HIOKI

INSTRUCTION MANUAL

8201-11·8202-11

MICRO Hi CORDER

WARNING

This Instrument is designed to prevent accidental shock to the operator when properly used. However, no engineering design can render safe an instrument which is used carelessly. Therefore, this manual must be read carefully and completely before making any measurement. Failure to follow directions can result in a serious or fatal accident.

CONTENTS

1. FEATURES

(1) In addition to being small and lightweight, the MICRO Hi CORDER employs an electrical recording method so that it requires no ink and is ready to use whenever and wherever required.

(2) At a rate of 32 times a second, the recording dotting speed is very high, so that even the slightest movement of the pen is faithfully recorded. In addition to this there are five paper speeds to select from, so that the range of uses is practically the same as that of a servo recorder.

(3) With the many functions and ranges provided, it is possible to record most electric signals without using a transducer. Input resistance is high.

(4) The recording paper is easy to change and suited to the keeping of records for long periods. Maintenance also is easy to carry out.

2. SPECIFICATIONS

Measuring ranges and maximum allowable inputs:

● 8201-11

DC Voltage:

10,20,50,100,200 and 500mV and 1,2,5,10,20 and 50V

DC Current:

0.1・0.2・0.5・1・2・5・10mA

Maximum Allowable Inputs:

Voltage: 100V rms/1 min. (10mV range)

Current: 0.2A/250V fuse

● 8202-11

DC Voltage and AC Voltage:

0.1,0.2,0.5,1,2,5,10,20, 50,100,200 and 500V

DC Current and AC Current:

1,2,5,10,20, 50 and 100mA

Maximum Allowable Inputs:

Voltage: 1000V dc or peak ac/1 min. (0.1 V range)

Current: 1A/250V fuse

Frequency Response: Voltage—20Hz~40kHz(within −3dB)
(at 1V range)
Current—20Hz~40kHz

● **GENERAL**

Recording Width: 50mm arc recording

Operating System: Direct action dot recording

Recording System: Electric discharge recording

Chart Paper: 70mm×15m, rolled

Chart Drive: Pulse motor drive

Chart Speeds: 5,20cm/min, 2,10,50cm/hr.

Zero Adjustment: Can be set at an position across full recording width

Frequency Response: At 1Hz, 70%

Input Resistance:

Voltage range—1MΩ, all ranges

Current range — 8201-11: 10mV, all ranges
— 8202-11: 50mV, all ranges

Note: Protective circuit resistance excepted

Maximum Common Mode Voltage: 1000V dc or peak ac

Accuracy: DC: ±2% F.S.
AC: ±3% F.S.

Temperature: 0°~45°C

Power: 110~120V, 210V~230V, 230V~250V AC, 50/60Hz
(within 10VA) or 12V DC (approx. 7W)

Dimensions: 94H×96W×280Lmm

Weight: Approx. 1.7kg

Accessories:

One input cord

One 15m roll of 9073 recording paper

Two spare fuses (one for input and one for AC power)

One power cord (One type for both AC and DC use)

