

INSTRUCTION MANUAL

UCAM-80A

DATA LOGGER

Data Logger : UCAM-80A
Scanner : USB-80A
External I/O Unit : UIO-80A
[Hardware Manual]

Thank you for purchasing this KYOWA product.

Read this Instruction Manual carefully in order to make full use of the high performance capabilities of the product.

Use this product only as described in this Manual.

This Manual mainly describes how to operate the hardware.

Refer to the Control Software Instruction Manual for information on control software.

Refer to the Control Command Instruction Manual for information on control commands.

The LGPL version of Qt is used for the software for UCAM-80A.

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KYOWA shall not be held responsible for any damage resulting from the use of this software.

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STANDARD ACCESSORIES

The following standard accessories are enclosed with the UCAM-80A.

After opening the package, confirm that all standard accessories are present.

UCAM-80A Data Logger

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of Product Warranty" document	1
AC power supply cable P-18	1
2-pin conversion plug CM-52	1
Recording paper TP-S245L-1	1 roll
Driver ^{*1}	1
Fuse	1
CD-R (Instruction Manual)	1
Ground wire P-72	1
LAN connector caps	1
D-sub connector caps	1

*1) Installed in UCAM-80A before shipment.

OPTIONS (OPTIONAL PRODUCTS)

The following optional products are available.

Scanning unit (TEDS compatible)	USM-81A
	USS-61B
Scanning unit (with NDIS connectors, TEDS compatible)	USM-82A
	USS-62B
Scanning unit (with lightning arrester, TEDS compatible)	USM-83A
	USS-63B
External I/O Unit	UIO-80A
External scanner	USB-80 Series
Dummy Panel	UD-80A
Recording paper	TP-S245L-1
UCAM-80A control software	UCS-80A

SAFETY PRECAUTIONS (BE SURE TO READ THIS BEFORE USE)

This device has been designed as described in "10-1. UCAM-80A PRODUCT SPECIFICATIONS."

Do not use in environments outside of specifications. Doing so could cause failure.

Prior to use

To ensure safe use of this product, be sure to read the safety precautions before use. Kyowa Electronic Instruments Co., Ltd., assumes no liability for any damage resulting from the user's failure to comply with the safety precautions.

The following symbol is used to help ensure safe use of the product:

	Indicates the [GND] terminal. Be sure to connect the product's [GND] terminal to ground.
	Indicates the operator must refer to an explanation in the INSTRUCTION MANUAL in order to avoid the risk of injury or death of personnel or damage to the instrument.

Warning and Caution indicators

The following symbols are used to draw attention to important issues and to help ensure safe use of the product:

 WARNING	Improper use of the system may result in death or severe injury.
 CAUTION	Improper use of the system may result in injury and/or damage to the system.

Warning label on this device

Labels attached to this device indicate the following.

** WARNING**

- To prevent an electric shock always connect the protective ground wire to GND.
- To prevent fire, always replace with a specified rating fuse.

** DANGER**

- This device uses an internal backup battery. Devices will be collected by KYOWA for battery replacement.
- Do not apply heat or throw into fire.
- Do not connect battery plus & minus to metals.

WARNING

- **Power supply**

- To prevent fire, be sure to check that the voltage of the power supply that you are using matches the power supply voltage specifications of this device, prior to connecting the power supply.

- **Grounding**

- Be sure to connect the GND terminal to ground. If this is not grounded, it could cause electric shock, reduced performance, or failure.

- **Flammable gas atmosphere**

- To prevent fire and explosions, do not use this device in a location where there are flammable gases, flammable vapors, or flammable dust.

- **If an error occurs**

- If the device generates smoke or an abnormal odor/sound, etc., immediately turn the power OFF, disconnect the power supply cable, and stop using the device. Do not place this device on or near combustible objects, in order to prevent fires caused by faults.

- **Attaching/Removing scanning units**

- Always turn the power OFF before attaching/removing a scanning unit. Doing otherwise could cause electric shock, reduced performance, or failure.

- **Securing scanning units**

- When mounting a scanning unit, be sure to use the included screws to secure it in place.
If it is not secured in place, it could become detached unexpectedly, which could cause product damage or failure, and could even result in injury.

- **Inserting/Removing cables**

- When inserting/removing a cable, turn the power supplies on this device and the connected drive OFF, and ensure that the GND terminal is grounded. Doing otherwise could cause electric shock, reduced performance, or failure.

- **Additional safety measures**

- If a failure in this device could cause secondary damage to the system, be sure to take additional safety measures using other technical means.

- **Do not disassemble or modify**

- Doing so could cause electric shock or failure. This is also not covered by warranty.

- **Fuses**

- To prevent fire, use only fuses with the specified ratings (current, voltage, type) in this device. Do not use fuses that are not specified, and do not short-circuit the fuse holder.
Pull out the power supply cable first before replacing the fuse.

- **External input/output signals**

- The UIO-80A External I/O Unit provides external trigger input/output.
If this will be used, read "6-2. (OPTIONAL) UIO-80A External I/O Unit FUNCTIONS" carefully and verify the overall operation of the system prior to use.
Use not in accordance with precautions in the Instruction Manual may cause electric shock, reduced performance, or failure.

CAUTION

- **Use within the operating temperature range (0°C to 50°C).**
 - Use outside of the operating temperature range may worsen performance or result in failure. If the device must be used in direct sunlight or in the cold, ensure that a sunshade is installed or heating measures are implemented.
- **Use within the operating humidity range (20% to 85%).**
 - Use outside of the operating humidity range may worsen performance or result in failure.
- **Be cautious of condensation if environmental conditions have changed suddenly.**
 - If the ambient temperature and humidity change suddenly (due to moving the device, etc.), it could cause condensation. This could worsen performance or result in failure. Confirm that there is no condensation prior to turning the power ON when using the device.
- **Do not allow the device to get wet.**
 - This device is neither water-proof nor drip-proof. Do not allow the device to get wet, as this could cause failure or current leakage.
- **Use caution when using the device in environments subject to strong vibration or impact.**
 - Subjecting the device to continuous vibration or strong impact could worsen performance or result in failure. If this device will be used in an environment subject to vibration/impact, secure the chassis and connection cables separately.
- **Do not use within a strong electromagnetic field.**
 - Use this device in the same kind of environment in which a PC could be used. Usage near a device that emits a strong electromagnetic field (such as a radio, microwave oven, or electric furnace) could worsen performance or cause a malfunction or failure.
- **Be cautious of static electricity.**
 - Static electricity may lead to failure. Before touching this device, first touch a piece of metal, etc. to release static electricity.
- **Do not use in areas with poor power supply conditions.**
 - Doing so may worsen performance or cause a malfunction or failure. Use within power supply voltage specifications.
 - Use a power supply without instantaneous power failure or noise.
- **Do not place sensors near welding machines or make measurements near welding machines.**
 - Doing so could cause an output fault, malfunction, or failure.
- **Do not use in high-pressure or low-pressure environments.**
 - Doing so may worsen performance or cause a malfunction or failure.
This product has been designed to be used within standard atmospheric pressure.
- **Do not use or store in environments exposed to dust, powdery dust, or corrosive gas.**
 - Doing so may worsen performance or cause failure.
- **If using or storing this device near the ocean, implement measures to protect the device from outside air.**
 - Doing otherwise may worsen performance or cause failure.

 CAUTION

- **Use indoors.**
 - Do not place this device outdoors, so that it can be used normally and safely.
- **After turning the power OFF, be sure to wait at least 5 seconds before turning the power back ON again.**
 - Turning the power ON within 5 seconds or switching the power ON/OFF repeatedly will generate rush current when the power is turned ON, which could worsen performance or cause failure.
- **Heat prior to use.**
 - The device will be ready to use approximately 1 minute after turning the power ON. However, internal parts will not be thermally stable immediately after receiving power. In order to reliably operate the device, allow it to warm up for approximately 30 to 40 minutes. If measuring around 100×10^{-6} of strain or measuring for a long period of time, allow the device to warm up for approximately 1 hour prior to measuring. If the device is not sufficiently heated up, accuracy may fall below product specifications.
- **If the ACCESS LED is lit up, do not remove the SD card or USB memory device.**
 - Removing the SD card or USB memory device while the LED is lit up could cause data corruption, or result in SD card or USB memory device failure.
- **Do not remove the communication cable during PC measurement.**
 - Removing the connected cable during PC measurement could cause data corruption or result in product failure.
- **Do not turn the power OFF or remove the SD card or USB memory device while reading/writing data files.**
 - Doing so could cause data corruption, or result in SD card or USB memory device failure.
- **Do not pull connection cables.**
 - Do not apply excessive force to the connectors on connection cables. Handle them gently when connecting. Pulling connection cables may cause data faults, cable disconnection, or connector damage.
- **Cleaning**
 - If the device becomes dirty, wipe it clean with a dry, soft cloth. Do not wipe it with a moist cloth, gasoline, paint thinner, alcohol, or similar substances. Doing so may cause discoloration or deformation.
- **Use at an altitude of 2000 m or lower.**
- **This device should be used in an IEC61010-1 OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2 environment.**
- **Power fluctuations of the power supply to the instrument should not exceed $\pm 10\%$ of the nominal voltage.**
- **Use this device with the protective ground (GND) terminal located on the rear grounded with a ground wire.**
- **Use shielded cables for connected input cables, control cables, etc.**

CAUTION

- **Do not apply impact or force to the front screen LCD.**
 - Doing so may cause damage. When packing this instrument in a box for transportation, do not face the front side (screen LCD) to the ground, and place the instrument flat or with the handle facing up.
- **Remove the cover from the USB-80A before use.**
 - The cover included with the USB-80A is for storage and transportation. Use of the USB-80A with the cover in place may cause damage. Be sure to remove the cover before use.

LIMITED LIFESPAN PARTS AND PREVENTIVE MAINTENANCE

This device is composed of many electrical parts, and some of these are limited lifespan parts. Limited lifespan parts will deteriorate or become worn depending on factors such as the frequency of use, passage of time, and usage environment (temperature, humidity, etc.). This may worsen performance or cause malfunction or failure.

These parts will therefore require preventive maintenance and will need to be replaced in order to prevent these problems from occurring.

The major limited lifespan parts used with this device and optional products are listed below.

- Aluminum electrolytic capacitor
- Backup battery
- Screen
- Power supply unit
- Printer

In order for the product to be used reliably for a long time, parts must be inspected and replaced through periodic maintenance. Refer to "7-1. MAINTENANCE DETAILS" for guidelines on when to replace parts. Contact KYOWA sales personnel or your nearest dealer for information on preventive maintenance and replacing limited lifespan parts.

EQUIPMENT RENEWAL

Conducting preventive maintenance and replacing parts are effective ways to maintain performance and extend the lifespan of devices.

However, the device itself will deteriorate gradually with age, as only certain parts can be replaced.

We recommend renewing devices that have been in use for a long time and that require frequent repairs.

NOTATIONS USED IN THE INSTRUCTION MANUAL

Notations used in the instruction manual

- "This device" refers to the UCAM-80A Data Logger.
- "Tap" refers to lightly pressing the device screen with your finger.
- Screen names displayed on the device screen are enclosed with rectangle frames.

Ex.: Menu screen

Prohibitions, cautions, and references

The following notations are used in this document to draw attention to items that require special caution during use or information that could be of reference.



PROHIBITED

Indicates that mishandling could cause physical damage (product failure, etc.).



CAUTION

Indicates something that requires special caution during use.



Indicates something that could be of reference during use.

Text citations

When citing text from the Instruction Manual, the text will be enclosed in quotation marks (" ").

Ex.: Refer to "NOTATIONS USED IN THE INSTRUCTION MANUAL" for information on notations.

PRECAUTIONS ON CE MARKING

Product has been confirmed that it complies with EN61326-1:2013 (EMC test requirements for equipment intended to be used in an industrial electromagnetic environment, Class A Group 1) under the following conditions. When using this product in EU countries, be sure to meet the following conditions. Note that the measures required to satisfy the standards may vary depending on the system configuration, wiring, etc. Therefore, it is necessary for the customer to confirm that the entire device complies with the CE marking.

- Be sure to use a shielded cable for connecting to this device. Also, the wiring length should be 30 m or less.
- Use the GND terminal on the back of the device by grounding it using the supplied ground wire.
- Applicable when the PC interface is set to LAN or USB.
- Please use an EU-certified AC power cord for the EU. (Equivalent to CEE3P-MS-1.8)
- USS-61/62/63 and USB-70 do not comply with CE marking.

1. PRODUCT OUTLINE

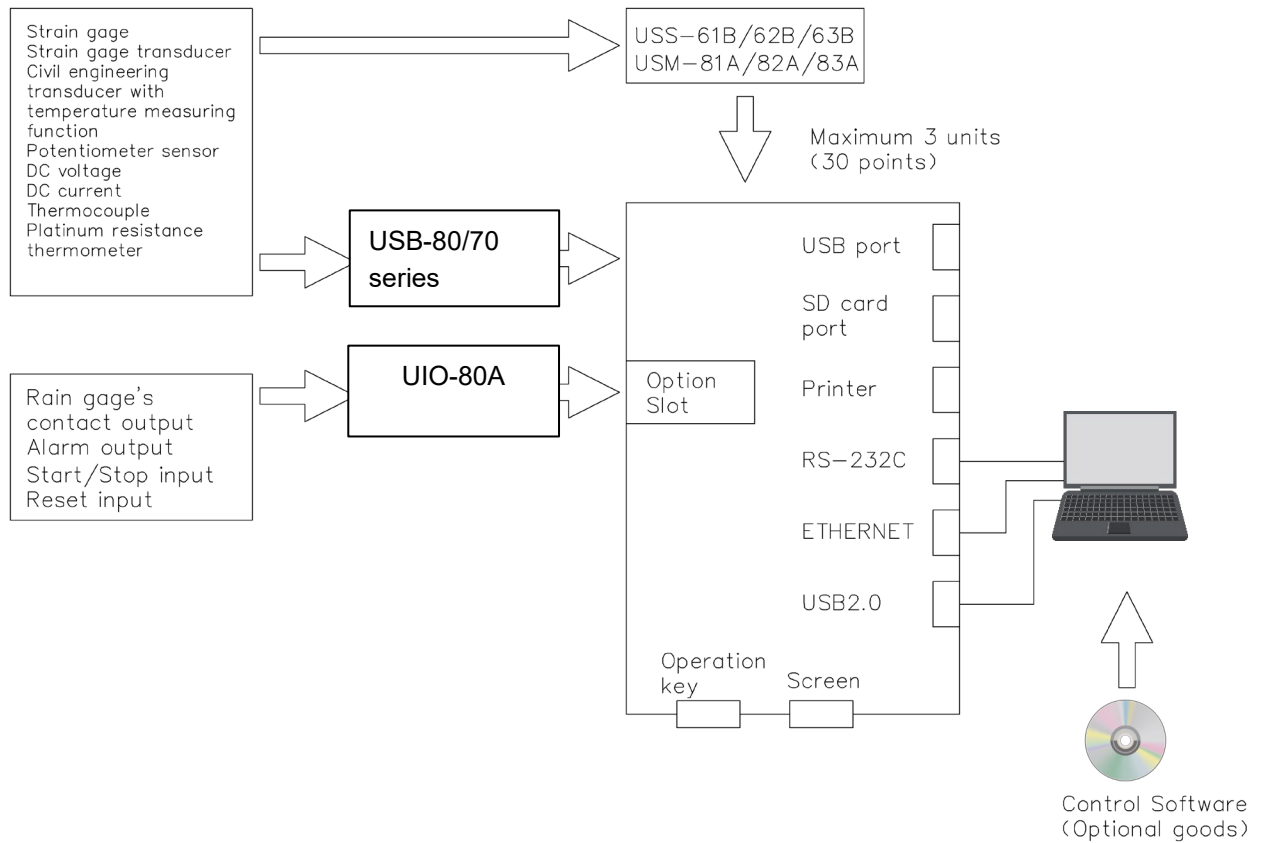
1-1. PRODUCT OUTLINE

The UCAM-80A Data Logger ("this device") is a highly accurate multi-input and multichannel static strain measuring instrument. It uses a touch panel for intuitive operation, allowing for measurements to be made efficiently. Strain gages, strain gage transducers (can be connected to TEDS-compatible parts), civil engineering transducers with temperature measuring function, potentiometer sensors, DC voltage-output instruments, DC current-output instruments, thermocouples, and platinum resistance thermometers can be connected as measured objects. The standard bridge configuration includes bridge resistance, so there is no need for a separate bridge box.

A scanning unit (USM-81A/82A/83A, USS-61B/62B/63B) with up to 30 channels can be installed, and this device is sufficient on its own for small-scale measurements. For large-scale multipoint measurement, a USB-80/70 Series External Scanner can be connected to measure up to 1000 channels. Measurement values can be stored to internal memory or an external SD card, or sent to a USB memory device. A printer comes standard-equipped, allowing measurement results to be immediately printed and confirmed. The device also comes standard-equipped with Ethernet, USB, and RS-232C interfaces. Optional control software can be used to control the device from a PC and to collect data directly on the PC.

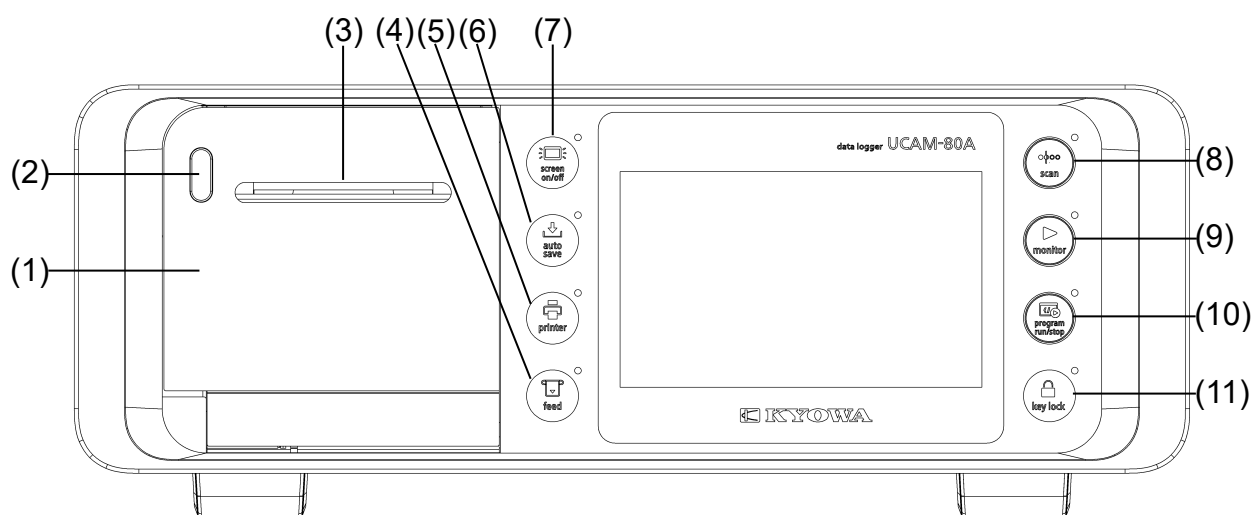
1-2. SYSTEM CONFIGURATION

The system configuration is shown below.

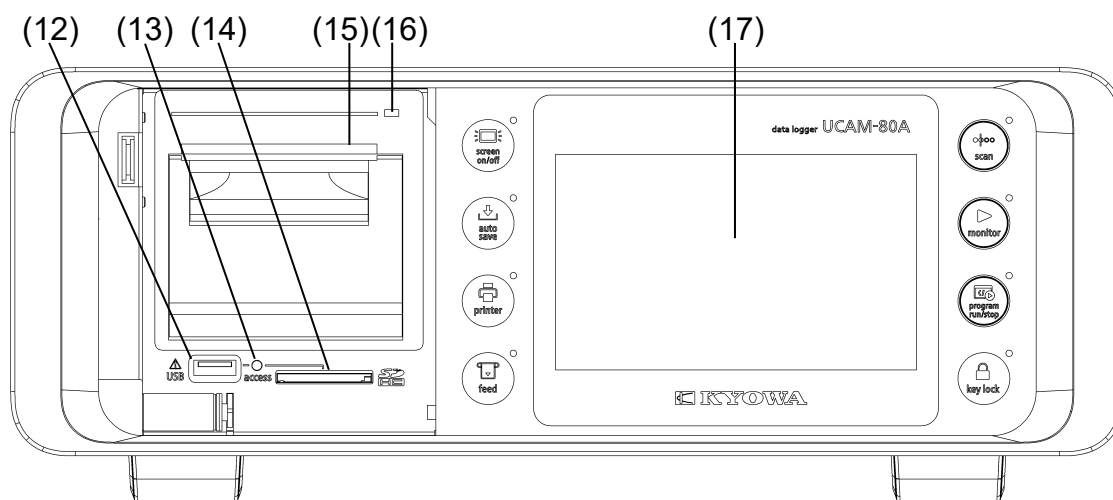


1-3. CONTROLS AND INDICATORS

1-3-1. Front



<Printer lid closed>



<Printer lid open>

(1) Printer lid

This covers the printer. In order to replace recording paper, insert an SD card, or connect a USB memory device, the lid must first be opened.

(2) Printer lid knob

This is used to open the printer lid. Pull it toward you to open the printer lid.

(3) Recording paper output

Recording paper is output here when printing. When cutting recording paper, grab either the left or right side of the recording paper, pull it upward, and then cut it.

(4) feed key

Used to feed printer paper.

(5) printer key

Used to select whether to print measurement values.

(6) auto save key

Used to select whether to save measurement values as a measurement data file.

(7) screen on/off key

Used to turn the screen ON/OFF.

(8) scan key

Used to start/stop real-time measurement.

(9) monitor key

Used to start/stop the monitor.

(10) program run/stop key

Used to start/stop automatic measurement.

(11) key lock key

Used to turn key lock ON/OFF.

(12) USB memory device port

Used to insert a USB memory device.

(13) ACCESS LED

Lights up when either the internal memory, SD card, or USB memory device is being accessed. Do not turn the power OFF or remove the SD card or USB memory device while this is lit up.

(14) SD card slot

Used to insert an SD card.

(15) Printer

Prints recording paper. Refer to "7-3. RECORDING PAPER REPLACEMENT" for information on replacing recording paper.

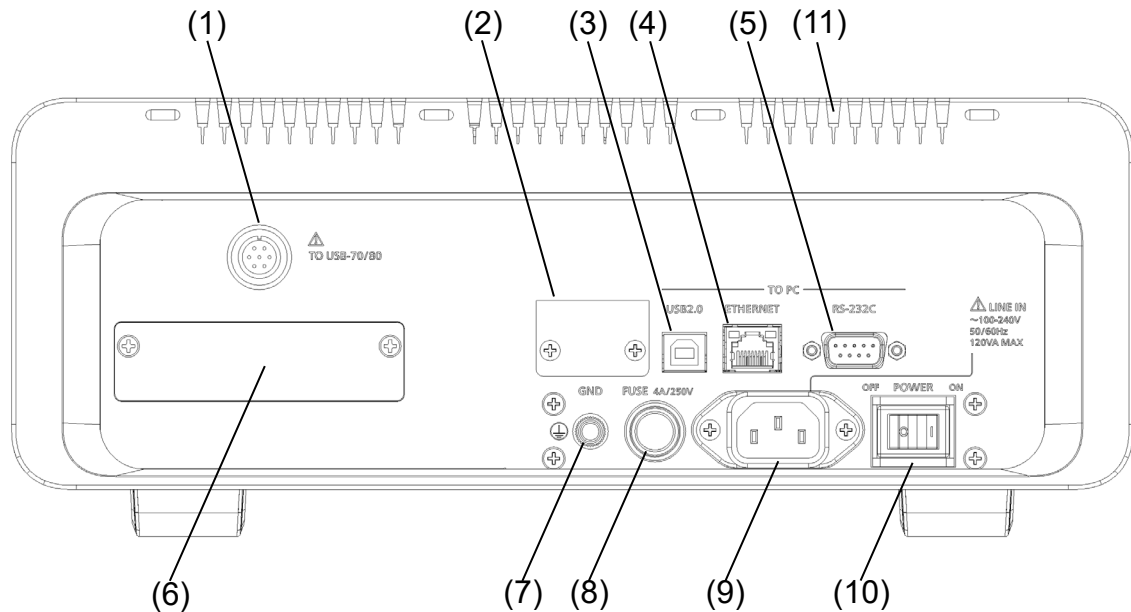
(16) Printer LED

Indicates the status of the printer. The LED turns OFF when the status is normal, and lights up when there is no more recording paper.

(17) Screen

Touch panel screen.

1-3-2. Back



(1) External scanner connector

Used to connect USB-80/70 Series External Scanner.

(2) Expansion panel

Covers the expansion connector. The expansion connector is currently disabled. Do not remove the expansion panel.

(3) USB 2.0 connector

USB interface connector.

(4) ETHERNET connector

Ethernet interface connector.

(5) RS-232C connector

RS-232C interface connector.

(6) Optional slot

Used to install UIO-80A External I/O Unit (a dummy panel is used when UIO-80A is not installed).

(7) GND terminal

Ground terminal. GND terminal is connected to the chassis.

(8) FUSE holder

Power supply fuse holder. If the fuse is blown, replace it with a compatible fuse ($\phi 5 \times 20$ mm, rated 250 V 4 A).

(9) LINE IN connector

Inlet socket used to connect the power supply cable.

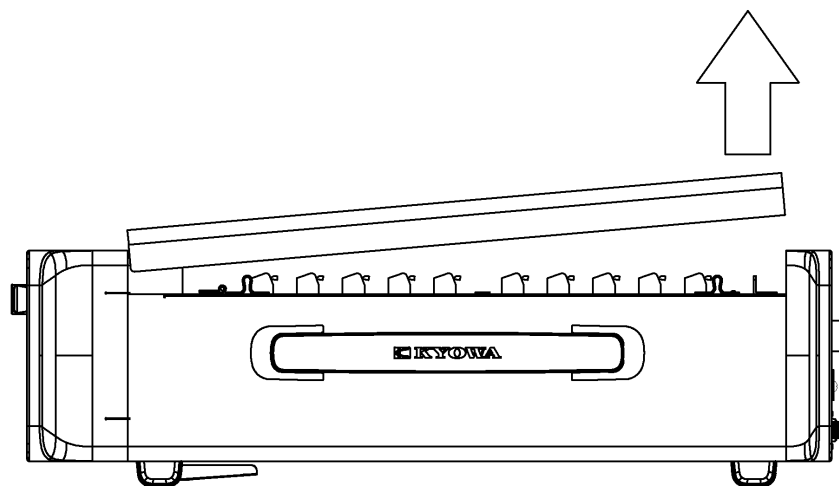
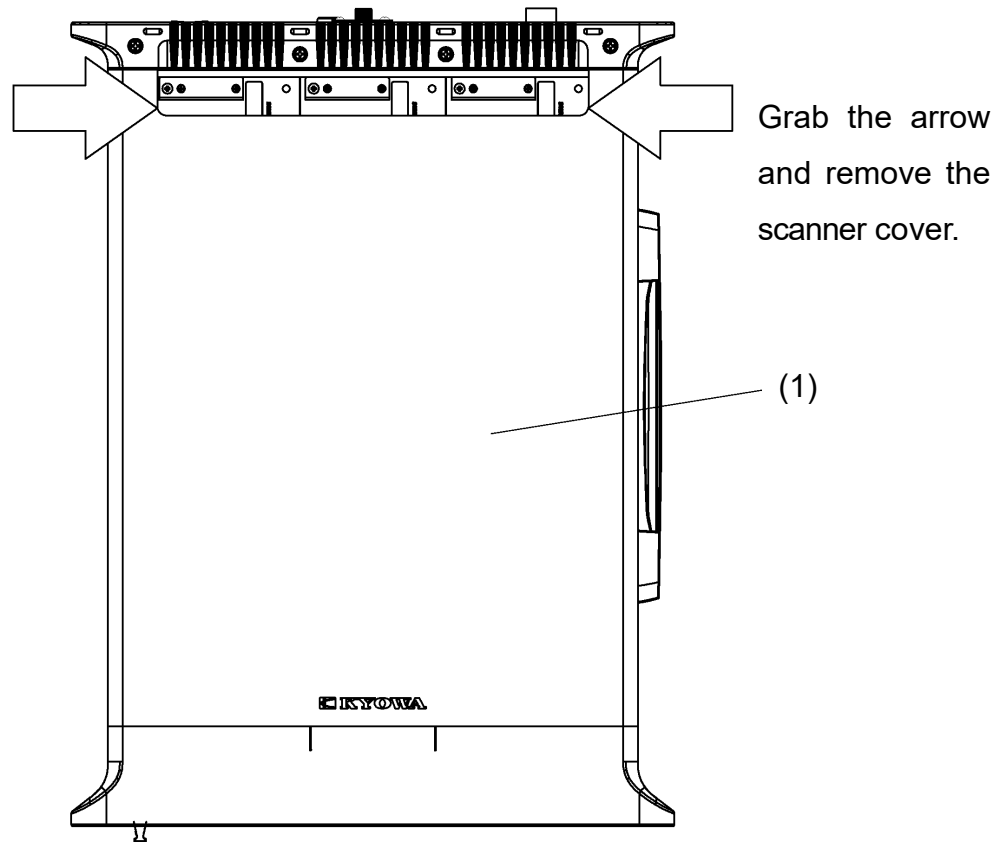
(10) POWER switch

Power switch. Used to turn the power ON/OFF.

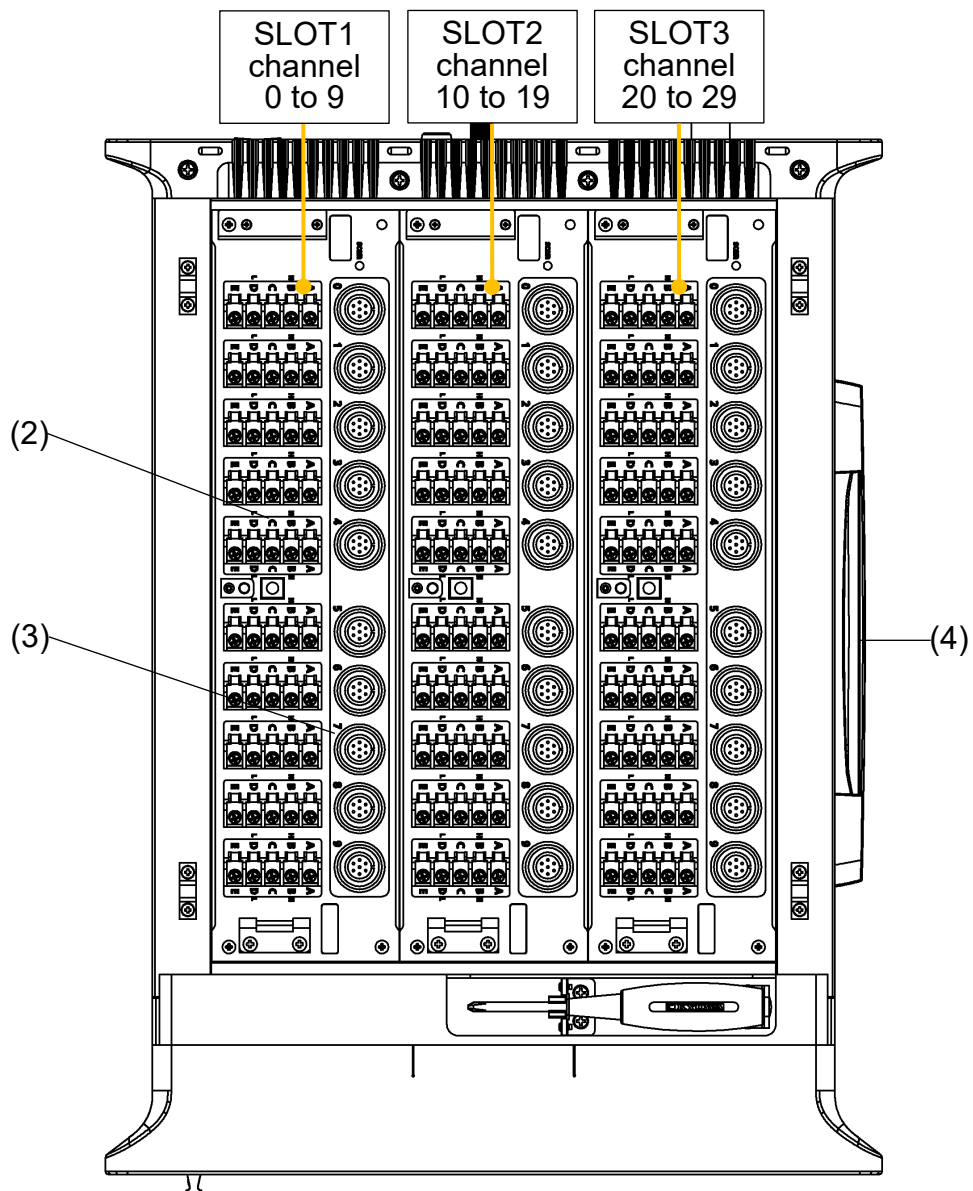
(11) Cable holder

Holders for fixing strain gage cables.

1-3-3. Top



To remove the scanner cover, grab the rear side and pull it in the direction indicated with the arrow.



* The illustration above shows three USM-82A units installed.

(1) Scanner cover

Used to cover the scanning units.

(2) Input terminal block

Input terminals (screw soldered terminal block) for measurement.

The screw diameter for the terminal block is M3, and the recommended tightening torque is 0.49 Nm. If connecting a crimped terminal, use a crimped terminal with an outer diameter of 6.5 mm or less.

(3) NDIS connector (installed on USM-82A and USS-62B only)

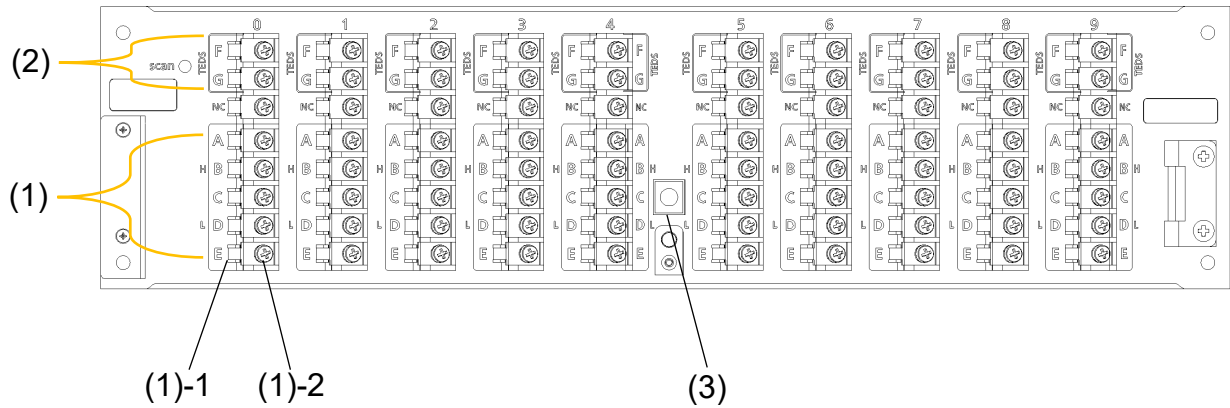
Used to connect a strain gage transducer or potentiometer sensor.

(4) Handle

Handle for carrying.

1-3-4. Scanning Unit Top

USM-81A, USM-83A



(1) Input terminals

Input terminals (screw soldered terminal block) for measurement.

(1)-1 Soldering lug

Used to solder a cable.

(1)-2 Screw with metal plate

The screw diameter for the terminal block is M3, and the recommended tightening torque is 0.49 Nm.

If connecting a crimped terminal, use a crimped terminal with an outer diameter of 6.5 mm or less.

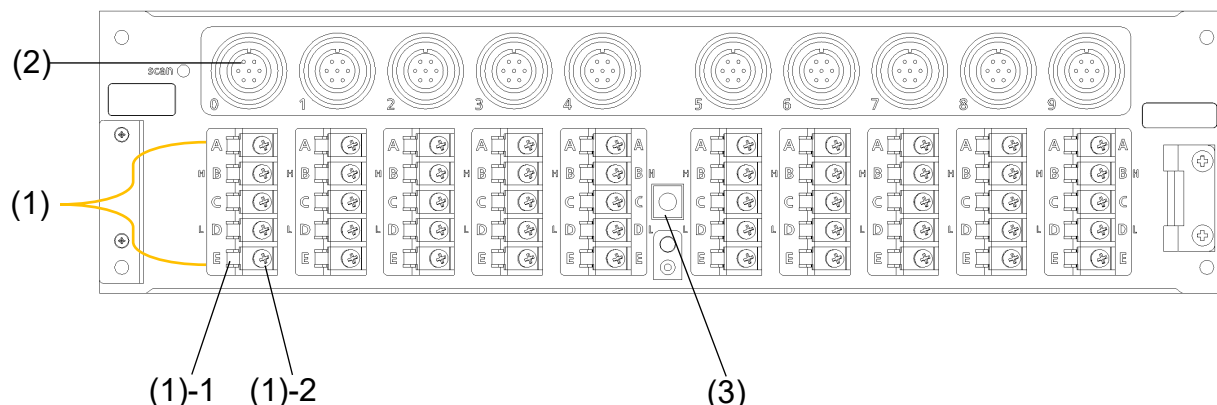
(2) TEDS terminals

TEDS sensor terminals.

(3) Terminal Temperature Sensor

This is a terminal temperature sensor for measurement. Do not touch it by hand or apply impact or force.

USM-82A



(1) Input terminals

Input terminals (screw soldered terminal block) for measurement.

(1)-1 Soldering lug

Used to solder a cable.

(1)-2 Screw with metal plate

The screw diameter for the terminal block is M3, and the recommended tightening torque is 0.49 Nm.

If connecting a crimped terminal, use a crimped terminal with an outer diameter of 6.5 mm or less.

(2) NDIS connector

Pin Assignment on This Device	Signal Name
	A: +BV B: -SIG C: -BV D: +SIG E: Shield F: TEDS+ G: TEDS-

Applicable connector on cable

Model: PRC03-12A10-7M10. 5

Manufacturer: Tajimi Electronics Co., Ltd.

(3) Terminal Temperature Sensor

This is a terminal temperature sensor for measurement. Do not touch it by hand or apply impact or force.



CAUTION

- Do not connect KYOWA "FV-1A" or "FV-2A" NDIS connector to BNC conversion adapters.
- Do not connect to the input terminal and the NDIS connector on the same channel at the same time.

2. PRODUCT CONNECTIONS

2-1. GROUND CONNECTION

Be sure to connect the GND terminal to ground. In addition to helping prevent noise, this can also help prevent electric shock caused by current leaking from the power supply noise filter. Use green plastic-coated electrical wire (0.75 mm² or more).

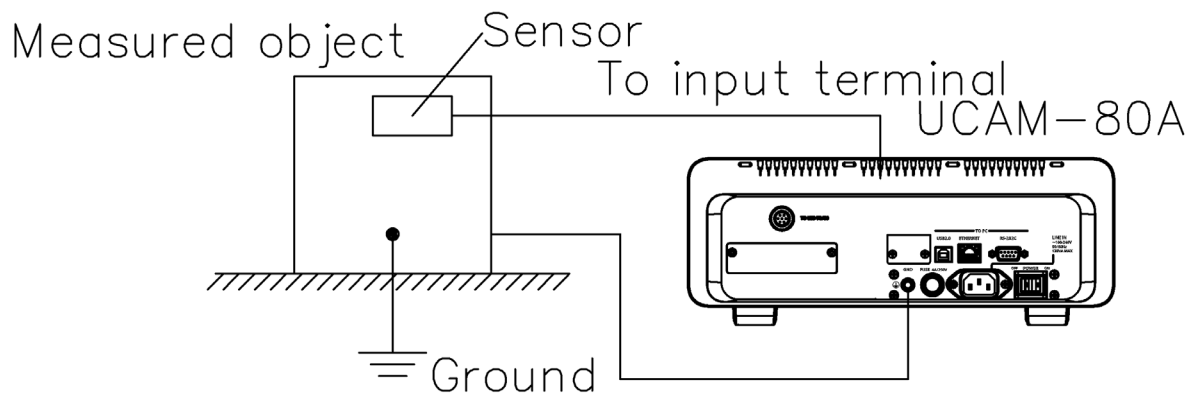
Grounding standards vary depending on the environment. Refer to the following grounding examples and ground the device so that reliable measurements can be taken with little impact from noise.

Single-point grounding should generally be used. Grounding two or more points could form a loop and more easily introduce noise. Be especially careful when connecting.

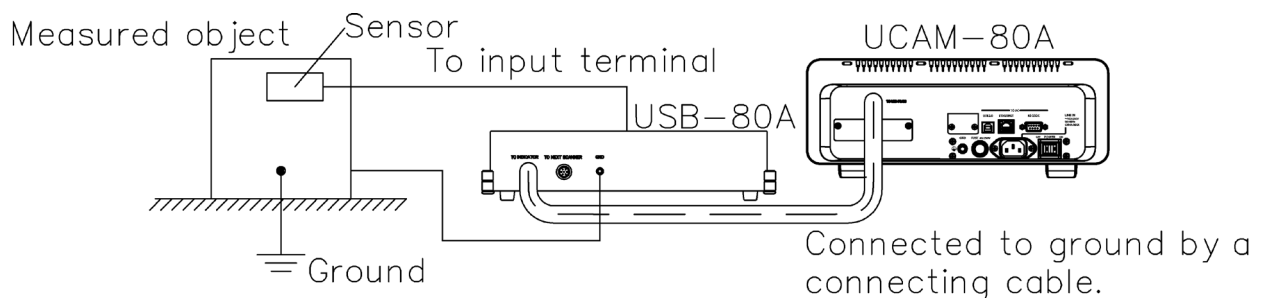
Use D-class or greater grounding that is separate from the power system.

2-1-1. Measured Object Is Grounded

- (1) If not using an external scanner, connect the measured object and the GND terminal of this device.

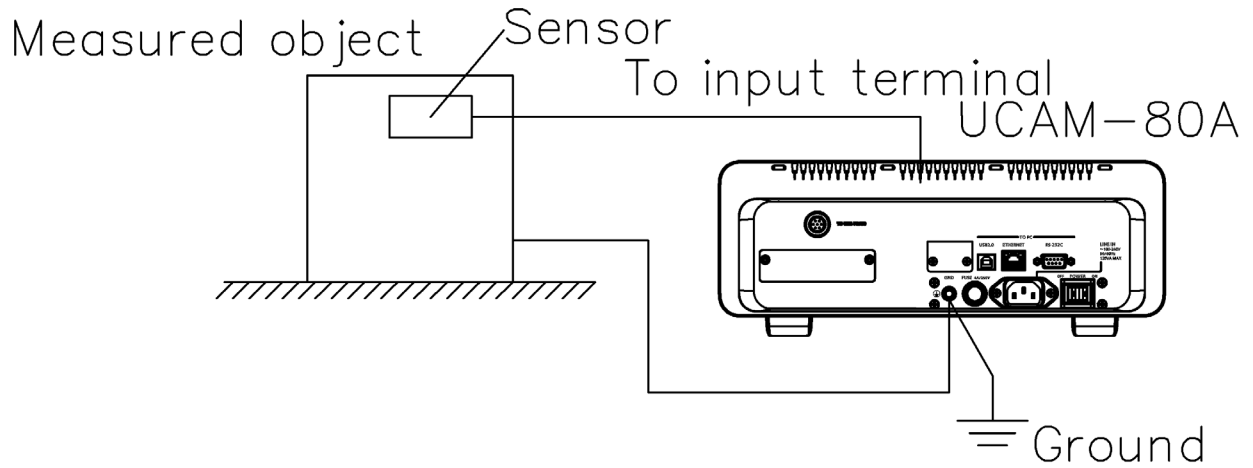


- (2) If using an external scanner, connect the measured object and the GND terminal of USB-80/70 Series External Scanner.

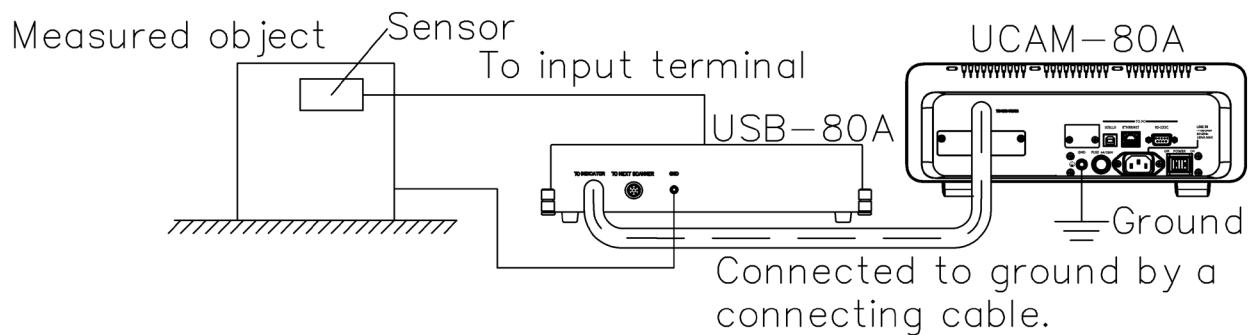


2-1-2. Measured Object Is Insulated from Ground

- (1) If not using an external scanner, connect the measured object and the GND terminal of this device, and then ground the GND terminal of this device.

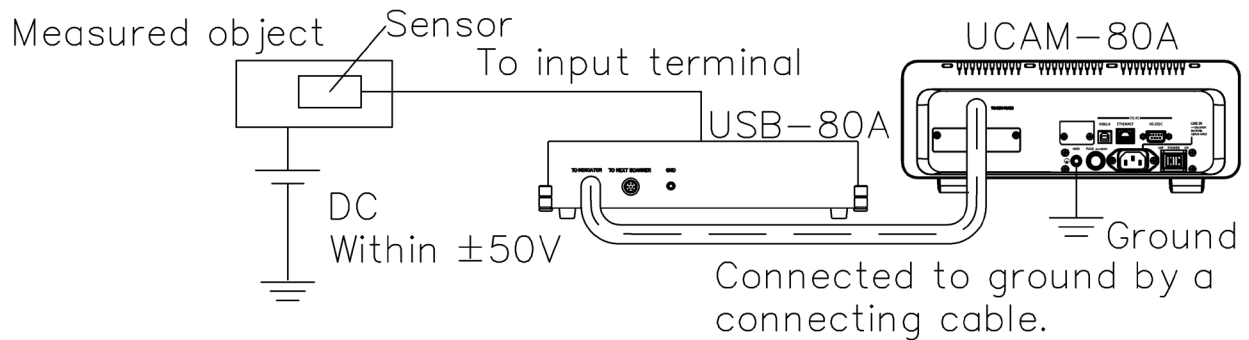


- (2) If using an external scanner, connect the measured object and the GND terminal of USB-80/70 Series External Scanner. Then, ground the GND terminal on either the external scanner or on this device.



2-1-3. Measured Object Has Potential to Ground

(1) Ground the GND terminal on either this device or on USB-80/70 Series External Scanner.

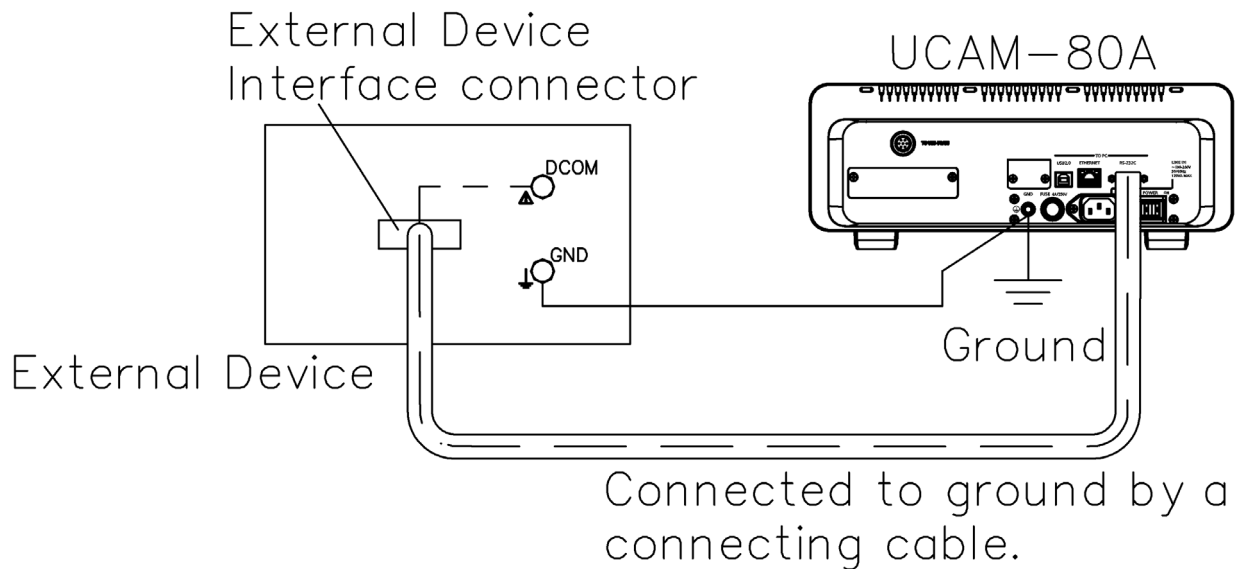


CAUTION

- If the measured object has potential to ground, ensure that the potential of the object is not input into this device. Doing otherwise may worsen performance or cause failure.
- If potential of the measured object will be input into this device, set Insulate ACOM-GND on this device. Refer to "6-11. MAINTENANCE SETTING" for details.

