0.316, 1, 3.16, 10, 31.6, 100 mm

With accelerometer sensitivity between 10.0 and 99.9 pC / (m / s²)

Acceleration (m / s²):

0.1, 0.316, 1, 3.16, 10, 31.6, 100 m / s²

Velocity (mm / s): 0.1, 0.316, 1, 3.16, 10, 31.6, 100 mm / s

Displacement (mm):

0.01, 0.0316, 0.1, 0.316, 1, 3.16, 10 mm

Vibration frequency range

Acceleration (m / s²):

1 Hz to 15 kHz (±5%), 0.5 Hz to 30 kHz (±10%)

Velocity (mm / s): 3 Hz to 3 kHz (±5%)

Displacement (mm):

3 Hz to 500 Hz (±10%)

Detection characteristics

RMS, EQ PEAK (RMS × $\sqrt{2}$), EQ P-P (EQ PEAK × 2)

Time constant for detection: 1 second

Display

10-step LED display

Display steps: 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%,
100% of full-scale value

Calibration

Amplifier gain calibration

Gain can be adjusted to match accelerometers with sensitivity from 0.100 to 0.999 pC / (m / s²), 1.00 to 9.99 pC / (m / s²), and 10.0 to 99.9 pC / (m / s²).

Calibration output signal for connected equipment

Internal signal generator (sine wave signal, 80 Hz $\pm 5\%$)

AC output voltage: 1 V rms $\pm 2\%$ (RMS detection characteristics)

1 V peak $\pm 2\%$ (EQ PEAK detection characteristics)

1 V p-p $\pm 2\%$ (EQ P-P detection characteristics)

DC output voltage: 1 V $\pm 2\%$

Overload indication

Indicator lights when signal waveform saturation occurs.

Outputs

AC output

Output connector type:

BNC (rear panel)

Output impedance: Approx. 50 Ω

Output voltage (80 Hz, at full-scale)

Acceleration 1 V $\pm 2\%$

Velocity 1 V $\pm 3\%$

Displacement 1 V $\pm 5\%$

Maximum output voltage:

± 10 V peak (no overload)

Load impedance: 10 k Ω or more

DC output

Output connector type:

BNC (rear panel)

Output impedance: Approx. 50 Ω

Output voltage (80 Hz, at full-scale)

Acceleration 1 V $\pm 2\%$

Velocity 1 V $\pm 3\%$

Displacement 1 V $\pm 5\%$

Maximum output voltage:

+10 V (no overload)

Load impedance: 10 k Ω or more

Noise level (input capacitance 1000 pF, sensitivity 5.00 pC / (m / s²))

Acceleration (m / s²):

0.01 m / s² rms

Velocity (mm / s): 0.1 mm / s rms

Displacement (mm):

0.0015 mm rms

Interface

Function: Data output and remote control

Standard: EIA RS-232-C standard

Flow control: Yes

Transmission: Asynchronous, half-duplex

Data word length: 8 bit

Stop bits: 2 bit

Parity: None

Baud rate: 4800 bps

Connection cable: RS-232-C interface cable CC-87 or CC-87E (option)

Power requirements

Power consumption:

Approx. 100 mA

(12 VDC accelerometer input range full-scale point)

Voltage: 9 to 15 V DC

Suitable AC adapter:

NC-11 (12 V 300 mA)

NC-97 (12 V 3.3 A)

(option)

Suitable battery unit:

BP-07 (option)

Ambient conditions for operation:

-10 to +50°C, 90% RH or less

Dimensions

33 (W) × 149 (H) × 210 (D) mm (without protruding parts)

Weight

Approx. 750 g

Supplied Accessories:

Instruction manual	1
Inspection certificate	1

Optional Accessories:

Filter unit (for internal installation)	NX-06
AC adapter	NC-11 / NC-97
Battery unit	BP-07
Display unit	UV-12 / UV-12A
Printer	DPU-414
RS-232-C interface cable	CC-87 series
CC-87:	25-pin male connector, for connection to printer DPU-414 / CP-11 / CP-10 and computer serial port
CC-87E:	9-pin female connector, for connection to computer se- rial port

Rack-mount base (for standard rack mounting)

UV-05-091

Joint plate and rubber feet (for linking several UV-05A units)