One instruction manual

9086 Carryinh Case

Accessories Available

9008 Clamp-on Probe

Measuring Ranges

10 · 20 · 50 · 100 · 200 · 500A AC

Output Voltage and Accuracy

200mVAC (F.S.) Within ±3%

Frequency

50/60Hz

Max. Dia. of DUT

46mm

Maximum Circuit Voltage : 600VAC

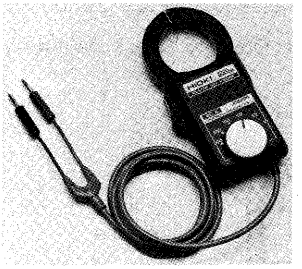
Dielectric Strength : 1500VAC

Line Cord Length : 3m

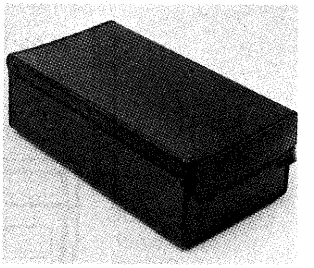
Dimensions, Weight

152H×80W×33Dmm approx. 400g

9301 Conversion scale

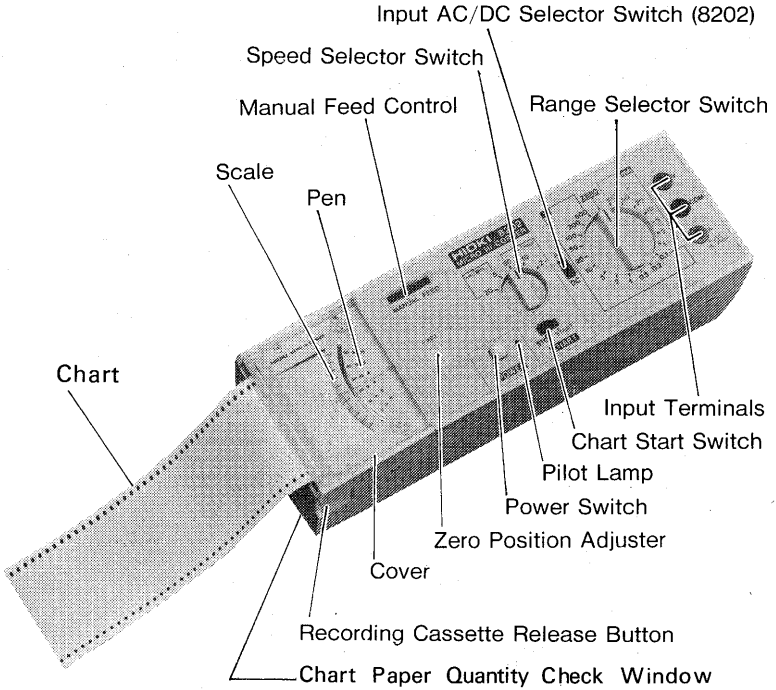


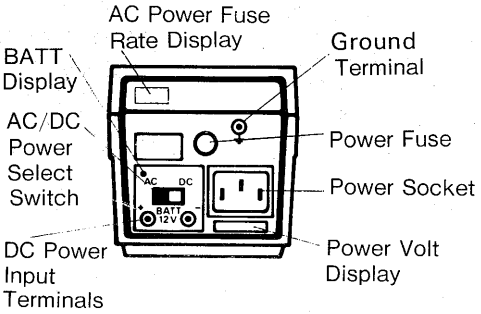
9008



9086

3. NAMES OF PARTS (8202 illustrated)





Equipped to Operate on DC Power Also

● **Input Terminals** (V-COM-A)

Ⓥ is for high input voltage, COM for low voltage and current input and Ⓐ for high current input.

The V-COM terminal combination is used for measuring voltage and A-COM for current. In terminal Ⓐ there is a protective fuse which may be removed by pressing the terminal down and turning it. The fuse rating for the 8201-11 is 0.2A/250V and for the 8202-11 1A/250V.

● **Range Selector Switch**

The most suitable range is selected, according to the amount of input voltage or current, to allow the pen to move across the entire recording width to record the input.

● **Input AC/DC Selector Switch** (AC/DC) (On the 8202-11 only)

The switch position is selected according to whether the input is AC or DC.

● **Speed Selector Switch**

This determines how fast the recording paper will be fed out. There are cm/min and cm/hour sides and five speeds in all.

● **Chart Start Switch** (Stop-Start)

This is for recording paper feed and recording stop-start control.

● **Power Switch** (POWER)

This button is pushed to switch the power on and pushed again to switch it off.

● **Pilot Lamp**

This pilot lamp lights up when the power is on.

● **Zero Adjuster**

This fixes the pen zero position.