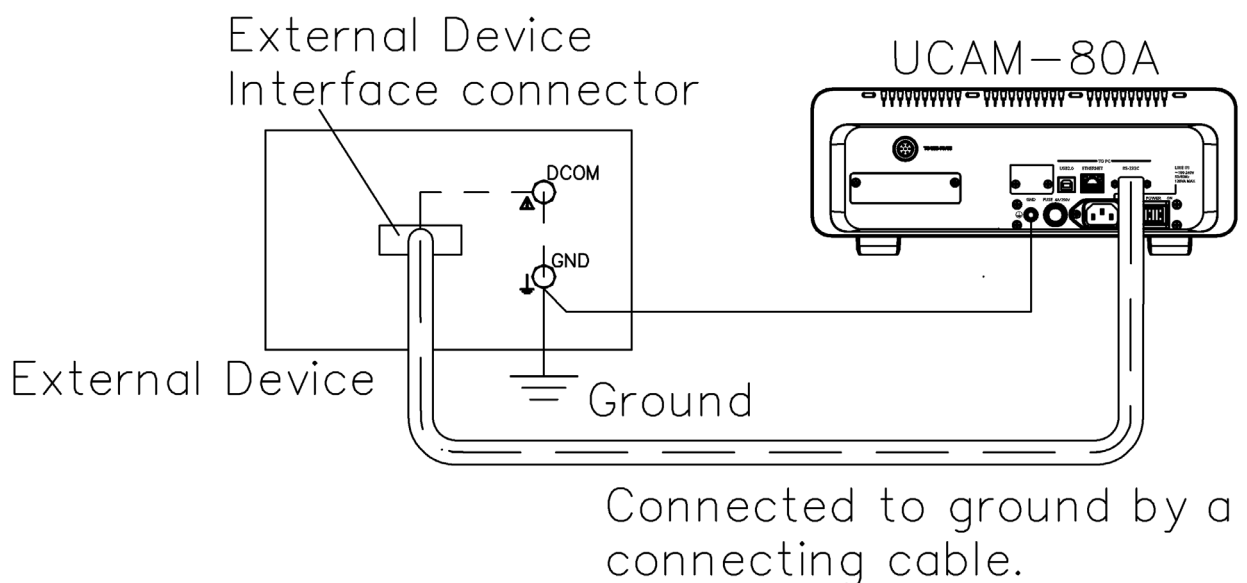
2-1-4. Connecting with External Device Where DCOM and GND Are Not Connected

- (1) Connect the GND terminals on this device and on the external device.
- (2) Ground the GND terminal on either this device or on the external device.



2-1-5. Connecting with External Device Where DCOM and GND (or Chassis) Are Connected

- (1) Connect the GND terminals on this device and on the external device.
- (2) Ground the GND terminal on the external device.



2-2. LIGHTNING SURGE PROTECTION GROUND CONNECTION

When implementing lightning surge protection using this device and an external scanner, be sure to connect the lightning surge protection ground to the E terminal and GND terminal on each input.

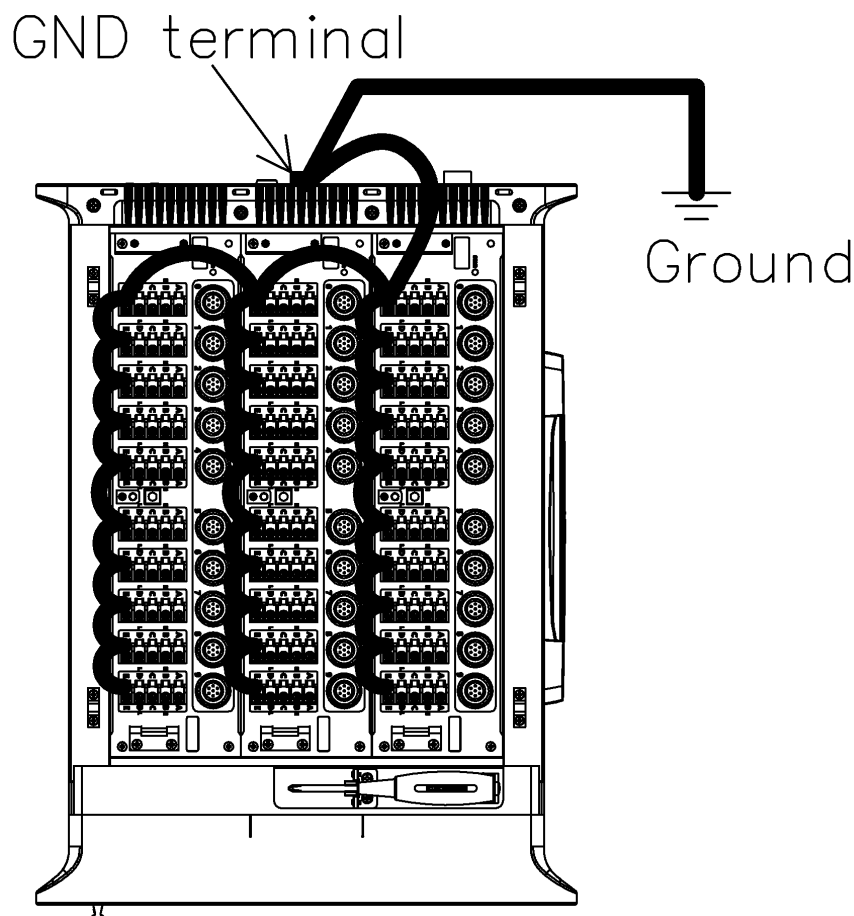
Prepare a separate Class A ground for use as the lightning surge protection ground.

The effectiveness of lightning surge protection will depend on the quality of grounding and connective wiring.

Use green plastic-coated electrical wire (1.25 mm² or more) for connections from the GND terminal to the lightning surge protection ground, and keep wiring as short as possible.

2-2-1. Data Logger and Scanner Lightning Surge Protection Ground Connection

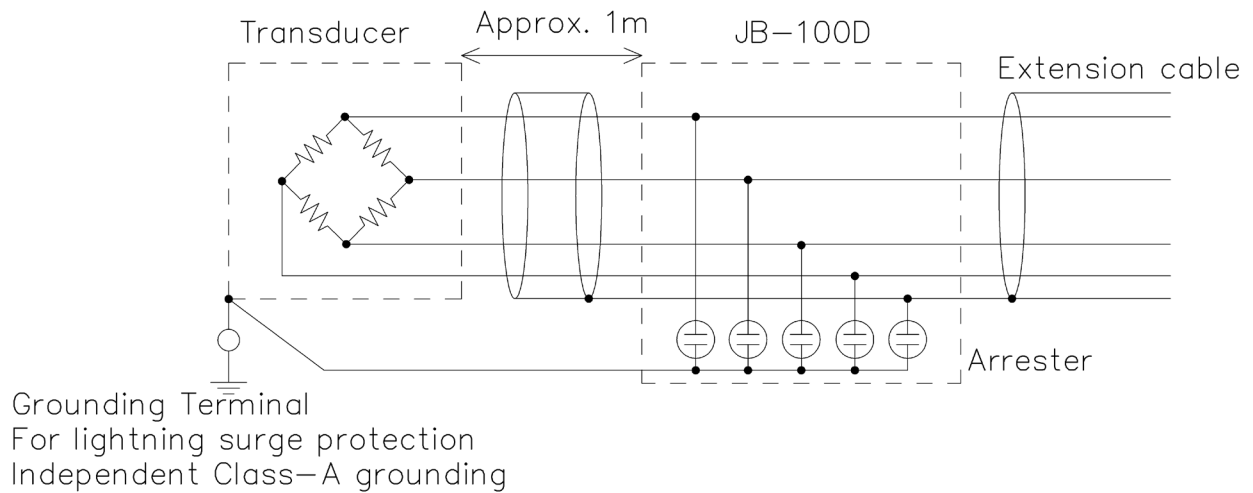
Connect all "E" input terminals on scanning units in parallel, and connect them to the GND terminal. Use plastic-coated electrical wire (0.5 mm² or more) for this.



2-2-2. Sensor Lightning Surge Protection Ground Connection

(1) KYOWA strain gage transducers

Connect the JB-100D KYOWA Lightning Arrester Kit near (approx. 1 m) each transducer, and connect a separate Class A ground for lightning surge protection. (Refer to the JB-100D Instruction Manual for details.)



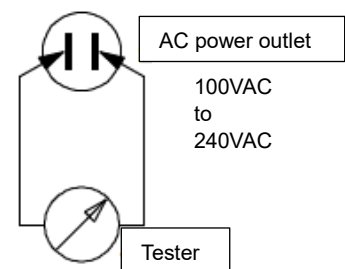
(2) Other sensors

Implement lightning surge protection in accordance with the sensor instruction manual or instructions from the manufacturer.

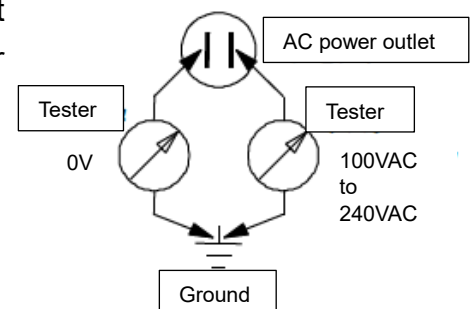
2-3. POWER SUPPLY CONNECTION

Power is supplied to this device from the included AC power supply cable. Before connecting the power supply cable, be sure to check the power supply voltage. The power-supply voltage range supported by this device is from 100 to 240 VAC (50/60 Hz). Make sure to stay within this range. If the power supply voltage is outside of the voltage range provided above, or if the voltage of each power supply terminal has potential exceeding the power supply voltage of ground, it could cause failure or an accident. Never connect such a power supply. Follow the procedure below to confirm the AC power supply voltage.

- (1) Use a tester to measure between terminals in the AC power supply outlet, and confirm that the voltage is within the specified range (100 to 240 VAC).



- (2) Use a tester to measure between one terminal in the AC power supply outlet and ground, and confirm that the voltage of one is 0 V and the voltage of the other is within the specified range (100 to 240 VAC).



- (3) If the device is being used in an environment where induction motors, electrical welding machines, or other devices that generate noise are being used, there will likely be a high amount of noise and the power supply condition will be poor. In this case, use an insulation transformer (optional product: UPT-300BR) or commercially available Noisecuttrans to implement anti-noise measures.



KYOWA Insulation Transformer (model UPT-300BR)

- Input: 100 / 120 / 220 / 240 V
- Output: 100 V, capacity 300 VA

**CAUTION**

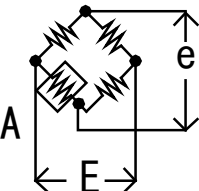
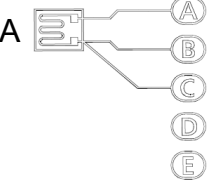
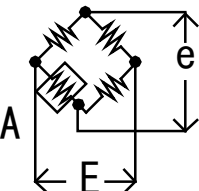
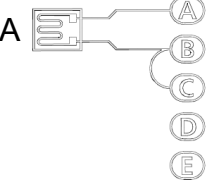
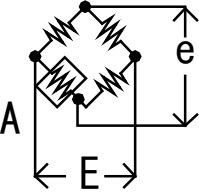
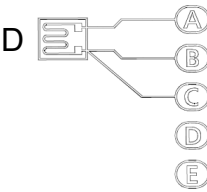
- If using 100 VAC generated from an uninterruptible power supply (UPS) or battery as the power supply for this device, ensure that AC is output as a sine wave. Some UPS products output AC as a square wave instead of a sine wave. Square wave AC may cause a malfunction.
- If power supply voltage fluctuation is severe, use a stabilized power supply unit.
- Do not use a power supply with poor frequency stability or that uses square wave output. Doing so could cause a malfunction.

**PROHIBITED**

- **The power-supply voltage range supported by this device is from 100 to 240 VAC. Make sure to stay within this range.**
Also, be sure to implement grounding.
- If the power supply voltage is outside of the voltage range provided above, or if the voltage of one power supply terminal is outside AC100 to 240V or the voltage of other power supply terminal is below 0V, it could cause failure or an accident. Never connect such a power supply.
- Be sure to connect the GND terminal to ground.
If this is not grounded, it could cause electric shock, reduced performance, or failure.

2-4. SENSOR CONNECTIONS

2-4-1. Strain Gage and Strain Gage Transducer Connections

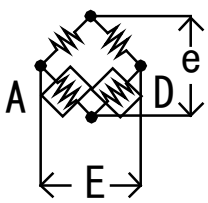
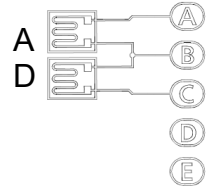
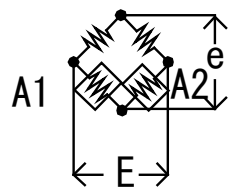
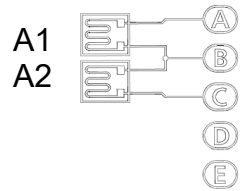
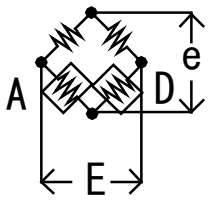
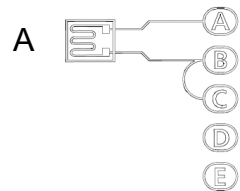
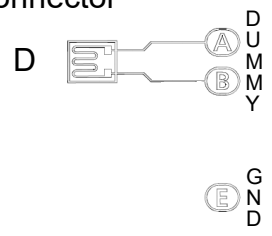
Measurement Method	Bridge Circuit	Connection Method	Channel Mode
	 : Strain gage  : Built-in fixed resistor A: Active gage D: Dummy gage E: Bridge exciter e: Bridge output	A: Active gage D: Dummy gage	
1-gage method (Quarter bridge system) (3-wire system connection method) Gage resistance 120 Ω 240 Ω 350 Ω			1-gage 120 Ω (BV 2 V) 1-gage 240 Ω (BV 2 V) 1-gage 350 Ω (BV 2 V) 1-gage 120 Ω _5 V(*1) 1-gage 240 Ω _5 V(*1) 1-gage 350 Ω _5 V(*1)
1-gage method (Quarter bridge system) (2-wire system connection method) Gage resistance 120 Ω 240 Ω 350 Ω			1-gage 120 Ω (BV 2 V) 1-gage 240 Ω (BV 2 V) 1-gage 350 Ω (BV 2 V) 1-gage 120 Ω _5 V(*1) 1-gage 240 Ω _5 V(*1) 1-gage 350 Ω _5 V(*1)
1-gage method (Quarter bridge system) (True dummy method) Gage resistance 120 Ω 350 Ω			1-gage 120 Ω D (BV 2 V) 1-gage 350 Ω D (BV 2 V) 1-gage 120 Ω A (BV 2 V) 1-gage 350 Ω A (BV 2 V) 1-gage 120 Ω D_5 V(*1) 1-gage 350 Ω D_5 V(*1) 1-gage 120 Ω A_5 V(*1) 1-gage 350 Ω A_5 V(*1)

■ (*1): Cannot be used with an external scanner.

■ (*1): BV 5 V.



- If connecting using the 1-gage method, it is recommended to use the 3-wire system connection method which is less likely to cause errors (due to gage lead wire temperature effect, initial value discrepancy, etc.).
- If measuring in an environment with a high amount of noise, use KYOWA low-noise lead wires (L-13/14/15/16).
- If using the 1-gage method (2-wire system connection method), short between B and C using the shorting bar included with USM-81A/82A/83A and USS-61B/62B/63B.

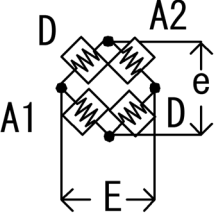
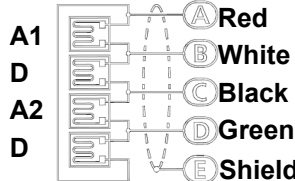
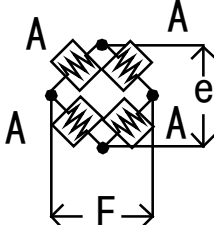
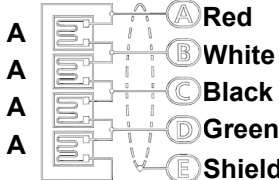
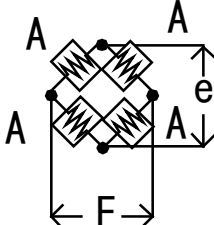
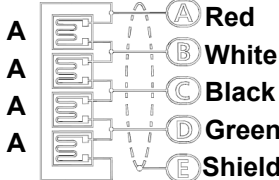
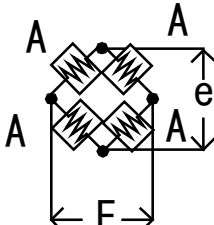
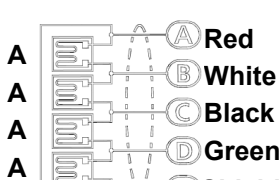
Measurement Method	Bridge Circuit	Connection Method	Channel Mode
	 : Strain gage  : Built-in fixed resistor A: Active gage D: Dummy gage E: Bridge exciter e: Bridge output	A: Active gage D: Dummy gage	
2-gage method (Half bridge system) (Active-dummy method) Gage resistance 60 Ω to 1 kΩ			2-gage A-D (BV 2 V) 2-gage A-D_5 V ^(*1)
2-gage method (Half bridge system) (Active-active method) Gage resistance 60 Ω to 1 kΩ			2-gage A-A (BV 2 V) 2-gage A-A_5 V ^(*1)
2-gage method (Half bridge system) (Common Dummy method) Gage resistance 60 Ω to 1 kΩ		 USB-80/70 COMMON DUMMY Connector 	2-gage COM-D ^(*2)

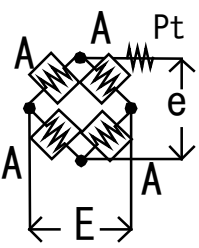
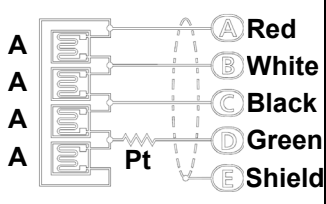
■ (*1): Cannot be used with an external scanner. BV 5 V.

■ (*2): Cannot be used with an scanning unit.

**CAUTION**

- If using a strain gage with a gage resistance of 120 Ω or lower with BV 5 V (applicable channel modes: 1-gage 120 Ω _5 V, 1-gage 120 Ω D_5 V, 1-gage 120 Ω A_5 V, 2-gage A-D_5 V, 2-gage A-A_5 V, 4-gage HR), and performing strain measurement for a material with poor heat dissipation (such as plastic or wood) or using a strain gage with a short gage length, strain gage self-heating may have an effect on measurement. Before measuring, first confirm that there will be no issues with measurement.
- Opposite side 2-active-gage method cannot be configured. To use the opposite side 2-active-gage method, use a separate bridge box that supports this method (such as DB-120A). If using a bridge box, set the channel mode to 4G.

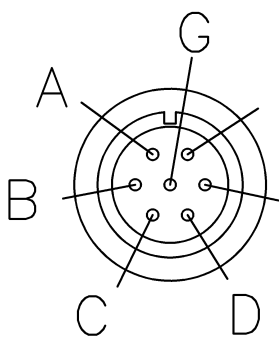
Measurement Method	Bridge Circuit	Connection Method	Channel Mode
	 : Strain gage  : Built-in fixed resistor A: Active gage D: Dummy gage E: Bridge exciter e: Bridge output	A: Active gage D: Dummy gage	
4-gage method (Full bridge system) (Opposite side active method) Gage resistance 60 Ω to 1 k Ω (*2)			4-gage A-A
4-gage method (Full bridge system) Full bridge method Strain gage transducer Bridge resistance 60 Ω to 1 k Ω High resolution: 120 Ω to 1 k Ω			4-gage 4-gage HR ^(*)
4-gage method (Full bridge system) (Constant current excitation) Full bridge method Strain gage transducer Bridge resistance 120 Ω			4-gage I (120 Ω) ^(*)
4-gage method (Full bridge system) (Constant current excitation) Full bridge method Strain gage transducer Bridge resistance 350 Ω			4-gage I (350 Ω) 4-gage I (350 Ω)_HR ^(*)

4-gage method (Full bridge system) Full bridge method Civil engineering transducer with temperature measuring function Bridge resistance 350 Ω			4-gage T
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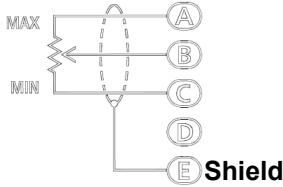
■ (*1): If using channel mode 4-gage HR, 4-gage I (120 Ω), or 4-gage I (350 Ω)_HR, this cannot be used with an external scanner.

■ (*2): Performs bridge nonlinearity compensation.

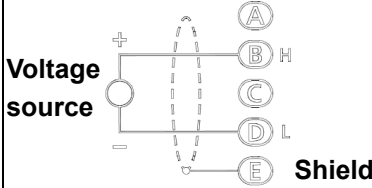
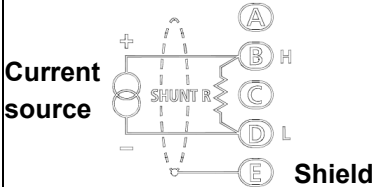
● NDIS connector

Measured Object	Pin Assignment on This Device	Signal Name
Strain gage Strain gage transducer		A: +BV B: -SIG C: -BV D: +SIG E: Shield F: TEDS+ G: TEDS-

2-4-2. Potentiometer Sensor Connection

Measurement Method	Connection Method	Channel Mode
Potentiometer sensor Potentiometer resistance 1 k Ω to 10 k Ω		Potentiometer

2-4-3. Voltage/Current Output Transducer Connection

Measurement Method	Connection Method	Channel Mode
Voltage measurement		Voltage 500 mV Voltage 50 V
Current measurement R=250 Ω Precision resistor		Current 50 mA



Recommended precision resistors for current measurement

- For 0 to ± 30 mA use: VISHAY Foil Resistor

Y0875250R000T9L (tolerance: 0.01%)

- For 0 to ± 50 mA use: VISHAY Foil Resistor

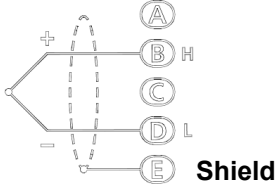
Y0785500R000T9L (tolerance: 0.01%)

For 0 to ± 50 mA use, connect two Y0785500R000T9L resistors in parallel.

**CAUTION**

- Do not input voltage or current outside of the specified range. Doing so may cause electric shock, reduced performance, or failure.
- When connecting input, make sure that the positive and negative sides are connected correctly.
- Do not connect KYOWA "FV-1A" or "FV-2A" NDIS connector to BNC conversion adapters.

2-4-4. Thermocouple Connection

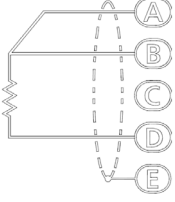
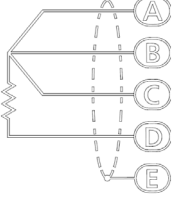
Measurement Method	Connection Method	Channel Mode
Thermocouple temperature measurement		Thermocouple K Thermocouple T Thermocouple E Thermocouple J Thermocouple R



CAUTION

- When measuring, be sure to cover the terminals with the terminal cover and ensure that the terminal temperature reaches room temperature.
- Do not expose to air from an A/C, direct sunlight, etc. If a thermal gradient is generated, it may cause measurement errors.
- Set this device on a flat surface. Using it vertically or placed against a wall may generate a thermal gradient and cause measurement errors.
- Use twisted pair shielded cable for thermocouples.
Using a parallel or unshielded cable may cause external noise and cause measurement errors.
- Do not connect thermocouples directly to measured objects with a larger potential than ground or smaller than ground. Doing so may cause failure or measurement errors.

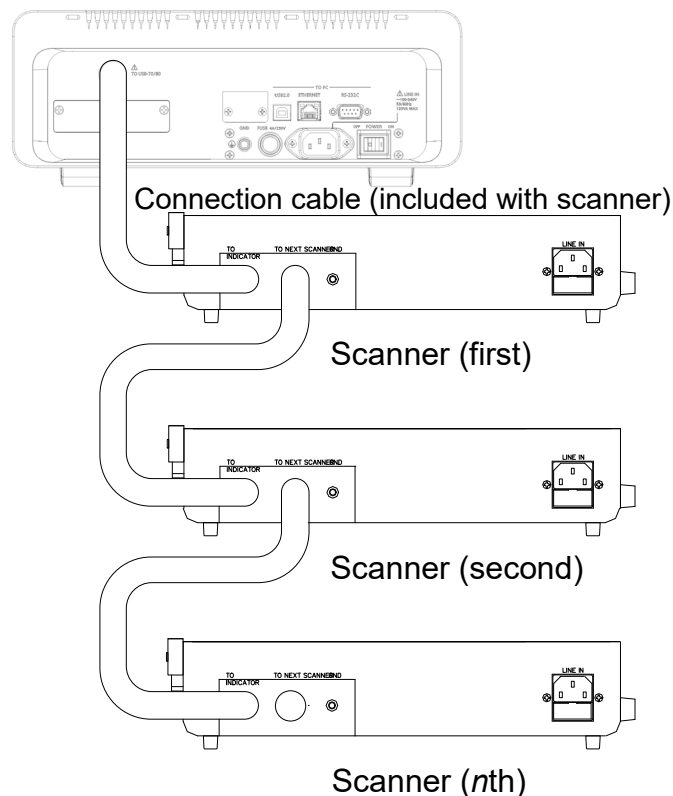
2-4-5. Resistance Thermometer Connection

Measurement Method	Connection Method	Channel Mode
Platinum resistor 3-conducting wire		Platinum resistance thermometer • 100 Ω (Pt100) • 100 Ω (JPt100)
Small thermometer BTS-100AT		Platinum resistance thermometer 100 Ω (Pt100)

2-5. EXTERNAL DEVICES CONNECTIONS

2-5-1. Connection with USB-80/70 Series Units

- (1) Connect "external scanner connector" and the "TO INDICATOR connector" on the USB-80/70 Series unit using the connection cable included with the scanner.
- (2) If connecting a second scanner, connect the "TO NEXT SCANNER connector" on the first scanner and the "TO INDICATOR connector" on the second device using the connection cable included with the scanner.
- (3) Connect any additional scanners using the method described in Step (2).



PROHIBITED

- Always turn the power supply on this device OFF prior to connecting an external scanner. Connecting while the power supply is ON may cause electric shock, reduced performance, or failure.
- If using a USB-80/70 Series unit equipped with an AC power supply unit (UPS-80A/70B), turn the power supply on this device ON after supplying power to the USB-80/70 Series unit.



If using the following type of connection with USB-80/70 Series, attach an optional AC power supply unit (UPS-80A/70B) to all scanners.

- One USB-80/70 unit, with a cable length of 240 m or more
- Two USB-80/70 units, with a total cable length exceeding 120 m
- Three USB-80/70 units, with a total cable length exceeding 60 m
- Connecting four or more USB-80/70 units



If using a USB-80/70 Series unit equipped with an AC power supply unit (UPS-80A/70B), the number of external scanners that can be connected to this device and the total length of connection cables are as follows:

- Up to 20 units, with a total connection cable length of up to 1 km.
- Up to 20 units, even when scanning units are installed in this device.



PROHIBITED

- If conditions require attaching the above AC power supply unit (UPS-80A/70B) but UPS-80A/70B is not attached, it could worsen performance or cause failure.
- If using under conditions requiring that an AC power supply unit (UPS-80A/70B) be attached, be sure to attach UPS-80A/70B and supply power to the USB-80/70 Series unit.

2-6. CONNECTION WITH A PC

There are three interfaces for connecting to a PC: RS-232C, USB, and Ethernet.

2-6-1. RS-232C Connection

- **Connection with PC**

Connect this device to the PC using an RS-232C cable.

Use the following cable to connect to a PC.

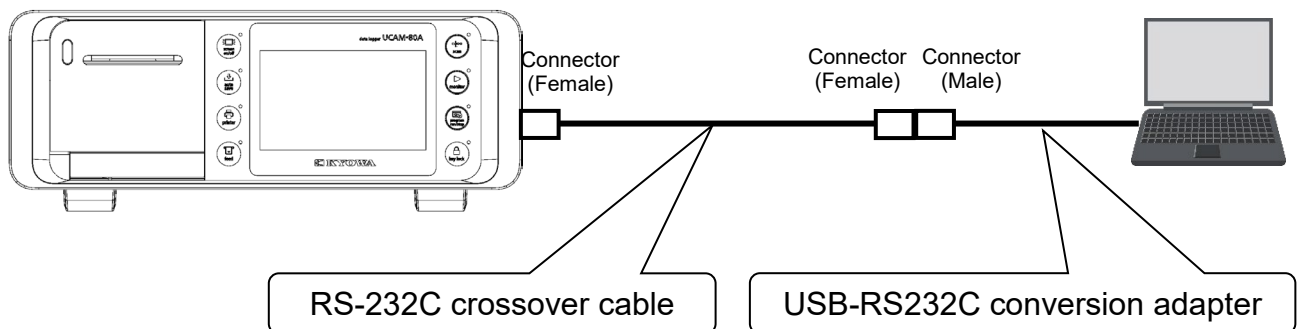


Compatible cable (D-sub 9P, female-female)

Recommended: Sanwa Supply RS-232C Crossover Cable (3 m)

Model: KRS-403XF3K2, etc.

If the PC does not have an RS-232C (serial) communication port, the USB-RS232C converter can be used to connect.





- USB-RS232C converter

Recommended: I-O DATA USB-RSAQ7R, etc.

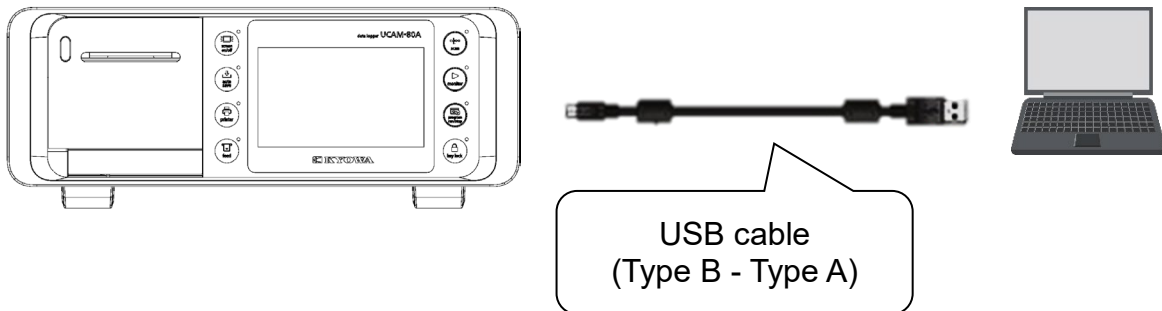
(Device side: D-sub 9P male, PC side: USB Type B)

* A USB driver will need to be installed separately on the PC. Refer to the manufacturer's USB-RS232C converter website for information on compatible OS and how to install the USB driver. RS communication protocol settings (baud rate, etc.) must match between this device, the USB-RS232C converter, and the PC (control software). Refer to "6-10. INTERFACE SETTINGS" for details on RS communication protocol settings. Note that the COM port of the USB-RS232C converter can be set in Device Manager.

2-6-2. USB Connection

• Connection with PC

Connect this device to a PC using a USB cable (Type A - Type B).

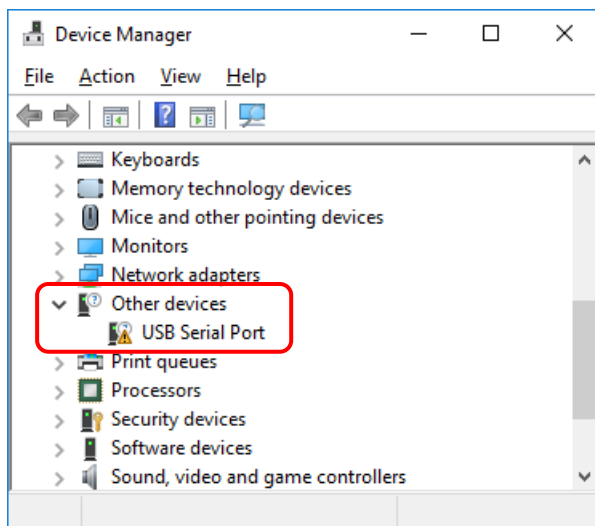


• USB driver setup

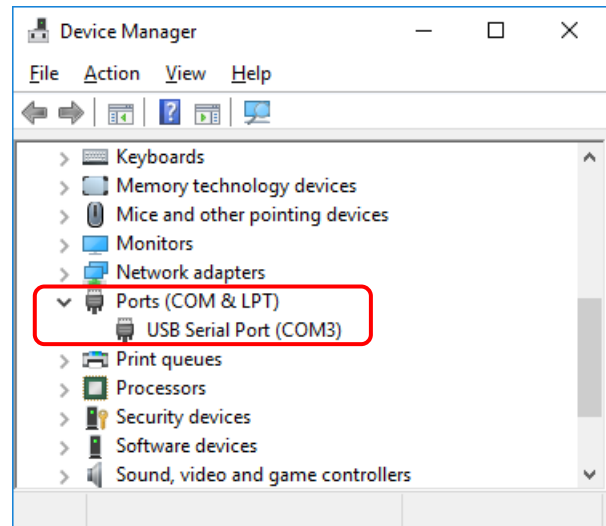
In order to control the device over USB, a USB driver will need to be setup separately on the PC.

After connecting this device to the PC with a USB cable, confirm the USB driver in Device Manager on the PC.

No driver



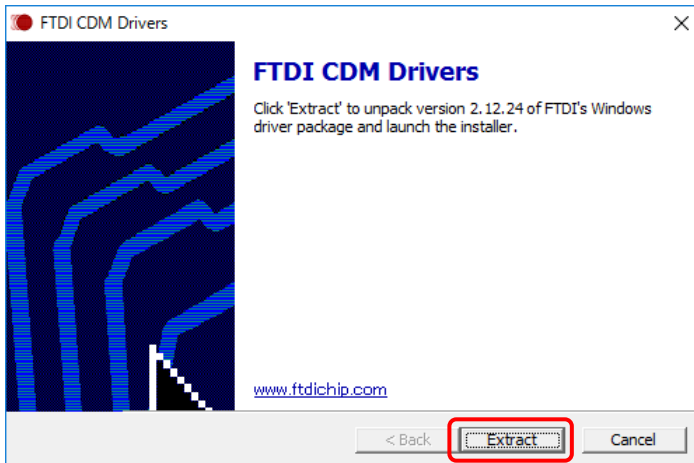
Driver installed



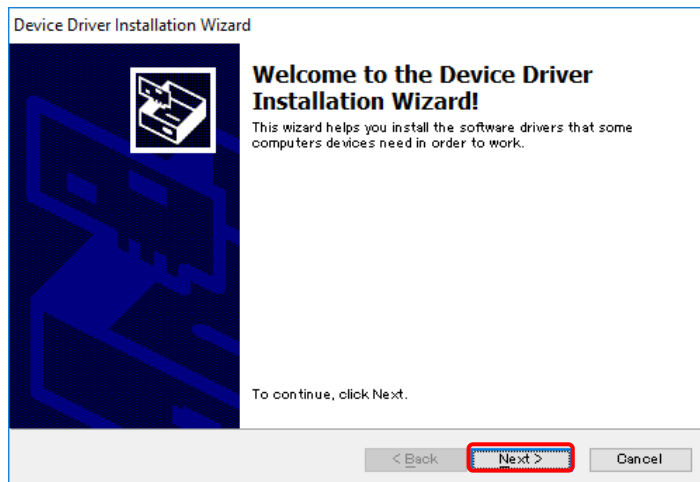
If no USB driver is installed, the driver will need to be installed.

Follow the procedure below to install the USB driver.

- (1) Select CDM212364_Setup.exe on the included CD-ROM, right-click, and then select "Run as administrator (A)."
- (2) If the User Account Control pop-up window is displayed, click **Yes (Y)** to continue.
- (3) Click **Extract**.



(4) Click **Next >**.

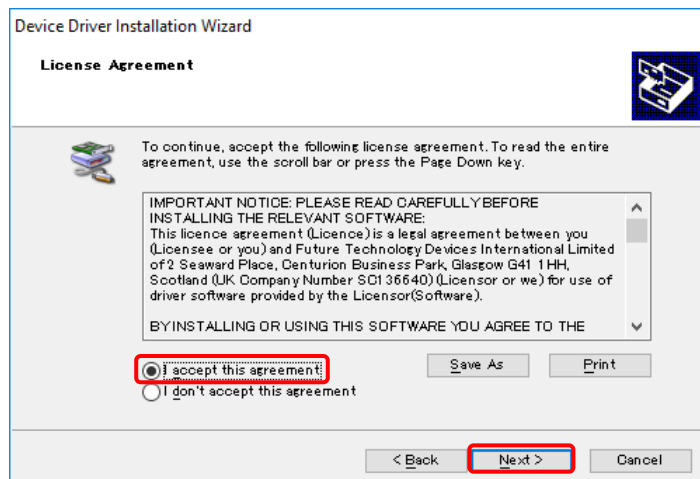


(5) The license agreement is displayed.

To agree to the license agreement, select "I accept this agreement"

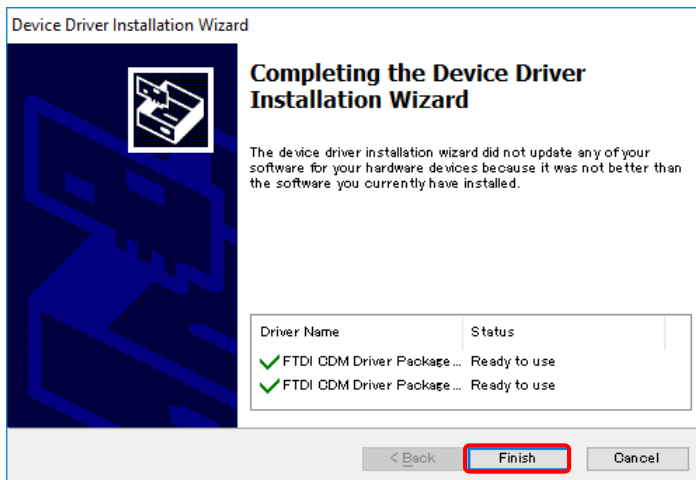
and then click **Next >** to start installation.

Selecting "I don't accept this agreement" will prevent installation from continuing.



(6) Installation is complete.

Click **Finish** to finish installation.



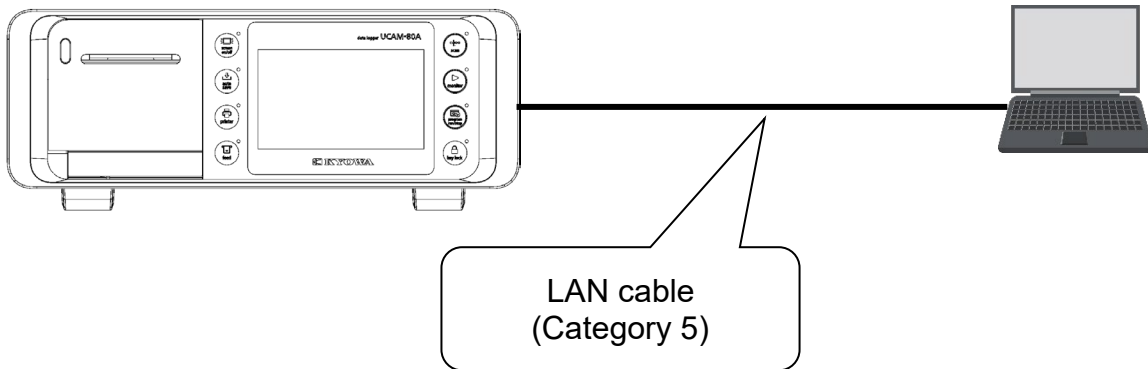
If no USB driver is installed on the PC, connecting this device to the PC will cause the PC to automatically search for the required driver on the network and then install it.

If the PC is not connected to the network or the driver cannot be found, the USB driver will need to be installed.

2-6-3. Ethernet Connection

- **Connection with PC**

Connect this device to the PC using LAN cable (Category 5 or higher).



CAUTION

- In order to connect to a network, an IP address and other settings must first be configured. Refer to "6-10. INTERFACE SETTINGS" for details on configuration.
- Check with the network administrator for details on the IP address and other settings.
- This device does not have firewall functionality.
Use sufficient caution when connecting it to a network.

- **IP address, subnet mask, and default gateway settings**

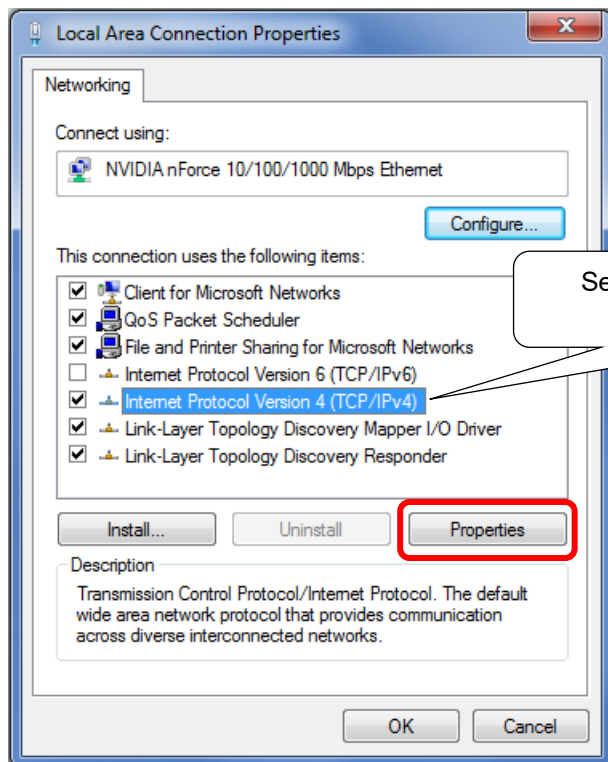
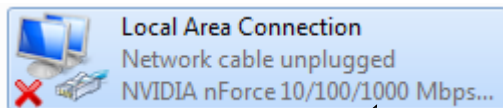
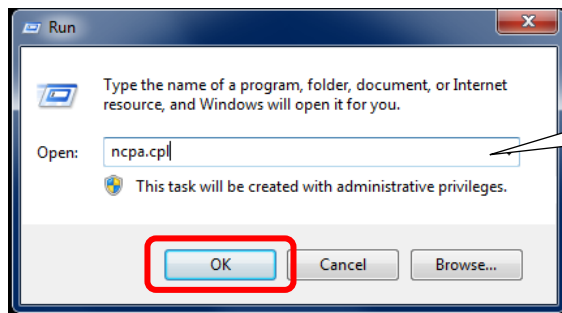
In order to control this device over an Ethernet connection, network settings will first need to be configured on this device and the connected PC.

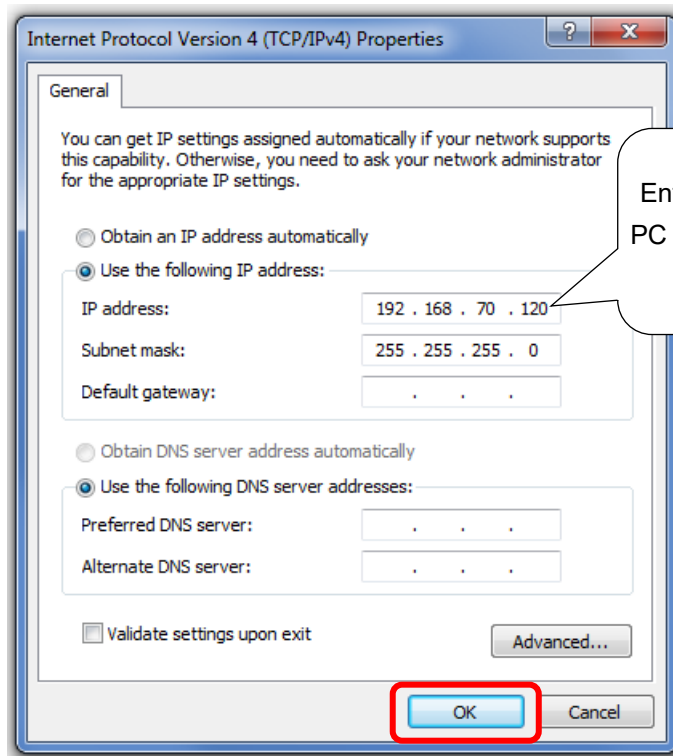


- The default network settings of this device are as follows:
IP address: 192.168.0.80
Subnet mask: 255.255.255.0
Default gateway: 0.0.0.0

The procedure for configuring network settings on the PC is provided below.

In order to connect to this device using an Ethernet connection, the IP address on the PC will need to be manually set to the same network as this device.





Enter an IP address and subnet mask so that the PC is in the same network as this device, and then press **OK**.



CAUTION

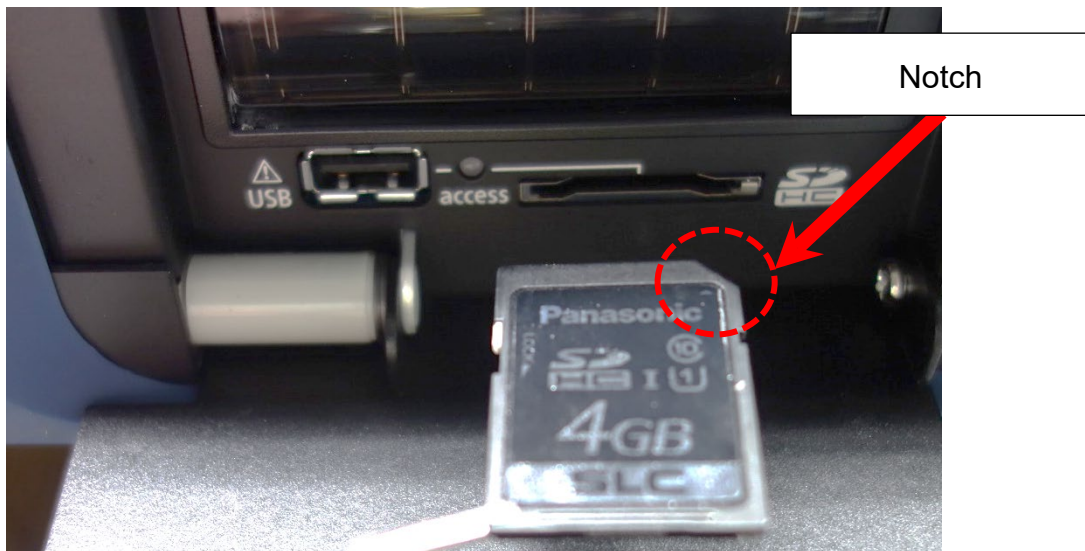
Communication is not possible if the IP address of this device is the same as that of the PC. Configure so that they are different.

The network settings for this device are configured on the screen of this device. Refer to "6-10-6. IP Address, Subnet Mask, Default Gateway" for details.

2-7. SD CARD INSERTION

This device is capable of saving measurement values and measurement conditions to an SD card.

To use an SD card, insert it as shown in the photo below.



PROHIBITED

SD cards must be inserted correctly.

Inserting an SD card incorrectly may damage the product or SD card.

**CAUTION**

- This device is compatible with the SDHC standard. Note that it is not compatible with the SDXC standard.
- Use only SD cards 32 GB in capacity or less.
- In order to use an SD card, it must first be formatted on a PC.

When formatting, select the FAT32 format file system. SD cards formatted with a file system other than FAT32 (NTFS, exFAT, etc.) will not be recognized.

However, there is no guarantee that a particular SD card will operate, even if it uses FAT32 format.

- The ACCESS LED will light up when the SD card is being accessed. Do not remove the SD card at this time.
- Inserting or removing an SD card may not be recognized for approximately 2 minutes after starting this device.

Wait a short while after the Menu screen is displayed prior to inserting the SD card.

- If the SD card is not recognized, start this device with the SD card removed. Insert the SD card after a while after the Menu screen is displayed.
- The following SD card has been tested by KYOWA.

Manufacturer: HAGIWARA Solutions

Model : NSDB-004GS(N24SEI

Capacity : 4 GB

2-8. USB MEMORY DEVICE INSERTION

This device is capable of transmitting saved measurement values and measurement conditions to a USB memory device.



PROHIBITED

Connect only USB memory devices (do not connect a PC or USB hard drive).
Doing so could cause failure.



CAUTION

- Use only USB memory devices 32 GB in capacity or less.
- In order to use a USB memory device, it must first be formatted on a PC.
When formatting, select the FAT32 format file system. USB memory devices formatted with a file system other than FAT32 (NTFS, exFAT, etc.) will not be recognized.
However, there is no guarantee that a particular USB memory device will operate, even if it uses FAT32 format.
- The ACCESS LED will light up when the USB memory device is being accessed. Do not remove the USB memory device at this time.
- If the USB memory device is not recognized, start this device with the USB memory device removed. Insert the USB memory device after a while after the **Menu** screen is displayed.
- The following USB memory device has been tested by KYOWA.

