HIOKI

8951
VOLTAGE / CURRENT UNIT

INSTRUCTION MANUAL

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1. Introduction

- Thank you for purchasing the HIOKI "8951 VOLTAGE / CURRENT UNIT". To obtain maximum performance from the device, please read this manual first, and keep it handy for future reference.
- The 8951 is the voltage / current unit for the MEMORY HiCORDERs. Always install this device on a Memory HiCORDER for use. For the detailed installation procedure, refer to Main unit manual.
- The device can be used with 8855 MEMORY HiCORDERs equipped with ROM Ver. 1.10 or later.
- Follow carefully the advice of "3. Notes on Use."

2. Safety Notes

⚠ DANGER

This device is designed to conform to IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the device. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from device defects.

Safety symbol

This manual contains information and warnings essential for safe operation of the device and for maintaining it in safe operating condition. Before using the device, be sure to carefully read the following safety notes.

⚠	• The ⚠ symbol printed on the device indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function. • In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the device.
⏚	• Indicates a grounding terminal.
⎓	• Indicates DC (Direct Current).
≂	• Indicates both DC (Direct Current) and AC (Alternating Current).

The following symbols in this manual indicate the relative importance of cautions and warnings.

⚠ DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
⚠ WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
⚠ CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the device.

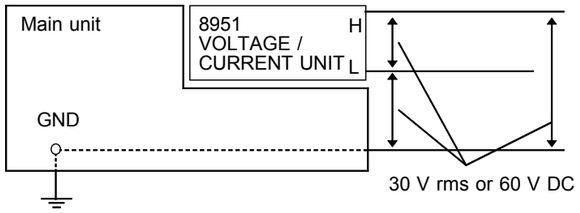
3. Notes on Use

⚠ DANGER

- **The maximum rated voltage to earth (voltage between 8951 input terminal and main unit frame, and between input terminals of other input modules) is 30 V rms or 60 V DC. To avoid the risk of electric shock and damage to the device, take care that voltage between 8951 input terminal and main unit frame, and between input terminals of other input modules does not exceed these ratings.**
- **The maximum input voltage is 30 V rms or 60V DC. Attempting to measure voltage in excess of the maximum input could destroy the device and result in personal injury or death.**
- **When using a clamp-on sensor, clamp-on probe, or universal clamp-on CT, the 8951 input terminal (L) is common with the ground side of the +/-12 V power supply of other mounted input modules. To avoid risk of electric shock and possible damage to the device or the sample being tested, be sure to make the connections correctly.**
- **Before using the device, make sure that the sheathing on the input cables and thermocouples is not damaged and that no bare wire is exposed. If there is damage, using the device could cause electric shock. Replace with the specified by hioki.**

⚠ CAUTION

- For safety reasons, only use the specified 9198 CONNECTION CORD for measurement.
- To clean the device, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.



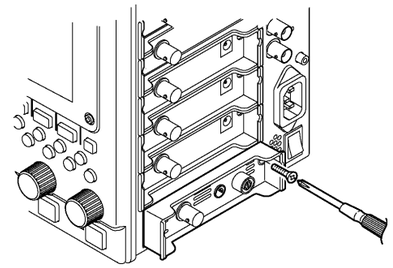
4. Replacement Procedure

⚠ WARNING

- **To avoid electric shock accident, before removing or replacing an input module, confirm that the device is turned off and that the all input cords, thermocouples, and power cord are disconnected.**
- **The mounting screws must be firmly tightened or the input module may not perform to specifications, or may even fail.**

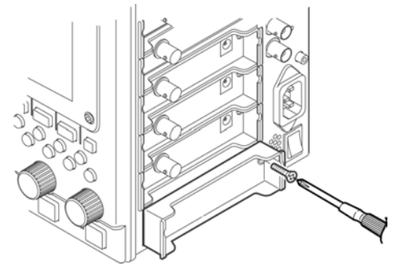
- This section describes how to replace the 8951 VOLTAGE / CURRENT UNIT.
- The following procedure describes how to remove the input module.
- Install the devices by reversing the procedure for removal.

1. Remove the connector cables from all input modules.
2. Power off the main unit, and disconnect the power cord.
3. Remove the two fixing screws with a Phillips screwdriver, as shown in the figure below.
4. Grasp the handle and pull the device out.



⚠ WARNING

- **To avoid the danger of electric shock, never operate the device with an input module removed. To use the device after removing an input module, install a blank panel over the opening of the removed module.**



⚠ CAUTION

Do not measure with a blank panel removed. Otherwise, the device internal temperature becomes unstable and consequently the specifications are not met.

5. Specifications

Accuracy at 23℃±5℃, 30% to 80% RH after zero adjustment after 30-minutes warming-up time. Accuracy guaranteed for 1 year.