Zero point can be fixed at any position across the width of the chart paper. Use a screwdriver or similar tool to make the adjustment.

● **Spare fuse (input, AC type)**

This is found in the fuse storage space in the bottom of the main part of the instrument.

● Chart Paper Quantity Check Window

By noting the size of the roll of paper remaining, it is possible to estimate how many meters of paper remain.

● Cover

This protects the recording unit and it can be removed by pulling in the direction in which the paper is fed.

● Pen

This is the electric discharge electrode used in recording.

● Manual Feed Control (MANUAL FEED)

This is used to feed the chart paper through by hand when putting a new roll in the recorder and at other times. DO not use this control knob while the recorder is actually operating.

● Scale

Used to read the position of the pen.

● Recording Cassette Release Button

When pushed in, the lock is released and the cassette can then be pulled out.

● Earth Terminal

This is used in earthing the recorder and electrical potential is the same as the recording paper.

● Fuse

AC power supply fuses should be midzet type, conforming to the ratings listed below.

Source Voltage	Fuse
AC 100~120V	0.3A/250V
AC 200~240V	0.1A/250V

DC Power Source

● DC Power Terminals

Tarminal used to connect to DC power.

CAUTION:

If the instrument is connected backwards, the internal fuse will blow when the power is turned ON. Fuse replacement is accomplished by removing the four upper side panel screws to remove the case back. The fuse can be located underneath the AC supply inlet. The replacement fuse may be a standard or glass tube type midzet fuse, and must have a rating of 1A/250V. Always unplug the line cord prior to changing the fuse.

● AC/DC Power Selector Switch

This is used to switch from an AC to a DC power source, or vice versa and can be operated even when the power connection has been made.

● BATT LOW Display

In the case of DC power, this display shows when power voltage is low.

NOTE: When this lamp lights up, the recorder is automatically stopped and resetting cannot be carried out simply by increasing the voltage; the power switch must first be switched off.

4. BEFORE USING THE MICRO Hi CORDER

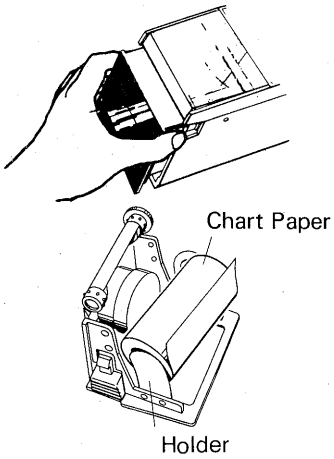
(1) Environment

- Keep in mind the fact that this instrument is an electric discharge type recorder and is not proof against explosions if used where there are volatile substances. Make certain to avoid using it where there are such liquids or gases, etc.
- The surface of the chart paper is a conductor and if brought into contact with bare conductors of power, shock or short-circuiting may result.
- The MICRO Hi CORDER should be used where the ambient temperature is 0°~45℃ and the relative humidity 20~80%. However, even when used within this range, if, due to sudden temperature changes, etc., dew is likely to form on the instrument, it should not then be used in that environment.
- Do not use this instrument in the presence of volatile solvents (such as lacquer thinner), or in an atmosphere containing fumes of such chemicals. Use over a long period of time under such conditions causes the silicone grease used in the meter movement and rotary switch to solidify, resulting in a malfunction.
- This instrument is to be used placed horizontally. If it is inclined, error will result.
- Since voltage passes through the pen when the recorder is in use, do not remove the cover and touch the pen while it is recording.
- On the 100, 200 and 500V AC ranges, do not measure voltages where the commercial power frequency is above 60Hz.

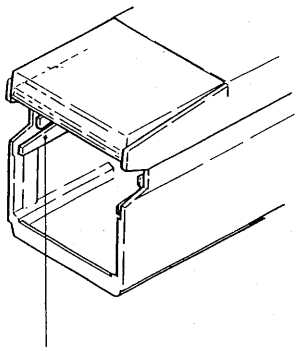
CAUTION: In order to avoid electric shock and the adverse effects of dew condensation, study the environment carefully before using the MICRO Hi CORDER.