Manufacturer: Green house

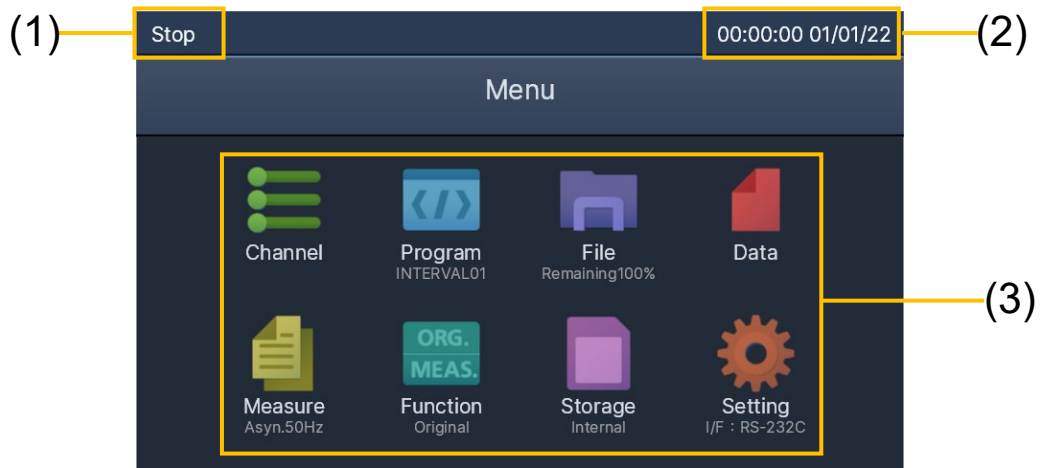
Model : GH-UF1-XSD2G

Capacity : 2 GB

3. TURNING THE POWER ON

Turn the POWER switch on the rear of this device ON to start the software.

The following **Menu** screen will be displayed once it has finished starting.



Number	Name	Function
1	Measurement status	Displays the measurement status of this device. • Stopped: Not measuring • Scan standby: Waiting to scan • Scanning: Currently scanning • Monitoring: Currently monitoring
2	Time	Displays the current time on this device.
3	Main area	Tap a button to access the corresponding screen.

Turn the POWER switch on the rear of this device OFF to stop the software.

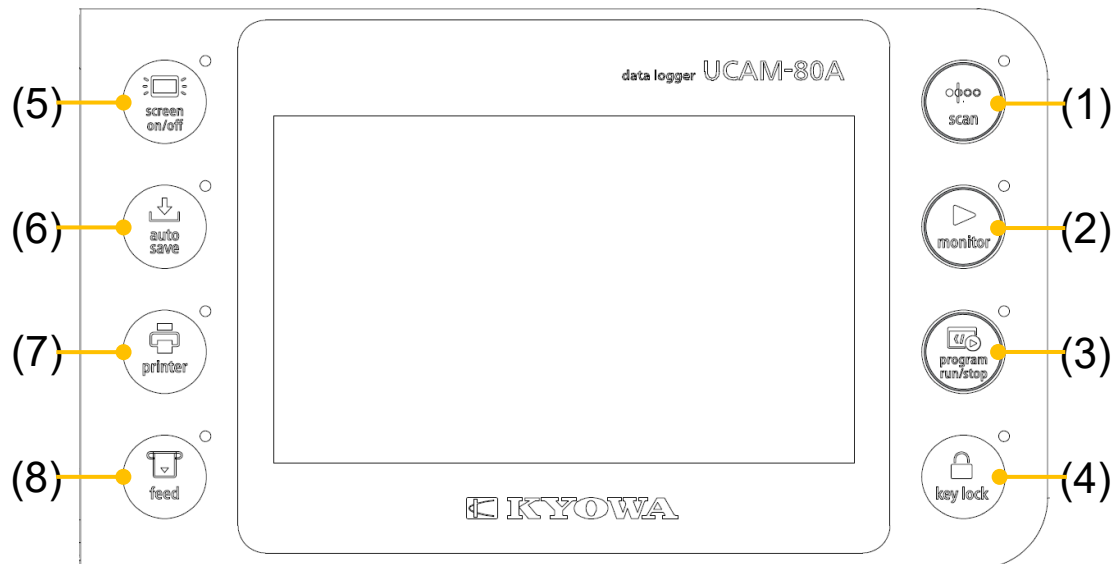
**CAUTION**

- The device will be ready to use approximately 1 minute after turning the power ON. However, internal parts will not be thermally stable immediately after receiving power. In order to reliably operate the device, allow it to warm up for approximately 30 to 40 minutes.
If measuring minor strain (around 100×10^{-6}) or measuring for a long period of time, allow the device to warm up for approximately 1 hour. If the device is not sufficiently heated up, accuracy may fall below specifications.
- After turning the power OFF, be sure to wait at least 5 seconds before turning the power back ON again. Turning the power ON within 5 seconds or switching the power ON/OFF repeatedly will generate rush current when the power is turned ON. Operation is not guaranteed in this situation.
- When turning the power OFF, first confirm that operations such as measurement or configuration are not being performed, and then turn the power OFF.

4. BASIC OPERATING METHOD

4-1. HARDWARE KEYS

The keys on the outside of the screen are called the "hardware keys."



Number	Name	Function	Key Upper-Right LED*1
1	scan key	Starts/stops real-time measurement	ON: Scanning OFF: Scanning stopped
2	monitor key	Starts/stops monitor	ON: Monitoring OFF: Monitor stopped
3	program run/stop key	Starts/stops automatic measurement	ON: Automatic measurement running OFF: Automatic measurement stopped
4	key lock key	Enables/disables key lock	ON: Key lock enabled OFF: Key lock disabled
5	screen on/off key	Turns the screen ON/OFF	ON: Screen OFF OFF: Screen ON
6	auto save key	Turns measurement value saving ON/OFF	ON: Measurement value saving ON OFF: Measurement value saving OFF
7	printer key	Turns measurement value printing ON/OFF	ON: Measurement value printing ON OFF: Measurement value printing OFF
8	feed key	Feeds recording paper	ON: Paper feeding OFF: Paper feeding stopped

*1) If key operation is disabled, pressing a key will cause its LED to flash.

4-1-1. Scan Key

Used to start/stop real-time measurement. Refer to "5-6-1. Real-Time Measurement" for details.

4-1-2. Monitor Key

Used to start/stop the monitor. Refer to "5-6-3. Monitor" for details.

4-1-3. Program Run/Stop Key

Press and hold for at least 2 seconds to start/stop automatic measurement. Refer to "5-6-2. Automatic Measurement" for details.

4-1-4. Key Lock Key

Press and hold for at least 2 seconds to enable key lock.

Press and hold during key lock to disable key lock.

When key lock is enabled, pressing a hardware key (except for the key lock key or screen on/off key) or the screen will have no effect.

4-1-5. Screen On/Off Key

Press and hold for at least 2 seconds to turn the screen ON/OFF.

When the screen is OFF, key lock will be enabled.



If a hardware key or the screen is not operated for 10 minutes, the screen will automatically turn OFF.

To turn the screen back ON, press and hold the screen on/off key or key lock key for at least 2 seconds.

4-1-6. Auto Save Key

Press and hold for at least 2 seconds to select whether to save measurement values to a measurement data file.

4-1-7. Printer Key

Press and hold for at least 2 seconds to select whether to print measurement values.

4-1-8. Feed Key

Used to feed printer paper.



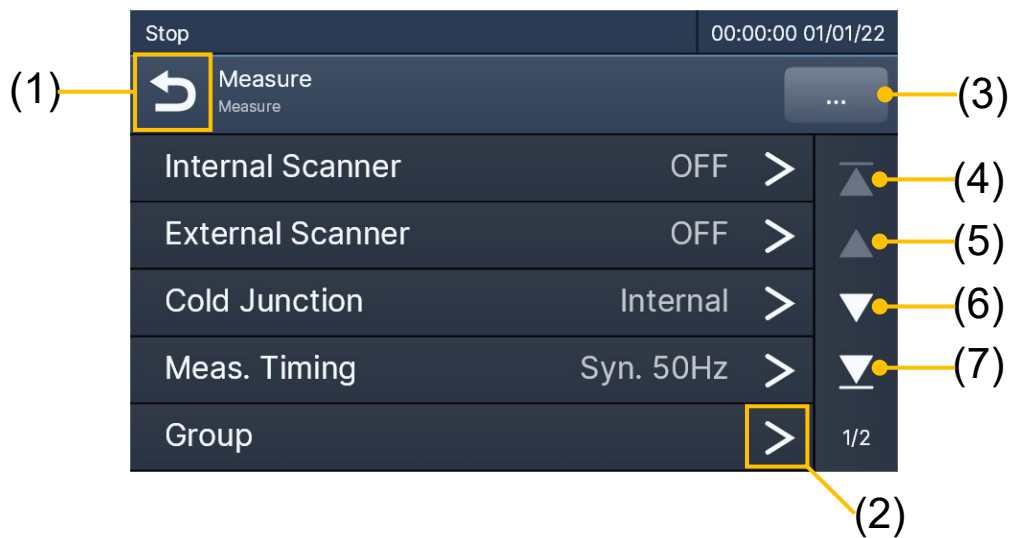
- The scan key can be pressed when the **Menu** screen or **Monitor** screen is displayed.
Refer to "5-6-3. Monitor" for details on the **Monitor** screen.
- The following hardware keys can be pressed when the **Menu** screen is displayed.
 - monitor key
 - program run/stop key
 - auto save key
 - printer key
- The following hardware keys can be pressed regardless of the screen displayed.
 - key lock key
 - screen on/off key
 - feed key

4-2. SCREEN

This device can be operated by tapping the screen.

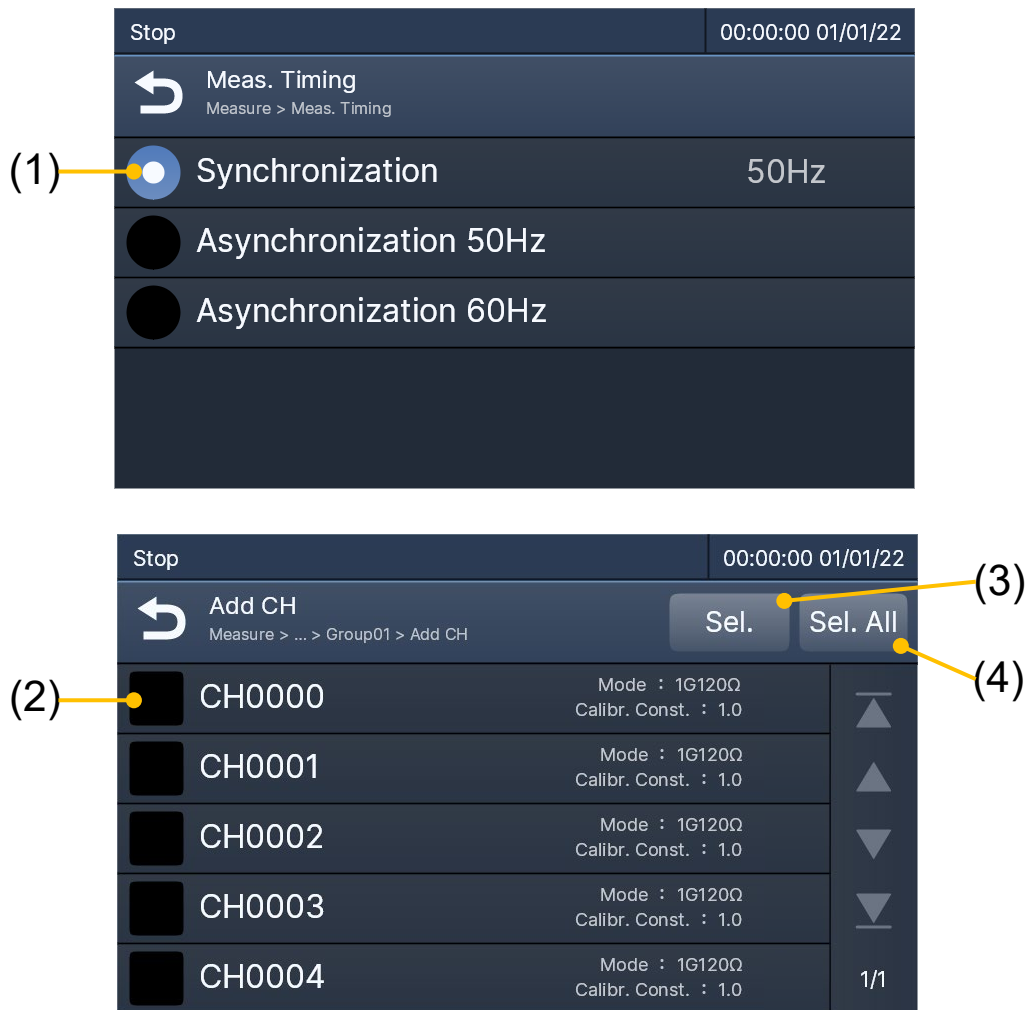
The basic methods of operating the screen are described below.

4-2-1. Moving between Screens/Pages



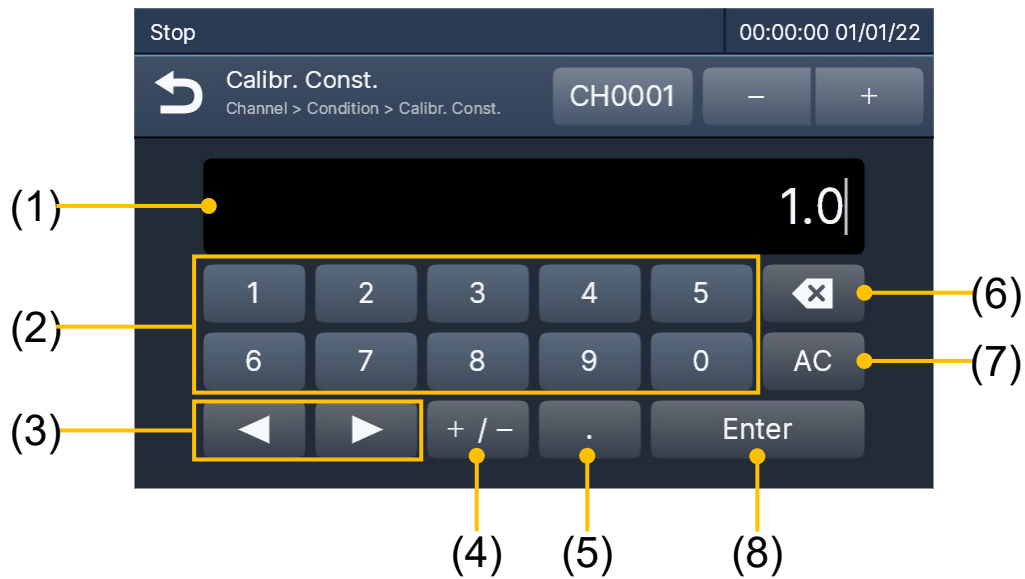
Number	Name	Function
1	Back button	Returns to the previous screen.
2	Arrow button	Moves to the next screen lower in the hierarchy.
3	Option button	Moves to the Option screen. The Option screen allows you to print what is displayed on the screen, etc.
4	Jump up button	Moves to the top page.
5	Previous page button	Moves one page up.
6	Next page button	Moves one page down.
7	Jump down button	Moves to the bottom page.

4-2-2. Selecting Items



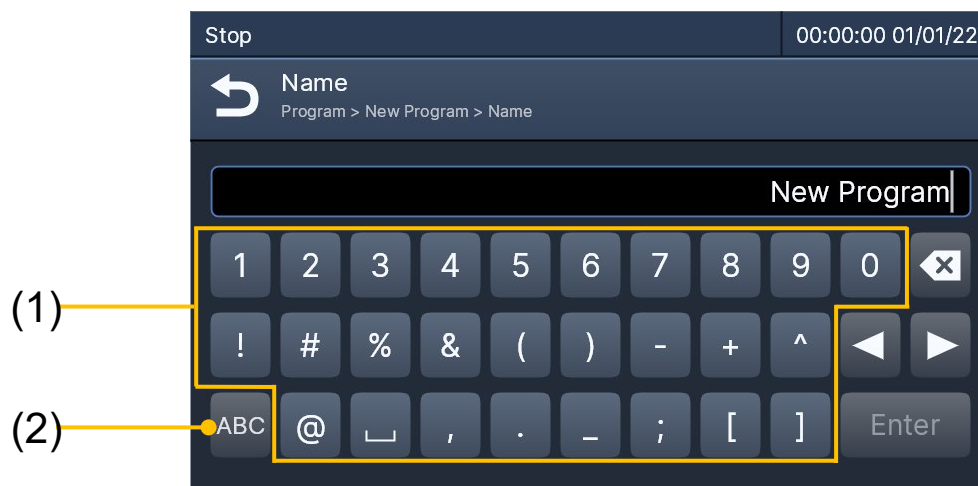
Number	Name	Function
1	Radio button	Used to select one of multiple items.
2	Check box	Used to select one or several of multiple items.
3	Select range button	Used to select a range of items.
4	Select all button	Used to select all items at once.

4-2-3. Entering Numbers



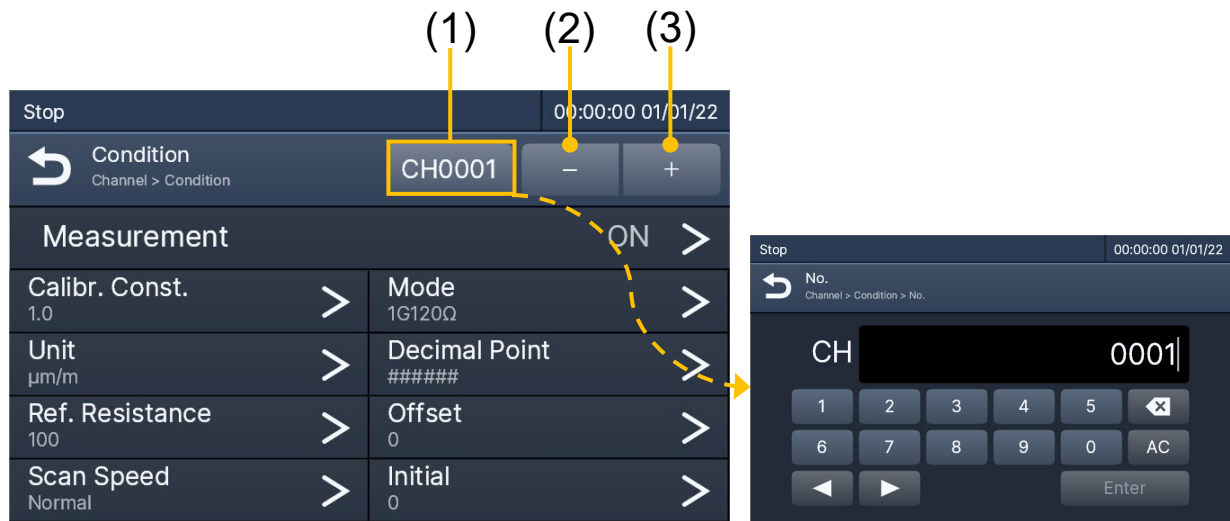
Number	Name	Function
1	Entry field	Used to enter a number. Tap to begin entering information.
2	Number buttons	Used to enter numbers.
3	Move cursor buttons	Moves the entry field cursor left/right.
4	+/- button	Used to select positive/negative numbers.
5	Decimal point button	Used to enter a decimal point.
6	Backspace button	Deletes one digit.
7	Clear all button	Deletes all digits.
8	Confirm button	Confirms the number entered.

4-2-4. Entering Text



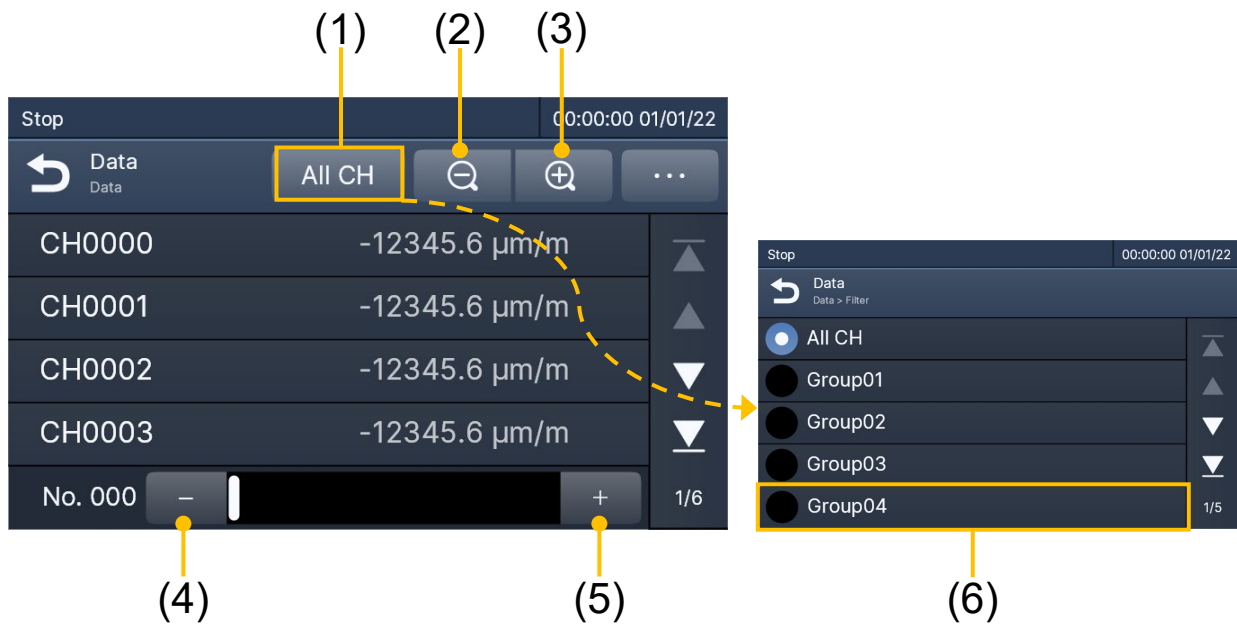
Number	Name	Function
1	Text buttons	Used to enter text characters.
2	Switch text button	Switches the text buttons.
3	Switch case button	Switches between uppercase and lowercase.

4-2-5. Selecting Channels



Number	Name	Function
1	Select channel button	Tap to display a keyboard for selecting a channel. The keyboard can be used to enter a channel number and move to that channel number.
2	Previous channel button	Moves to the previous channel number.
3	Next channel button	Moves to the next channel number.

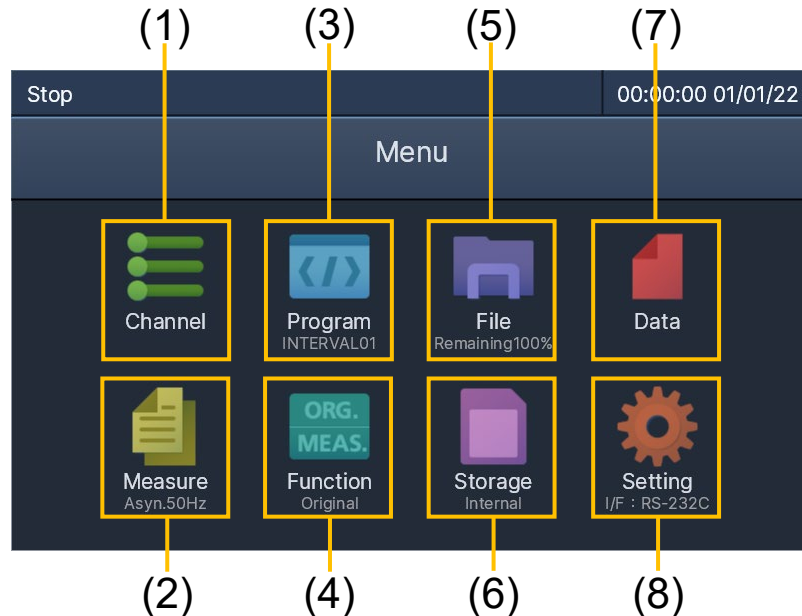
4-2-6. Confirming Measurement Values



Number	Name	Function
1	Filter button	Tap to display a screen for selecting a group. A group can be selected to display only certain channels. Refer to "5-1-5. Group Settings" for details on groups.
2	Shrink button	Increases the number of channels displayed.
3	Expand button	Decreases the number of channels displayed.
4	Previous measurement value button	Displays the previous measurement value.
5	Next measurement value button	Displays the next measurement value.
6	Group	After selecting All CH , tap the Back button to display measurement values for all channels. After selecting Group ** , tap the Back button to display measurement values for channels registered only to Group **. (** will be the group number.)

4-2-7. Menu Screen

Once the software has finished starting, the first screen that is displayed is the **Menu** screen. Tap a button on the **Menu** screen to access the corresponding screen.



Number	Name	Function
1	Channel	Moves to the screen used to configure channels.
2	Measure	Moves to the screen used to configure measurement.
3	Program	Moves to the screen used to configure automatic measurement and programs.
4	Function	Moves to the screen used to set measurement values.
5	File	Moves to the screen used to confirm files, etc.
6	Storage	Moves to the screen used to configure measurement value saving.
7	Data	Moves to the screen for confirming the latest measurement values.
8	Setting	Moves to the screen used to configure this device.



CAUTION

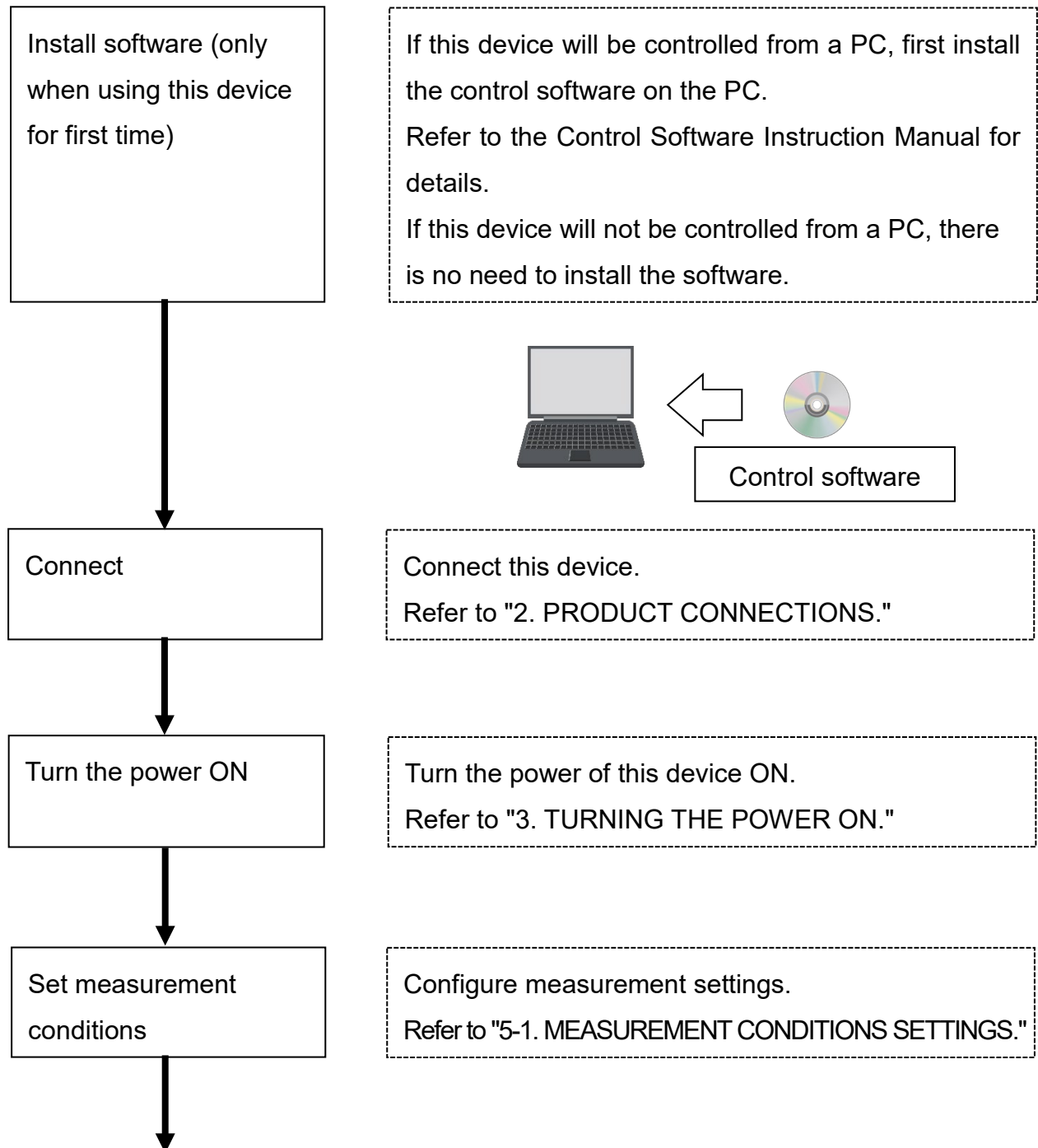
Settings configured in **Channel**, **Measure**, **Program**, **Function**, **Storage**, and **Setting** are applied once you return to the **Menu** screen.

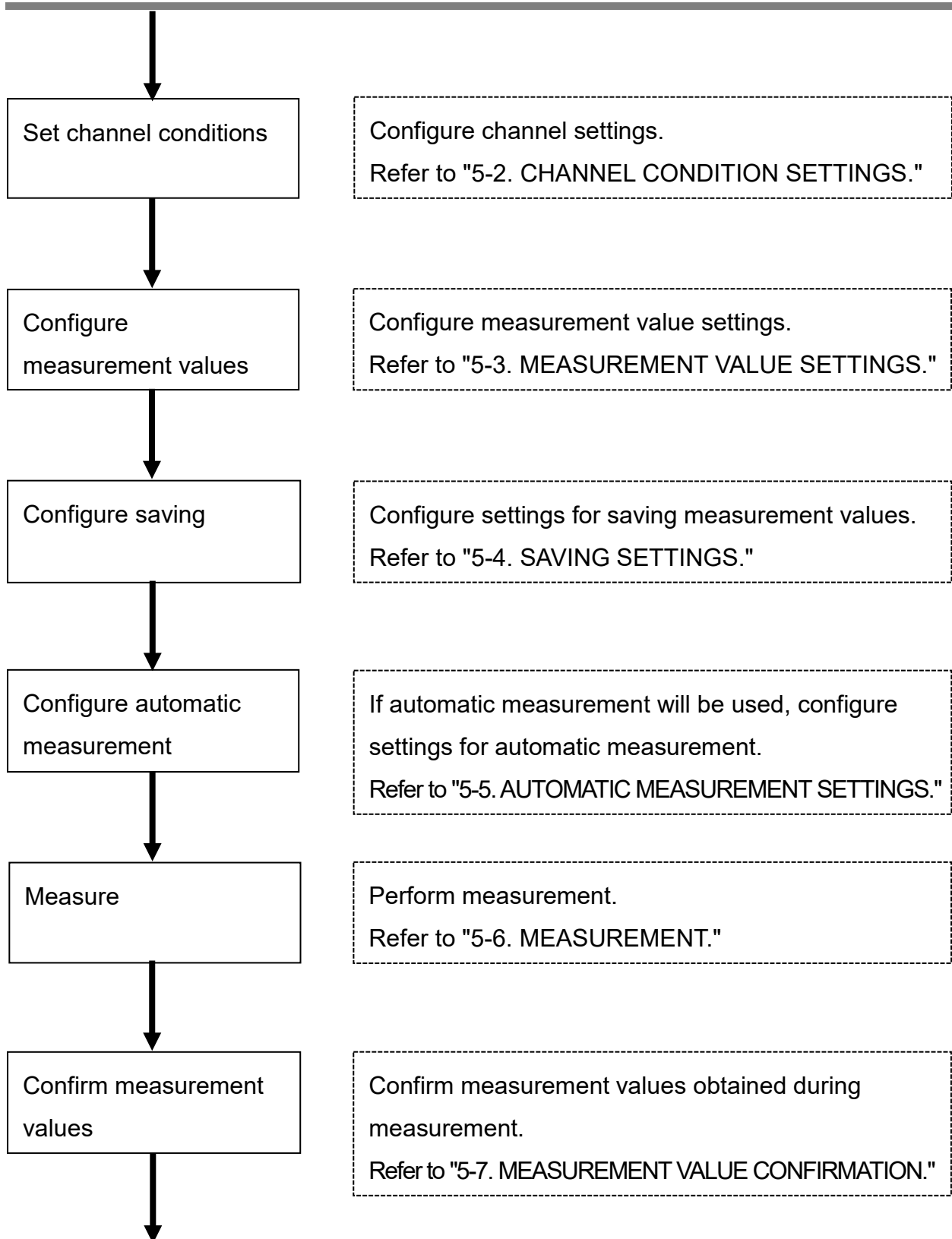
If the power of this device is turned OFF prior to returning to the **Menu** screen, any settings configured on other screens will not be applied to this device.

5. MEASUREMENT PROCEDURE

The procedure from connecting the device to measuring data is shown below. Follow this procedure to start working.

Refer to "6. FUNCTIONS" for an explanation of other functions.





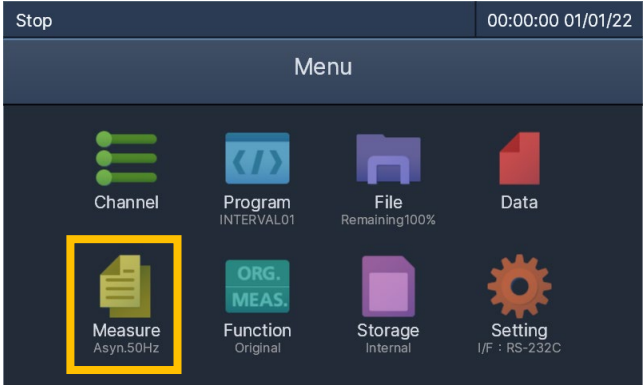


Collect measurement
data files

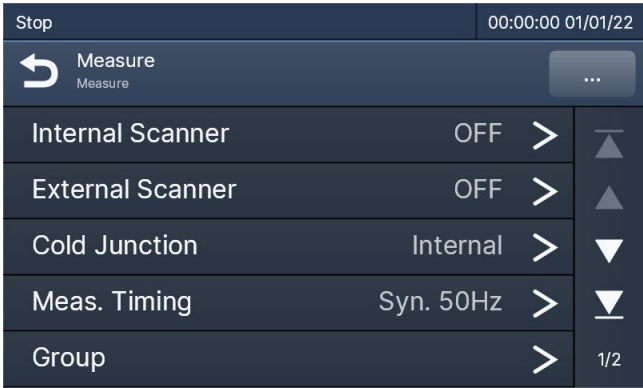
If this device will be controlled from a PC, use the control software to collect measurement data files. If this device will not be controlled from a PC, use a USB memory device or SD card to collect measurement data files. The file format for measurement data files is KU1. The CSV conversion function of this device can also be used to convert the file format to CSV.

5-1. MEASUREMENT CONDITIONS SETTINGS

Measurement settings are called "measurement conditions."
This section describes how to set measurement conditions.



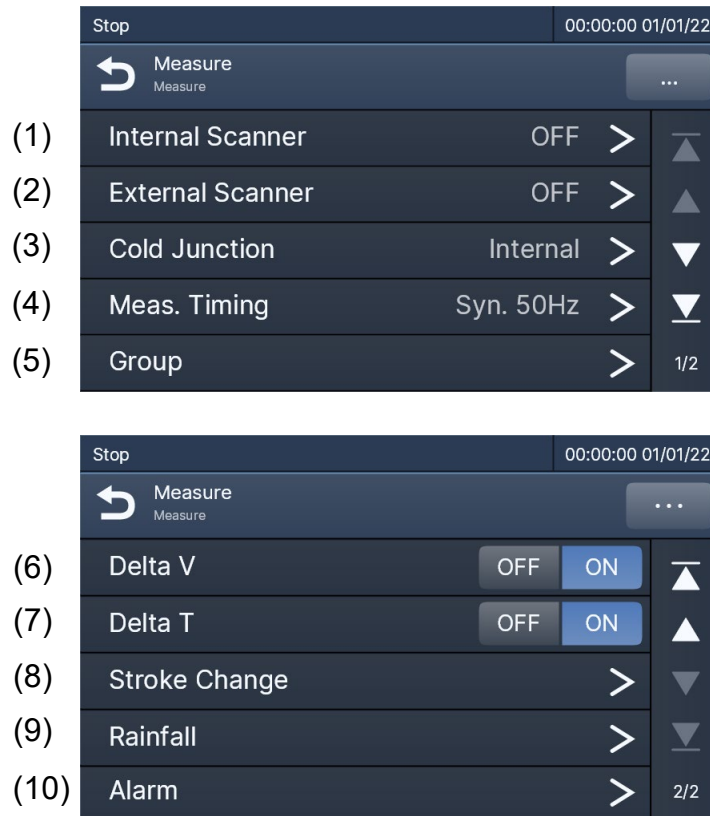
1. Tap **Measure** on the **Menu** screen.



2. The **Measure** screen is displayed.

The **Measure** screen is used to set measurement conditions, such as the range of channels used.

The following functions are available on the **Measure** screen.



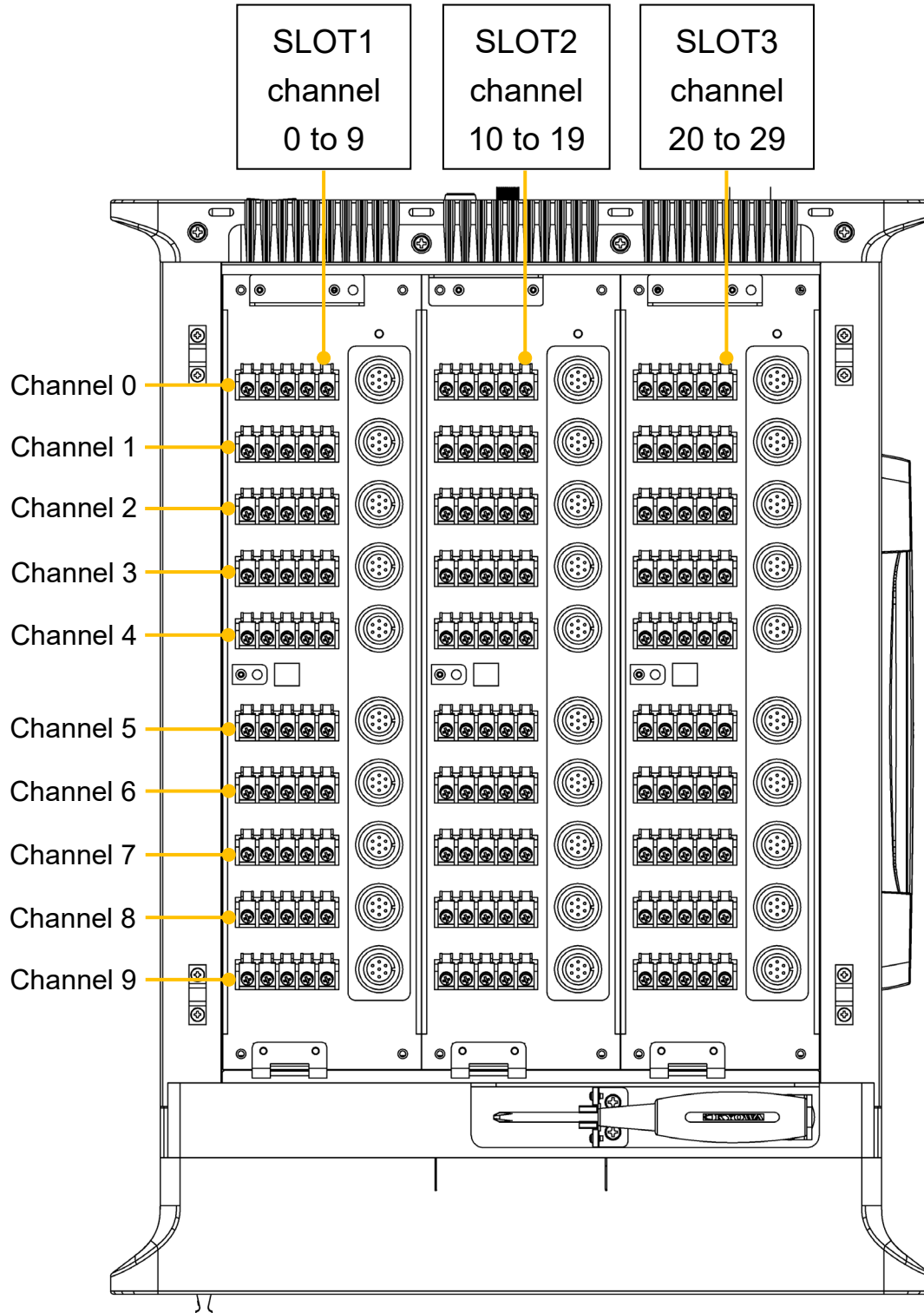
Number	Name	Function	Reference Page
1	Internal Scanner	Scanning unit settings	5-1-1
2	External Scanner	External scanner settings	5-1-2
3	Cold junction	Cold junction compensation settings	5-1-3
4	Meas. Timing	Measurement timing settings	5-1-4
5	Group	Group settings	5-1-5
6	Delta V	Delta V ON/OFF	5-1-6
7	Delta T	Delta T ON/OFF	5-1-6
8	Stroke Change	Stroke change execution ^{*1}	6-1
9	Rainfall	Rainfall input settings ^{*2}	6-2-3
10	Alarm	Alarm settings ^{*3}	6-2-4

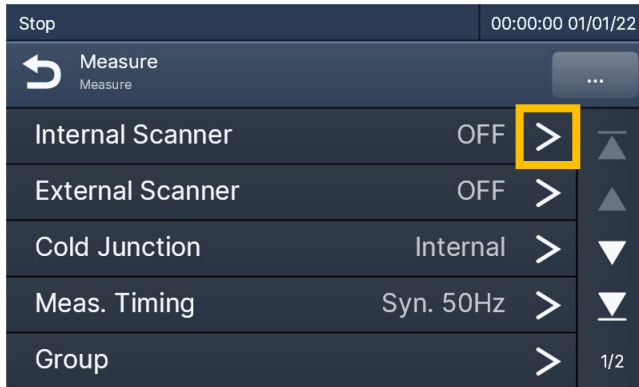
- *1) No need to be executed if the stroke change function is not used.
- *2) No need to be configured if the External I/O Unit rainfall input function is not used.
If an External I/O Unit is not connected, Rainfall cannot be tapped.
- *3) No need to be configured if the External I/O Unit alarm function is not used.
If an External I/O Unit is not connected, Alarm cannot be tapped.

5-1-1. Scanning Unit Settings

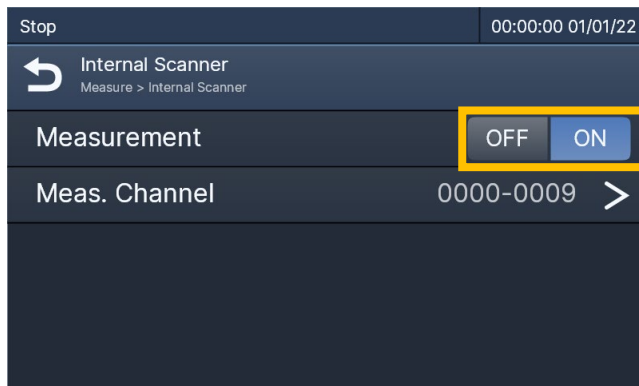
Devices connected to the top of this device are called "scanning units."

The relationship between scanning units and channel numbers is shown below.



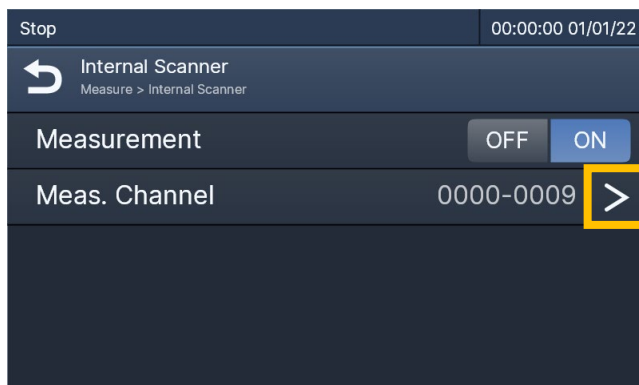


1. Tap **Internal Scanner**.

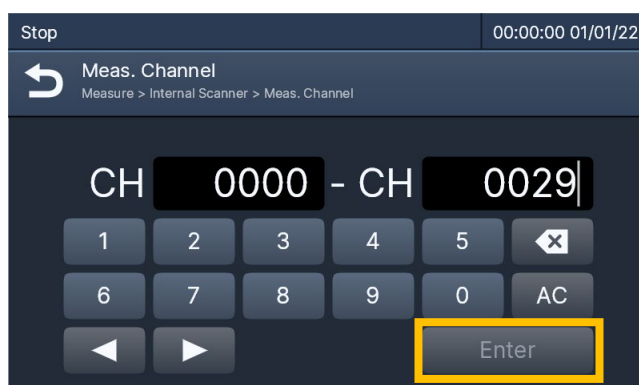


2. If using a scanning unit,
tap **ON**.

If not using a scanning unit,
tap **OFF**.

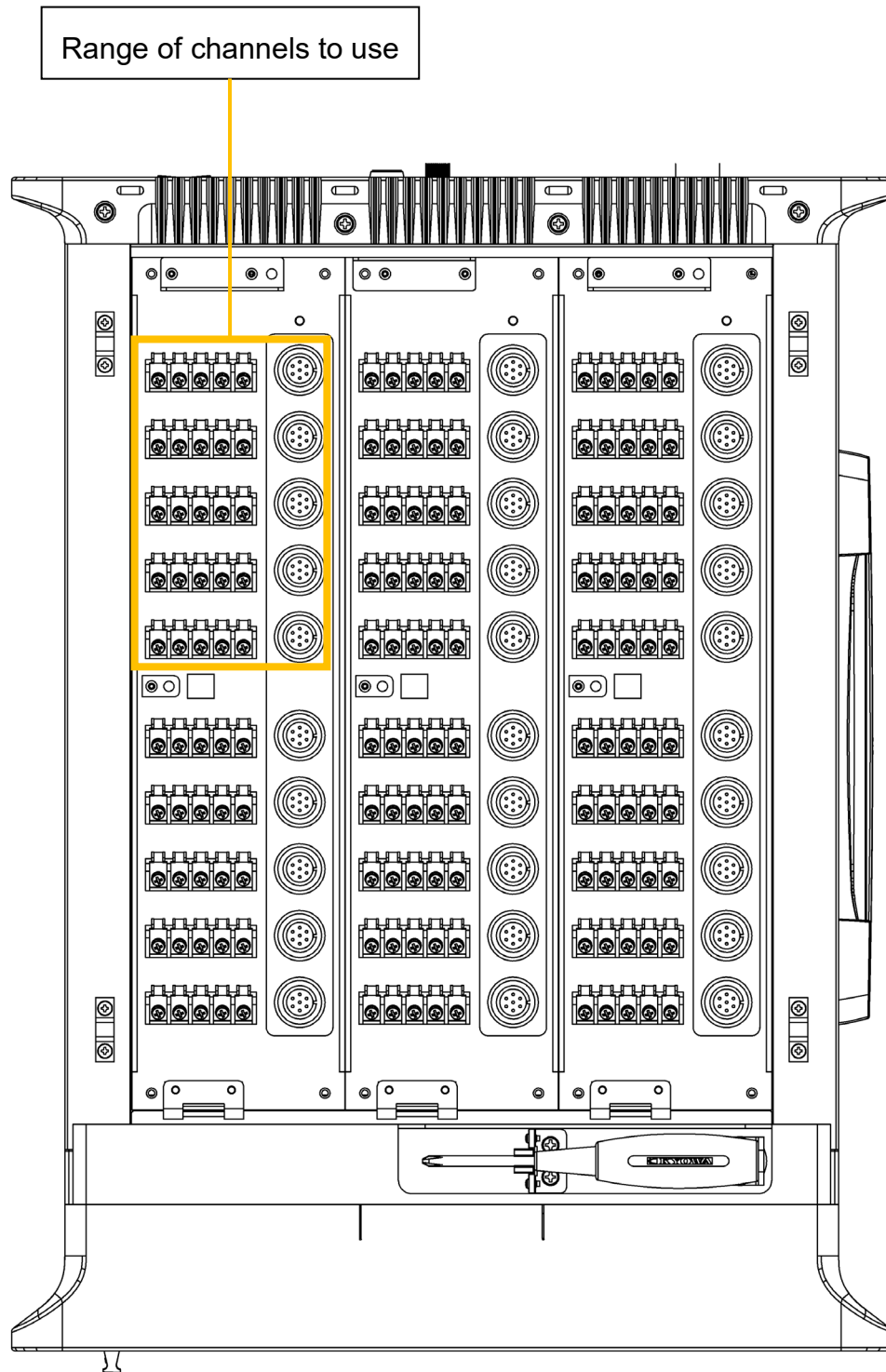


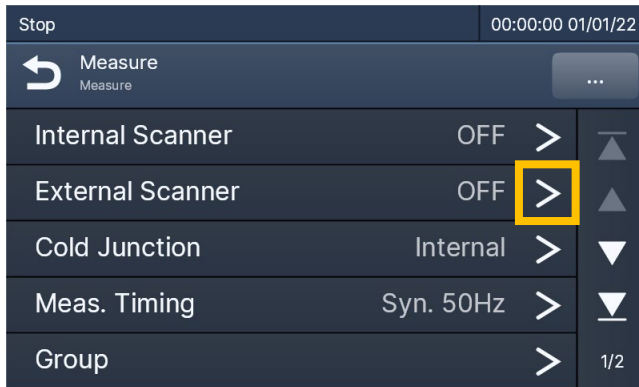
3. If using a scanning unit,
tap **Meas. Channel**.