❑ General specification

A/D resolution	12 bit
Measurement function	Voltage measurement, Current measurement
Maximum sampling speed	20 MS/s
Low-pass filter	Voltage, 3273, 3273-50, 3274, 3275, 3276: OFF, 5, 500, 100 k, 1 MHz±50% -3 dB 9270, 9271, 9272: OFF, 500 Hz±50% -3 dB 9277, 9278: OFF, 5, 500, 100 kHz±50% -3 dB 9279 : OFF, 5, 500 Hz±50% -3 dB
Input coupling	Voltage, 3273, 3273-50, 3274, 3275, 3276, 9277, 9278, 9279: DC, GND, AC 9270, 9271, 9272: GND, AC
Maximum input voltage	30 V rms or 60 V DC
Input, connection terminals	Input resistance: 1 MΩ±1% Input capacitance: 50 pF±10 pF (at 100 kHz) Input type: Unbalanced
: BNC terminal	(Voltage measurement, current measurement (When using the 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], or 3276[*1])) Maximum rated voltage to earth: 30 V rms or 60 V DC (When using the clamp, shares common ground with the ±12 V terminals of other mounted input modules.)
: Sensor connector (for 9270s)	Power supply*: ±12 V±8% GND: Shares common ground with the ±12 V terminals of other mounted input modules.
: Power connector (for 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], 3276[*1])	Power supply*: ±12 V±8% GND: Shares common ground with the ±12 V terminals of other mounted input modules. Note: When using the 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], or 3276[*1], the BNC terminal serves as the power supply connector.
Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8951 is installed
Operating Environment	Same as the MEMORY HiCORDER in which the 8951 is installed
Temperature and humidity ranges for storage	Temperature: -10℃ to 50℃ (14℉ to 122℉) Relative humidity: 80% RH maximum (with no condensation)
Dimensions	Approx. 107.4 W x 28 H x 164.5 D mm Approx. 4.23" W x 1.10" H x 6.48" D
Mass	Approx. 190 g (6.7 oz.)
Accessory	Instruction manual
Option	9318 CONVERSION CABLE (to connect the clamp on sensor)
Correspondence current sensor and probe	Clamp on sensor: 9270, 9271, 9272, 9277, 9278, 9279 Clamp on probe: 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], 3276[*1],

Standard Applying	
Safety	EN 61010 Pollution Degree 2, Measurement category I (anticipated transient overvoltage 330 V)
EMC	EN 61326, ClassA
Effect of radiated radio-frequency electromagnetic field	±15% f.s. at 3V/m

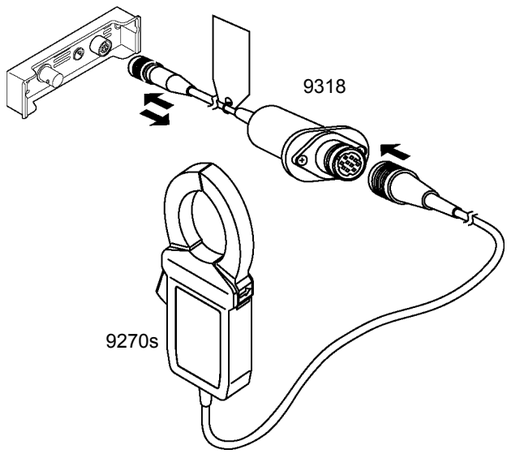
❑ Voltage, Current Measurement

1. Voltage	
Measurement range	1 m, 2 m, 5 m, 10 m, 20 m, 50 m, 100 m, 200 m, 500 m, 1, 2, 5 V/DIV
2. Current	
Measurement range	When using the 9270, 9272 (20 A), 9277, 3273*1, 3273-50*1, and 3276*1 10 m, 20 m, 50 m, 100 m, 200 m, 500 m, 1, 2, 5 A/DIV When using the 9271, 9272 (200 A), 9278, 3274*1, and 3275*1 100 m, 200 m, 500 m, 1, 2, 5, 10, 20, 50, 100*5 A/DIV When using the 9279 200 m*2, 500 m, 1*2, 2*2, 5, 10*2, 20*2, 50, 100*2 A/DIV
3. Common specification	
Frequency characteristic	DC to 4 MHz ±3 dB (DC coupling) (When using a sensor, the sensor characteristics are also added.) 7 Hz to 4 MHz ±3 dB (AC coupling) (When using a sensor, the sensor characteristics are also added.)
DC amplitude accuracy*3*4	±0.5% f.s. (filter 5 Hz ON, averaging)
Zero position accuracy*3*4	±0.15% f.s. (filter 5 Hz ON, averaging, after zero adjustment)
Temperature characteristic*3	Gain: ±0.025%f.s./℃ Zero position: ±0.045%f.s./℃ (f.s. = low sensitivity range of more than 100 mV) ±0.05%f.s./℃ (f.s. = high sensitivity range of more than 50 mV)
Common mode rejection ratio	80 dB minimum (at 50/60 Hz and with signal source resistance 100 Ω maximum)
Noise	Voltage measurement: 500 μVp-p max., 300 μVp-p (typ) (in the 1 mV/DIV range) Current measurement: 5 mAp-p max. +7.1 mAp-p max. (3273) (in the 10 mA/DIV range when using the 3273)