- Remember that a meter is employed in this recorder and to prevent damage to it, vibration and shock are to be avoided.

(2) Fitting the Paper



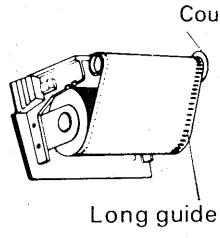
- Push the right and left chart paper cassette release buttons and pull the cassette out.
- Now push the chart paper into the holder. To make sure that the direction is correct, make sure that the side of the paper with the long guide holes which is in the side of Coupling gear.
- Steady the roll and set the chart paper. over the sprockets
- Place the chart paper cassette in the guide slots, and push it in carefully.



- The guide groove fixture is connected internally to the input COM terminal.
  Be sure to disconnect the input terminal when removing the recording paper cassette from the 8201-11 and 8202-11.

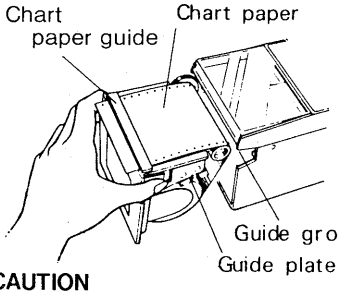
CAUTION

Possible damage to 8201-11 and 8202-11 can result if recording paper is improperly set (e. g., if it is not securely set in the holder or it is so loose that the paper becomes folded).
Make sure that the recording paper is set properly.



CAUTION:

If it is cocked in relation to the guide plate when it is pushed home, the chart paper suppression spring located underneath the scale may be damaged by the cas sette coupling gear, disabling the recorder.

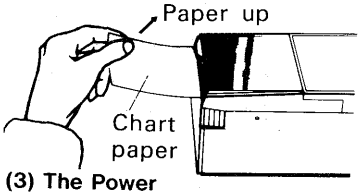


- Once the paper roll has been put into the cassette in the above manner, use the manual feed control to make sure that the paper is feeding through correctly.
- Be sure to pass the recording chart paper under the paper guide.

CAUTION

Do not use the manual feed controll to send the chart paper through while the MICRO Hi CORDER is actually use. This may damage the gears in the mechanism.

This type of cassette cannot be used with other units.



- **How to cut off the Chart paper:**

Pull the paper up, as shown in the illustration, tearing off along the perforations.

(3) The Power

AC Power Source

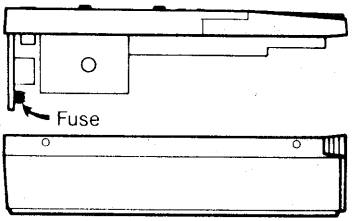
- Check to see that the voltage shown in the power voltage display is at the correct level for use.
- Power frequency should be 50 or 60Hz.
- When using two-pin power plug, make sure to earth the recorder

This will guard against accidents involving shock should there be lowered insulation resistance involving the input circuit or AC power source.

- Where tow-pole 3 wire power plugs are used, earthing is carried out, by way of the cord, from the plug but in the case of two-pole power use the Earth Terminal to carry out earthing.

DC Power Source

- In a usable DC voltage range, from 9V to 14V, approximately 600mA of power is used.
- Connect the power to the DC Power Input Terminal. Now, when the AC/DC Power Selector Switch is pushed to the 'DC' position, the DC power source is able to be used.



- If power voltage drops and the BATT LOW display is seen, the recorder is automatically stopped. When this happens either switch off the power to the recorder or break the connection to the power. This must be done in order to effect resetting. It is not sufficient to simply increase power voltage.
- If polarity is reversed when connecting the power to the DC Power Input Terminals, the Power Source Fuse will blow and in this way protect the circuit.
- Always use a 1A/250V glass tube covered midget fuse.
- When the unit is being used on a DC power source, if the 「BATT LOW」 display appears, leave the power switch 「OFF」 for at least 10 seconds before turning it back 「ON」. This is because the battery voltage sensor circuit also acts as the

cattering prevention manual reset, and if the power switch is turned back 「ON」 while the circuit capacitors are still in a discharged status, the battery voltage sensor circuit will sometimes continue to operate.