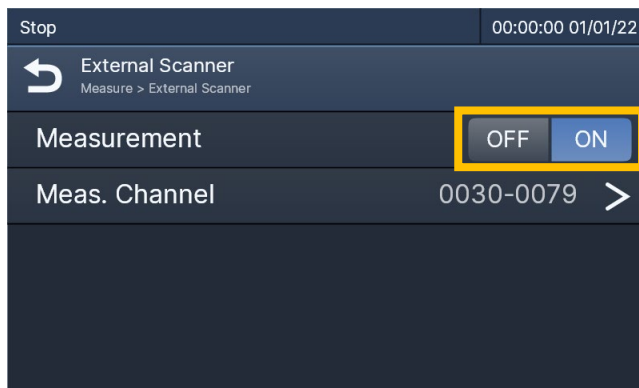
4. After entering the range of
channels to use,
tap the **Enter** button.

For example, if using channels 0 through 4 on SLOT1 (indicated below in the yellow box), the first channel number would be 0 and the last channel number would be 4. Enter a channel range from 0000 to 0004.



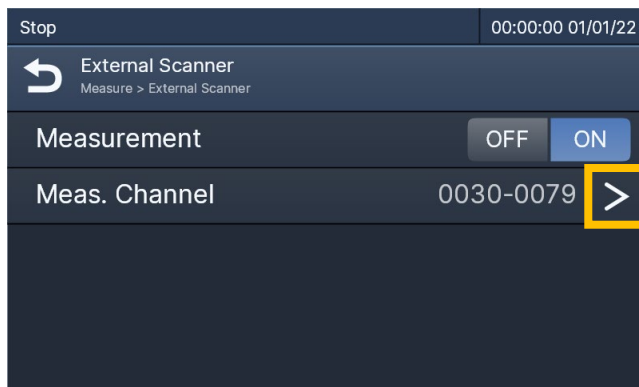


1. Tap **External Scanner**.

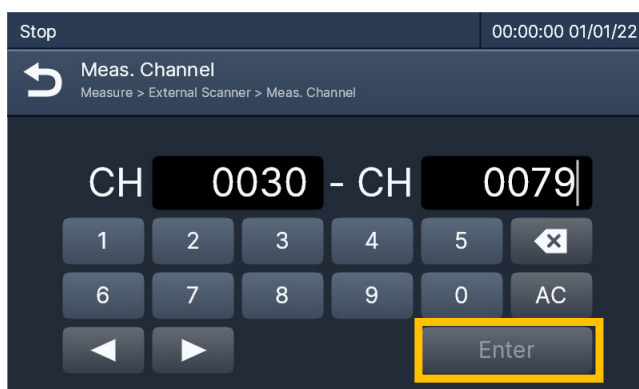


2. If using an external scanner, tap **ON**.

If not using an external scanner, tap **OFF**.



3. If using an external scanner, tap **Meas. Channel**.

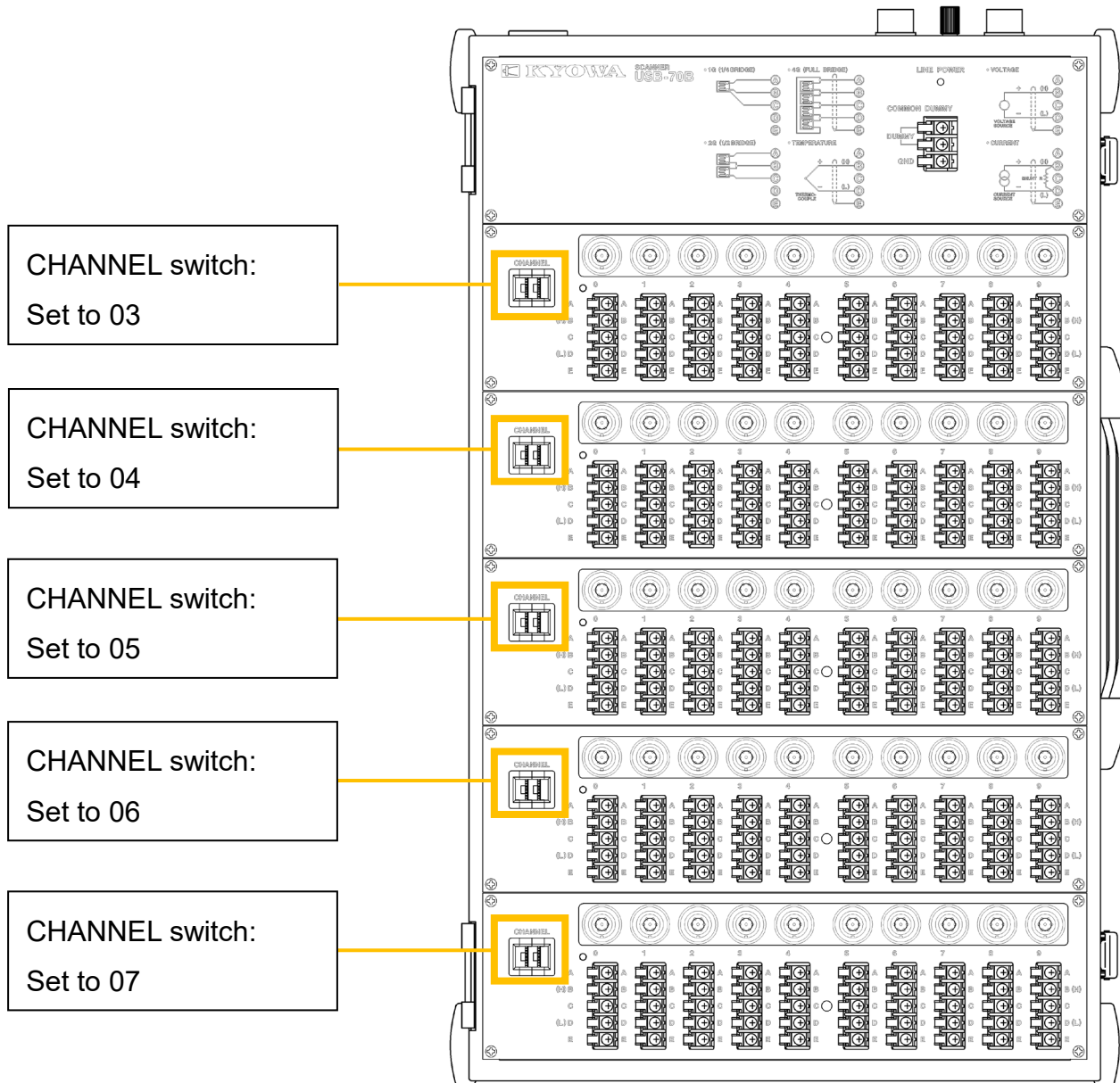


4. After entering the range of channels to use, tap **Enter**.

5. **CHANNEL switch settings when using USB-80A/70B**

To prevent any overlap with the range of channels set for **Internal Scanner**, configure the USB-80A/70B CHANNEL switches.

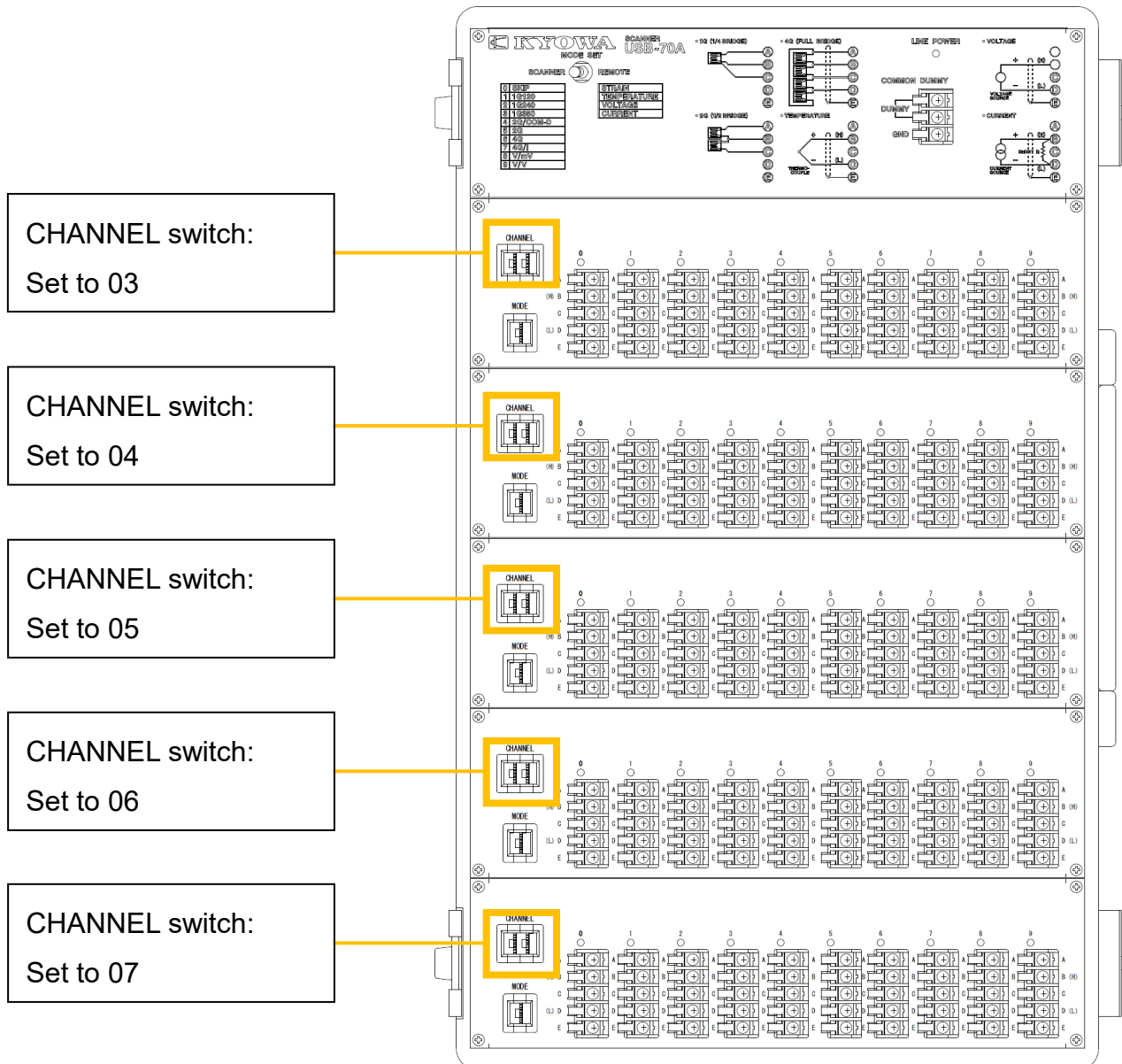
For example, if the range of channels set for **Internal Scanner** is 0000 to 0029, configure the USB-80A/70B CHANNEL switches as follows.



6. **CHANNEL switch settings when using USB-70A**

To prevent any overlap with the range of channels set for **Internal Scanner**, configure the USB-70A CHANNEL switches.

For example, if the range of channels set for **Internal Scanner** is 0000 to 0029, configure the USB-70A CHANNEL switches as follows.

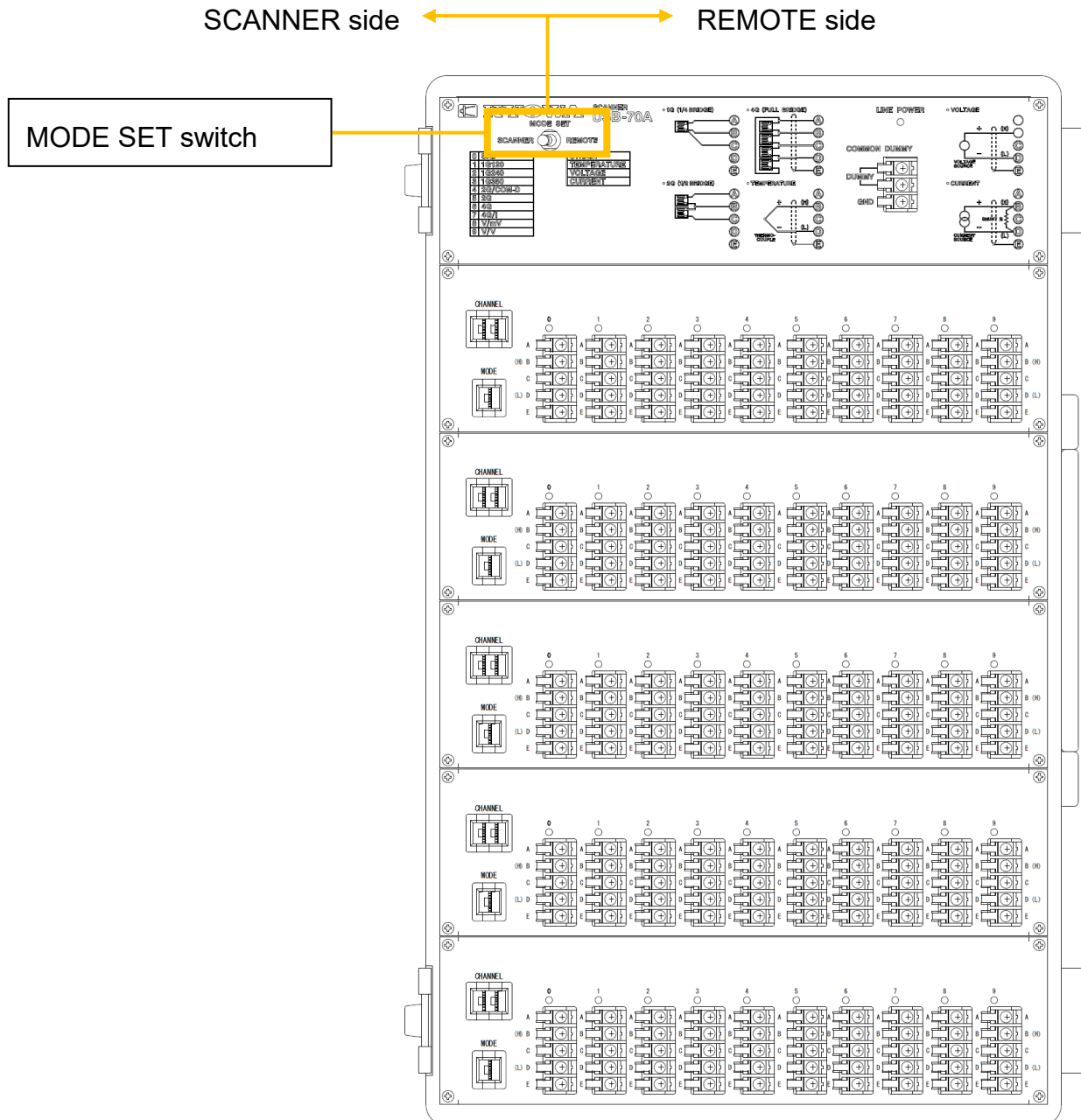


7. **MODE SET switch setting when using USB-70A**

If using the screen of this device to set the channel mode of USB-70A, set the MODE SET switch to REMOTE.

If using the USB-70A MODE switch to set the channel mode of USB-70A, set the MODE SET switch to SCANNER.

Refer to "5-2-6. Channel Mode Settings" for details on channel modes.



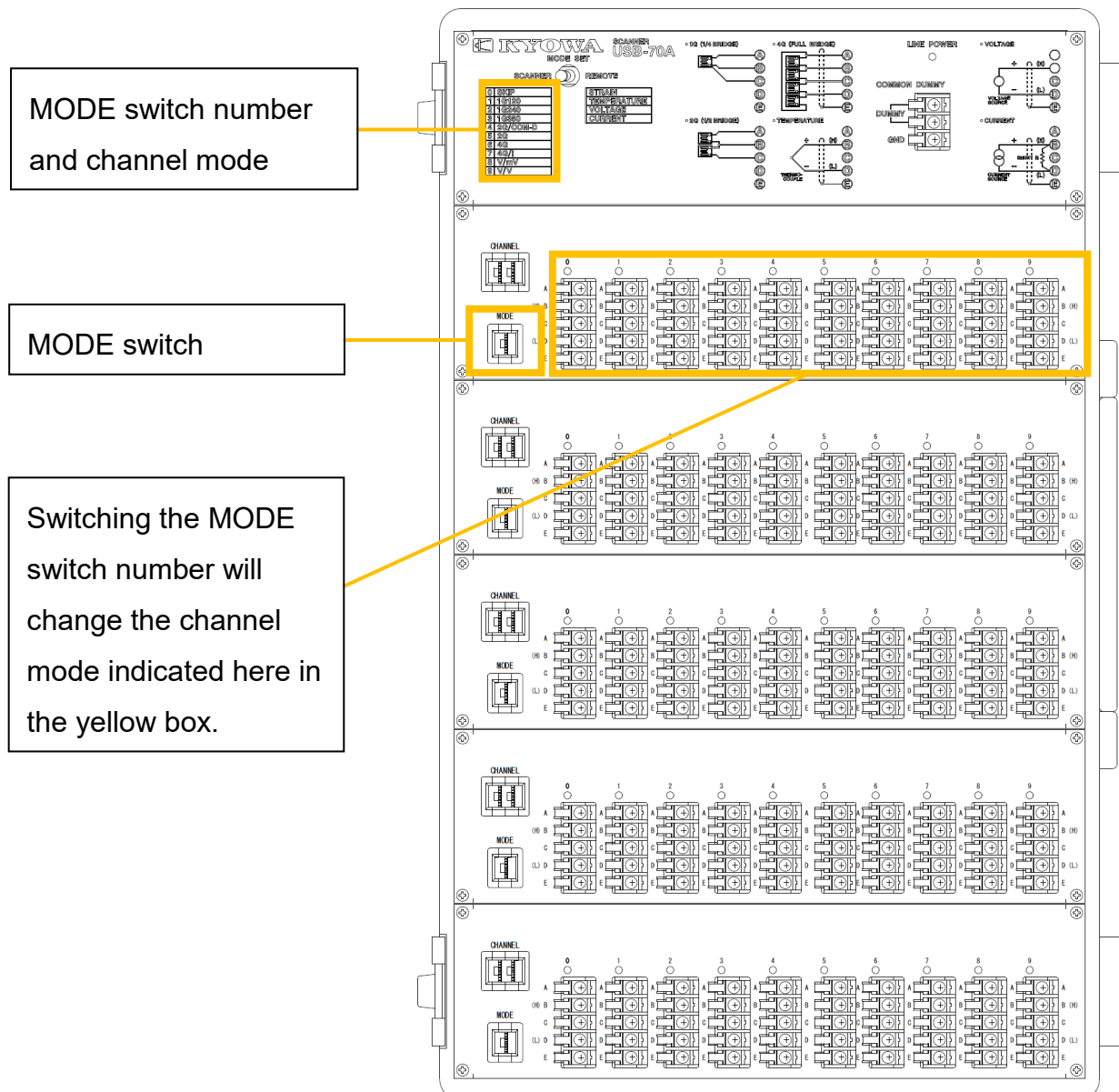
8. MODE switch setting when using USB-70A

If the USB-70A MODE SET switch is set to SCANNER, the USB-70A MODE switch can be set to select the USB-70A channel mode.

The relationship between the MODE switch number and channel mode is shown toward the top of USB-70A.

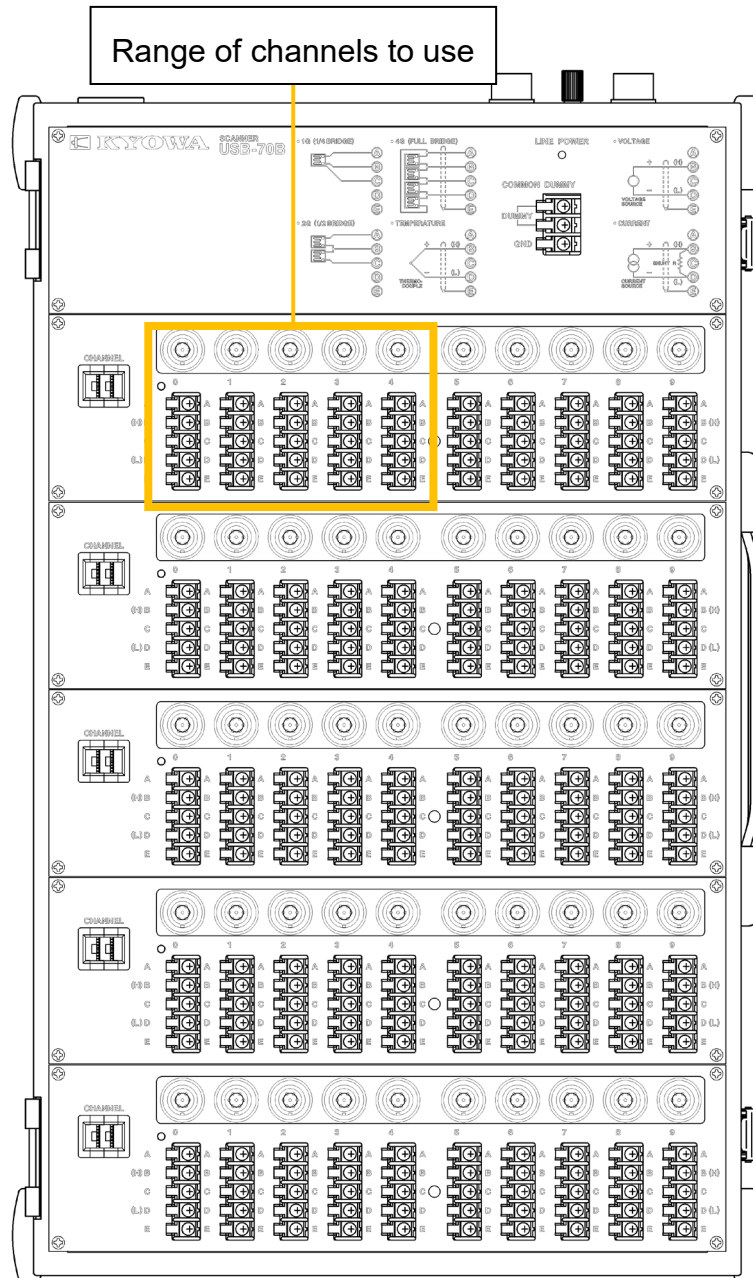
Use the screen on this device to set the channel mode to USB70A-S.

Refer to "5-2-6. Channel Mode Settings" for information on setting the mode to USB70A-S.



9. Enter the range of channels to use for USB-70A/70B/80A.

For example, if using channels 30 through 34 in the first slot (indicated in the yellow box below), the first channel number would be 30 and the last channel number would be 34. Enter a channel range from 0030 to 0034.



CAUTION

- If using internal scanners and external scanners, set the external scanner channel numbers from 30 or more.
- If using internal scanners and external scanners, the external scanner channel numbers must be larger than the internal scanner channel numbers.

5-1-3. Cold Junction Compensation Settings

If temperature measurement will be performed using a thermocouple, configure the cold junction compensation method.

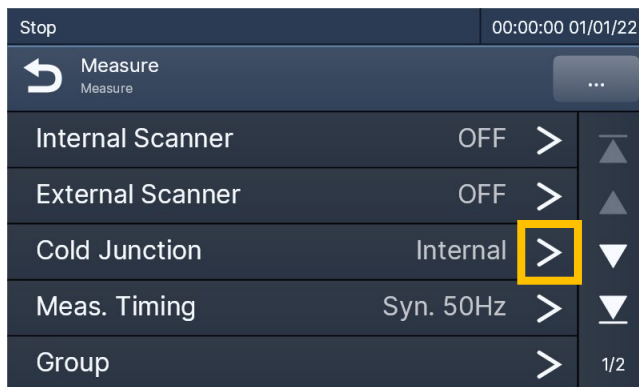
There are two cold junction compensation methods:

(1) Internal

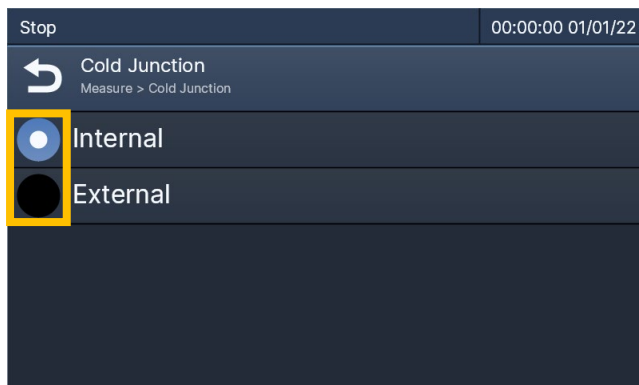
Perform cold junction compensation inside this device.

(2) External

Perform cold junction compensation outside this device, take the output after compensation, and then input it into this device.



1. Tap **Cold Junction**.



2. If cold junction compensation will be performed internally, tap **Internal**.

If cold junction compensation will be performed externally, tap **External**.

5-1-4. Measurement Timing Settings

Set whether to synchronize with the power frequency when performing measurement.

There are three types of measurement timing:

(1) Power synchronized

Measure in synchronization with the power frequency.

When the measurement timing is set to power synchronized, this device will automatically detect the power frequency.

The measurement timing should normally be set to power synchronized.

(2) Power non-synchronized 50 Hz

Measure unsynchronized with the power frequency.

If the power frequency cannot be detected or the power frequency of region in which this device is used is 50 Hz, set the measurement timing to power non-synchronized 50 Hz.

(3) Power non-synchronized 60 Hz

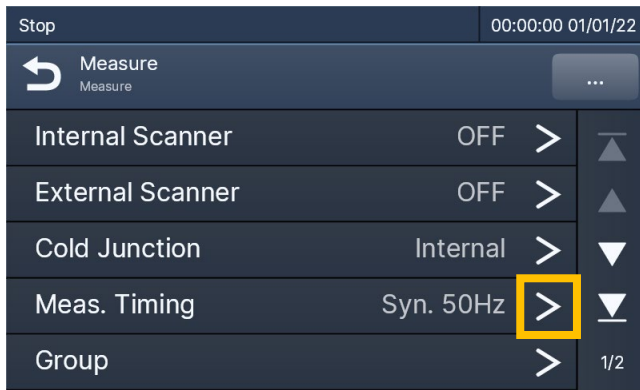
Measure unsynchronized with the power frequency.

If the power frequency cannot be detected or the power frequency of region in which this device is used is 60 Hz, set the measurement timing to power non-synchronized 60 Hz.

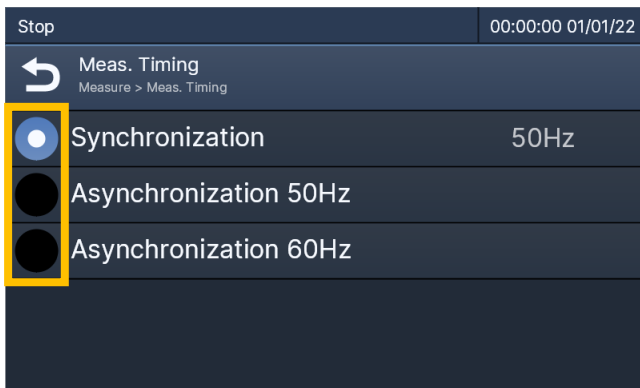


CAUTION

- If the measurement timing is set to power non-synchronized, be sure to set the power frequency of the region in which this device is used.
- If the power frequency does not match, it could cause measurement value inconsistency or other issues.

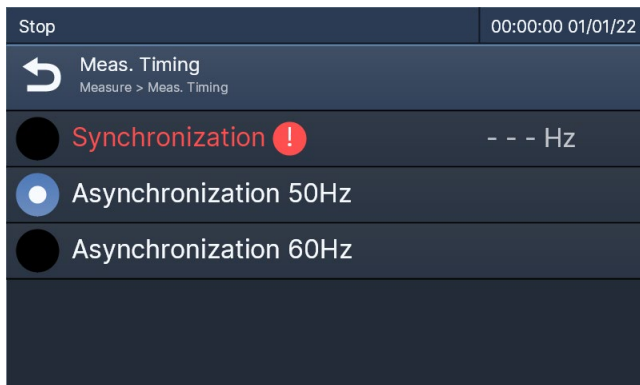


1. Tap **Meas. Timing**.



2. Tap the measurement timing to set.

If the measurement timing is set to power synchronized but this device cannot detect the power frequency, the **Meas. Timing** screen will appear as shown below.

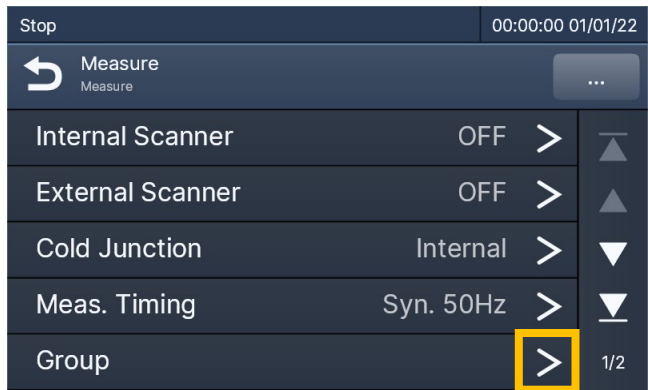


If the power frequency could not be detected, set the measurement timing to power non-synchronized.

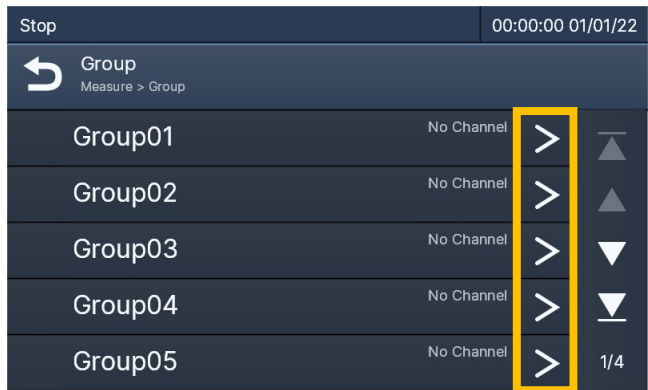
5-1-5. Group Settings

Groups are used to display only certain channels during measurement. Channels to display in a group can be registered ahead of time, in order to display only certain channels from among multiple channels.

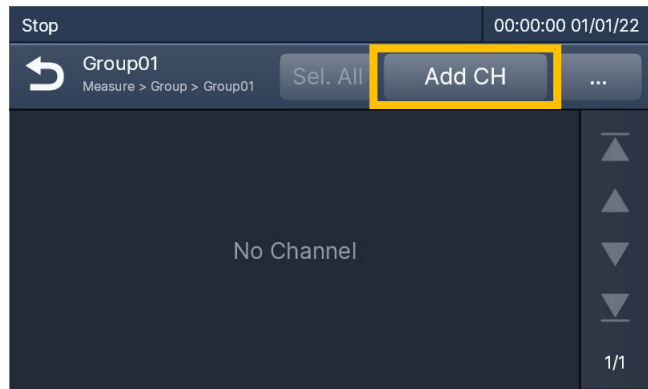
The procedure for registering channels to a group is described below.



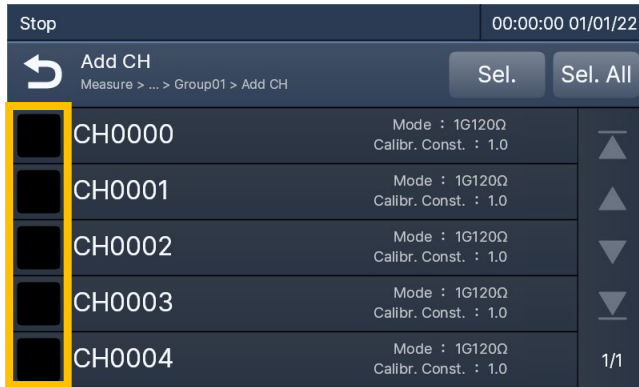
1. Tap **Group**.



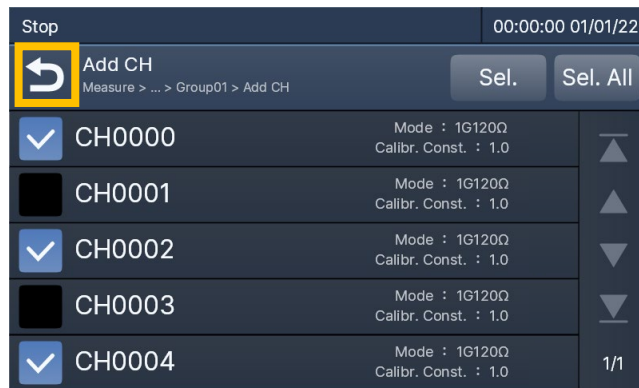
2. Tap the group to add channels.



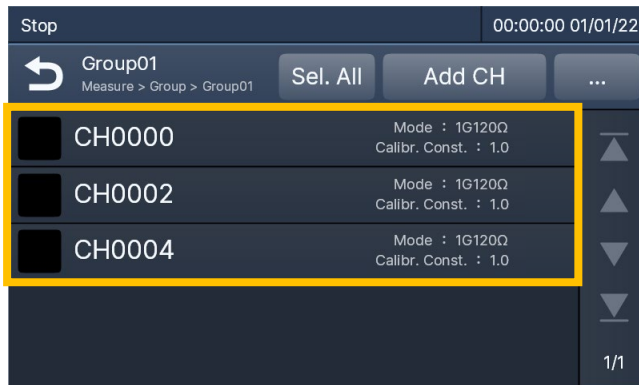
3. Tap **Add CH**.



4. Tap the check boxes of the channels to register to the group.



5. Tap the Back button.

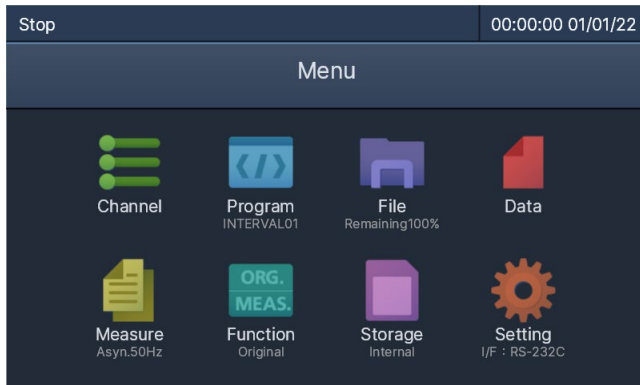


6. The channels are added to the group.



- There are 20 groups.
- Up to 50 channels may be registered to a single group.

The procedure for using a group to display only certain channels is described below. The procedure when monitoring is shown here as an example.



1. After moving to the **Menu** screen, press the monitor key.



2. After moving to the **Monitor** screen, tap **CH**.



3. Tap the group that contains the channels to view.

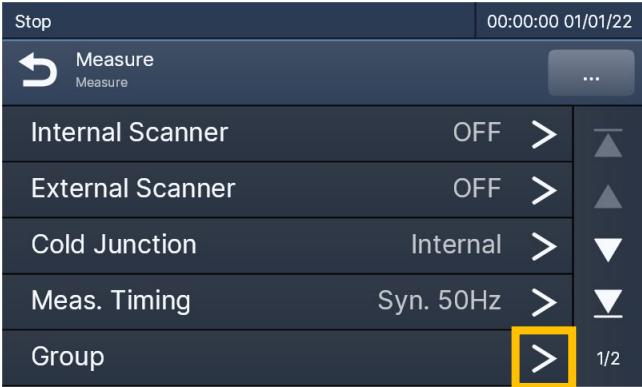


4. Tap the Back button.

Monitoring		00:00:00 01/01/22
 Monitor Monitor		Group01  
CH0000	-12345.6 mV	
CH0002	-12345.6 mV	
CH0004	-12345.6 mV	
		
		1/1

5. Only the channels registered to the group are displayed.

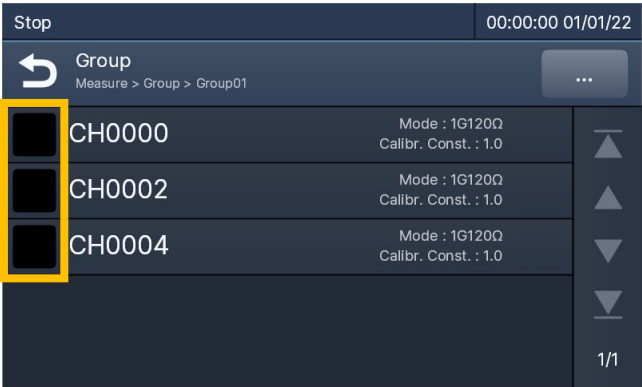
The procedure for deleting a channel from a group is described below.



1. Tap **Group**.



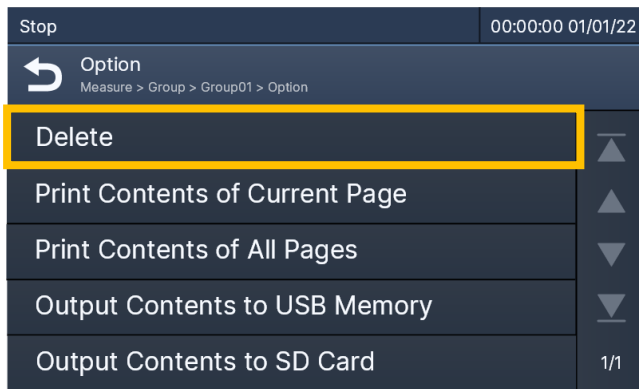
2. Tap the group from which to delete a channel.



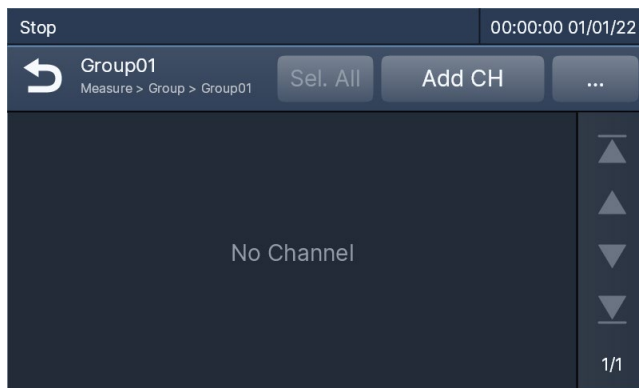
3. Tap the channel to delete.



4. Tap the Option button.



5. Tap **Delete**.

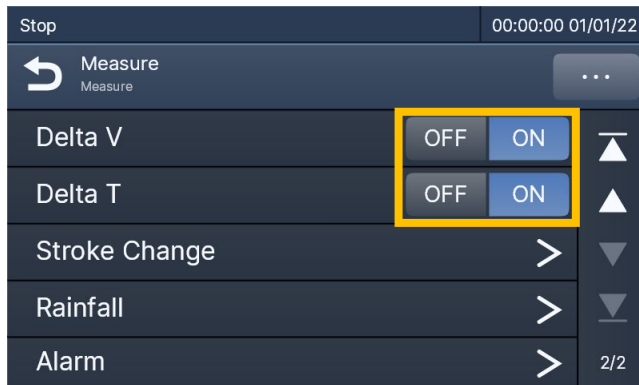


6. The channel is deleted.

5-1-6. Delta V and Delta T Settings

The Delta V function is used to subtract the initial value from the measurement value on a channel with the channel mode set to voltage as the measured object, when the measurement value setting is "measured value."

The Delta T function is used to subtract the initial value from the measurement value on a channel with the channel mode set to temperature as the measured object, when the measurement value setting is "measured value."



1. After moving to the **Measure** screen, turn **Delta V** and **Delta T** ON or OFF.

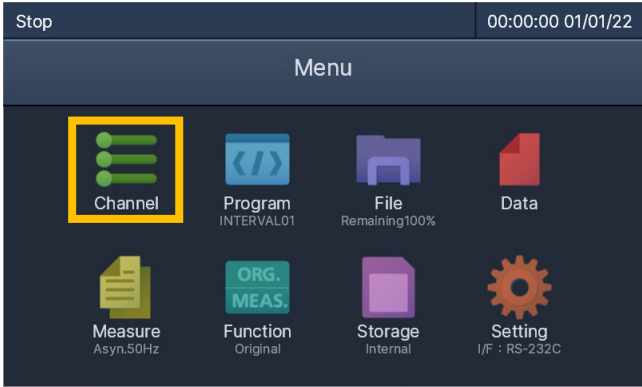
Refer to "5-2-6. Channel Mode Settings" for details on channel modes.

Refer to "5-3. MEASUREMENT VALUE SETTINGS" for details on measurement value settings.

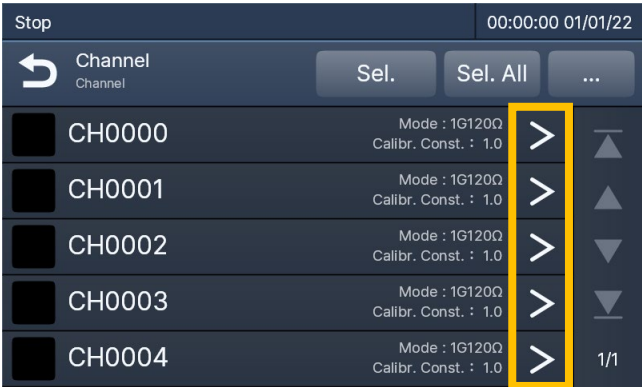
Refer to "5-3-2. Initial Value Measurement" for details on the initial value.

5-2. CHANNEL CONDITION SETTINGS

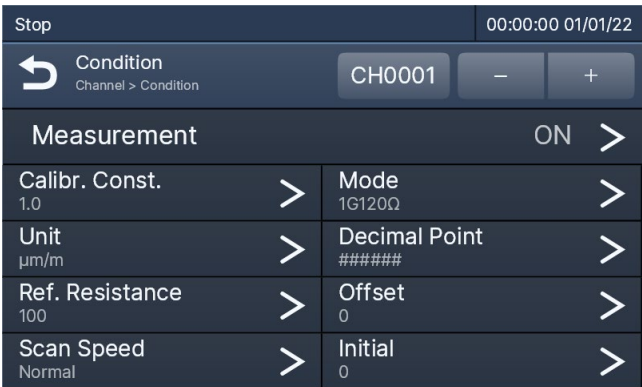
Channel settings are called "channel conditions."
This section describes how to set channel conditions.



1. Tap **Channel** on the **Menu** screen.



2. Tap the arrow button of the channel to set.

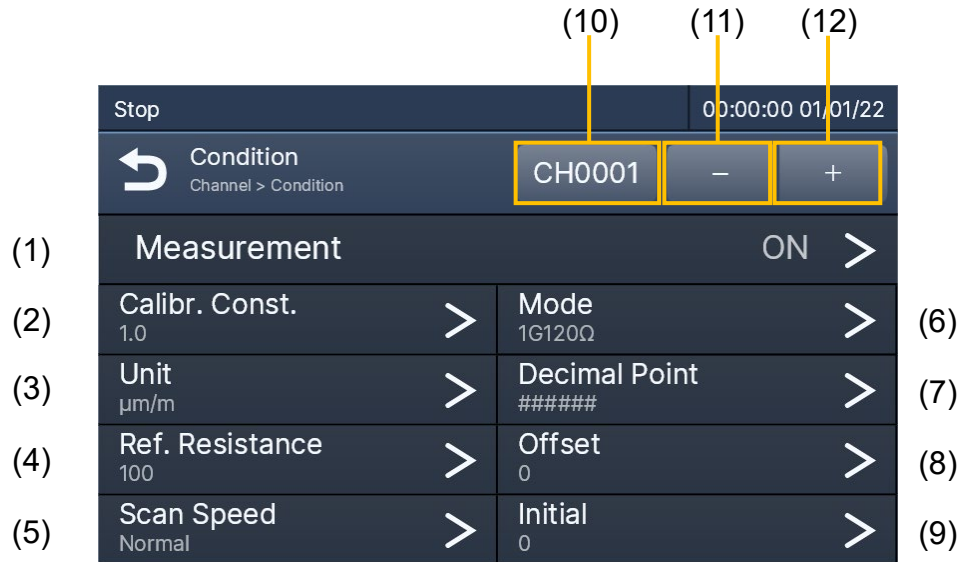


3. The **Condition** screen is displayed.

The **Condition** screen is used to set the calibration coefficient and other channel conditions.

Channel conditions are set for each channel.

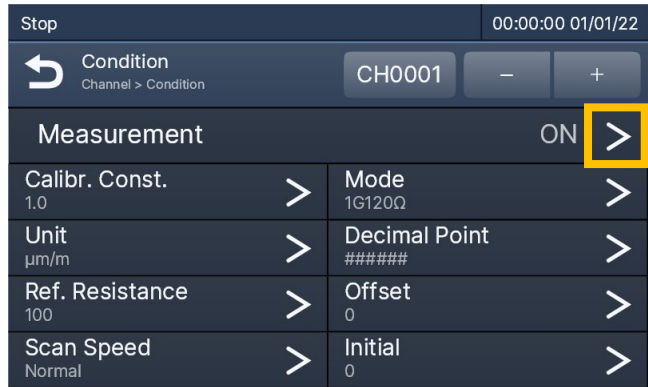
The following functions are available on the **Condition** screen.



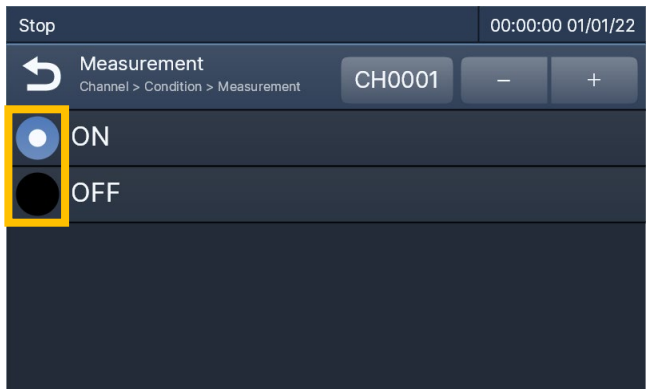
Number	Name	Function	Reference Page
1	Measurement	Measurement ON/OFF	5-2-1
2	Calibr. Const.	Calibration coefficient settings	5-2-2
3	Unit	Unit settings	5-2-3
4	Ref. Resistance	Reference resistance value settings	5-2-4
5	Scan speed	Scanning speed settings	5-2-5
6	Mode	Channel mode settings	5-2-6
7	Decimal Point	Decimal point position settings	5-2-7
8	Offset	Offset value settings	5-2-8
9	Initial	Initial value settings	5-2-9
10	Select channel button	Selects the channel number to set	4-2-5
11	Previous channel button	Moves to the previous channel number	4-2-5
12	Next channel button	Moves to the next channel number	4-2-5

5-2-1. Measurement ON/OFF

Turn **Measurement** ON for any channels used for measurement.



1. Tap **Measurement**.



2. To turn **Measurement** ON,
tap **ON**.

To turn **Measurement** OFF,
tap **OFF**.

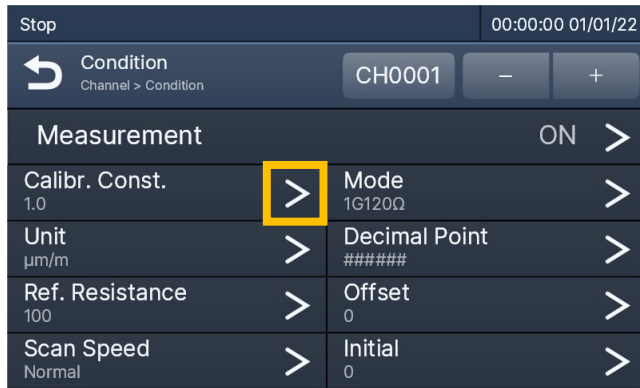
Measurement	Real-Time Measurement, Automatic Measurement, During Monitoring
ON	Measure
OFF	Do not measure (measurement values will not be saved)

Refer to "5-6-1. Real-Time Measurement" for details on real-time measurement.
Refer to "5-6-2. Automatic Measurement" for details on automatic measurement.
Refer to "5-6-3. Monitor" for details on monitoring.

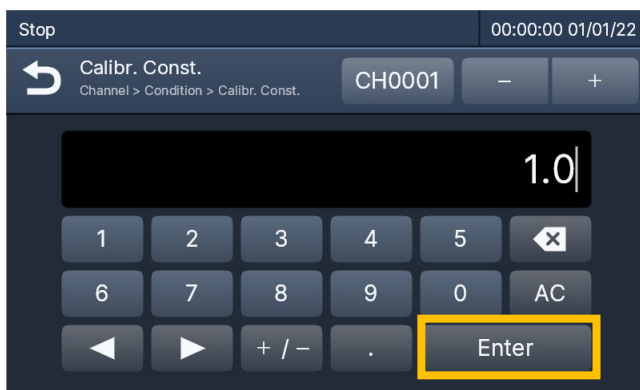
5-2-2. Calibration Coefficient Settings

The calibration coefficient is used to convert measurement values into physical quantities.

Set the calibration coefficient in order to convert measurement values into physical quantities.