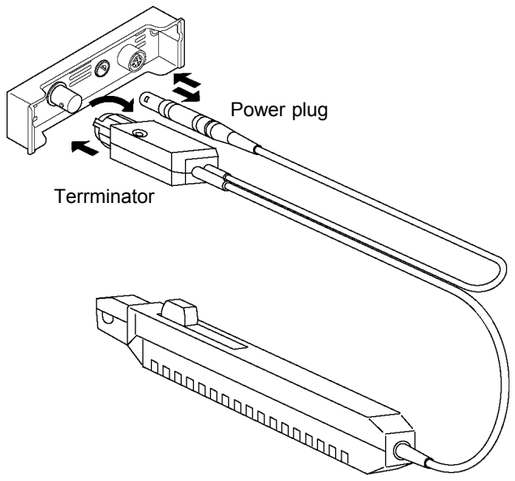
*1: Safety restrictions apply. (See 7 and 8.)
*2: The resolution of the vertical scale is 80 LSB/DIV.
*3: When measuring current, accuracy and characteristics of the sensor or probe are added.
*4: When using the 9279
DC amplitude accuracy 0.625%f.s.
Zero position accuracy 0.20%f.s.
*5: When using the 3275

6. Clamp Connection Procedure

❑ 9270, 9271, 9272, 9277, 9278, 9279



❑ 3273, 3273-50, 3274, 3275, 3276



7. Precautions when using the 3273, 3273-50, 3276

⚠ DANGER

- **When conductors being measured carry in excess of the safe voltage level (SELV-E)* and not more than 300 V, to prevent short circuits and electric shock while the core section is open, make sure that conductors to be measured are insulated with material conforming to (1) Measurement Category (Overvoltage Category) I, (2) Double (reinforced) Insulation Requirements for Working Voltages of 300 V, and (3) Pollution Degree 2. For safeties sake, never use this sensor on bare conductors. The core and shield case are not insulated.**
- **Be careful to avoid damaging the insulation surface while taking measurements.**
- **Refer to the following standards regarding the meanings of underlined terms.**
  IEC 61010-1
  IEC 61010-2-032

*: The voltage levels are 30 V rms and 42.4 V peak or 60 V DC.

8. Precautions when using the 3274, 3275

⚠ DANGER

- **When conductors being measured carry in excess of the safe voltage level (SELV-E)* and not more than 600 V (CAT II) or 300 V (CAT III), to prevent short circuits and electric shock while the core section is open, make sure that the conductor insulation satisfies the (1) Basic insulation requirements for the applicable (2) Measurement Categories (Overvoltage Categories), (3) Working Voltage, and (4) Pollution Degree. For safeties sake, never use this sensor on bare conductors.**
- **Be careful to avoid damaging the insulation surface while taking measurements.**
- **Refer to the following standards regarding the meanings of underlined terms.**
  IEC 61010-1
  IEC 61010-2-032

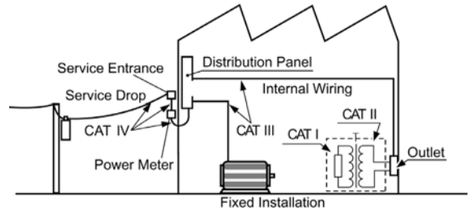
*: The voltage levels are 30 V rms and 42.4 V peak or 60 V DC.

9. Number of Usable Clamps

The number of clamps that can be used with the 8855 is limited according to clamp type. The clamps that can be used for the relevant clamp type is shown to the list shown below.
In the case that the relevant clamp type is used the clamp total use number is confirmed and please do not exceed the number of the list shown below.

Clamp			Number
3274 CLAMP ON PROBE	Continuous	150 A	8
	Non-continuous	300 A	4
3275 CLAMP ON PROBE			4
3273-50, 3276 CLAMP ON PROBE			4
9278 UNIVERSAL CLAMP ON CT			7
9279 UNIVERSAL CLAMP ON CT			7

Measurement categories (Overvoltage categories)
This device complies with CAT I safety requirements.
To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.
CAT I : Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar instrument.
CAT II : Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)
CAT III : Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.
CAT IV : The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection instrument (distribution panel).
Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement instrument designed for CAT III environments can endure greater momentary energy than a instrument designed for CAT II.
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.
The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



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