5. HOW TO USE THE MICRO Hi CORDER

(1) General Operating Procedure

Check to see that

1. the Range Selector Switch is at ZERO and that.
2. the Chart Start Switch is at the STOP position.

In this way the recorder will be protected against the effects of excessive input and unnecessary recording action.

- Connect the power cord and switch on the power.
- Connect the input cords. For voltage input, use the V-COM connection and for current use A-COM.
- The input cords with a shielded wire have a red banana plug on the wire side and a black banana plug on the shield side. Always connect the black plug to the COM terminal.

CAUTION:

Before changing the input cord connections, do not fail to turn

the Range Selector Switch to ZERO.

- While the Range Selector Switch is still at the ZERO position, turn the Speed Selector Switch to a suitable speed for recording.
- Push the Chart Start Switch to the START position to begin the chart paper feed and with the Zero Position Adjuster fix the recording zero position.

  Note that if the zero position adjustment is done immediately after switching on the power, internal temperature rise may cause the position to shift.

  You are advised to allow the recorder to warm up for about ten minutes after switching on the power before making the zero position adjustment.

CAUTION:

Adjust the zero position with reference to the scale lines and the recording line inscribed with the pen. If the pen and scale only are taken as references, sometimes the position on the chart paper will shift.

- On the 8202-11 type, turn the input AC/DC Power Selector Switch to AC or DC, as required.
- Use the Range Selector Switch to select a range appropriate for the

input.

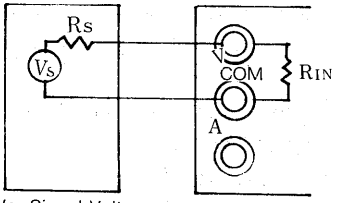
CAUTIONS:

A. Remember that voltage is reaching the pen during recording and it should not be touched with the hands.

B. Do not use the Manual Feed Control while recording is in progress.

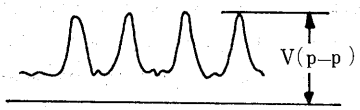
- Sometimes an amount of aluminium powder will adhere to the pen during recording.
  When this happens, turn the Chart Start Switch off, remove the cover and remove the powder with a brush or other suitable implement.
- Just before the end of the chart paper is reached, the end mark will be seen along the long perforation side and the paper should be replaced with a new roll.
  If allowed to go through to the end, the feed mechanism will continue to function but the paper will stop in one position.

(2) Cautions Concerning the Measurement of Voltage



Vs: Signal Voltage
Rs: Signal Source Output Resistance
RIN: Recorder Input Resistance (1MΩ)

- Input resistance between the input Ⓥ and COM terminals is a fixed 1MΩ.
  When signal source output resistance increases, error increases.
  Error equivalent to $\frac{Rs}{Rs+R_{IN}} \times 100\%$ occurs.



8202-11 Ranges		Frequency response (within-3dB)
AC	0.1V	20Hz~15kHz
	0.2V	20Hz~20kHz
	0.5V	20Hz~30kHz
	1~5V	20Hz~40kHz
	10~50V	20Hz~20kHz
	100~500V	Commercial power frequency

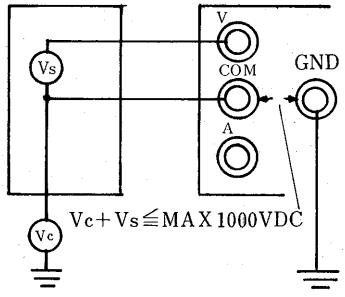
8201-11

Range	Max. allowable input voltage
10mV	100V rms/1 min.
20mV ~ 500mV	1000Vdc or peak ac/1 min.
1V ~ 50V	1000Vdc or peak ac