1. Tap **Calibr. Const.**.



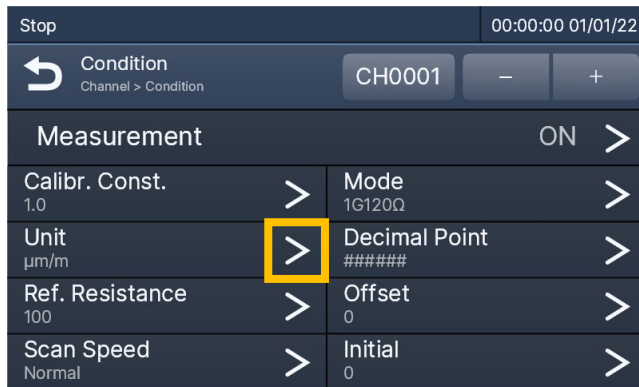
2. Enter the calibration coefficient and then tap **Enter**.

Calibration coefficient calculation must be turned ON in order to apply the calibration coefficient to measurement values.

Refer to "5-3-3. Calibration Coefficient Calculation Settings" for details on calibration coefficient calculation.

5-2-3. Unit Settings

If calibration coefficient calculation is enabled, set the unit for displaying physical quantities.



1. Tap **Unit**.



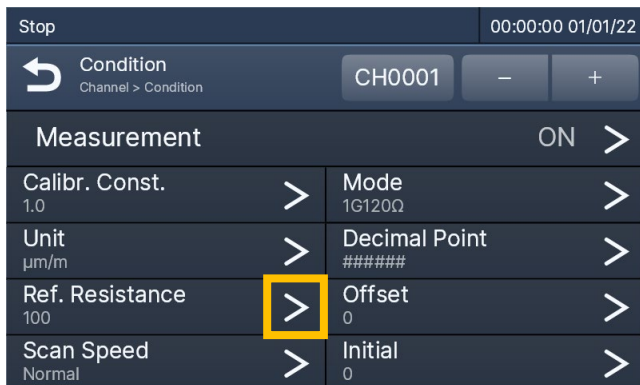
2. Tap the unit to set.



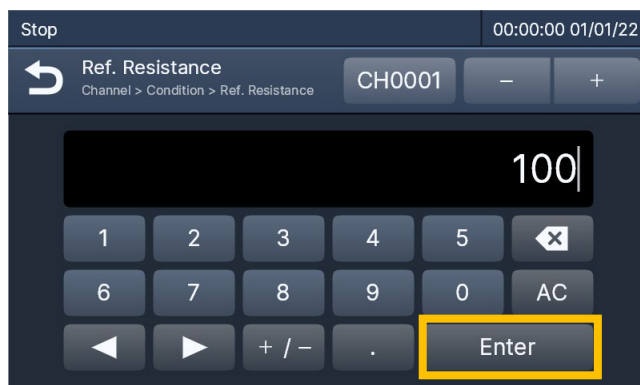
- The unit can also be set by tapping one of the units shown in **Log**.
- **Log** shows the most recently set units.
- If calibration coefficient calculation is disabled, the channel mode will determine the unit displayed.

5-2-4. Reference Resistance Value Settings

The reference resistance value is the resistance at 0°C for a platinum resistance thermometer or civil engineering transducer with temperature measuring function. If using a platinum resistance thermometer or civil engineering transducer with temperature measuring function, set the reference resistance value.



1. Tap **Ref. Resistance**.



2. Enter the reference resistance value (unit: Ω), and then tap **Enter**.



CAUTION

- Make sure to set the correct reference resistance value.
Setting the wrong value will cause measurement value errors.
- If the reference resistance value is unknown, set a value of 100.
- Do not set a negative value for the reference resistance value.

5-2-5. Scanning Speed Settings

This device performs measurement while switching channels. Measuring while switching channels is called "scanning."

The time required for measurement on one channel is called the "scanning speed."

Scanning Speed	Description
High speed	Measurement is performed at a scanning speed of 20 ms per channel. Only a scanning unit may be used. However, the set channel mode will take priority. Refer to the table on the following page for details.
Normal	Measurement is performed at a scanning speed of 50 ms per channel (for scanning units) or 60 ms per channel (external scanners). However, the set channel mode will take priority. Refer to the table on the following page for details.
0.28 sec	Measurement is performed at a scanning speed of 0.28 s per channel.
0.5 sec	Measurement is performed at a scanning speed of 0.5 s per channel.
1 sec	Measurement is performed at a scanning speed of 1 s per channel.
2 sec	Measurement is performed at a scanning speed of 2 s per channel.
5 sec	Measurement is performed at a scanning speed of 5 s per channel.
10 sec	Measurement is performed at a scanning speed of 10 s per channel.



CAUTION

- If using high speed, scanning unit channels must all be set to high speed.
- Do not set high speed for external scanners.
- If using the device in a region with a 60 Hz power frequency, high speed will be 16.7 ms per channel.

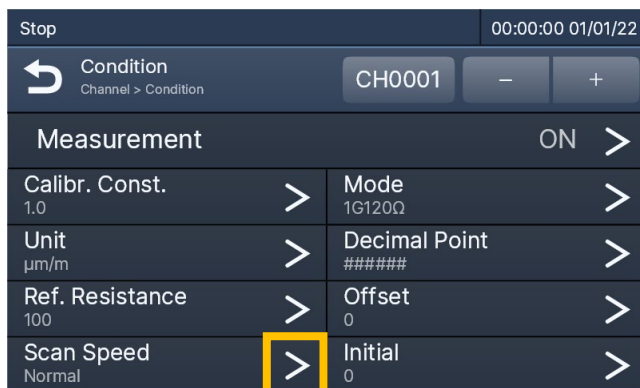
Normal and external scanner speed will be 58.4 ms per channel.

Some scanning speeds may not be compatible depending on the channel mode. For example, a channel set to a channel mode of 4-gage HR will not scan faster than 0.28 sec.

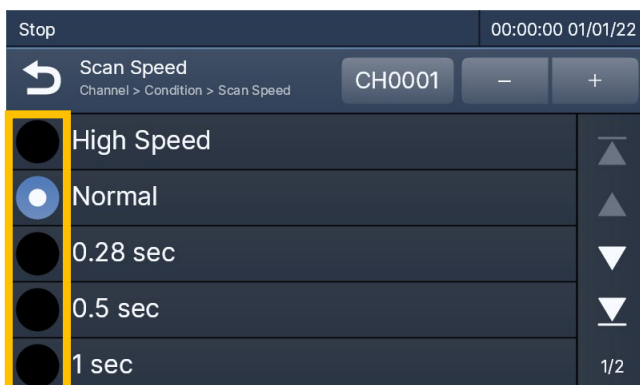
The following table summarizes channel modes and incompatible scanning speeds.

Channel Mode	Incompatible Scanning Speeds
4-gage HR	Normal, high speed
4-gage I (350 Ω)_HR	Normal, high speed
1-gage channel mode	High speed
2-gage channel mode	High speed
4-gage T	High speed
Thermocouple K/T/E/J/R	High speed
Pt100, JPt100	High speed

The procedure for setting the scanning speed is shown below.



1. Tap **Scan Speed**.



2. Tap the scanning speed to set.

5-2-6. Channel Mode Settings

Modes compatible with each sensor connected to this device or an external scanner must be set for each channel.

These modes are called "channel modes".

Channel Mode	Function	Measured Object
1G 120 Ω	1-gage (120 Ω , BV2V)	Strain
1G 240 Ω	1-gage (240 Ω , BV2V)	Strain
1G 350 Ω	1-gage (350 Ω , BV2V)	Strain
1G 120 Ω D	1-gage (120 Ω , dummy, BV2V)	Strain
1G 120 Ω A	1-gage (120 Ω , active, BV2V)	Strain
1G 350 Ω D	1-gage (350 Ω , dummy, BV2V)	Strain
1G 350 Ω A	1-gage (350 Ω , active, BV2V)	Strain
2G A-D	2-gage (active, dummy, BV2V)	Strain
2G A-A	2-gage (active, active, BV2V)	Strain
2G COM-D	2-gage (common dummy, BV2V) ^{*1}	Strain
4G A-A	4-gage (opposite side active, BV2V)	Strain
4G	4-gage (constant voltage, BV2V)	Strain
4G HR	4-gage (constant voltage, BV5V) high-resolution mode ^{*2}	Strain
4G I (120 Ω)	4-gage (constant current, 120 Ω) ^{*2}	Strain
4G I (350 Ω)	4-gage (constant current, 350 Ω)	Strain
4G I (350 Ω)_HR	4-gage (constant current, 350 Ω) high-resolution mode ^{*2}	Strain
4G T	Civil engineering transducer with temperature measuring function ^{*3}	Strain

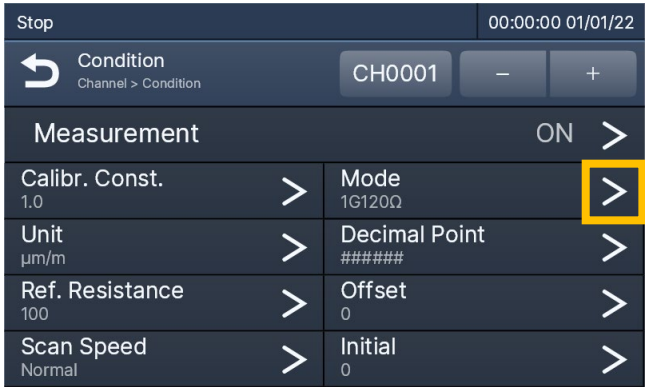
*1) Do not set for scanning unit channels.

*2) Do not set for external scanner (USB-80A-10/20/30, USB-70A-10/20/30, USB-70B-10/20/30) channels.

*3) If the channel mode is set to civil engineering transducer with temperature measuring function, strain measurement values and temperature measurement values will both be obtained. In this case, there will be two measurement values per single channel. Do not set for external scanner (USB-80A-10/20, USB-70A-10/20, USB-70B-10/20) channels.

Channel Mode	Function	Measured Object
1G 120 Ω _5 V	1-gage (120 Ω , BV5V)* ²	Strain
1G 240 Ω _5 V	1-gage (240 Ω , BV5V)* ²	Strain
1G 350 Ω _5 V	1-gage (350 Ω , BV5V)* ²	Strain
1G 120 Ω D_5 V	1-gage (120 Ω , dummy, BV5V)* ²	Strain
1G 120 Ω A_5 V	1-gage (120 Ω , active, BV5V)* ²	Strain
1G 350 Ω D_5 V	1-gage (350 Ω , dummy, BV5V)* ²	Strain
1G 350 Ω A_5 V	1-gage (350 Ω , active, BV5V)* ²	Strain
2G A-D_5 V	2-gage (active, dummy, BV5V)* ²	Strain
2G A-A_5 V	2-gage (active, active, BV5V)* ²	Strain
Pot.	Potentiometer sensor	Strain
Voltage 500 mV	Voltage (500 mV)	Voltage
Voltage 50 V	Voltage (50 V)	Voltage
Current 50 mA	Current (50 mA)	Current
TC K	Thermocouple K	Temperature
TC T	Thermocouple T	Temperature
TC E	Thermocouple E	Temperature
TC J	Thermocouple J	Temperature
TC R	Thermocouple R	Temperature
Pt100	Platinum resistance thermometer 100 Ω (Pt100)* ⁴	Temperature
Jpt100	Platinum resistance thermometer 100 Ω (JPt100)* ⁴	Temperature
USB70A-S	If using a USB-70A External Scanner in SCANNER mode, set to USB70A-S. * ¹	-

*4) Do not set for external scanner (USB-80A-10/20, USB-70A-10/20, USB-70B-10/20) channels.



1. Tap **Mode**.



2. Tap the channel mode to set.

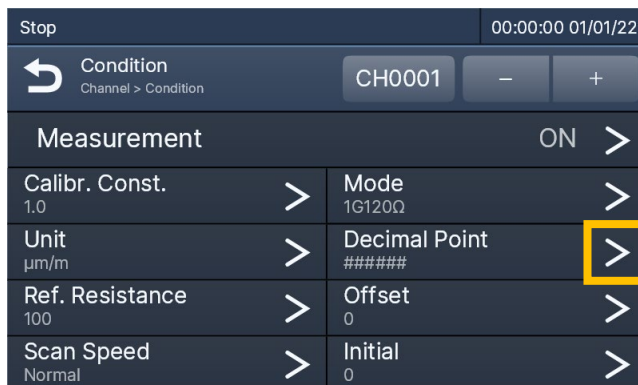


- You can also tap a channel mode in **Log** to set the channel mode.
- **Log** shows the most recently set channel modes.

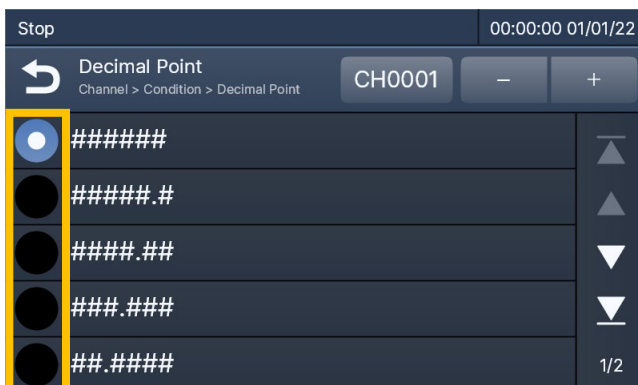
5-2-7. Decimal Point Position Settings

If calibration coefficient calculation is enabled, set the decimal point position when displaying measurement values as physical quantities.

Decimal Point Position	Description
#####	No decimal point
#####.#	Display 1 digit after decimal point
####.##	Display 2 digits after decimal point
###.###	Display 3 digits after decimal point
##.####	Display 4 digits after decimal point
#.#####	Display 5 digits after decimal point



1. Tap **Decimal Point**.

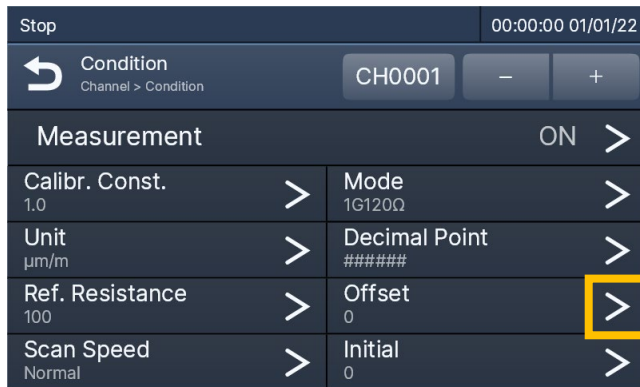


2. Tap the decimal point position to set.

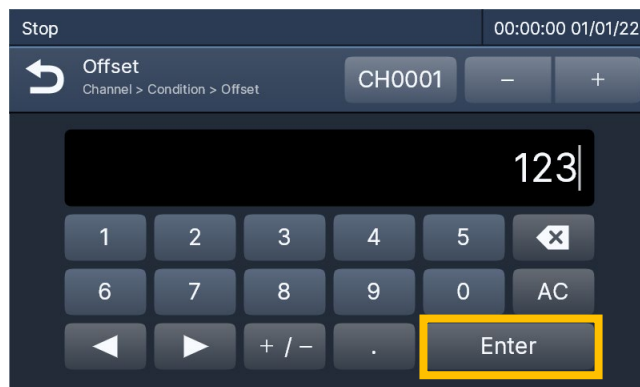
5-2-8. Offset Value Settings

The offset value is a variable applied to measurement values during calibration coefficient calculation.

If using calibration coefficient calculation, set the offset value.



1. Tap **Offset**.



2. Enter the offset value and then tap **Enter**.

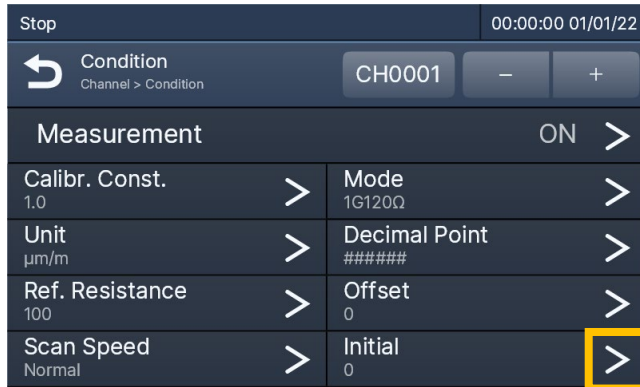
Calibration coefficient calculation must be turned ON in order to apply the offset value to measurement values.

Refer to "5-3-3. Calibration Coefficient Calculation Settings" for details on calibration coefficient calculation.

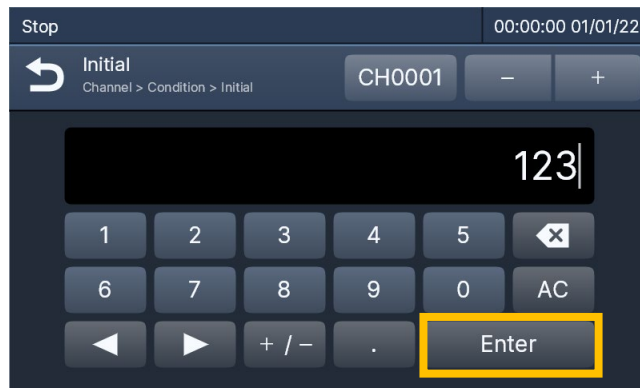
5-2-9. Initial Value Settings

The initial value is the variable used when the measurement value setting is "measured value."

Follow the procedure below to set the initial value manually.



1. Tap **Initial**.

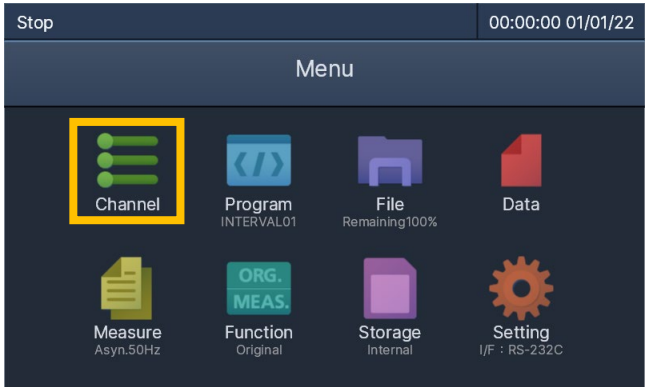


2. Enter the initial value and then tap **Enter**.

Refer to "5-3-2. Initial Value Measurement" for details on the initial value.

5-2-10. Multiple Channel Condition Settings

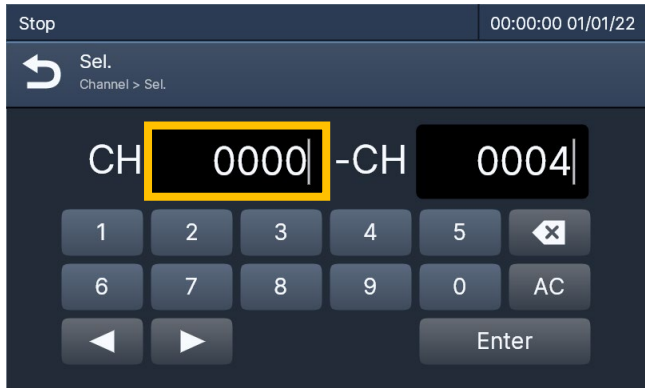
The procedure for setting channel conditions for multiple channels is shown below.



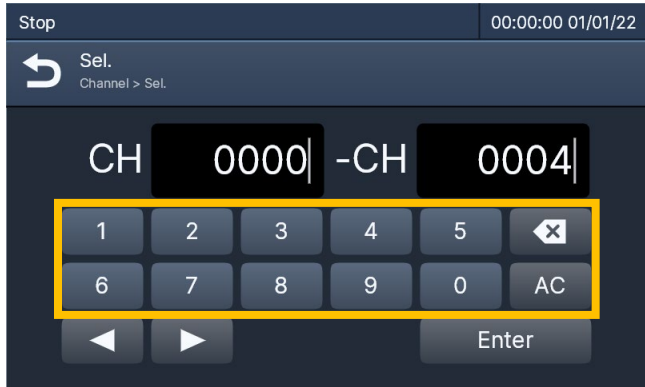
1. Tap **Channel** on the **Menu** screen.



2. Tap **Sel.**



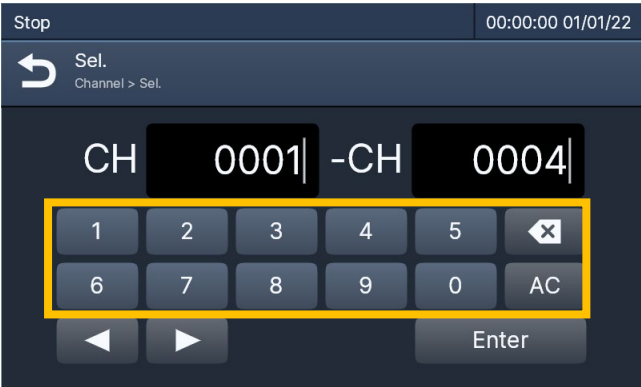
3. Tap the entry field on the left side.



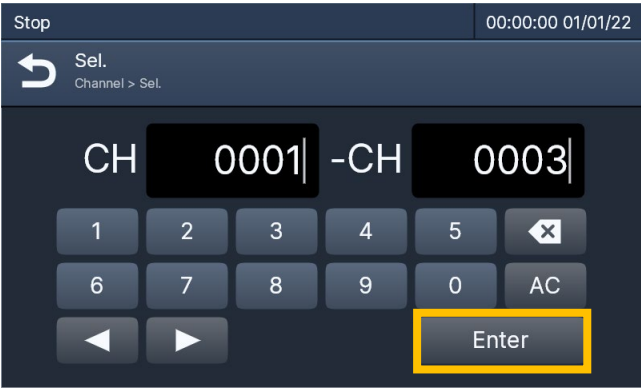
4. Tap either the Backspace button or the Clear all button, and then enter the first channel number to configure.



5. Tap the entry field on the right side.



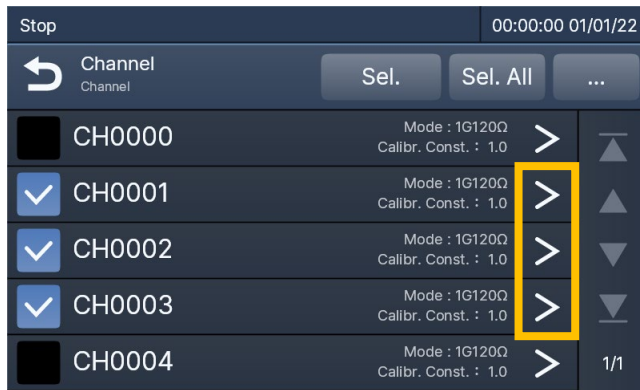
6. Tap either the Backspace button or the Clear all button, and then enter the last channel number to configure.



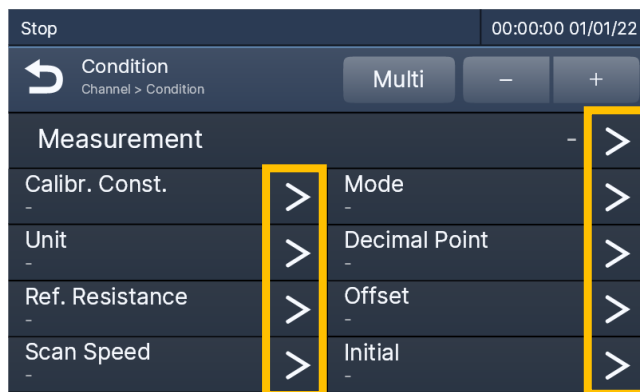
7. Tap **Enter**.



8. The check boxes for the selected range of channels are selected.

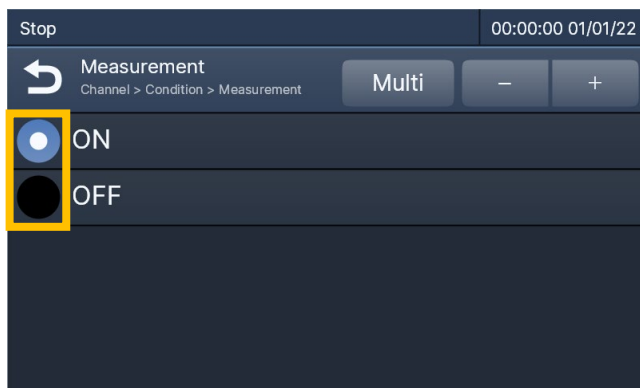


9. Tap the arrow button for any of the channels in the selected range.

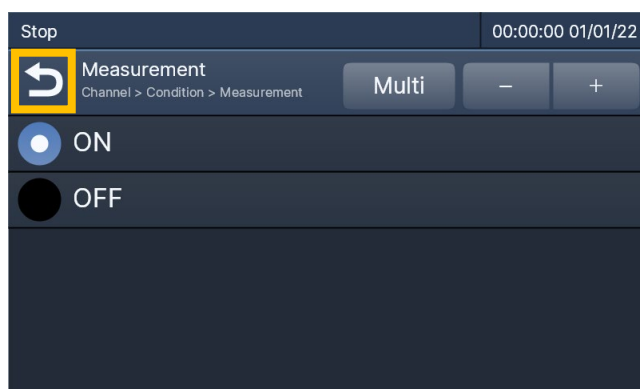


10. Tap the arrow button for the channel condition to set for all selected channels.

In this example, **Measurement** will be set.



11. Tap **ON** or **OFF**.



12. Tap the Back button.

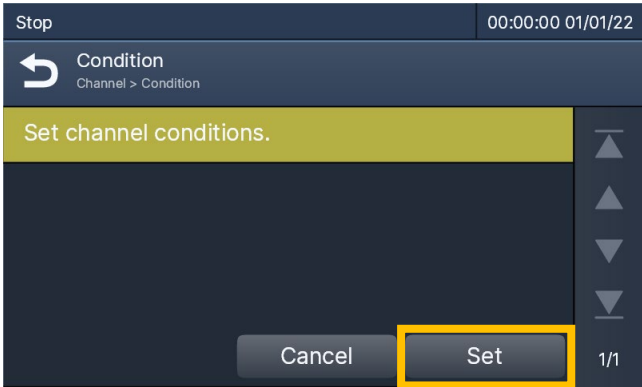


13. The display returns to the **Condition** screen.

Any channel conditions indicated with  here will not be set.



14. Tap the Back button.



15. Tap **Set** to set the channel condition for all selected channels.

To cancel, tap **Cancel**.

5-3. MEASUREMENT VALUE SETTINGS

This section describes how to set measurement values. There are two types of measurement values:

(1) Original value

Raw sensor output is displayed as the measurement value.

Use this if the initial unbalance has already been compensated on the sensor, or to confirm raw sensor output.

(2) Measured value

The result of subtracting the initial value from the original value is displayed as the measurement value.

If the measurement value setting is "measured value," whether the initial value is subtracted from sensor output depends on the channel mode and Delta V/T setting (as shown in the table below).

Delta V	Delta T	Channel Mode			
		Measured Object Strain	Measured Object Voltage	Measured Object Current	Measured Object Temperature
OFF	OFF	Subtracted	Not subtracted	Subtracted	Not subtracted
ON	OFF	Subtracted	Subtracted	Subtracted	Not subtracted
OFF	ON	Subtracted	Not subtracted	Subtracted	Subtracted* ¹
ON	ON	Subtracted	Subtracted	Subtracted	Subtracted* ¹

*1) If the channel mode is set to "civil engineering transducer with temperature measuring function," regardless of whether Delta T is ON/OFF, nothing will be subtracted with regard to temperature measurement values for civil engineering transducers with temperature measuring function.

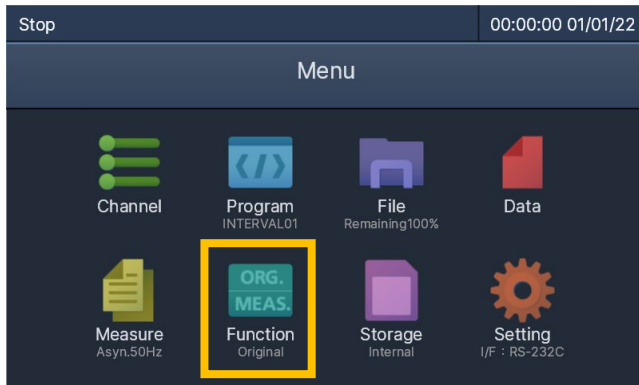
Refer to "5-2-6. Channel Mode Settings" for information on civil engineering transducers with temperature measuring function.

Refer to "5-1-6. Delta V and Delta T Settings" for details on Delta V/T.

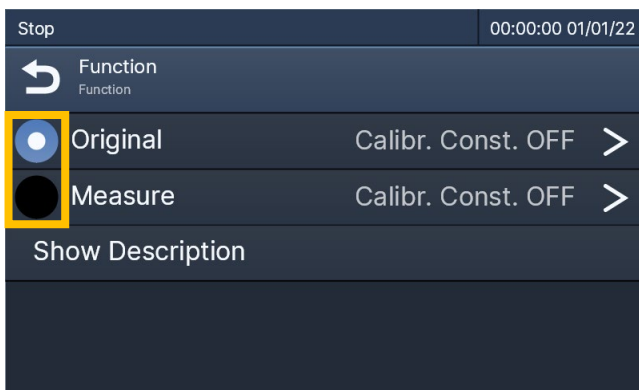
Refer to "5-2-6. Channel Mode Settings" for details on channel modes.

Refer to "5-3-2. Initial Value Measurement" for details on the initial value.

5-3-1. Original Value or Measured Value Selection



1. Tap **Function** on the **Menu** screen.



2. The **Function** screen is displayed.

The **Function** screen is used to select either original value or measured value.

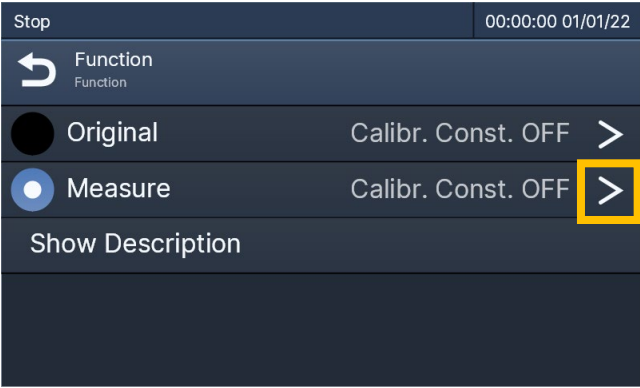
To use the original value, select the **Original** radio button.

To use the measured value, select the **Measure** radio button.

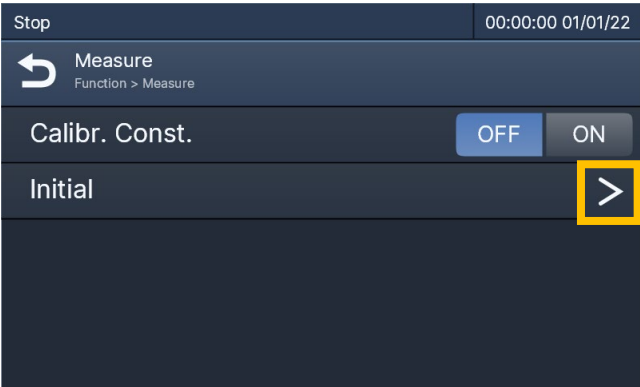
5-3-2. Initial Value Measurement

If the measurement value setting is "measured value," perform initial value measurement.

This device stores the measurement value obtained during initial value measurement as the initial value.



1. Tap the **Measure** arrow button.



2. Tap **Initial**.



3. Tap the check box for the channel to perform initial value measurement.

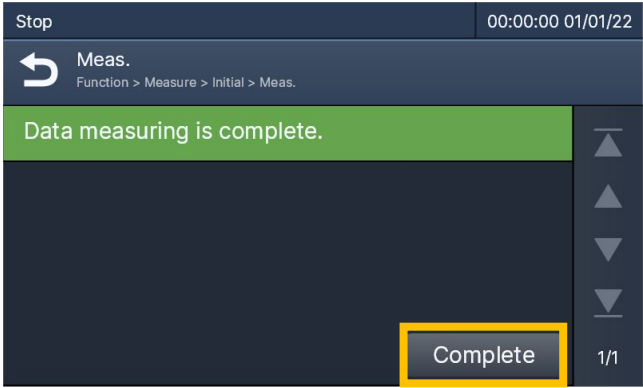


4. Tap the **Meas.** button to begin initial value measurement.



CAUTION

Performing initial value measurement will overwrite the previous initial value. Do not perform initial value measurement on a channel unless you want to change the initial value.



5. Once initial value measurement is complete, tap **Complete**.

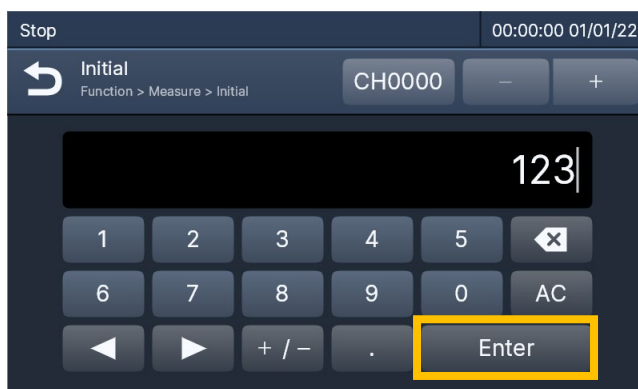


6. The initial value is updated. Initial value measurement is now complete.

The following procedure can also be used to directly change the initial value.



1. Tap the arrow button for the channel to change the initial value.



2. Enter the initial value, and then tap **Enter**.



3. The initial value is changed.



CAUTION

Changing the initial value will overwrite the previous initial value.

The initial value is very important as it serves as the standard for measurement values.

Sufficient caution when changing the initial value.

5-3-3. Calibration Coefficient Calculation Settings

Calibration coefficient calculation is used to convert measurement values into physical quantities.

If calibration coefficient calculation is enabled, this device will perform the following calculations on measurement values.

(1) If the measurement value setting is "original value"

Physical quantity = Measurement value × Calibration coefficient + Offset value

(2) If the measurement value setting is "measured value"

Physical quantity = (Measurement value - Initial value) × Calibration coefficient + Offset value

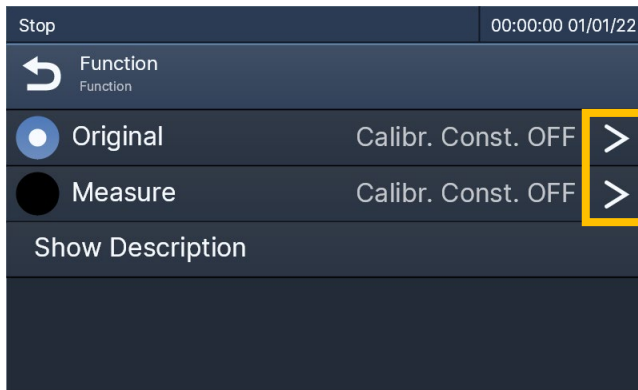
Whether calibration coefficient calculation is performed depends on the channel mode and calibration coefficient calculation setting (as shown in the table below).

Calibration Coefficient Calculation	Channel Mode			
	Measured Object Strain	Measured Object Voltage	Measured Object Current	Measured Object Temperature
OFF	Not calculated	Not calculated	Not calculated	Not calculated
ON	Calculated	Calculated	Calculated	Not calculated

Refer to "5-2-2. Calibration Coefficient Settings" for information on setting the calibration coefficient.

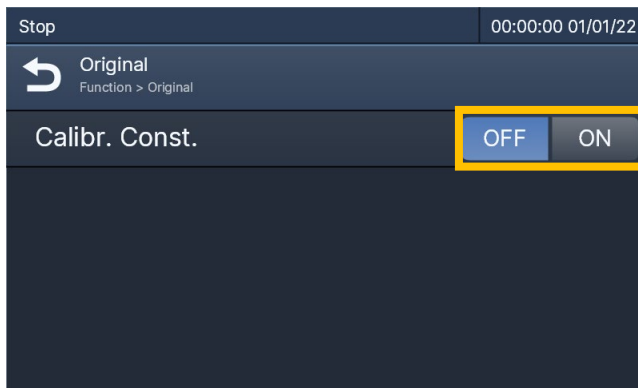
Refer to "5-2-6. Channel Mode Settings" for details on channel modes.

Refer to "5-2-8. Offset Value Settings" for information on setting the offset value.



1. If using "original value," tap the **Original** arrow button.

If using "measured value," tap the **Measure** arrow button.

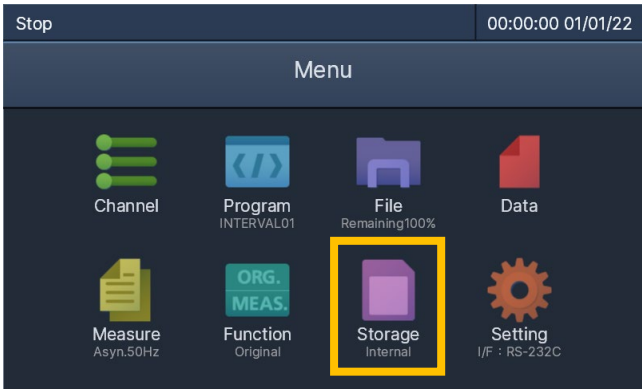


2. To turn calibration coefficient calculation ON, tap **ON**.

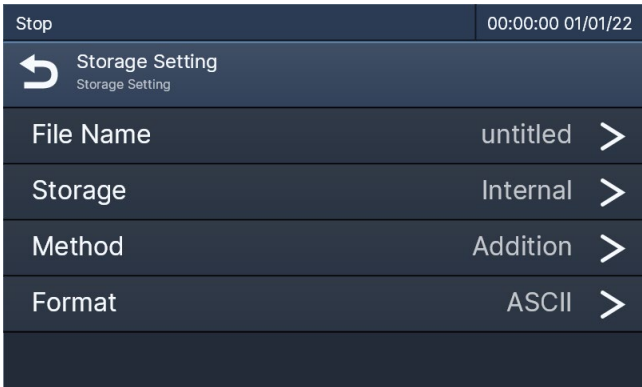
To turn calibration coefficient calculation OFF, tap **OFF**.

5-4. SAVING SETTINGS

This section describes how to configure saving settings.



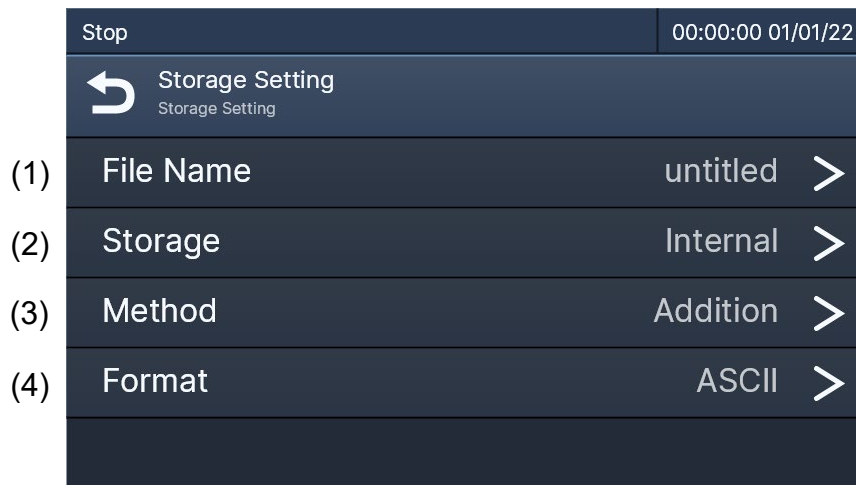
- 1. Tap **Storage** on the **Menu** screen.



- 2. The **Storage Setting** screen is displayed.

The **Storage Setting** screen is used to configure settings such as file names and storage locations.

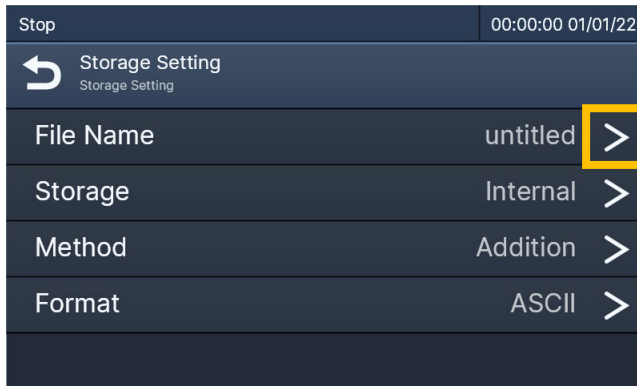
The following functions are available on the **Storage Setting** screen.



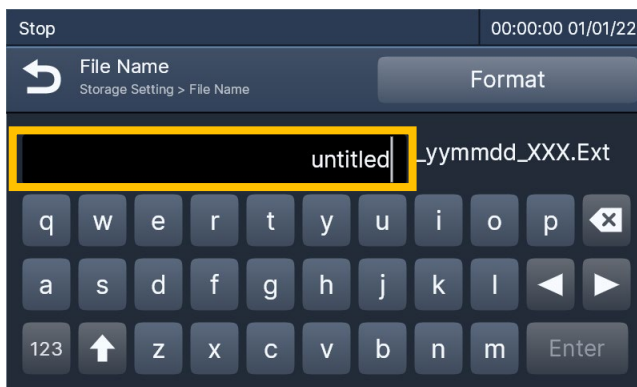
Number	Name	Function	Reference Page
1	File Name	Set the name for measurement data files	5-4-1
2	Storage	Set the file storage location	5-4-2
3	Method	Set the saving method for measurement data files	5-4-3
4	Format	Set the saving format for measurement data files	5-4-4

5-4-1. Saved File Name Settings

Set the name for measurement data files created when saving measurement values.



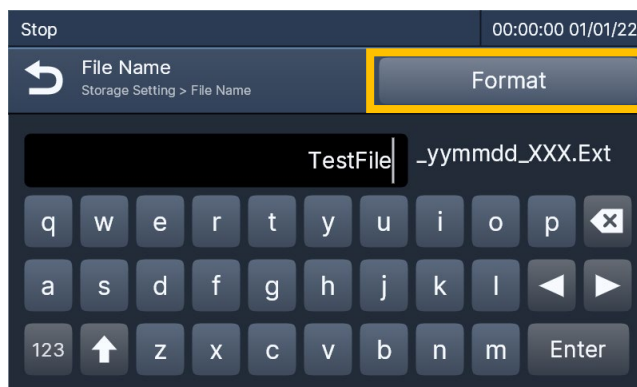
1. Tap **File Name**.



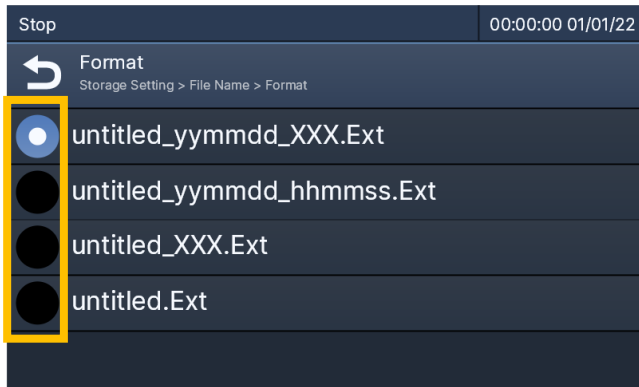
2. Enter the file name.



- The file name may be up to 32 characters long.
- Enter a file name so that the total number of characters will be 32 or less when the file name format is included.



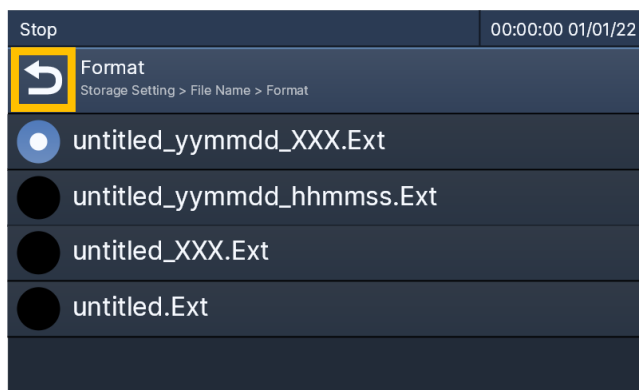
3. Tap **Format**.



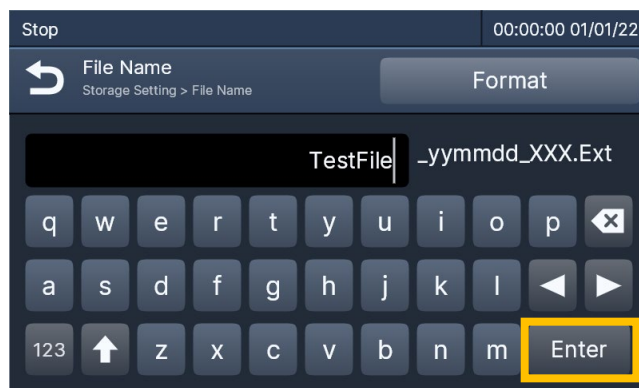
4. Tap the file name format to set.



- The yymmdd portion will be replaced with the year (yy), month (mm), and day (dd) when saving the file.
 - The hhmmss portion will be replaced with the hour (hh), minutes (mm), and seconds (ss) when saving the file.
 - The XXX portion will be replaced with a fixed character string (000).
 - The extension portion will be replaced with the file extension.
- Refer to "5-7-2. Measurement Data File Confirmation" for details on extensions.



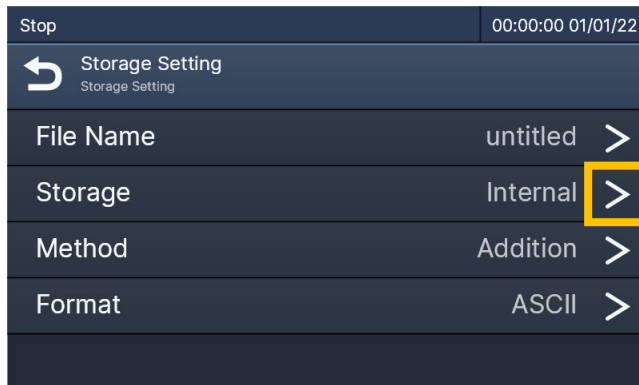
5. Tap the Back button.



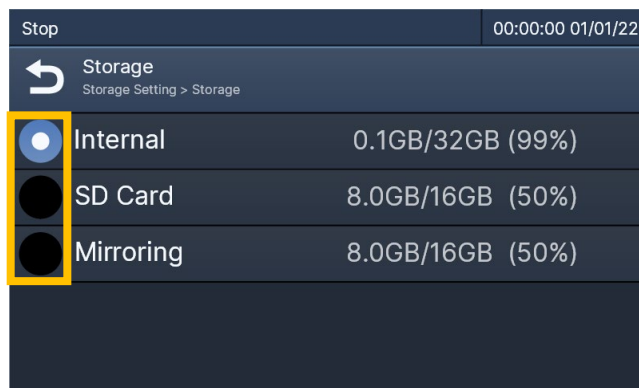
6. Tap Enter.

5-4-2. Storage Location Settings

Set the file storage location.



1. Tap **Storage**.



2. Tap the location to save files.

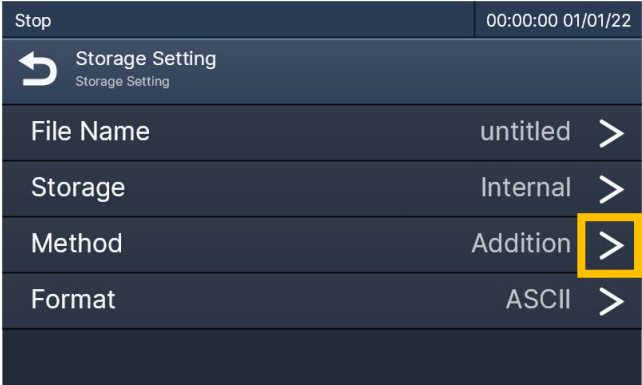
Storage Location	Description
Internal	• Save files to the internal memory of this device. • On the right is shown the amount of internal memory used, followed by the total capacity, and then the remaining amount (in parentheses).
SD card	• Save files to an SD card inserted into this device. • On the right is shown the amount of SD card storage used, followed by the total capacity, and then the remaining amount (in parentheses). • This can only be set when an SD card is inserted into this device.
Mirroring	• Save files to both internal memory and an SD card. • On the right is shown the amount used, followed by the total capacity, and then the remaining amount (in parentheses), for whichever storage device has less remaining storage. • This can only be set when an SD card is inserted into this device.



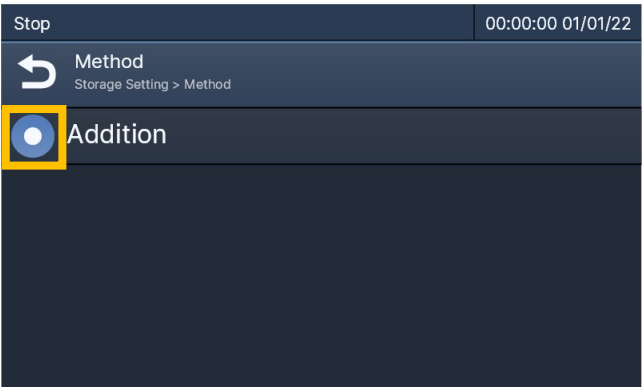
Even if the number of files in the internal memory is 0, the remaining amount of the Internal memory may not reach 100%.

5-4-3. Saving Method Settings

Set the saving method for measurement data files.