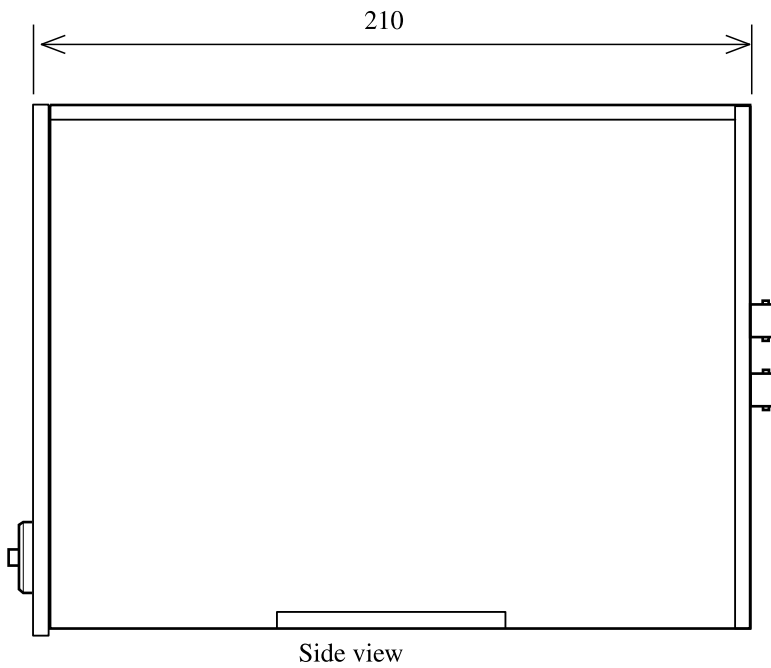
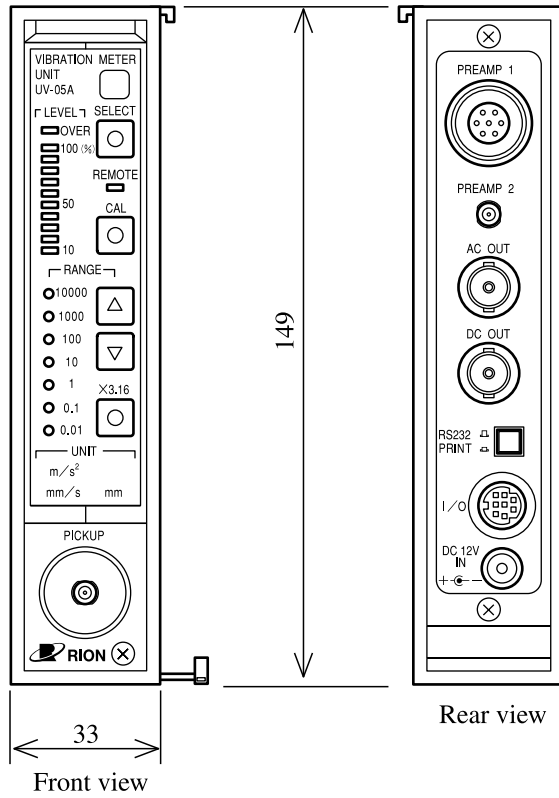
Piezoelectric accelerometer

Vibration meter preamplifier VP-26A

Vibration level meter accelerometer cable

EC-02 series

Vibration meter unit UV-05A



Unit: mm

Rack-mount base UV-05-091

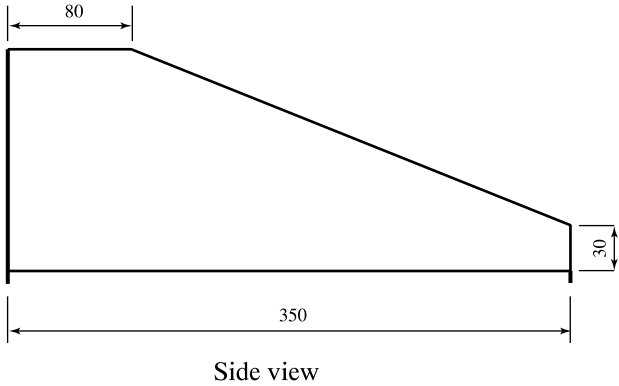
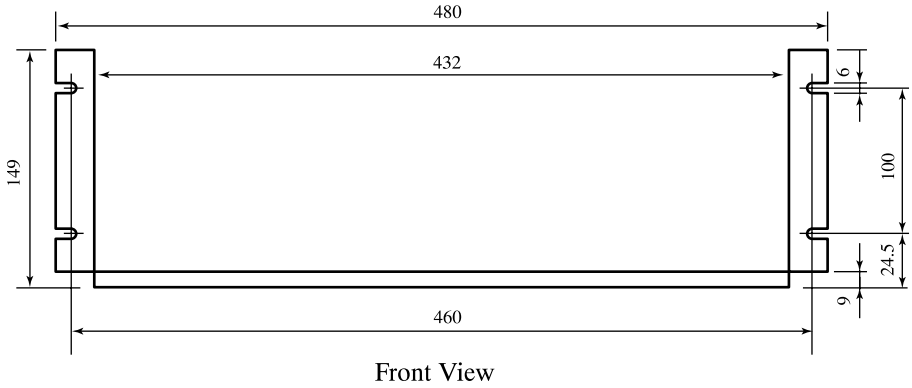


Plate thickness: 1.6

Unit: mm

Dimensional Drawings

Technical Information

Noise Level and Measurement range

Noise level using accelerometer input and sensitivity 5.00 pC/(m/s²)

Measurement mode	Measurement range	Display characteristics	Noise level
Acceleration	1	RMS	0.01 m/s ² rms
Velocity	1	RMS	0.1 mm/s rms
Displacement	0.1	RMS	0.0015 mm rms

Noise level examples using piezoelectric accelerometer input

Accelerometer type	Measurement mode	Measurement range	Display characteristics	Noise level
PV-85	Acceleration	1	RMS	0.008 m/s ² rms
	Velocity	1	RMS	0.08 mm/s rms
	Displacement	0.1	RMS	0.0013 mm rms
PV-87	Acceleration	0.1	RMS	0.0013 m/s ² rms
	Velocity	0.1	RMS	0.013 mm/s rms
	Displacement	0.01	RMS	0.00025 mm rms
PV-90B	Acceleration	10	RMS	0.25 m/s ² rms
	Velocity	10	RMS	2.5 mm/s rms
	Displacement	1	RMS	0.05 mm rms

Measurement conditions: BP-07 battery operation (25°C)