8202-11

Range (AC,DC)	Max. allowable input voltage
0.1V ~ 2V	1000Vdc or peak ac/1 min.
5V ~ 500V	1000Vdc or peak ac

- When the DC voltage range on the 8201-11 and 8202-11 is used to measure a superimposed AC and DC signal, use the equipment in such a way that the peak voltage is not more than double that for the range selected.
  If this limit is exceeded the protective circuit will function, an accurate average value indication will become impossible and error will result.
- For 8202-11 input a converted rms value based on the average value is obtained so that when wave distortion, etc., is measured, error due to wave form factor occurs. The Model 8202-11 AC range frequency response are shown in the table.
- On the 100, 200 and 500V AC ranges, do not measure voltages where the commercial power frequency is above 60 Hz.
- The table lists the maximum allowable input voltage for the various voltage input ranges. Care must be taken to avoid exceeding these figures in order to guard against burning of the internal components of the recorder and accidents involving electric shock.



Vs : signal voltage
Vc : Common mode voltage

- The maximum common mode voltage is 1000V dc or peak ac. When measuring a signal source where there is the possibility of high voltage reaching earth, to avoid any possibility of shock, do not fail to connect to earth from the Earth Terminal before using the recorder to record measurements.

(3) Cautions Concerning the Measurement of Current

- In the case of the 8201-11, the voltage drop between the Ⓐ and COM terminals is 10mV and for the 8202-11 50mV and the resistance figure for the protective fuse is added. The table above shows the resistance figures for the fuses used in our 8201-11 and 8202-11 MICRO Hi CORDERS.

Recorder Model	Fuse Rating	Resistance
8201-11	0.2A/250V	Approx. 5Ω
8202-11	1A/250V	Approx. 0.4Ω

- The A terminal is protected with a fuse rated at 250V and filled with arc suppressor and even if connect to a power source with an open voltage in excess of 250V, no damage will result due to an arc, etc., when the fuse blows. Since measurement of equipment with over 250V involves considerable risk, great care must be taken. When a fuse blows and has to be replaced, use either the input

fuses for the 8201-11 and 8202-11 or the midget fuse containing arc suppressor of the rating shown on terminal Ⓐ

- When measuring current also, the maximum common mode voltage is 1000V dc or peack ac. When measuring current in high voltage circuits, do not fail to connect to earth from the Earth Terminal.

6. TRANSDUCER

The following shoúld be kept in mind concerning the use of the transducer:

- When using a voltage output type transducer, make sure that the output resistance figure is guite small when compared with the input resistance of the voltage input range of this recorder.
- When using a current output type (or output for an electromagnetic oscillograph) transducer, use the current input range. If the voltage input range is used, the transducer output becomes saturated and measuring is made impossible.
- When the transducer output and the recorder input range figure do not correspond,

$$\frac{\text{Transducer range value}}{\text{Transducer output value}} \times \text{Range value used on recorder}$$

=Transducer input sufficient to move the pen across the full recording width.

For example, when the output of a transducer with a 100V AC input and 1.5V DC output is connected to the 1V range of the Type 8201 MICRO Hi CORDER,

$\frac{100V}{1.5V} \times 1V \fallingdotseq 66.7V$ and the 8201-11 recording from the zero position to maximum position on the scale is transducer input and is 0~66.7V

AC.

- When the transducer output is superimposed DC and AC component voltage (for example half wave rectified wave form) in order that the output voltage peak value does not exceed double that of the voltage range in use, make the appropriate setting for the transducer range or the recorder range.
  When the peak voltage exceeds double the figure, the protective circuit functions and error results so that an accurate average value recording becomes.