1. Tap **Method**.



2. The current saving method is displayed.

Saving Method	Description
Addition	Measurement values are saved appended within a single measurement data file.

This device creates measurement data files in the following situations.

(1) If the file name format is "yymmdd XXX.extension"

A measurement data file is created the first time that measurement values are saved. Measurement values are then appended whenever real-time measurement or automatic measurement is performed.

A new measurement data file will be created when the date (yymmdd portion) changes.

(2) If the file name format is "yymmdd hhmmss.extension"

A measurement data file is created the first time that measurement values are saved. Measurement values are then appended whenever real-time measurement or automatic measurement is performed.

A new measurement data file will be created when the date and time (yymmdd_hhmmss portion) change.

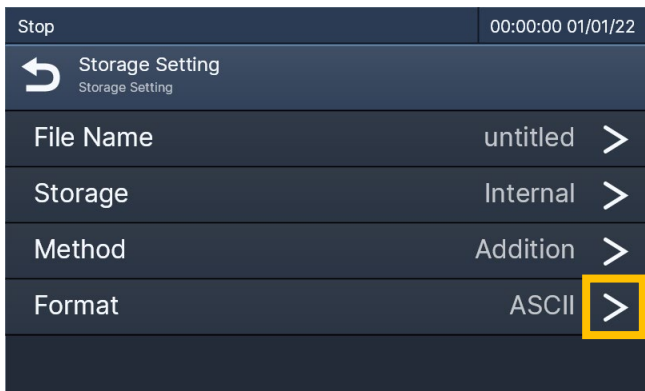
(3) If the file name format is "XXX.extension" or no file name format is used

A measurement data file is created the first time that measurement values are saved. Measurement values are then appended whenever real-time measurement or automatic measurement is performed.

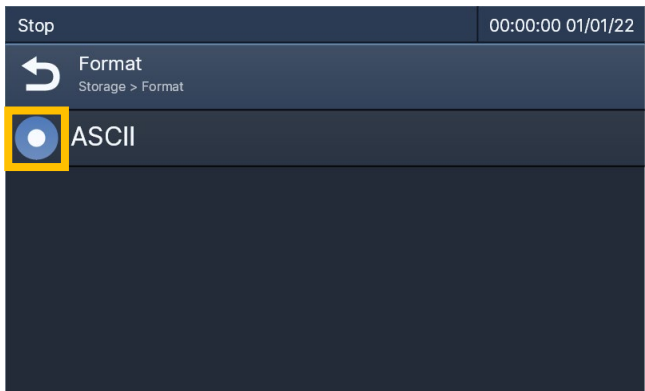
Measurement values will continue to be appended to this first measurement data file until the file name changes.

5-4-4. Saving Format Settings

Set the saving format for measurement data files.



1. Tap **Format**.



2. The current saving format is displayed.

Saving Format	Description
ASCII	Save measurement values in ASCII format.

5-5. AUTOMATIC MEASUREMENT SETTINGS

The automatic measurement function is used to automatically perform measurements under preset conditions.

There are three types of automatic measurement:

(1) Interval measurement

The time to start measurement and the time interval are set in advance. Once the measurement start time is reached, automatic measurement begins.

Scanning will then be performed at the set time intervals. Interval measurement settings are shown below.

- **Measurement start time**

Set the time to begin interval measurement. It is also possible to start interval measurement when the program run/stop key is pressed.

- **Step**

Interval measurement is composed of at least one step.

Set the time interval, repeat times, and operation once repetition is complete, for each step.

Steps are represented as numbers (from 1 to 15), so up to 15 steps can be created.

- **Step time interval**

Set the time interval to perform scanning.

- **Step repeat times**

Set the number of times to repeat scanning.

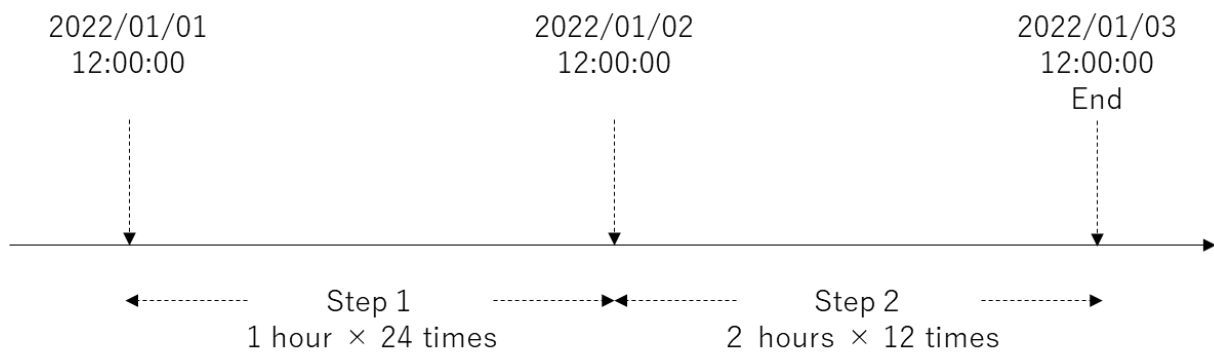
- **Operation once step repetition is complete**

Set the operation to be performed once repetition is complete. Any of the three following operations can be set.

Operation	Function
Go to next step	Perform the next step (based on number).
Go to specified step	Perform the step of the specified number.
End	End interval measurement.

As an example, an interval measurement operation using the following settings is shown below.

Setting Item		Setting Details
Measurement start time		2022/01/01 12:00:00
Step 1	Time interval	1 hour
	Repeat times	24
	Operation once repetition is complete	Go to next step
Step 2	Time interval	2 hours
	Repeat times	12
	Operation once repetition is complete	End



Example of interval measurement operation

(2) Trigger measurement

The channel to monitor ("trigger channel") is set in advance.

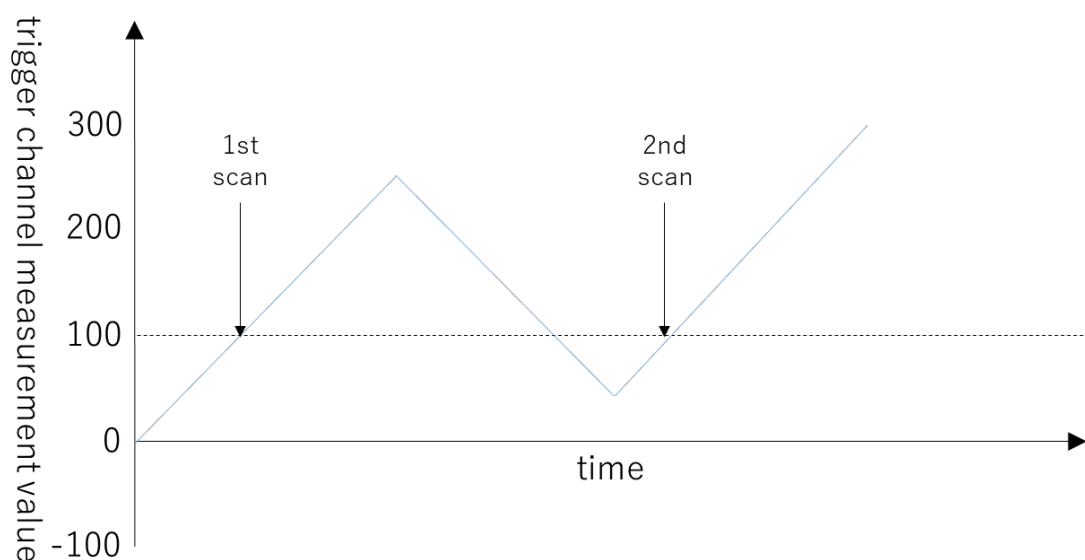
Once the "trigger channel measurement value" exceeds the threshold, measurement starts automatically.

Scanning is then performed whenever the "trigger channel measurement value" exceeds the threshold. Trigger measurement settings are shown below.

- Trigger channel
Set the channel number of the trigger channel.
- Trigger mode
Set the trigger measurement mode. Either of the two following modes can be set.

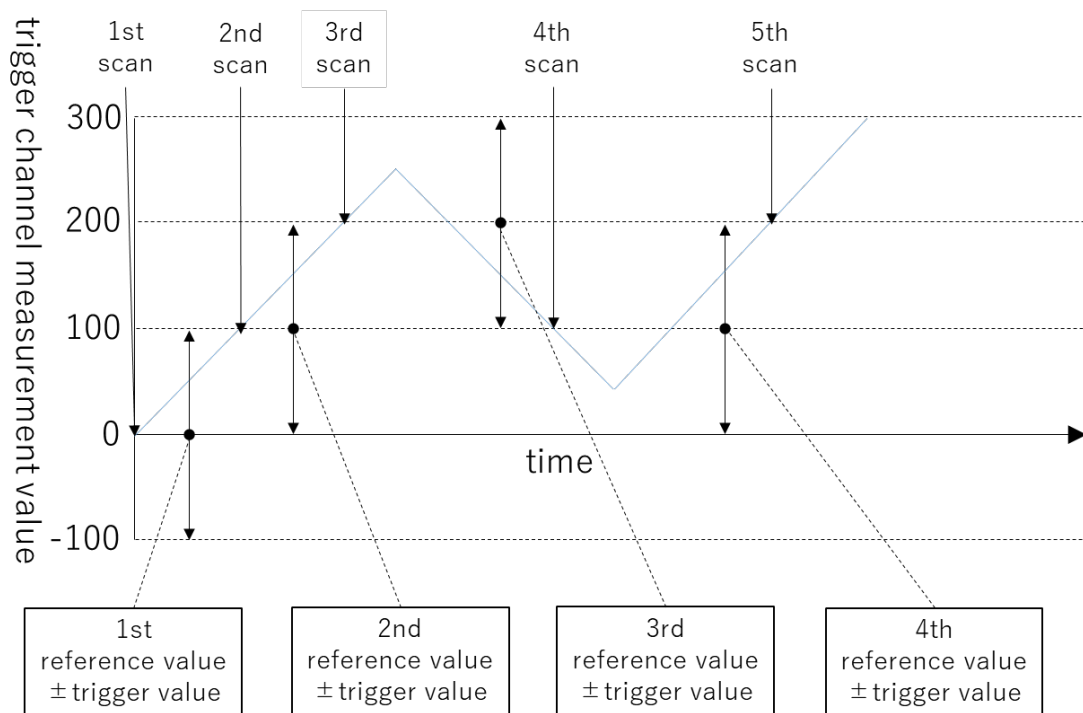
Trigger Mode	Function
Absolute value	Whenever the "trigger channel measurement value" exceeds the "trigger value," scanning is performed.
Relative value	Whenever the "trigger channel measurement value" exceeds the "reference value $\pm$ trigger value," scanning is performed. The reference value will vary each time scanning is performed.

In the following example, the trigger mode is set to "absolute value" and the trigger value is set to "100."



Example of absolute value operation

The trigger mode is set to "relative value," the trigger value is set to "100," and the reference value is set to "0" in the following example.



Example of relative value operation



CAUTION

If the trigger mode is set to "relative value," do not set the trigger value to "0."

- Step

Trigger measurement is composed of at least one step.

Set the trigger value, repeat times, and operation once repetition is complete, for each step.

Steps are represented as numbers (from 1 to 15), so up to 15 steps can be created.

- Step trigger value

Set the threshold to perform scanning.

- Step repeat times

Set the number of times to repeat scanning.

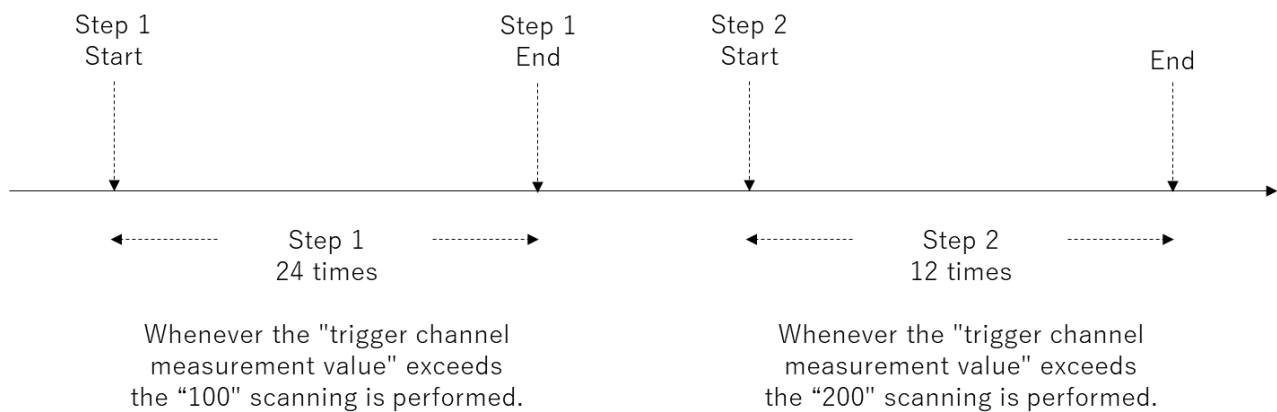
- Operation once step repetition is complete

Set the operation to be performed once repetition is complete. Any of the three following operations can be set.

Operation	Function
Go to next step	Perform the next step (based on number).
Go to specified step	Perform the step of the specified number.
End	End trigger measurement.

As an example, a trigger measurement operation using the following settings is shown below.

Setting Item		Setting Details
Trigger mode		Absolute value
Step 1	Trigger value	100
	Repeat times	24
	Operation once repetition is complete	Go to next step
Step 2	Trigger value	200
	Repeat times	12
	Operation once repetition is complete	End



Example of trigger measurement operation

(3) Trigger interval measurement

The trigger channel and time interval are set in advance. When the "trigger channel measurement value" exceeds the threshold, measurement starts automatically.

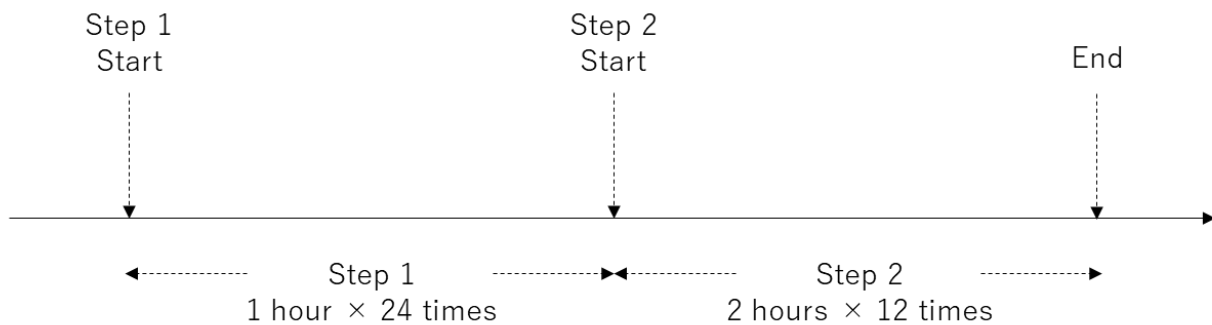
Scanning will then be performed at the set time intervals.

- **Trigger channel**
Set the channel number of the trigger channel.
- **Reference value**
Set the threshold to begin trigger interval measurement.
- **Step**
Trigger interval measurement is composed of at least one step.
Set the time interval, repeat times, and operation once repetition is complete, for each step.
Steps are represented as numbers (from 1 to 15), so up to 15 steps can be created.
- **Step time interval**
Set the time interval to perform scanning.
- **Step repeat times**
Set the number of times to repeat scanning.
- **Operation once step repetition is complete**
Set the operation to be performed once repetition is complete. Any of the three following operations can be set.

Operation	Function
Go to next step	Perform the next step (based on number).
Go to specified step	Perform the step of the specified number.
End	End trigger interval measurement.

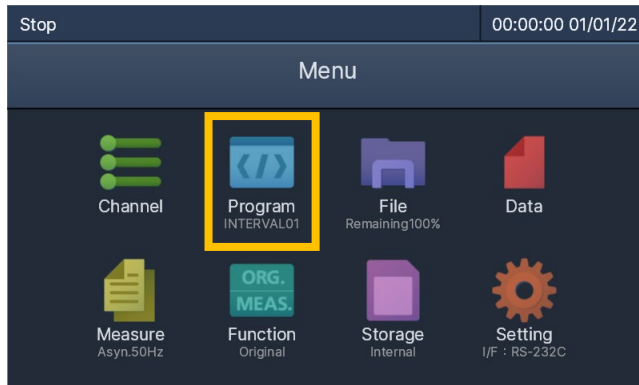
As an example, a trigger interval measurement operation using the following settings is shown below.

Setting Item		Setting Details
Reference value		100
Step 1	Time interval	1 hour
	Repeat times	24
	Operation once repetition is complete	Go to next step
Step 2	Time interval	2 hours
	Repeat times	12
	Operation once repetition is complete	End

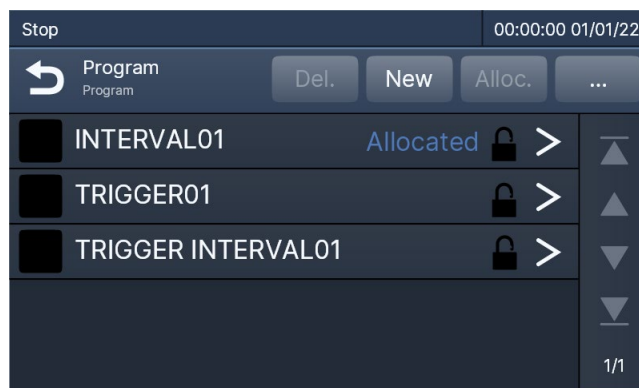


Example of trigger interval measurement

Automatic measurement is configured on the **Program** screen.



1. Tap **Program** on the **Menu** screen.

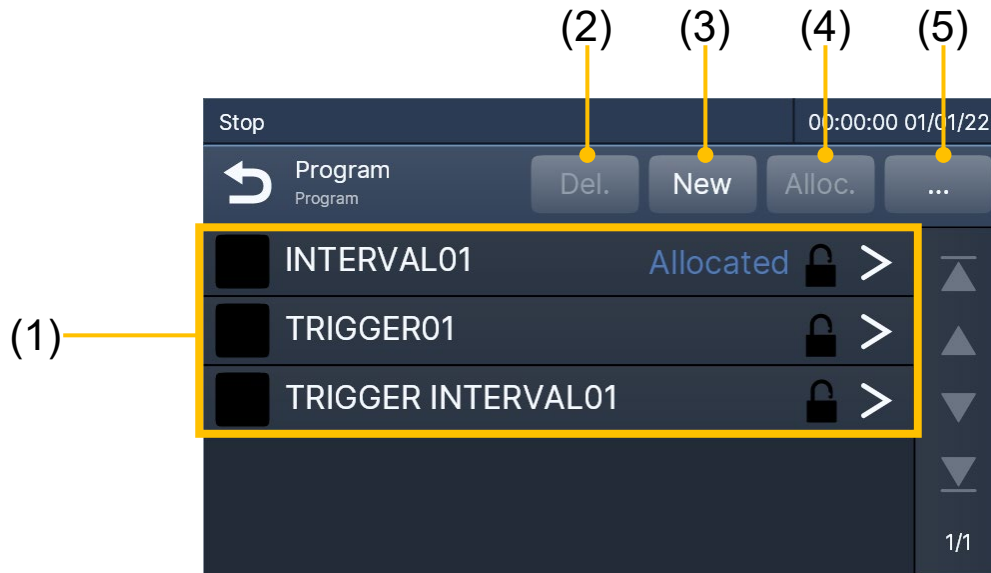


2. The **Program** screen is displayed.

The **Program** screen is used to create, configure, assign, and delete programs.

Programs are collections of automatic measurement settings. Configuring a program allows you to start automatic measurement simply by pressing the program run/stop key.

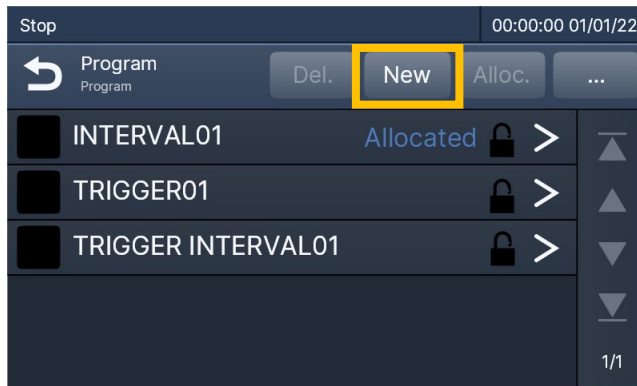
The following functions are available on the **Program** screen.



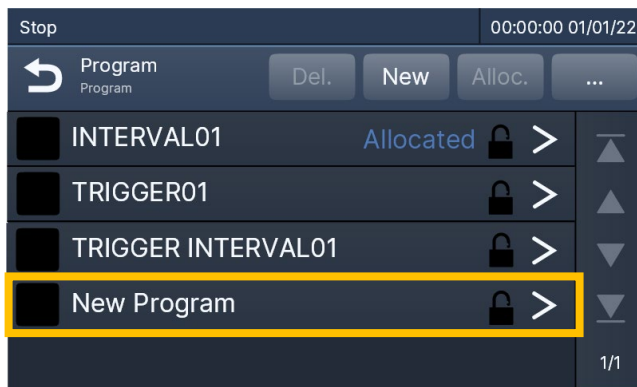
Number	Name	Function	Reference Page
1	Program	A list of programs that have been created. Tap an arrow button to move to the Program settings screen for the corresponding program.	5-5-2
2	Del.	Delete a program.	5-5-4
3	New	Create a new program.	5-5-1
4	Alloc.	Assign a program to run when the program run/stop key is pressed.	5-5-3
5	Option button	Moves to the Option screen. The Option screen can be used to duplicate programs, lock programs, etc.	5-5-5 5-5-6

5-5-1. New Program Creation

The procedure for creating a new program is shown below



1. Tap **New**.



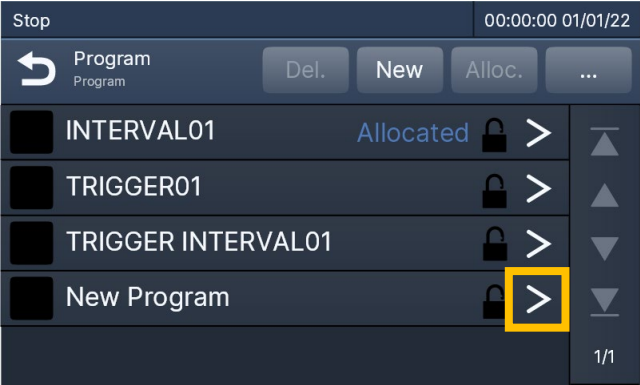
2. A new program is created.



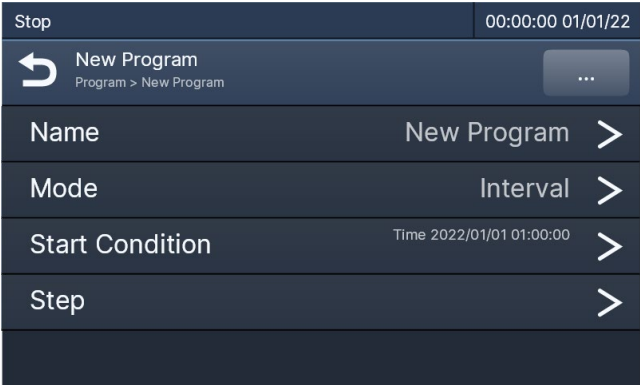
Up to 15 programs may be created.

5-5-2. Programs Settings

The procedure for configuring a new program is shown below

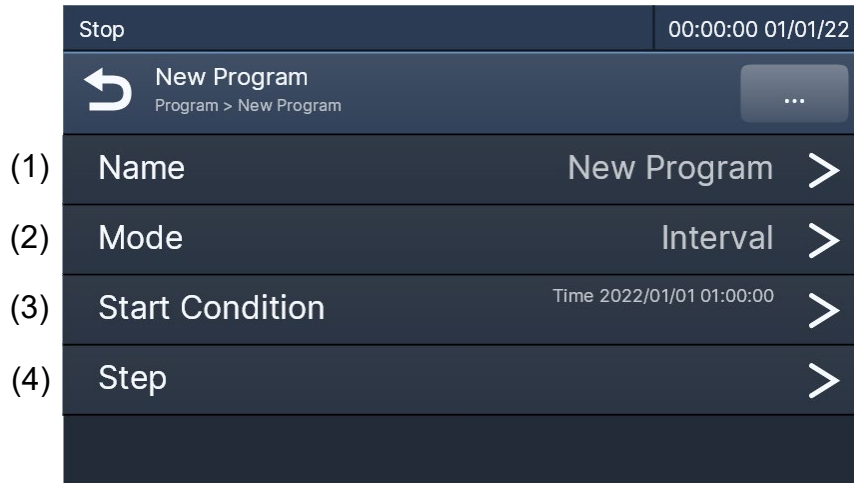


1. Tap the arrow button of the program to configure.



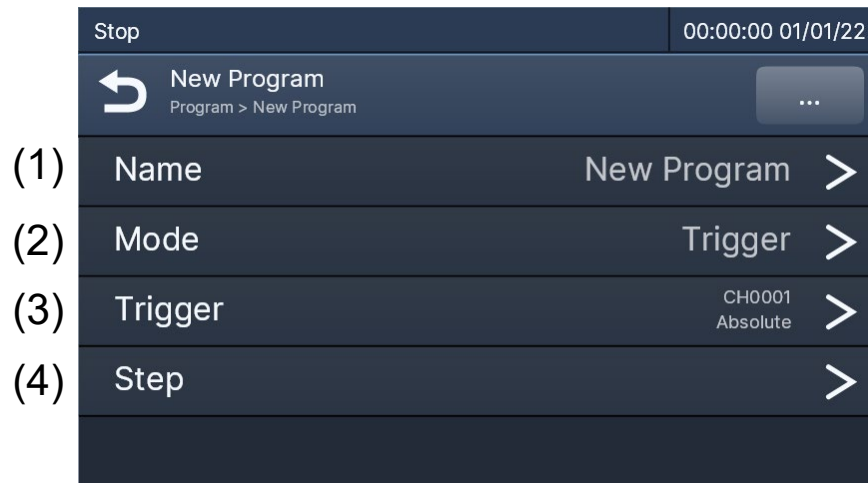
2. The **Program settings** screen is displayed.

The **Program settings** screen is used to configure a program. The items displayed on the **Program settings** screen will vary depending on the automatic measurement mode setting. The following functions are available on the **Program settings** screen.



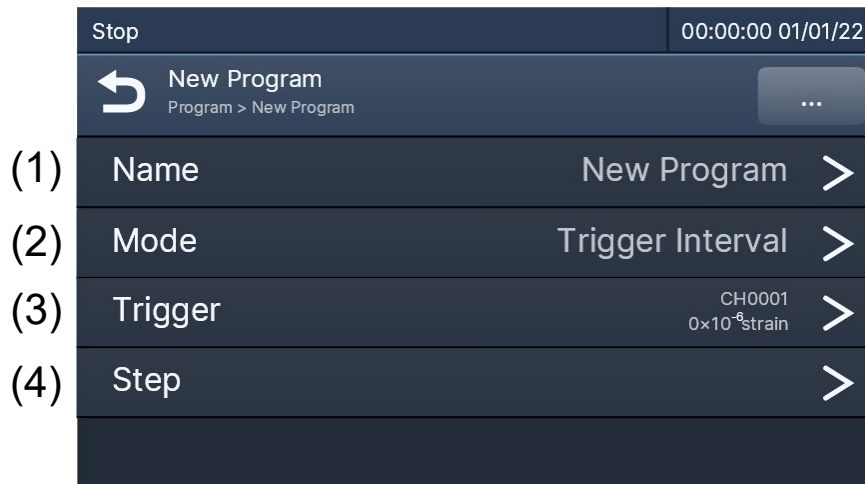
Automatic measurement mode set to "interval"

Number	Name	Function
1	Name	Change the program name.
2	Mode	Set the automatic measurement mode. Any of the three following modes can be set. • Interval • Trigger • Trigger interval
3	Start Condition	Set the time to begin automatic measurement.
4	Step	Set the automatic measurement step.



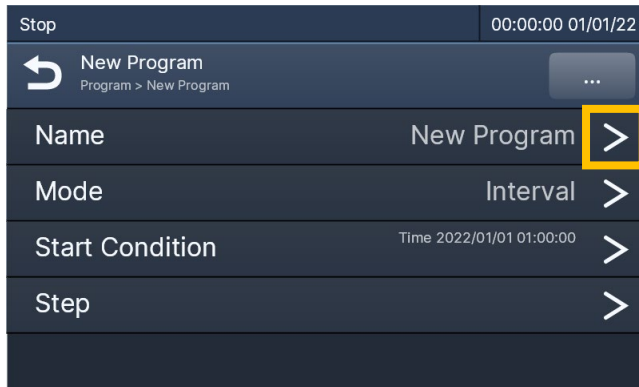
Automatic measurement mode set to "trigger"

Number	Name	Function
1	Name	Change the program name.
2	Mode	Set the automatic measurement mode. Any of the three following modes can be set. • Interval • Trigger • Trigger interval
3	Trigger	Set the trigger channel. Also, set the trigger mode (absolute value or relative value).
4	Step	Set the automatic measurement step.

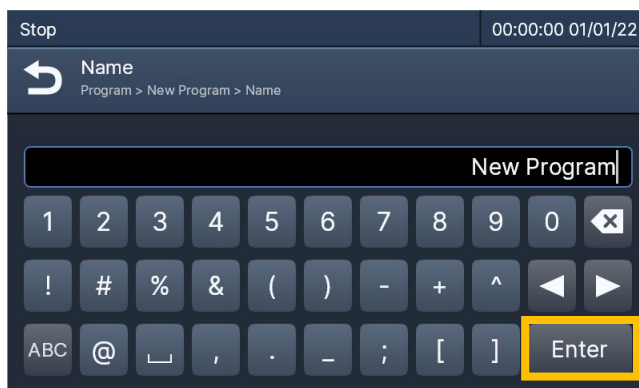


Automatic measurement mode set to "trigger interval"

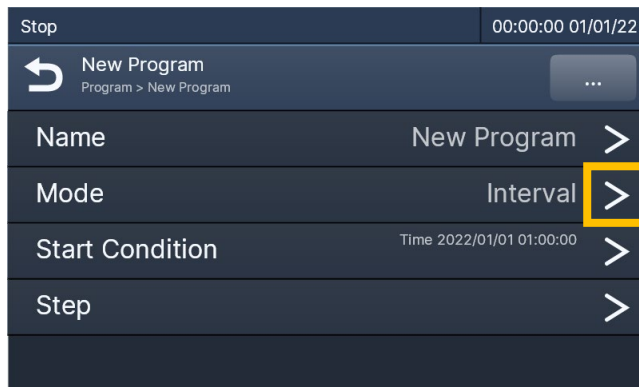
Number	Name	Function
1	Name	Change the program name.
2	Mode	Set the automatic measurement mode. Any of the three following modes can be set. • Interval • Trigger • Trigger interval
3	Trigger	Set the trigger channel. Also, set the reference value to begin automatic measurement.
4	Step	Set the automatic measurement step.

(1) Procedure for setting interval measurement

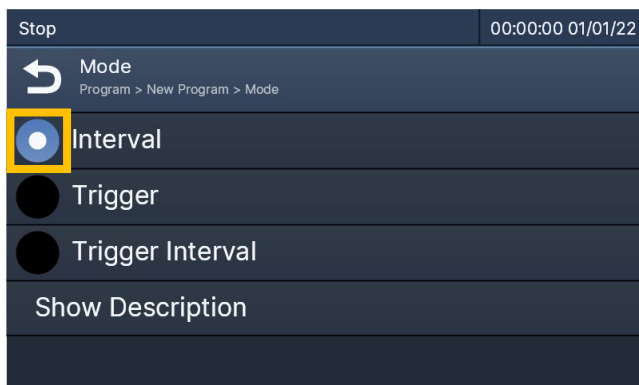
1. Tap **Name**.



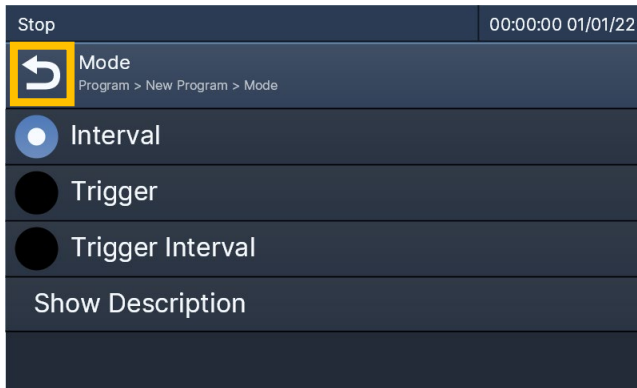
2. Enter a program name, and then tap **Enter**.



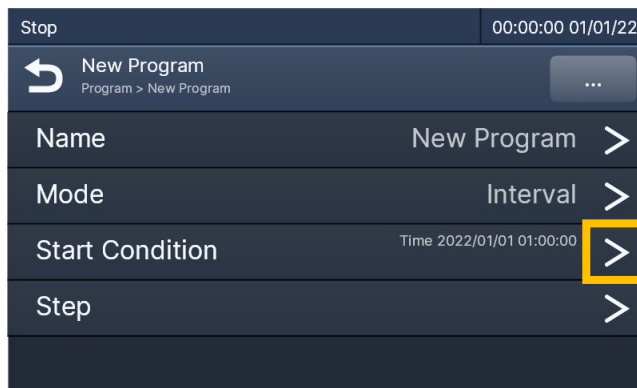
3. Tap **Mode**.



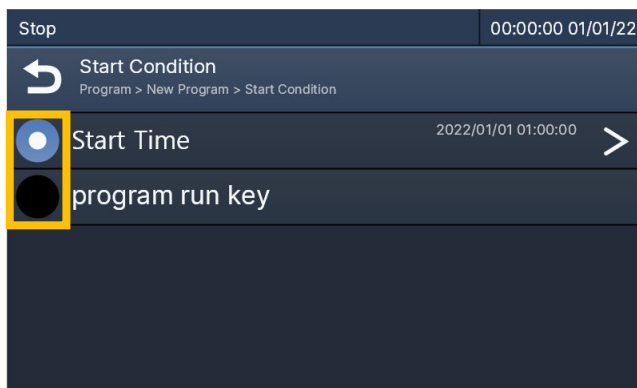
4. Tap **Interval**.



5. Tap the Back button.

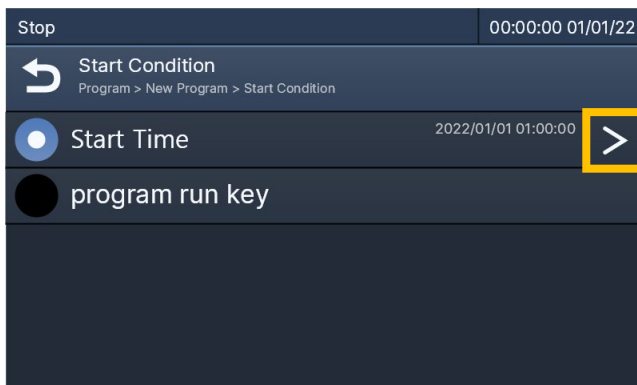


6. Tap **Start Condition**.

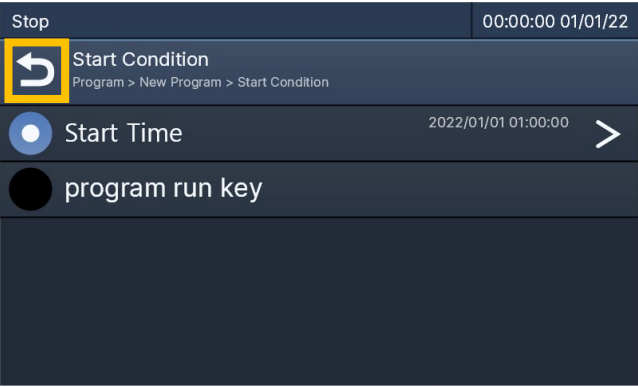


7. To start interval measurement from a given time, tap the **Start Time** radio button.

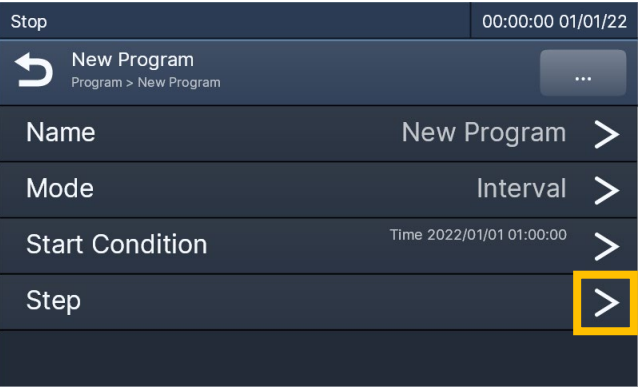
In order to press the program run/stop key and start interval measurement, tap the **program run key** radio button.



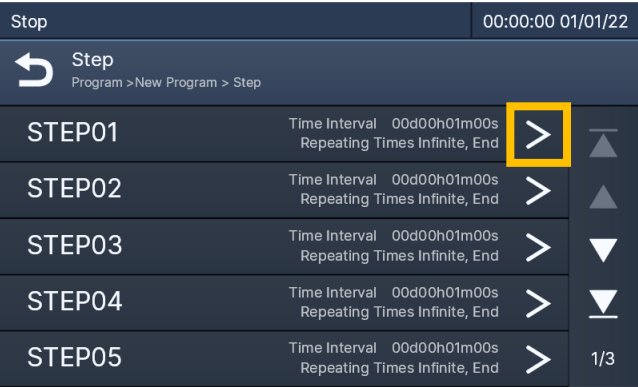
8. To start interval measurement from a given time, tap the **Start time** arrow button, and then enter the measurement start time.



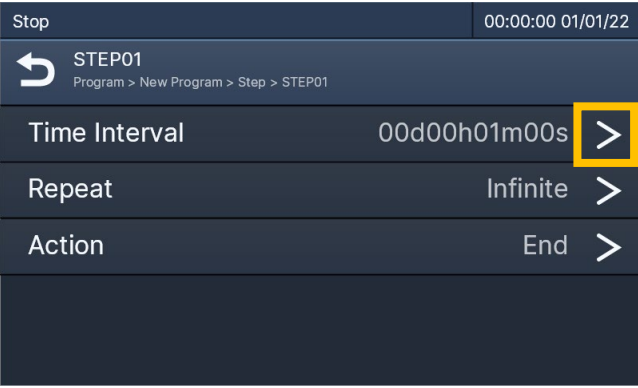
9. Tap the Back button.



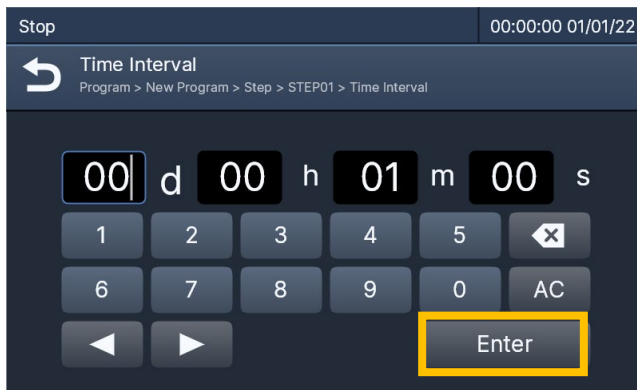
10. Tap **Step**.



11. Tap **STEP01**.



12. Tap **Time Interval**.



13. Enter the time interval to perform scanning, and then tap **Enter**.

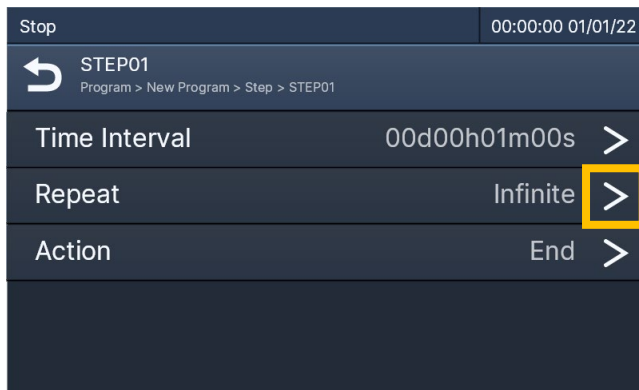


CAUTION

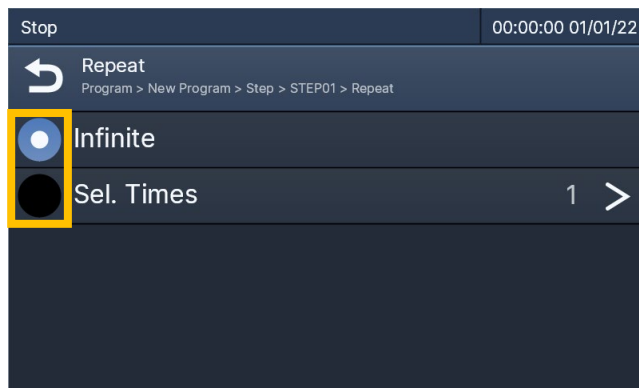
- Set a time interval with some leeway for the "time for one scan."
- An example of calculating the "time for one scan" is shown below.
 - Channel range: Use from CH0 to CH2
 - CH0 scanning speed: 0.5 sec
 - CH1 scanning speed: 1 sec
 - CH2 scanning speed: 2 sec
 - Process time: 5 sec or less
 - Time for one scan = 0.5 + 1 + 2 + Process time = 3.5 sec + Process time
- The process time above will vary depending on conditions such as the number of measurement channels.
- The process time above is the time without printing measurement values to the printer.
If printing measurement values to the printer, depending on the number of measurement channels, the process time may be 5 sec or more.
- If the time interval is 10 sec or less, intervals of the interval measurement may not be uniform.
- If the subsequent scanning time is reached prior to completing the current scan, the subsequent scan will not be performed.



The "day" for the time interval can be set from 0 to 31.

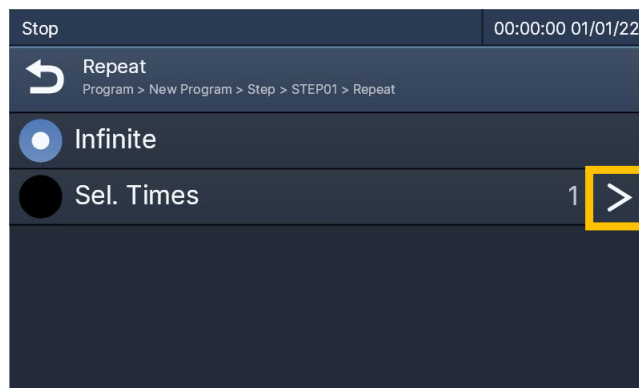


14. Tap **Repeat**.

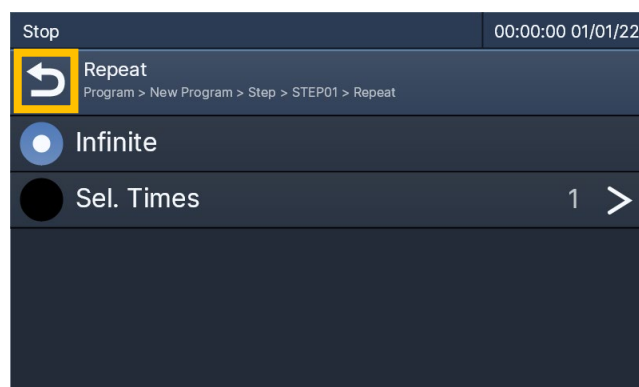


15. To indicate that interval measurement should continue until the program run/stop key is pressed, tap **Infinite**.

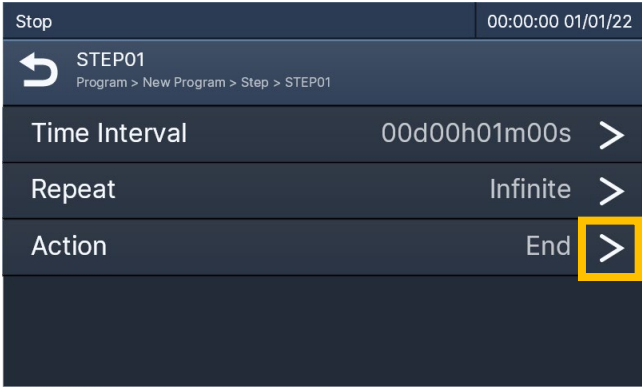
To specify the count, tap the **Sel. Times** radio button.



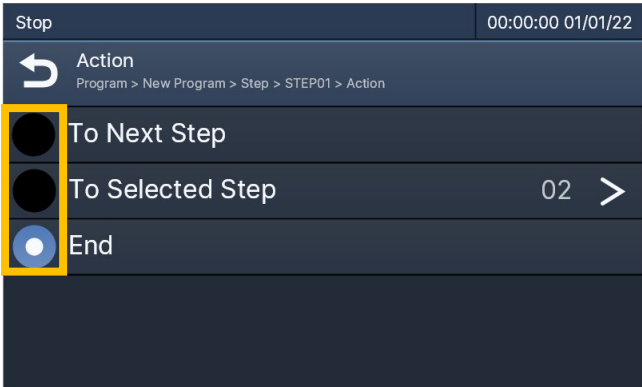
16. To specify the count, tap the **Sel. Times** arrow button, and then enter the count.



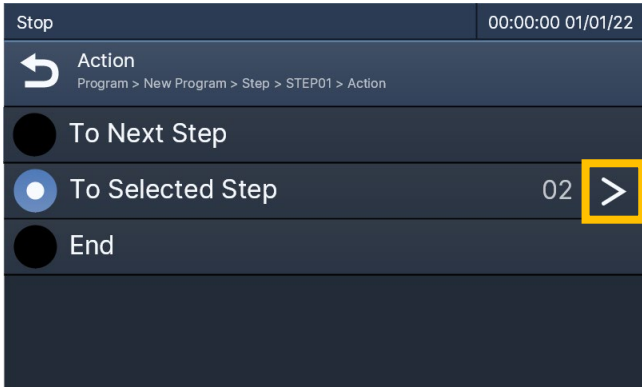
17. Tap the Back button.



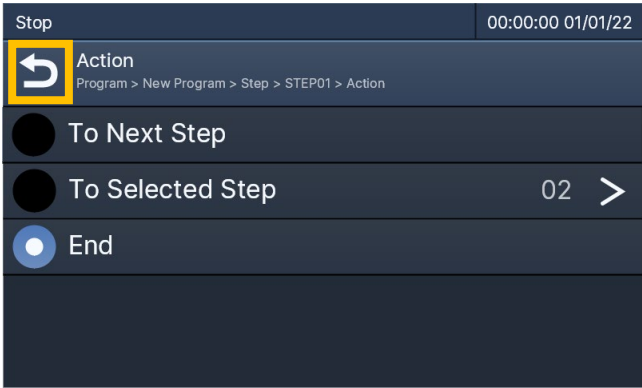
18. Tap **Action**



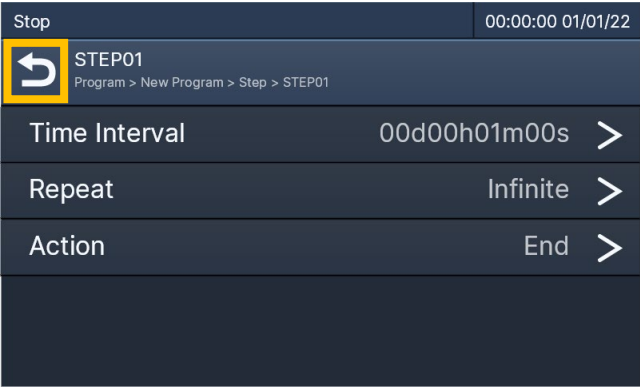
19. Tap the operation to set.



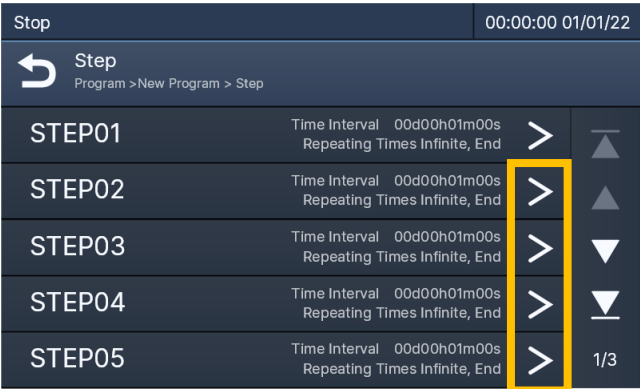
20. To set the specified step, select the **To Selected Step** arrow button, and then enter the step number.



21. Tap the Back button.

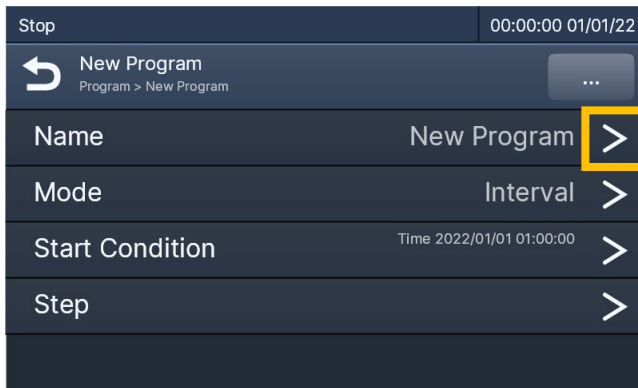


22. Tap the Back button.

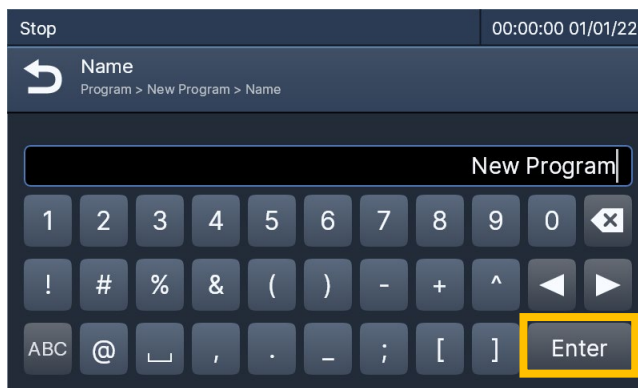


23. If setting step 02 onward, tap the arrow button of the step to set, and then set the step.

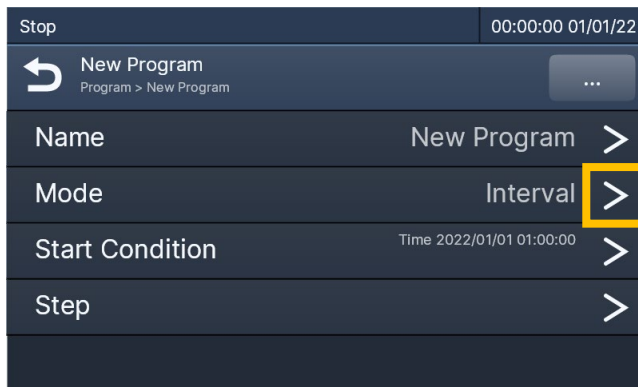
(2) Procedure for setting trigger measurement



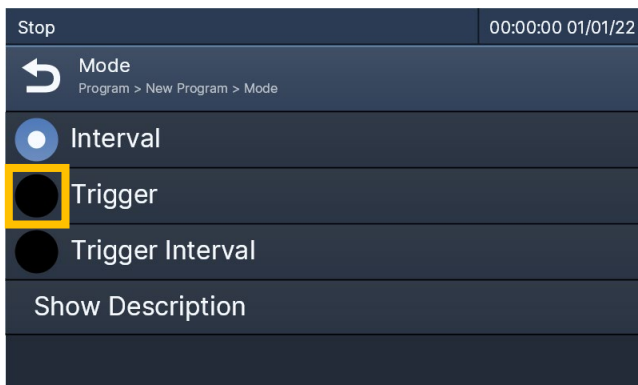
1. Tap **Name**.



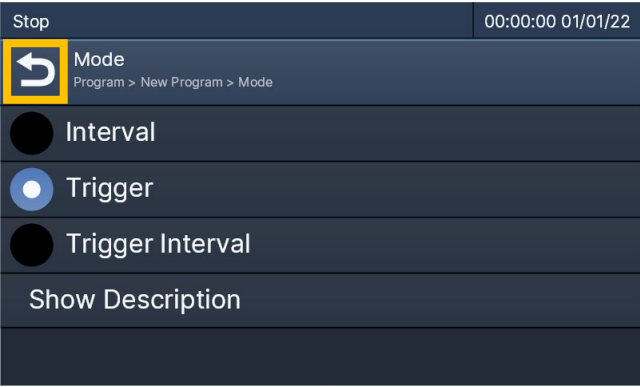
2. Enter a program name, and then tap **Enter**.



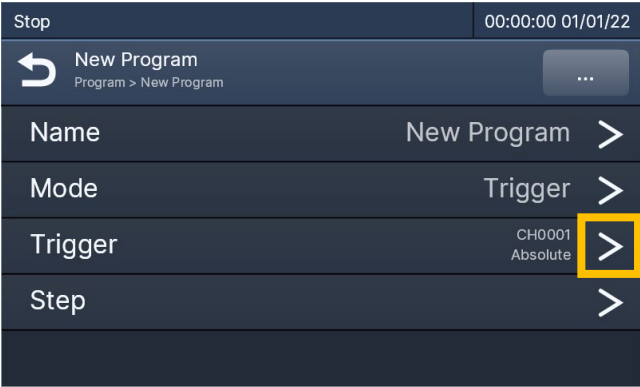
3. Tap **Mode**.



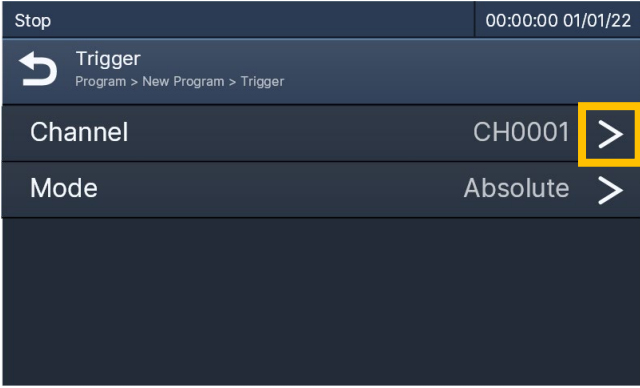
4. Tap **Trigger**.



5. Tap the Back button.



6. Tap **Trigger**.

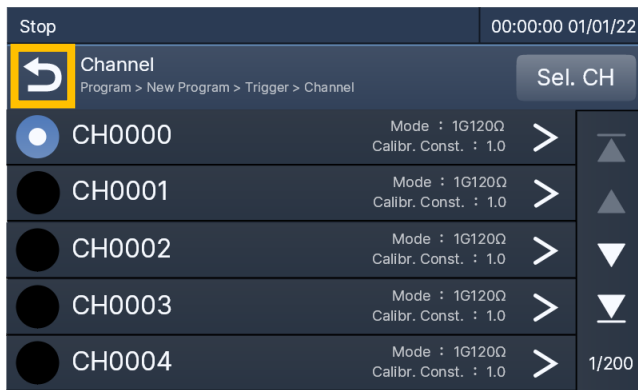


7. Tap **Channel**.

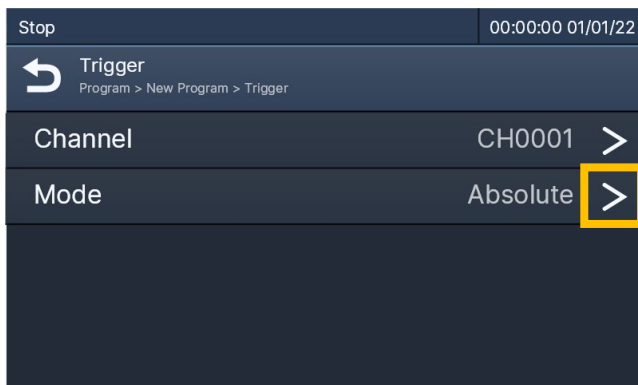


8. Determine the trigger channel and tap the corresponding channel radio button.

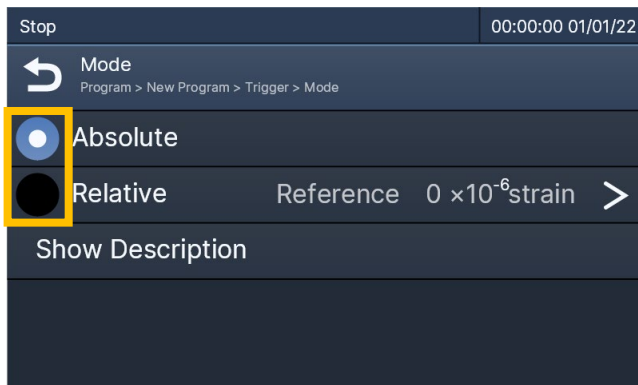
You can also tap **Sel. CH** and enter the channel directly.



9. Tap the Back button.

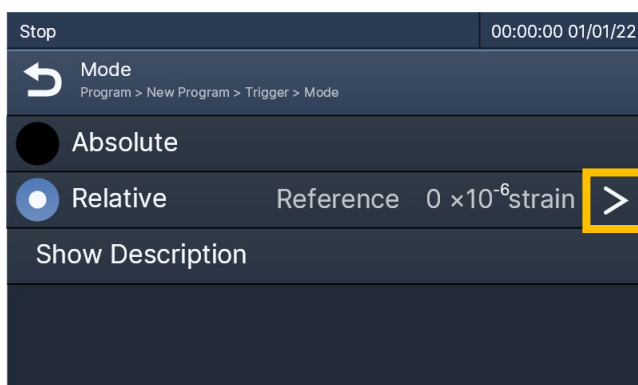


10. Tap Mode.

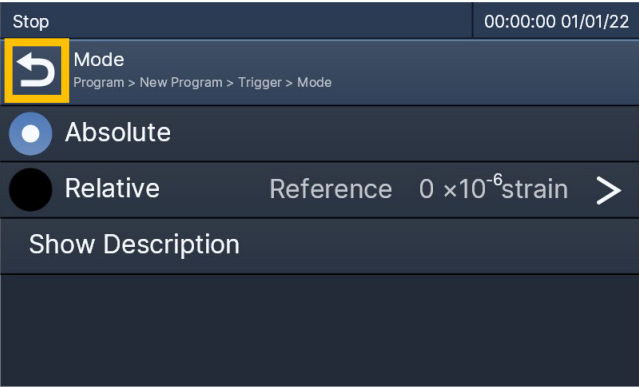


11. To set the trigger mode to "absolute value," tap the Absolute radio button.

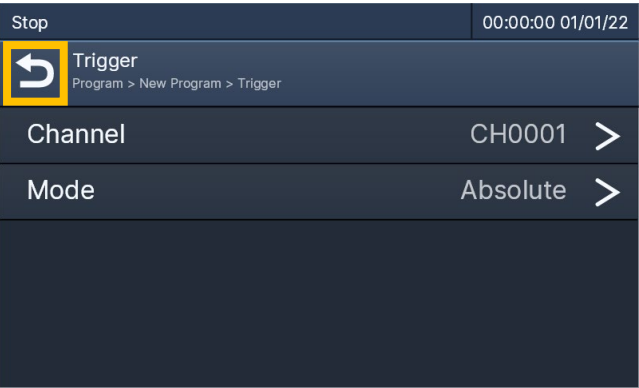
To set the trigger mode to "relative value," tap the Relative radio button.



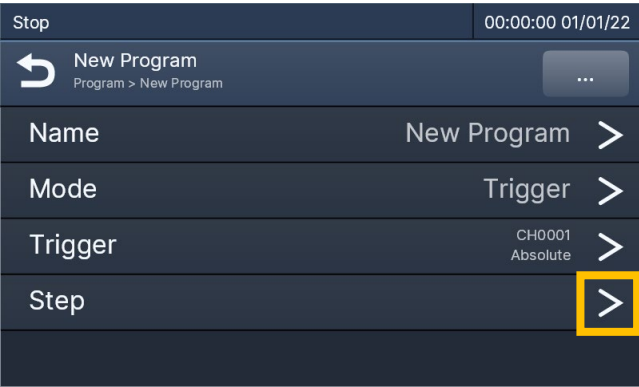
12. To set the trigger mode to "relative value," tap the Relative arrow button, and then enter the reference value.



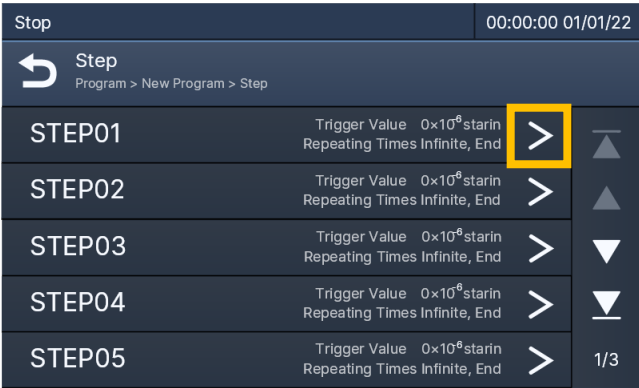
13. Tap the Back button.



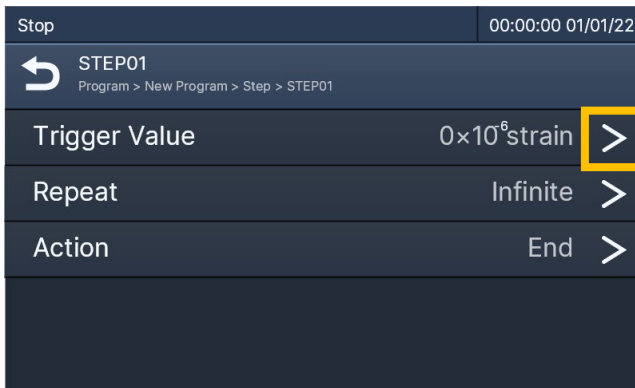
14. Tap the Back button.



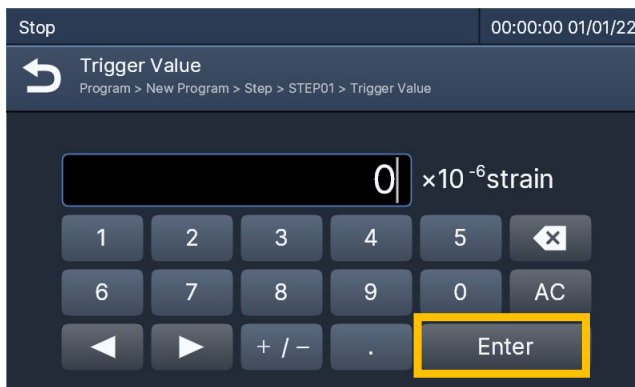
15. Tap **Step**.



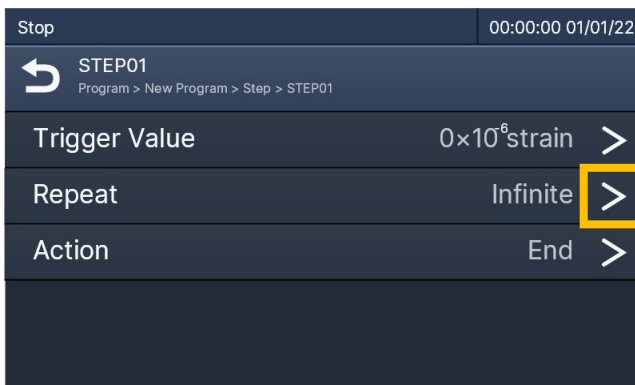
16. Tap **STEP01**.



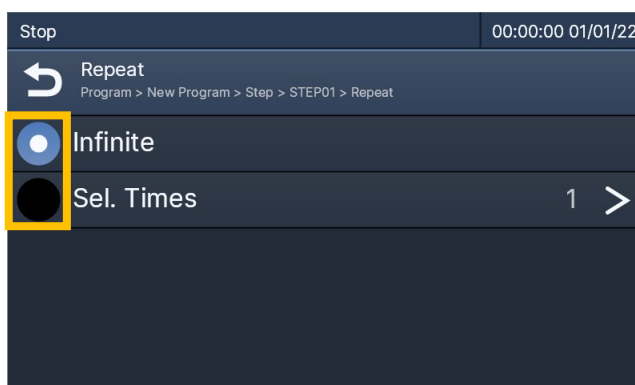
17. Tap **Trigger Value**.



18. Enter the trigger value and then tap **Enter**.

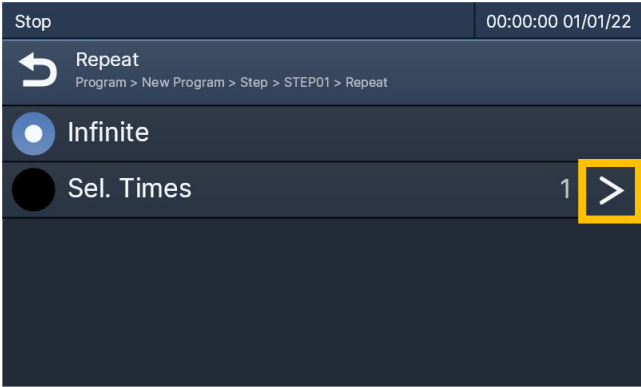


19. Tap **Repeat**.

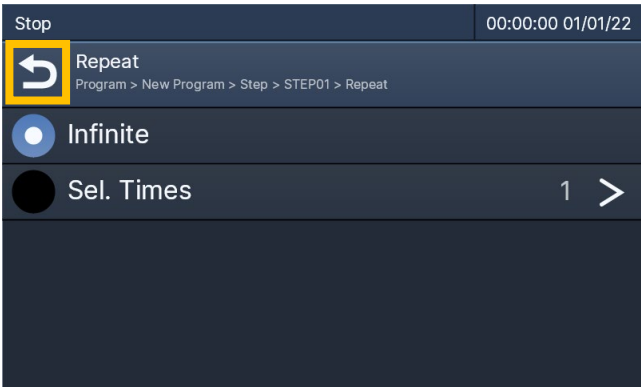


20. To indicate that trigger measurement should continue until the program run/stop key is pressed, tap **Infinite**.

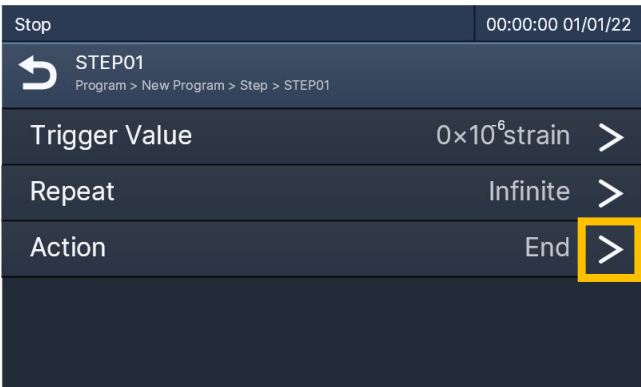
To specify the count, tap the **Sel. Times** radio button.



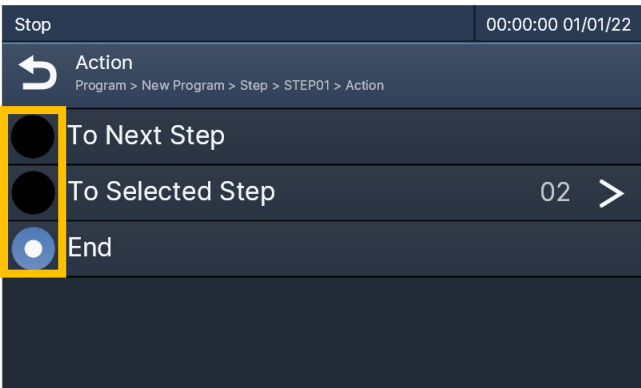
21. To specify the count, tap the **Sel.** **Times** arrow button, and then enter the count.



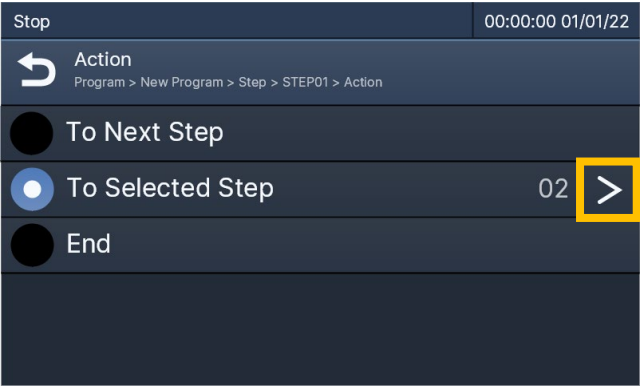
22. Tap the Back button.



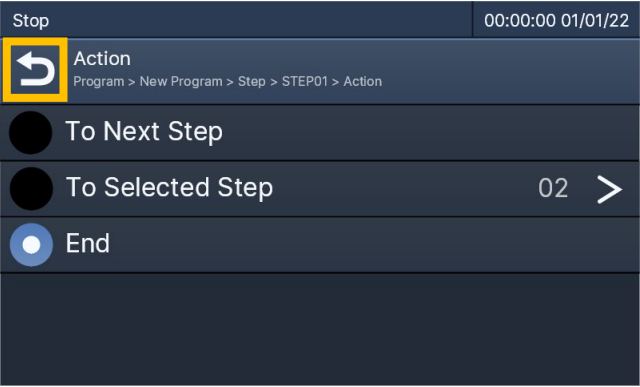
23. Tap **Action**.



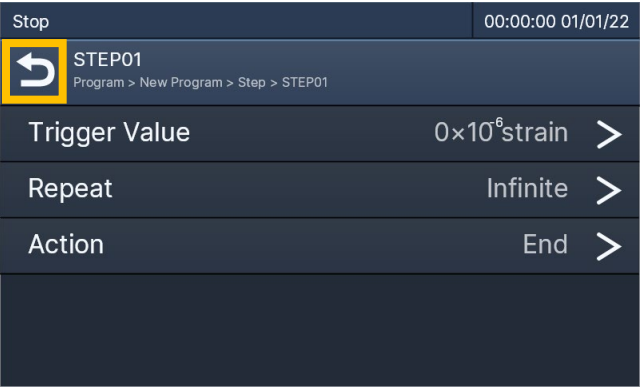
24. Tap the operation to set.



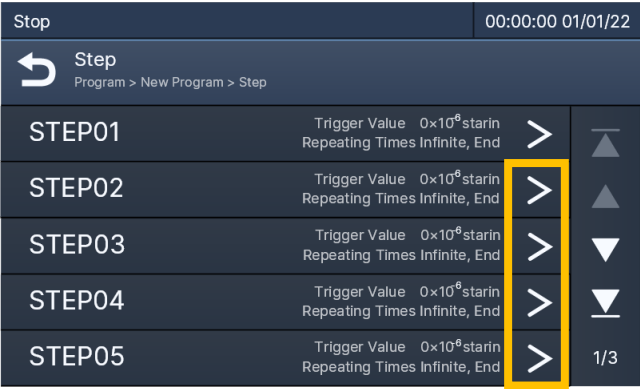
25. To set the specified step, select the **To Selected Step** arrow button, and then enter the step number.



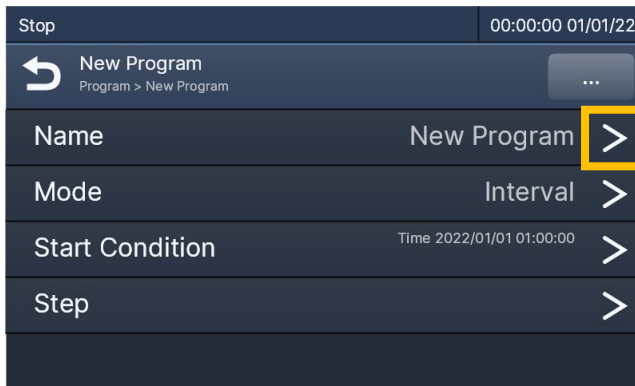
26. Tap the Back button.



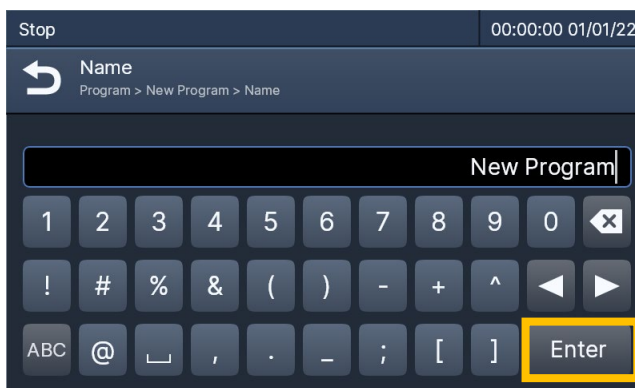
27. Tap the Back button.



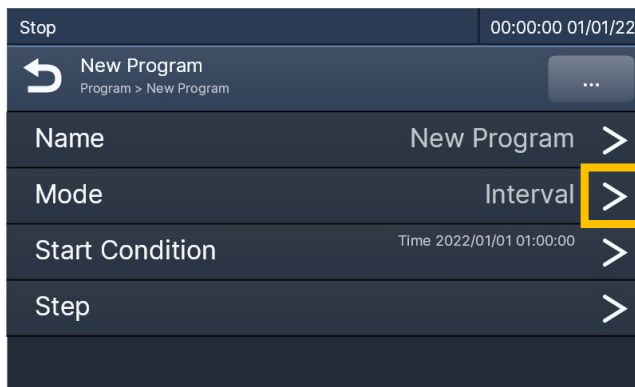
28. If setting step 02 onward, tap the arrow button of the step to set, and then set the step.

(3) Procedure for setting trigger interval measurement

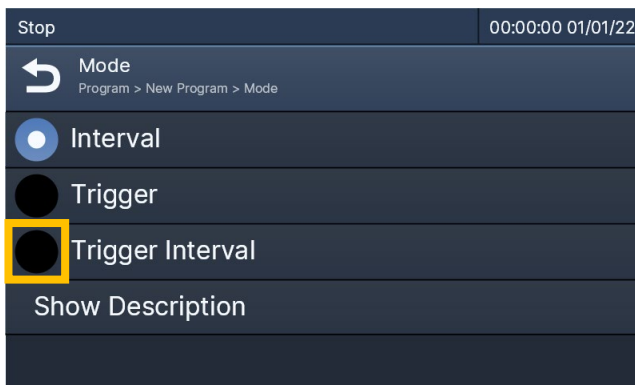
1. Tap **Name**.



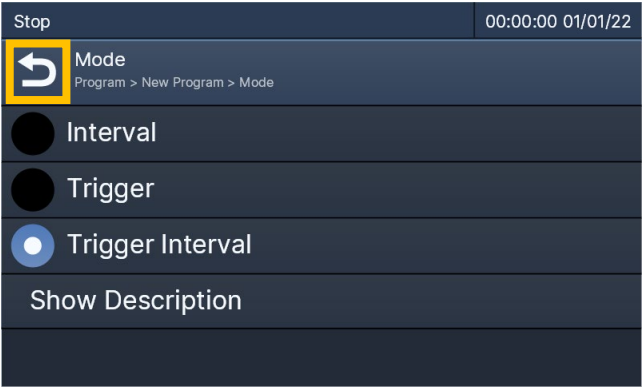
2. Enter a program name, and then tap **Enter**.



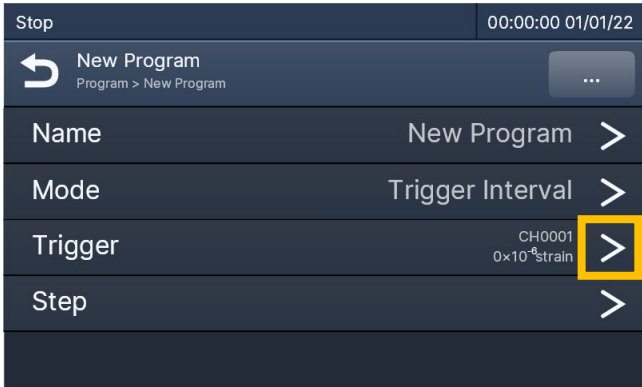
3. Tap **Mode**.



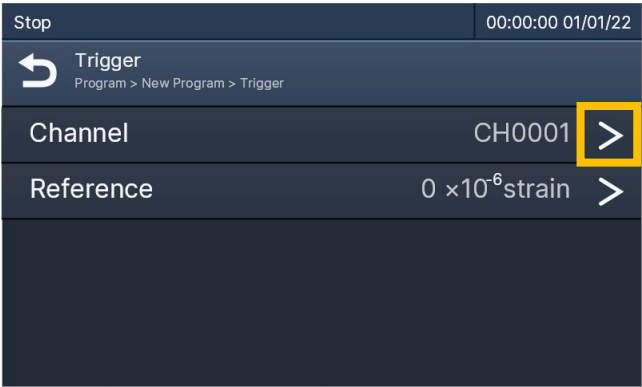
4. Tap **Trigger Interval**.



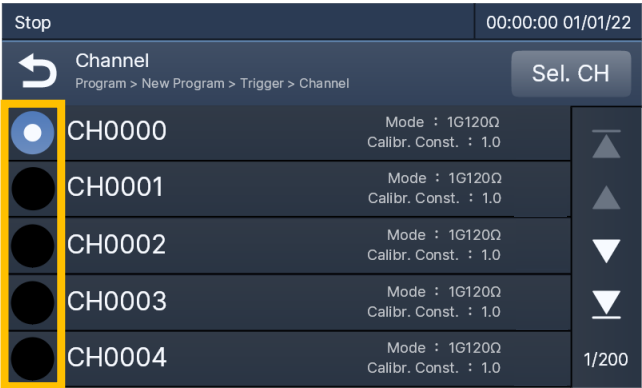
5. Tap the Back button.



6. Tap **Trigger**.



7. Tap **Channel**.

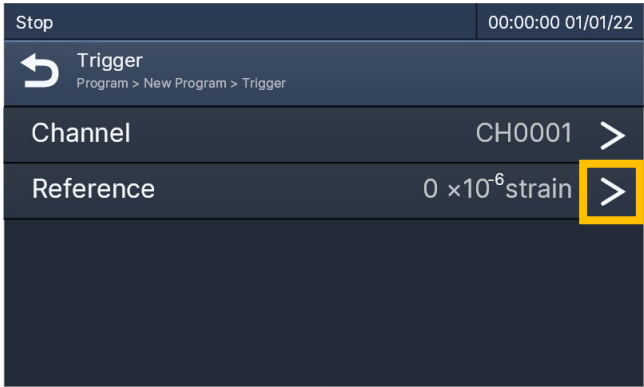


8. Determine the trigger channel and tap the corresponding channel radio button.

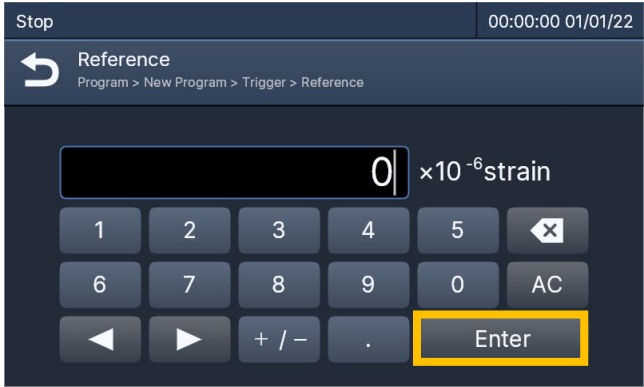
You can also tap **Sel. CH** and enter the channel directly.



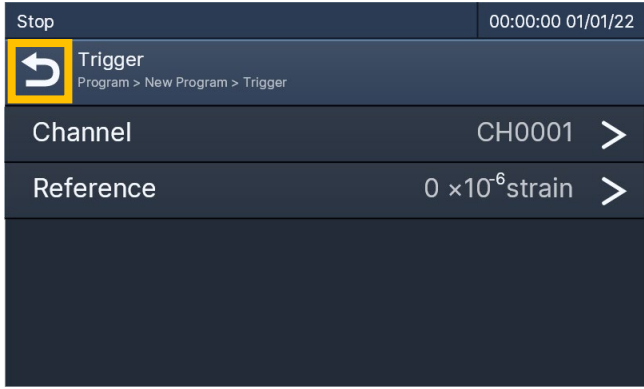
9. Tap the Back button.



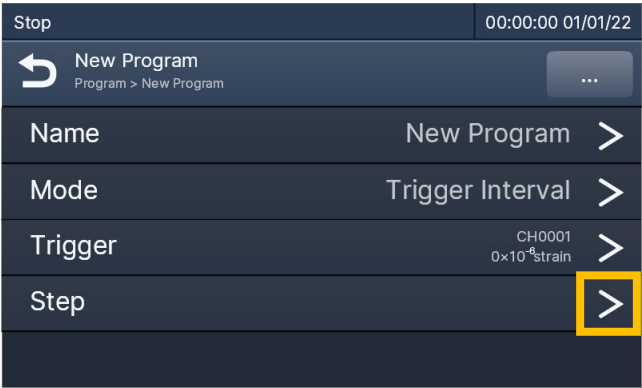
10. Tap **Reference**.



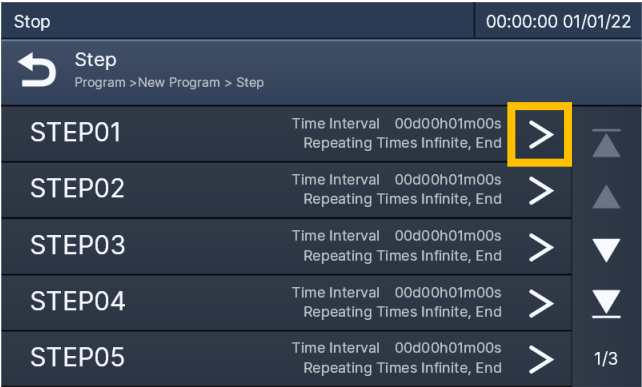
11. Enter the reference value and then tap **Enter**.



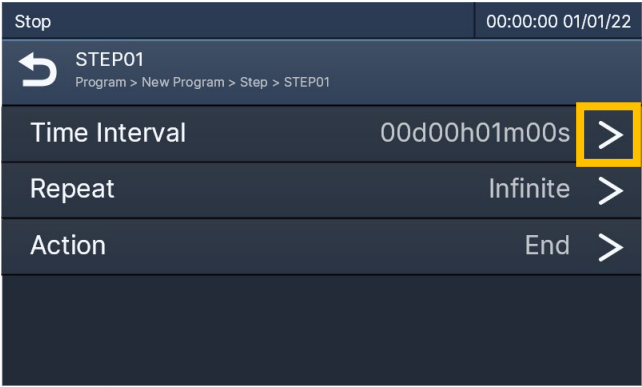
12. Tap the Back button.



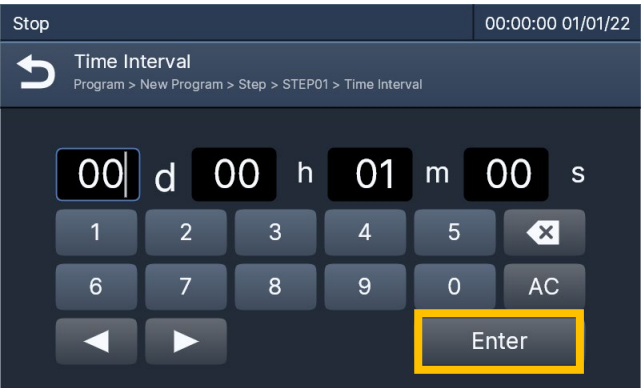
13. Tap **Step**.



14. Tap **STEP01**.



15. Tap **Time Interval**.



16. Enter the time interval to perform scanning, and then tap **Enter**.

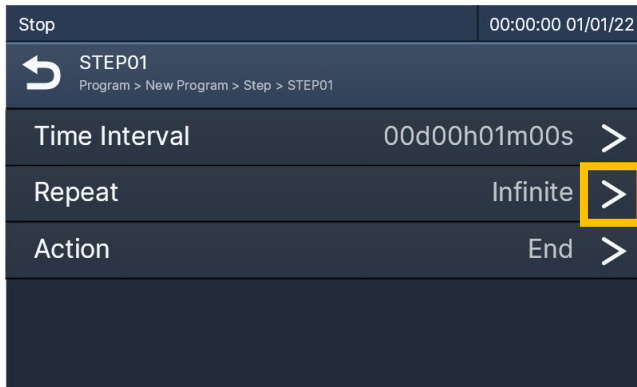
**CAUTION**

- Set a time interval with some leeway for the "time for one scan."
- An example of calculating the "time for one scan" is shown below.
 - Channel range: Use from CH0 to CH2
 - CH0 scanning speed: 0.5 sec
 - CH1 scanning speed: 1 sec
 - CH2 scanning speed: 2 sec
 - Process time: 5 sec or less
 - Time for one scan = $0.5 + 1 + 2 + \text{Process time} = 3.5 \text{ sec} + \text{Process time}$
- The process time above will vary depending on conditions such as the number of measurement channels.
- The process time above is the time without printing measurement values to the printer.

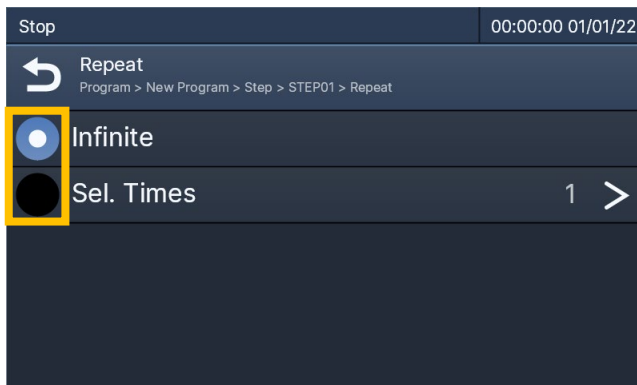
If printing measurement values to the printer, depending on the number of measurement channels, the process time may be 5 sec or more.
- If the time interval is 10 sec or less, intervals of the trigger interval measurement may not be uniform.
- If the subsequent scanning time is reached prior to completing the current scan, the subsequent scan will not be performed.



The "day" for the time interval can be set from 0 to 31.

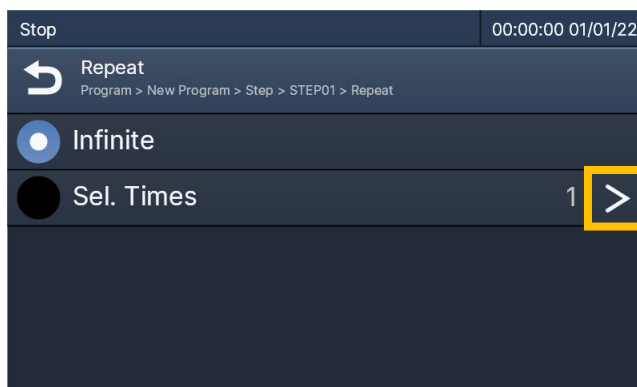


17. Tap **Repeat**.

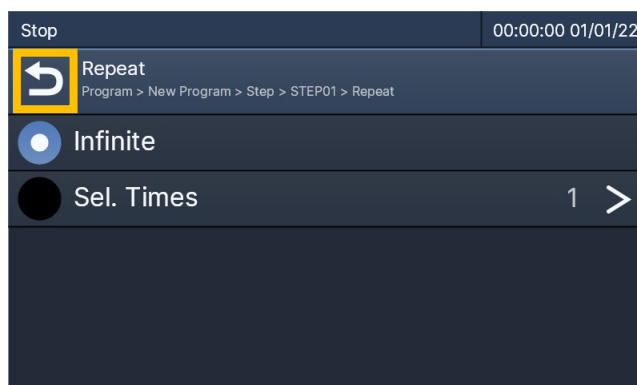


18. To indicate that interval measurement should continue until the program run/stop key is pressed, tap **Infinite**.

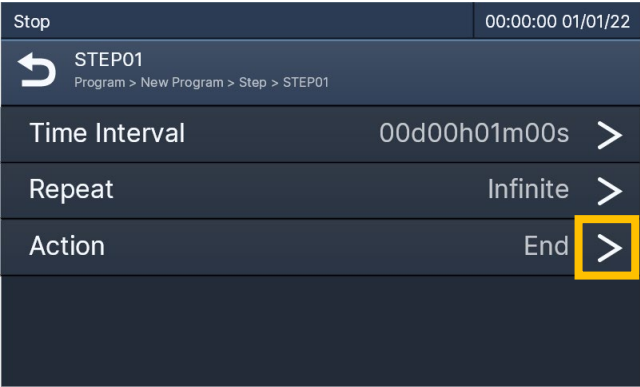
To specify the count, tap the **Sel. Times** radio button.



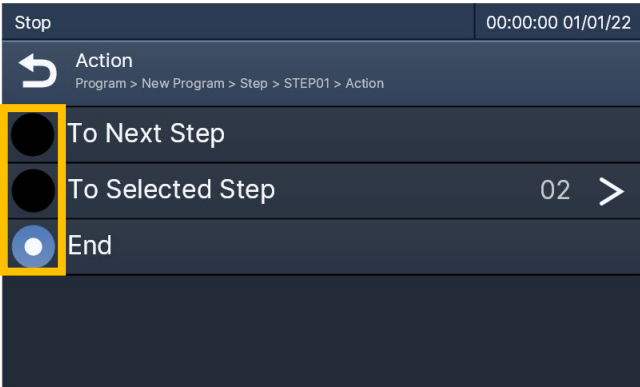
19. To specify the count, tap the **Sel. Times** arrow button, and then enter the count.



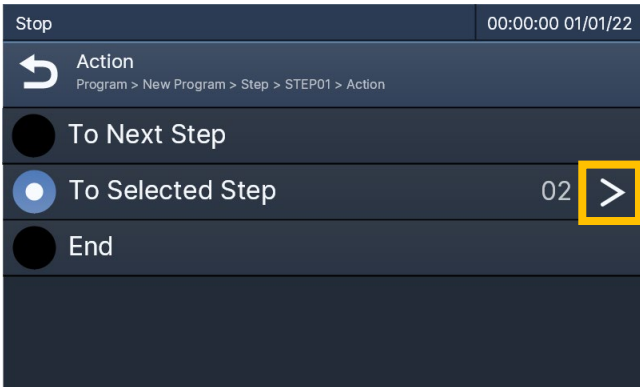
20. Tap the Back button.



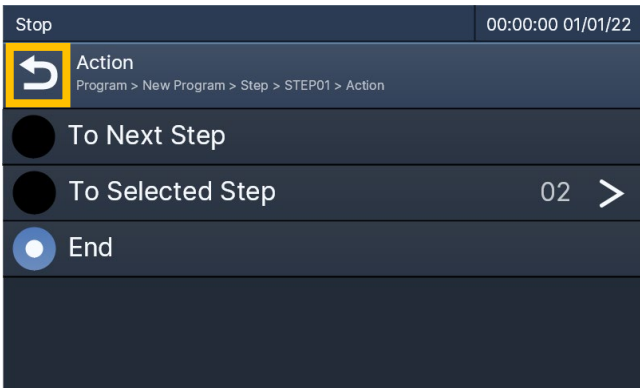
21. Tap **Action**.



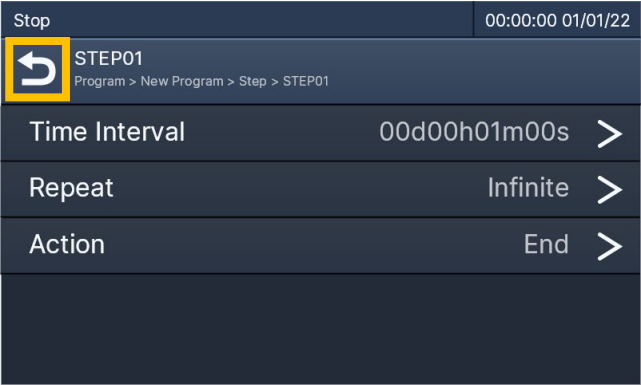
22. Tap the operation to set.



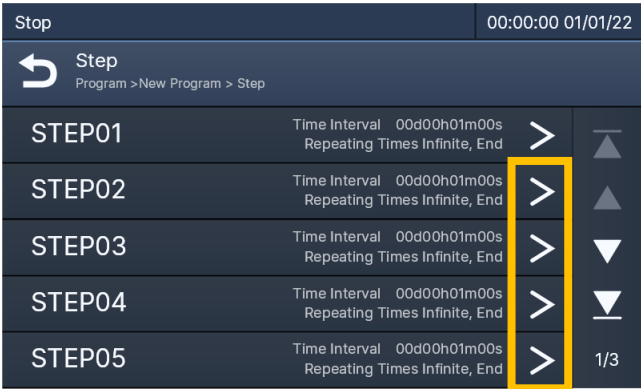
23. To set the specified step, select the **To Selected Step** arrow button, and then enter the step number.



24. Tap the Back button.



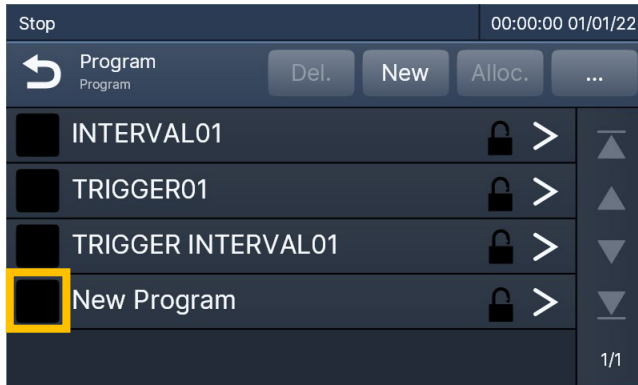
25. Tap the Back button.



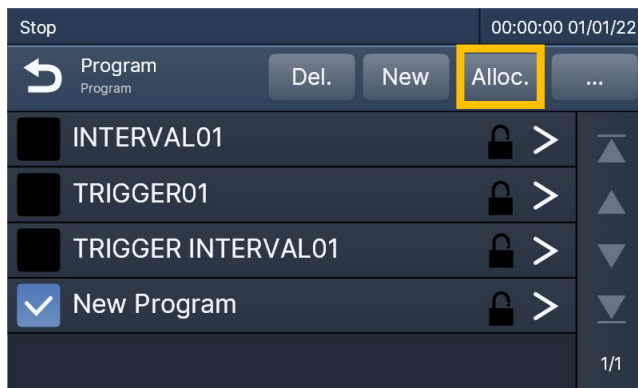
26. If setting step 02 onward, tap the arrow button of the step to set, and then set the step.

5-5-3. Program Assignment

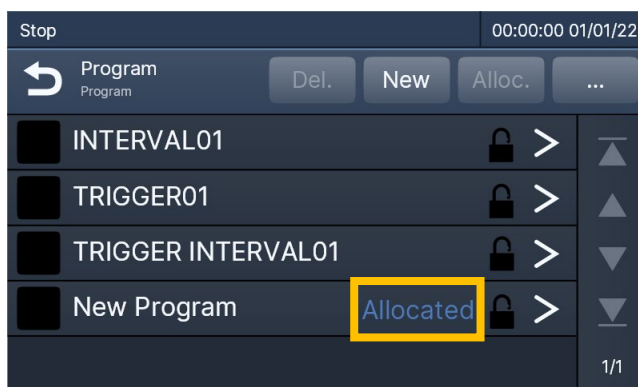
The procedure for assigning a program to run when the program run/stop key is pressed is shown below.



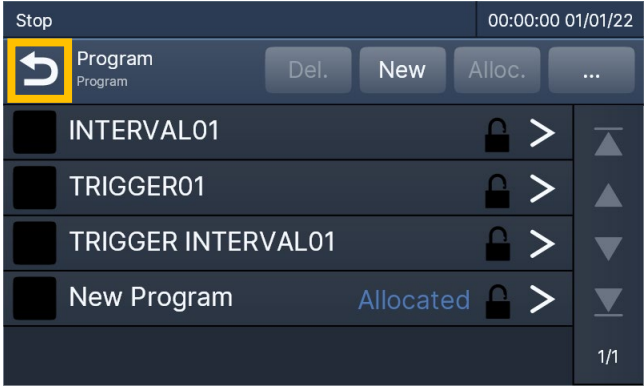
1. Tap the check box of the program to assign.



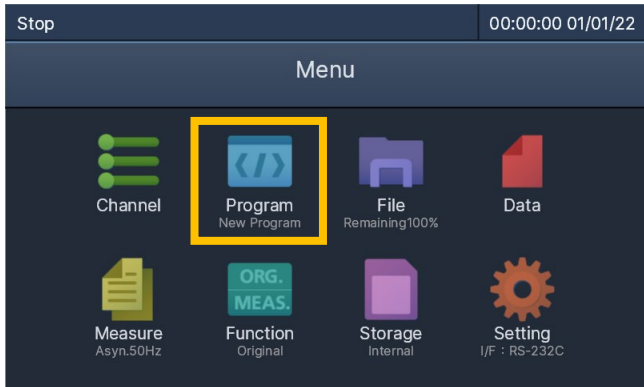
2. Tap **Alloc.**



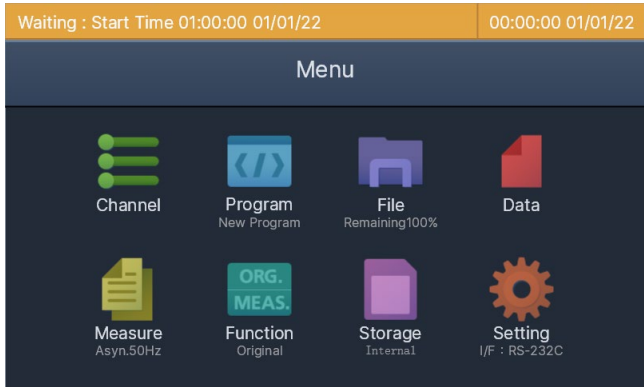
3. On the right of the assigned program, **Allocated** is displayed.



4. Tap the Back button.



5. Beneath **Program** on the **Menu** screen, the name of the assigned program is displayed.



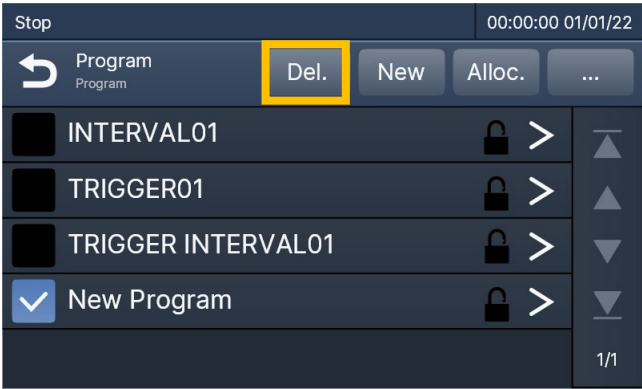
6. While the **Menu** screen is displayed, pressing and holding the program run/stop key will start automatic measurement according to the assigned program.