7. CHART PAPER

The chart paper used in this recorder is of a special type for electric discharge recording. Note the following points concerning its use:

- The surface of the paper is a cunductor and care should be taken to avoid having bare power wires, etc., come into contact with it, in order to prevent accidents.
- Each roll of chart paper is supplied in a glass container from which it should not be removed until ready to use it.
- Stowage of chart paper printouts
  - If glue or adhesive tape is used to affix the chart paper to logs etc., depending upon the composition of the adhesive, the paper may blacken after a few months. Copies should be made for record-keeping pur poses, or adhesive contact with the printed portion of the recording paper avoided.
  - In extremely rare cases, filing the chart paper in vinyl plastic folders will cause it to turn black after several years. It is thus recommended that copies be made of print-outs for long term storage purposes.
- If the chart paper is not used for some time after removing it from the glass container, seal it in a vinyl bag or other suitable container to protect it from high humidity and dew condensation.
- Protect the paper from humidity following use.

8. MAINTENANCE

The 8201-11 and 8202-11 MICRO Hi CORDERs do not require maintenance under normal condition but, in order to obtain long and satisfactory service from them, keep the following point in mind:

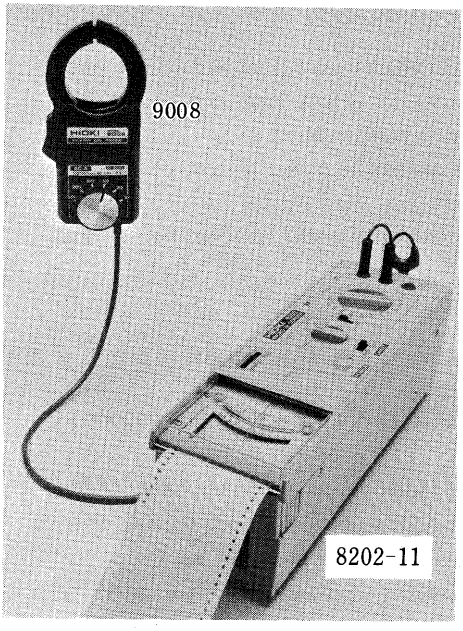
* After using the recorder, remove aluminium power and dust from the pen.
* Keep the plastic gear on the recording cassette sprocket free of dust and dirt.

9. Current Recorder

8202-11+9008—Total accuracy ± 4.3% f.s.(reference value)

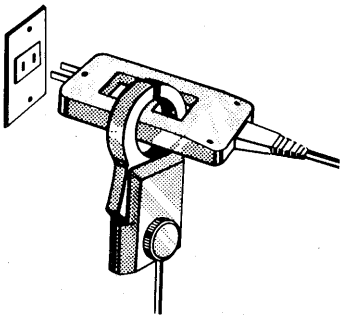
The current recorder can be used in keeping a check on fluctuations in current equipment and power lines.

* Make a 0.2V AC setting on the recorder, plug the red plug of the clamp probe into the Ⓥ terminal and the black plug into the COM terminal and then clamp the probe over the line being tested.
* If it is impossible to know beforehand approximately how great the amperage is, select the highest range on the probe and, after obtaining a reading on that range, then change to the most suitable range for the amperage involved.
* Make sure to read the instruction manuals for both the recorder and the clamp probe carefully before using the instruments.



- The maximum rating of the 9008 current sensor is as shown in the table below. For measurements in circuits where a significant difference exists between the average current load and rush current load (e.g.; motor circuits), make sure the range selected falls within both maximum rating, and the time allowed for rush current. Rush current caused scale overshoot will not damage the 8202-11.

9008 Range	Maximum Rating (for 1 min.)
10A	150A
20A	200A
50A	350A
100A	500A
200A	700A
500A	1000A



- Maximum circuit voltage rating for the 9008 is 600VAC. Do not attempt measurements of power lines exceeding this rating.
- Measurements may be taken on appliances or tools operated from a standard 2-conductor line cord by using the optionally available CT-101A Line Splitter.

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