5-5-4. Program Deletion

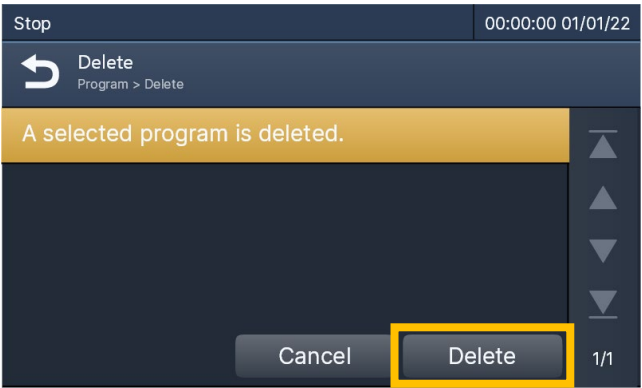
The procedure for deleting programs is shown below



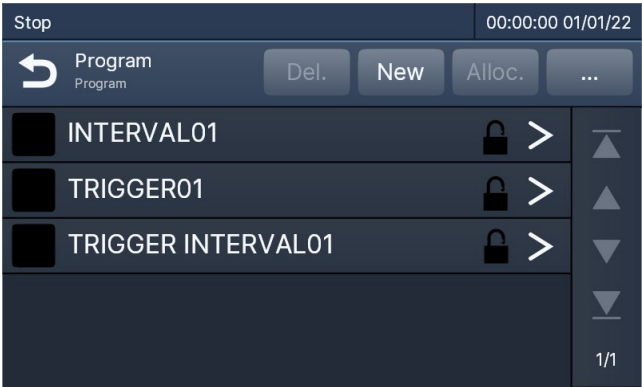
1. Tap the check box of the program to delete.



2. Tap **Del.**



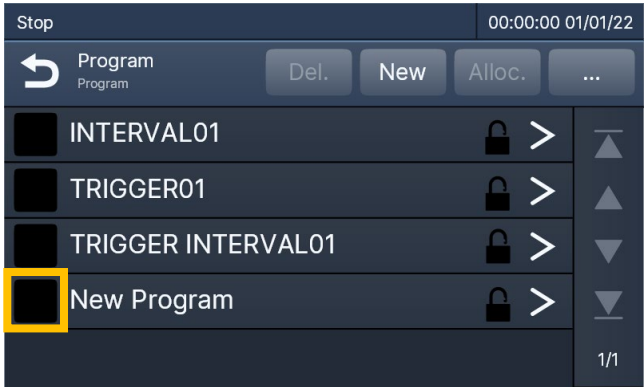
3. Tap **Delete**.



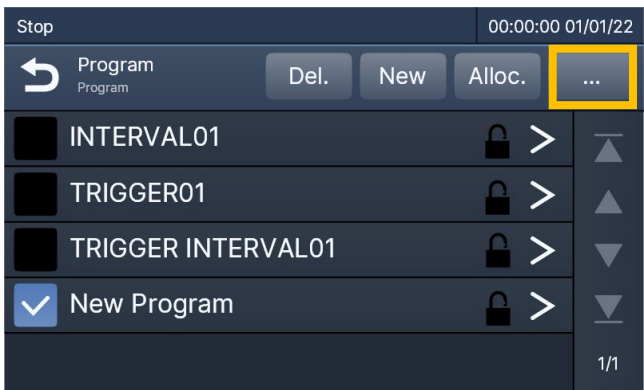
4. The program is deleted.

5-5-5. Program Duplication

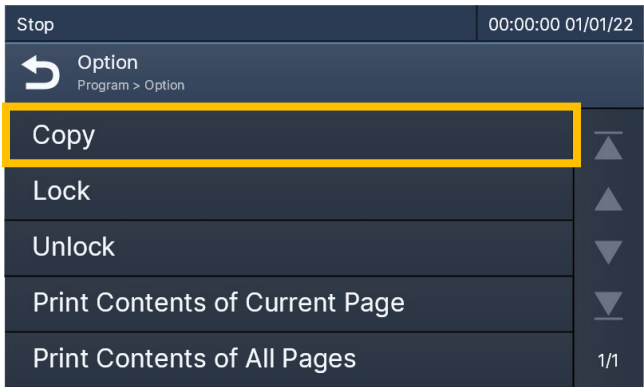
The procedure for duplicating programs is shown below.



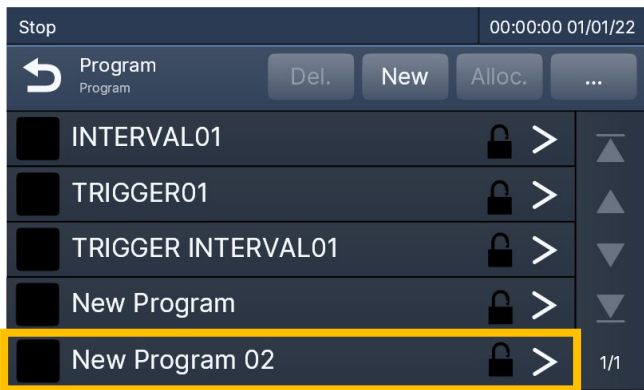
1. Tap the check box of the program to duplicate.



2. Tap the Option button.



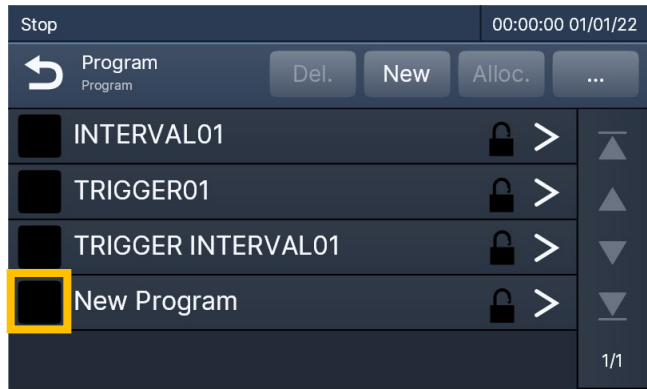
3. Tap **Copy**.



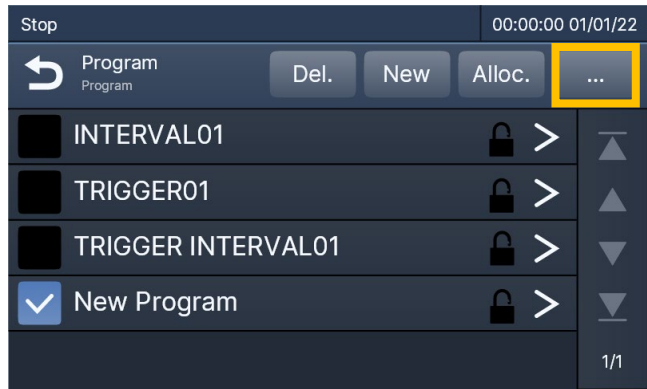
4. The program is duplicated.

5-5-6. Program Locking

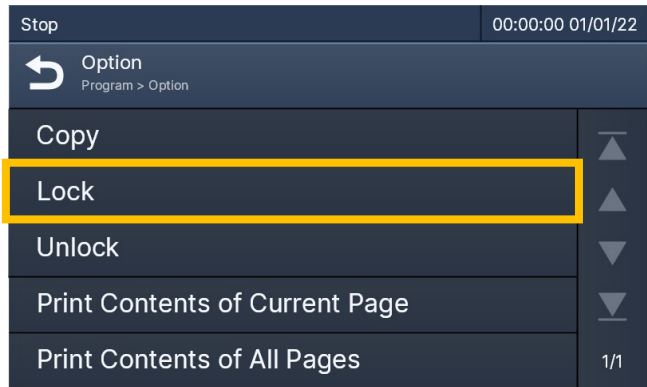
The procedure for locking a program (preventing it from being configured or deleted) is shown below.



1. Tap the check box of the program to lock.

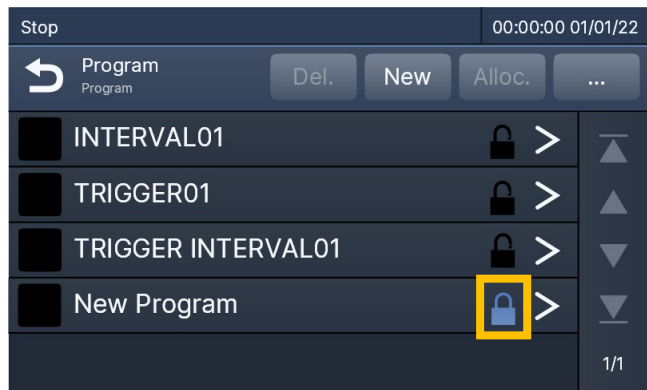


2. Tap the Option button.



3. Tap **Lock**.

Tap **Unlock** to unlock.

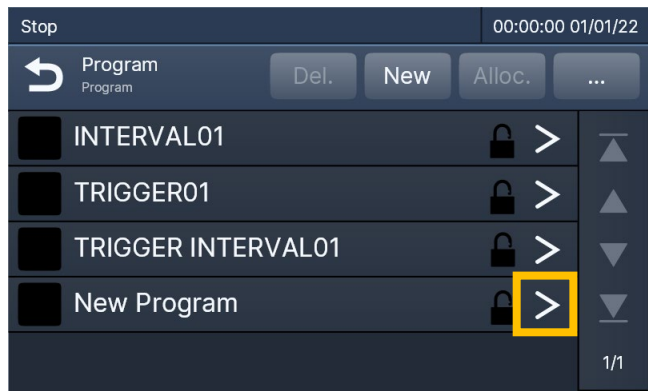


4. The program is locked.

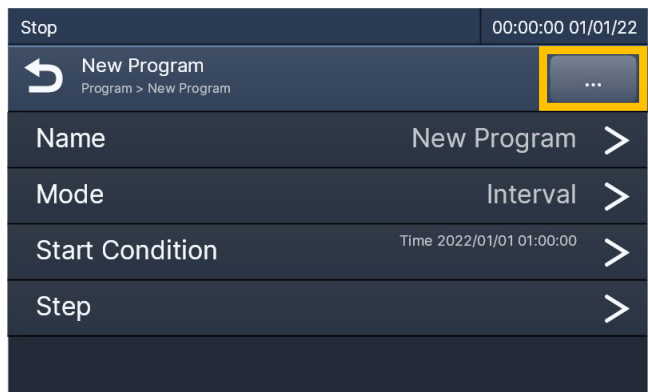
5-5-7. Detailed Preview Display

The detailed preview function displays the schedule for performing a scan during a program.

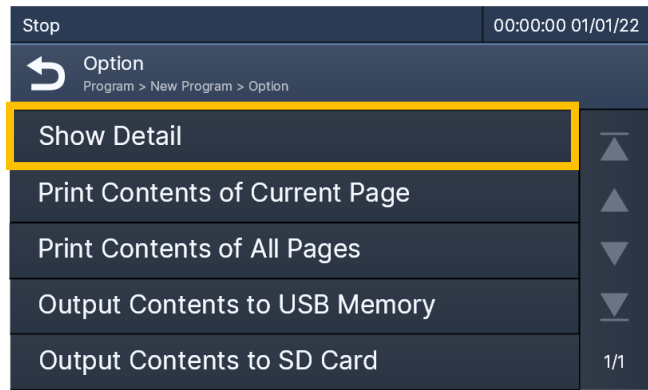
The procedure for displaying a detailed preview is described below.



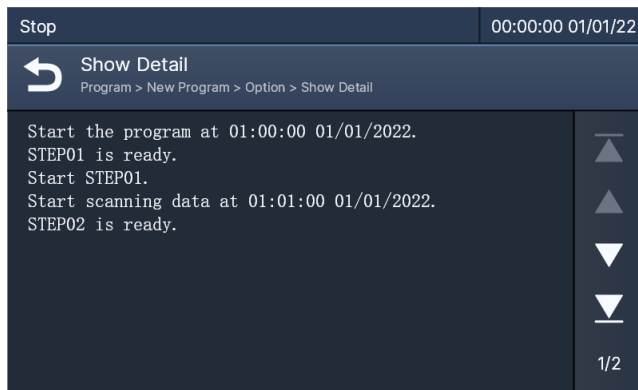
1. To display a detailed preview for a program, tap its arrow button.



2. Tap the Option button.



3. Tap Show Detail.



4. The detailed preview is displayed.



A detailed preview can be displayed only for programs where the automatic measurement mode is "interval."

5-6. MEASUREMENT

There are three types of measurement:

(1) Real-time measurement

This function obtains measurement values one time only. When the scan key is pressed, real-time measurement starts.

The screen during real-time measurement is shown below.

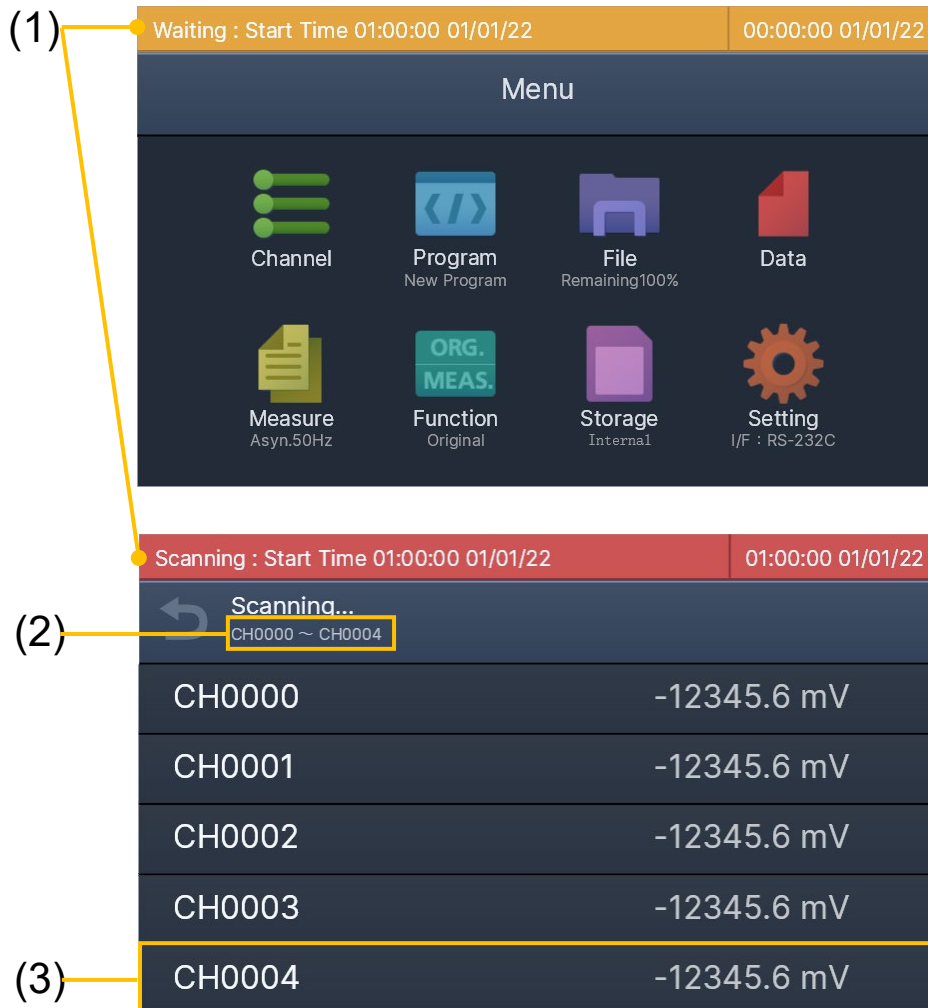


Number	Name	Function
1	Status bar	Displays the measurement status of this device. This will be red when scanning.
2	Measurement channel range	Displays the range of channels to perform measurement.
3	Measurement value	Measurement values are displayed for each channel.

(2) Automatic measurement

This function automatically obtains measurement values based on program settings. Press and hold the program run/stop key to start automatic measurement. For details on programs, refer to "5-5. AUTOMATIC MEASUREMENT SETTINGS."

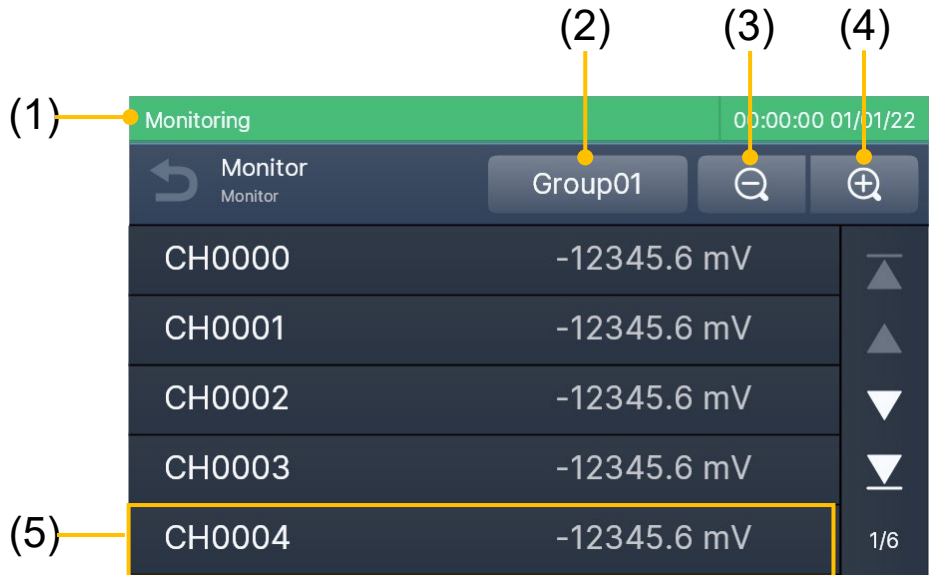
The screen during automatic measurement is shown below.



Number	Name	Function
1	Status bar	Displays the measurement status of this device. This will be yellow during scan standby, or red when scanning. This also displays the next measurement start time and threshold.
2	Measurement channel range	Displays the range of channels to perform measurement.
3	Measurement value	Measurement values are displayed for each channel.

(3) Monitor

This function displays measurement values in series. Press the monitor key to start monitoring.
 Use this to confirm measurement values prior to starting real-time measurement or automatic measurement.
 The screen during monitoring is shown below.



Number	Name	Function
1	Status bar	Displays the measurement status of this device. This will be green when monitoring.
2	Filter button	A group can be selected to display only certain channels.
3	Shrink button	Increases the number of channels displayed. The number of channels can be set to either 5, 15, or 30.
4	Expand button	Decreases the number of channels displayed. The number of channels can be set to either 5, 15, or 30.
5	Measurement value	Measurement values are displayed for each channel.

5-6-1. Real-Time Measurement

The procedure for performing real-time measurement is shown below.

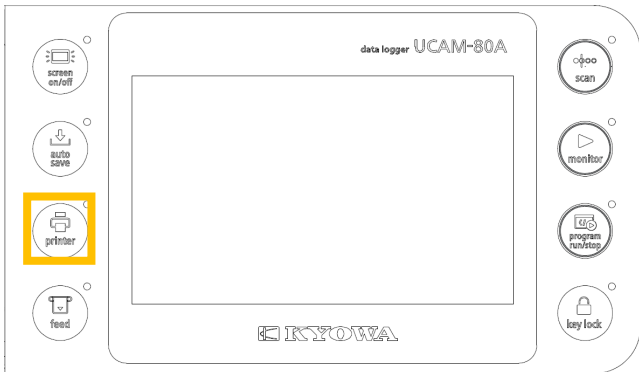


1. To save a measurement data file, press and hold the auto save key until the LED to the upper right of the auto save key lights up.

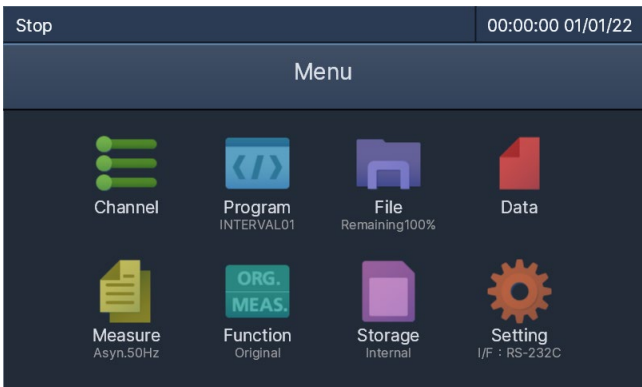


CAUTION

If the LED to the upper right of the auto save key is not lit up, a measurement data file will not be saved.



2. To print measurement values, press and hold the printer key until the LED to the upper right of the printer key lights up. For details on printing, refer to "6-14. PRINTING SETTINGS."

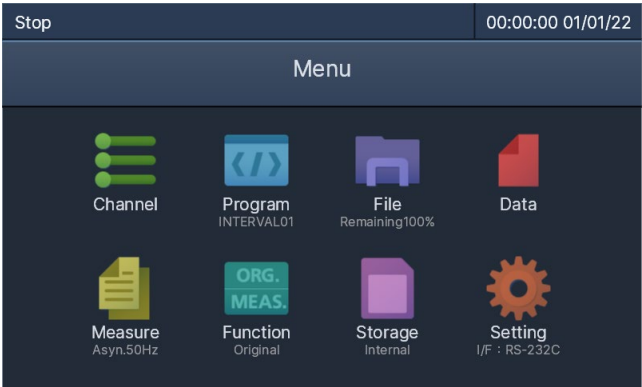


3. While the **Menu** screen is displayed, press the scan key.

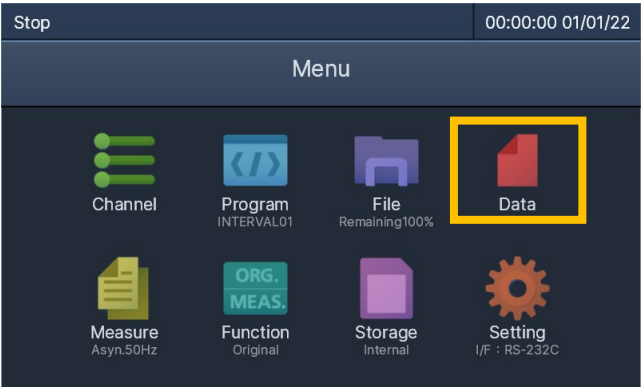


4. Real-time measurement starts.

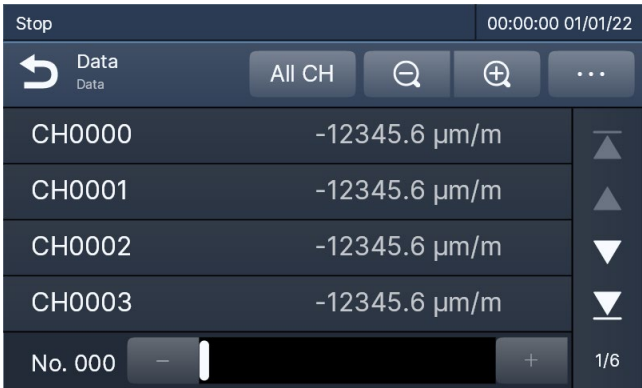
To stop real-time measurement, press the scan key again.



5. Once real-time measurement ends, the display will automatically return to the **Menu** screen.



6. Tap **Data**.



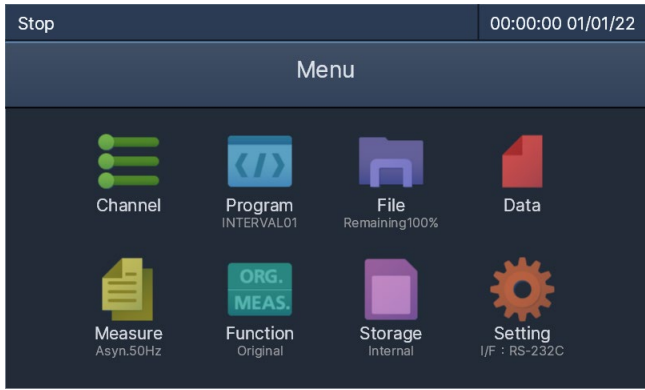
7. Measurement values obtained during real-time measurement are displayed. Refer to "5-7-1. Latest Measurement Values" for details on this screen.

5-6-2. Automatic Measurement

The procedure for performing automatic measurement is shown below.

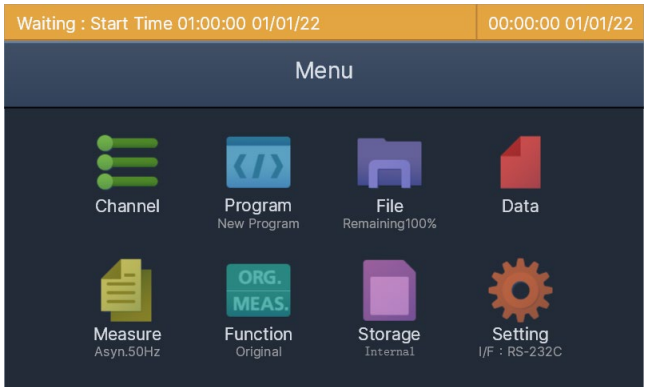


- 1. To print measurement values, press and hold the printer key until the LED to the upper right of the printer key lights up. For details on printing, refer to "6-14. PRINTING SETTINGS."



- 2. While the **Menu** screen is displayed, press and hold the program run/stop key.

When automatic measurement is started by pressing and holding the program run/stop key, the auto save key LED (upper right) lights up, and measurement data file saving turns ON.



- 3. Automatic measurement starts.
- To stop automatic measurement, press and hold the program run/stop key again.



CAUTION

- During automatic measurement, do not move to any screen other than the **Menu** screen.
- Scanning will not be performed on any screen other than the **Menu** screen.

Scanning : Start Time 01:00:00 01/01/22		01:00:00 01/01/22
Scanning... CH0000 ~ CH0004		
CH0000	-12345.6 mV	
CH0001	-12345.6 mV	
CH0002	-12345.6 mV	
CH0003	-12345.6 mV	
CH0004	-12345.6 mV	

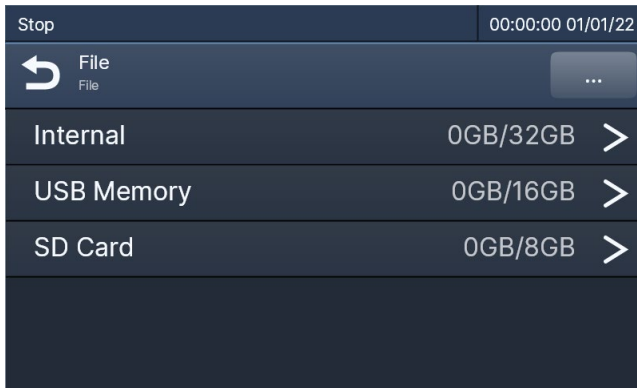
4. Scanning will automatically be performed once the conditions are met.

Stop		00:00:00 01/01/22
Menu		
 Channel	 Program INTERVAL01	 File Remaining100%
 Data	 Measure Asyn.50Hz	 Function Original
 Storage Internal	 Setting I/F : RS-232C	

5. Once automatic measurement ends, the display will automatically return to the **Menu** screen.

Stop		00:00:00 01/01/22
Menu		
 Channel	 Program INTERVAL01	 File Remaining100%
 Data	 Measure Asyn.50Hz	 Function Original
 Storage Internal	 Setting I/F : RS-232C	

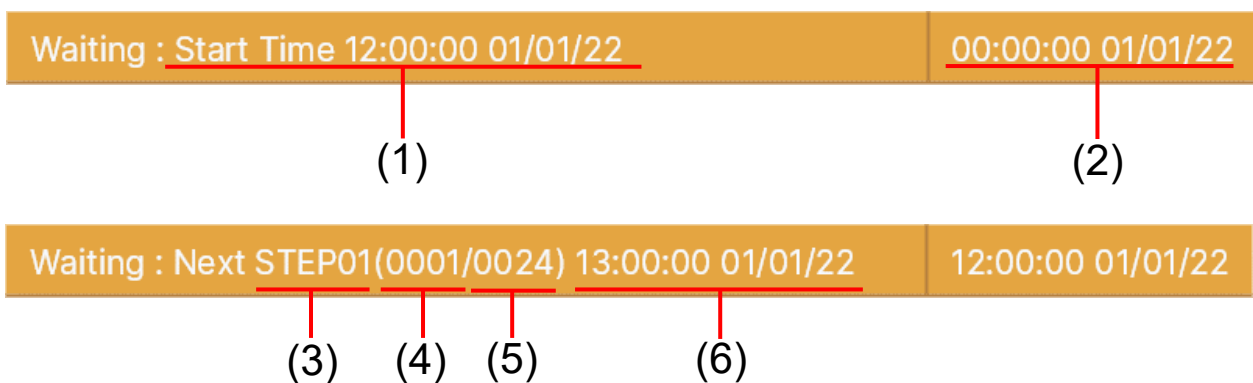
6. To check the saved measurement data file, tap **File**.



7. The **File** screen is displayed.

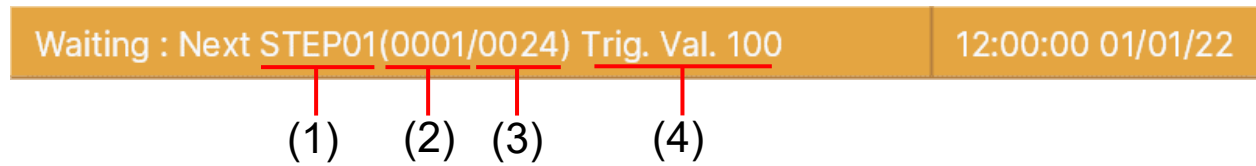
For details on this screen, refer to "5-7-2. Measurement Data File Confirmation."

During interval measurement, the following information is displayed at the top of the screen.



Number	Details
1	Displays the time to start measurement. In the example above, measurement will start at 2022/01/01 12:00:00.
2	Displays the current time on this device.
3	Displays the number of the next step to perform. In the example above, "Step 1" will be performed next.
4	Displays the scan count of the next scan to perform. In the example above, the first scan is the scan that will be performed next.
5	Displays the repeat times for the next step to perform. In the example above, Step 1 will end once 24 scans have been performed.
6	Displays the time when the next scan will be performed. In the example above, the next scan will be performed at 2022/01/01 13:00:00.

During trigger measurement with the trigger mode set to "absolute value," the following information is displayed at the top of the screen.



Number	Details
1	Displays the number of the next step to perform. In the example above, "Step 1" will be performed next.
2	Displays the scan count of the next scan to perform. In the example above, the first scan is the scan that will be performed next.
3	Displays the repeat times for the next step to perform. In the example above, Step 1 will end once 24 scans have been performed.
4	Displays the trigger value for the scan that will be performed next. In the example above, the next scan will be performed once the trigger channel measurement value exceeds 100.

During trigger measurement with the trigger mode set to "relative value," the following information is displayed at the top of the screen.

Waiting : <u>Ref. Val. 100</u>					12:00:00 01/01/22
	(1)				
<u>STEP01</u>	<u>(0001/0024)</u>	<u>Ref. Val. 100</u>	<u>Trig. Val ±200</u>		12:00:00 01/01/22
(2)	(3)	(4)	(5)	(6)	

Number	Details
1	Displays the reference value to start measurement. In the example above, measurement will start once the trigger channel measurement value exceeds 100.
2	Displays the number of the next step to perform. In the example above, "Step 1" will be performed next.
3	Displays the scan count of the next scan to perform. In the example above, the first scan is the scan that will be performed next.
4	Displays the repeat times for the next step to perform. In the example above, Step 1 will end once 24 scans have been performed.
5	Displays the reference value for the scan that will be performed next.
6	Displays the trigger value for the scan that will be performed next. In the example above, the next scan will be performed once the trigger channel measurement value exceeds the range of 100 ±200.

During trigger interval measurement, the following information is displayed at the top of the screen.

Waiting : Ref. Val. 100	12:00:00 01/01/22
(1)	
Waiting : Next STEP01(0001/0024) 13:00:00 01/01/22	12:00:00 01/01/22
(2) (3) (4) (5)	

Number	Details
1	Displays the reference value to start measurement. In the example above, measurement will start once the trigger channel measurement value exceeds 100.
2	Displays the number of the next step to perform. In the example above, "Step 1" will be performed next.
3	Displays the scan count of the next scan to perform. In the example above, the first scan is the scan that will be performed next.
4	Displays the repeat times for the next step to perform. In the example above, Step 1 will end once 24 scans have been performed.
5	Displays the time when the next scan will be performed. In the example above, the next scan will be performed at 2022/01/01 13:00:00.

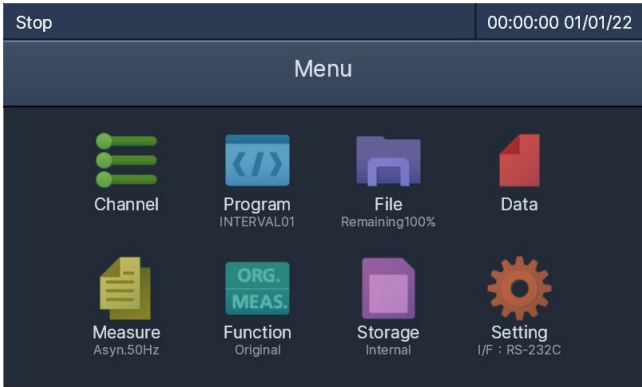


CAUTION

If this device power supply is turned OFF during automatic measurement, this device will resume automatic measurement once power is restored.

5-6-3. Monitor

The procedure for performing monitoring is shown below.



- 1. While the **Menu** screen is displayed, press the monitor key.

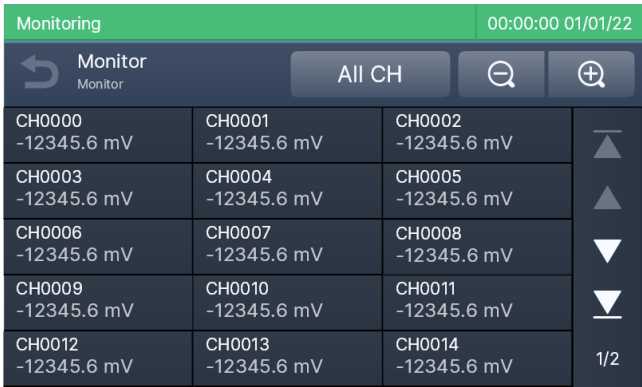


- 2. Monitoring starts.

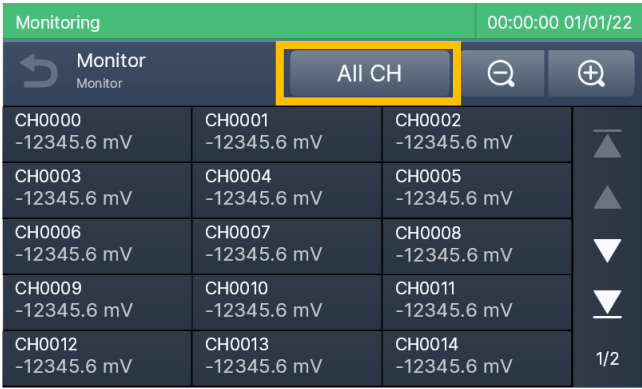
To stop monitoring, press the monitor key again.



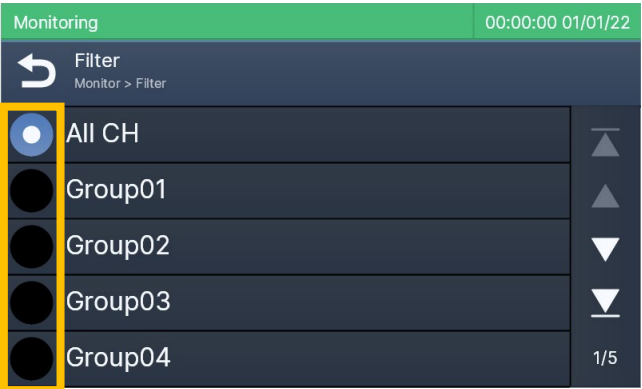
- 3. To increase/decrease the number of channels displayed, tap the Shrink button or Expand button.



- 4. The number of channels increases/decreases.



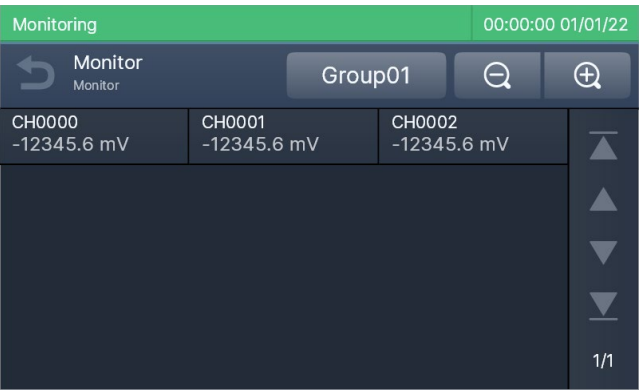
5. To display only certain channels, tap the Filter button.



6. Tap a group.



7. Tap the Back button.

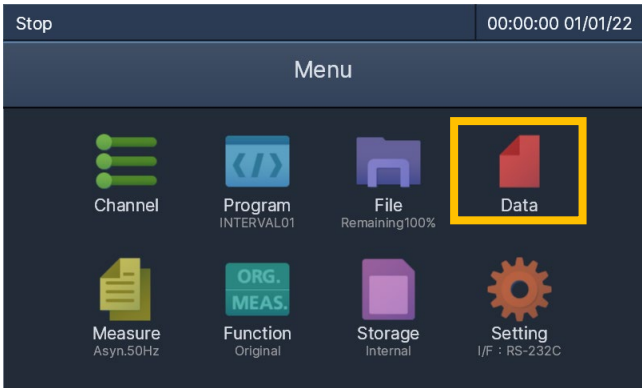


8. Only the channels registered to the group are displayed.

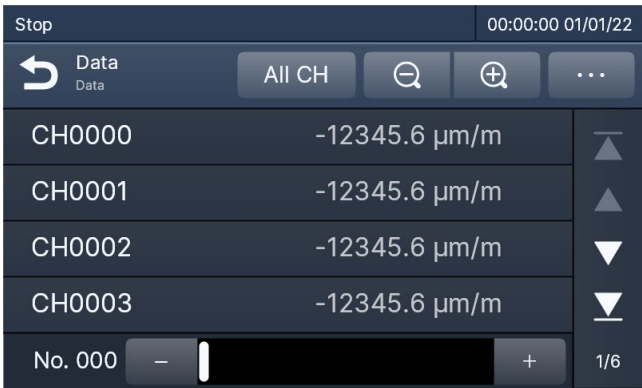
5-7. MEASUREMENT VALUE CONFIRMATION

5-7-1. Latest Measurement Values

Confirm measurement values obtained through real-time measurement or automatic measurement.



1. Tap **Data** on the **Menu** screen.



2. The **Data** screen is displayed.

The **Data** screen is used to confirm measurement values. The following functions are available on the **Data** screen.



Number	Name	Function
1	Filter button	A group can be selected to display only certain channels.
2	Shrink button	Increases the number of channels displayed. The number of channels can be set to either 4, 12, or 24.
3	Expand button	Decreases the number of channels displayed. The number of channels can be set to either 4, 12, or 24.
4	Measurement value	Measurement values are displayed for each channel.



CAUTION

If real-time measurement or automatic measurement is performed again, the measurement values displayed on the **Data** screen will be updated.

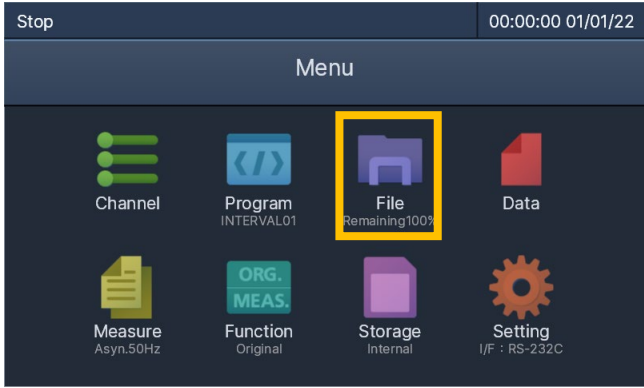


Only the measurement values for the first data item can be confirmed on the **Data** screen.

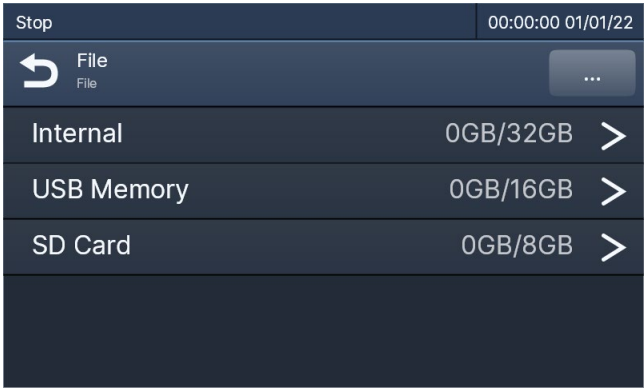
Subsequent measurement values can be confirmed on the **File** screen. For details on the **File** screen, refer to "5-7-2. Measurement Data File Confirmation."

5-7-2. Measurement Data File Confirmation

Confirm measurement data files saved through real-time measurement or automatic measurement.

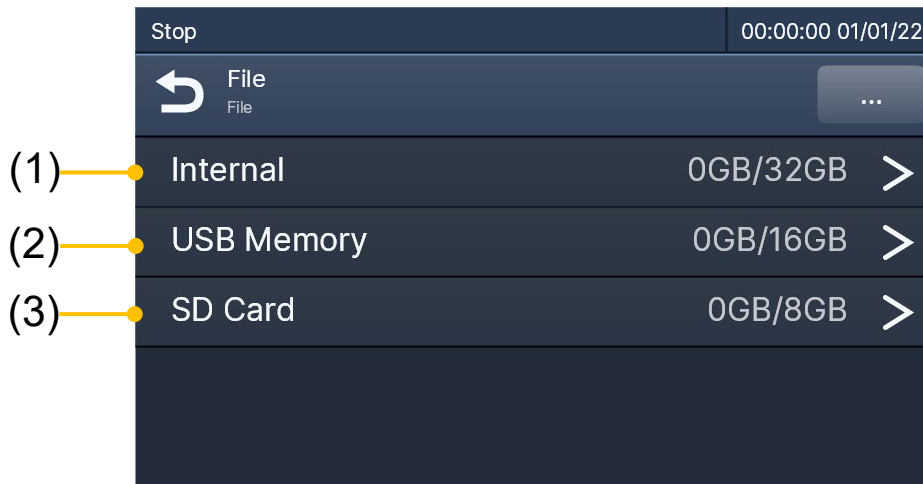


1. Tap **File** on the **Menu** screen.



2. The **File** screen is displayed.

The **File** screen is used to confirm files saved to memory. The following functions are available on the **File** screen.

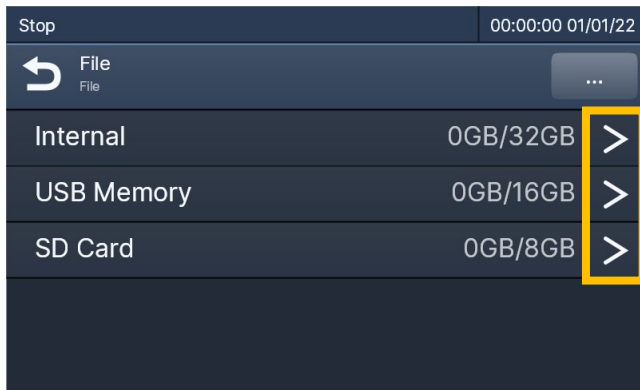


Number	Name	Function
1	Internal memory	- Displays files saved to internal memory. - On the right is shown the amount of internal memory used, followed by the total capacity.
2	USB memory	- Displays files saved to the USB memory device. - On the right is shown the amount of USB memory device storage used, followed by the total capacity.
3	SD card	- Displays files saved to the SD card. - On the right is shown the amount of SD card storage used, followed by the total capacity.

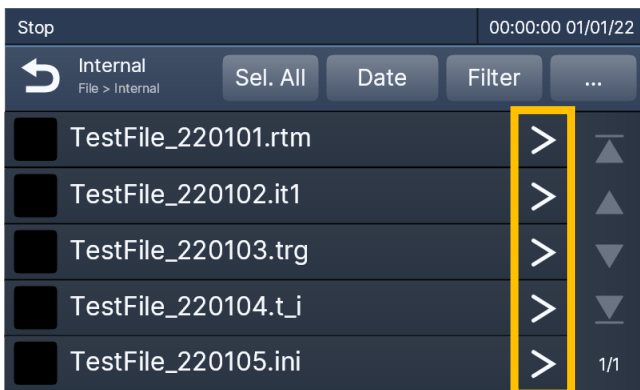


CAUTION

- When confirming files saved to a USB memory device or SD card, only files inside the "ucam" folder of the root directory (top directory) can be confirmed.
- File names may be up to 32 characters long.
When saving files to the ucam folder in the root directory of the USB memory device or SD card, do not save any files 33 characters or longer (including extension).
- When saving files to the ucam folder in the root directory of the USB memory device or SD card, do not place any files including characters that cannot be used as described in "4-2-3. Entering Numbers" and "4-2-4. Entering Text."



3. Tap the memory location containing the file.



4. Tap the arrow button of the file to confirm. For information on file extensions, refer to the following table.

Extension	Meaning
rtm	Measurement data file saved during real-time measurement
lt1	Measurement data file saved during interval measurement
trg	Measurement data file saved during trigger measurement
t_i	Measurement data file saved during trigger interval measurement
ini	Measurement data file saved during initial value measurement
csv	Measurement data file converted into CSV format
prm	Condition file. Contains settings for this device. Refer to "6-6. CONDITION FILES" for details.
txt	Text file. Contains screen display information. Refer to "6-18. SCREEN CONTENT OUTPUT TO EXTERNAL MEMORY DEVICE" for details.



Stop		00:00:00 01/01/22	
Tes...101.rtm		All CH	...
CH0000	-12345.6 μm/m	▲	
CH0001	-12345.6 μm/m	▲	
CH0002	-12345.6 μm/m	▼	
CH0003	-12345.6 μm/m	▼	
No. 000	-	+	1/6

5. File information is displayed.



This screen can be used to confirm measurement values for data items 1 through 101.



Information is not displayed for csv files, prn files, and txt files.



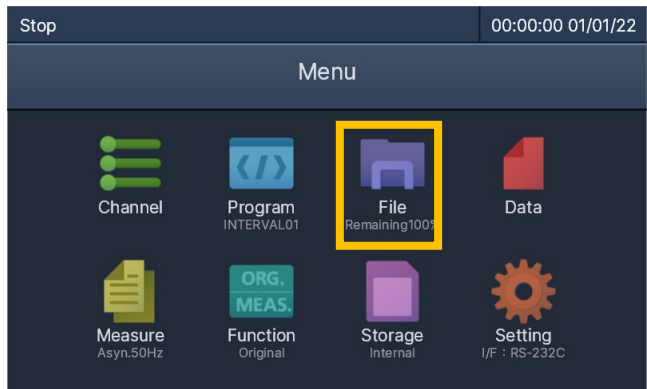
CAUTION

- Do not remove the USB memory device or SD card while confirming files.
- Do not turn the power of this device OFF while confirming files.

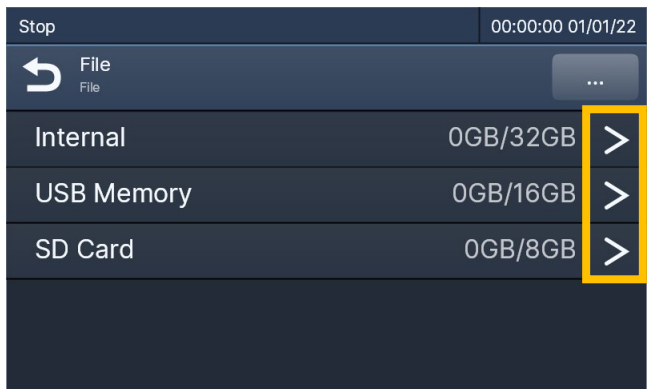
5-7-3. Measurement Data File Operations

Measurement data files can be copied, deleted, renamed, or converted to CSV files.

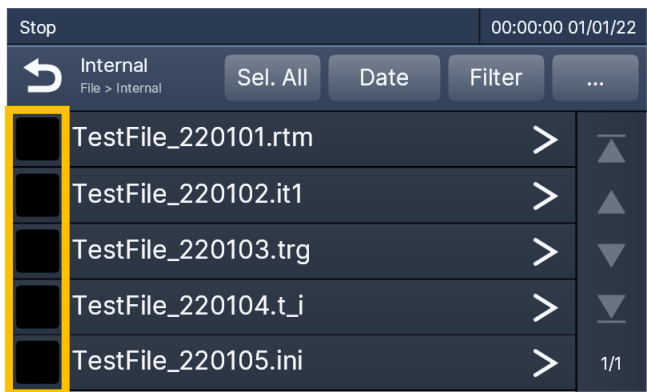
(1) Copying a file



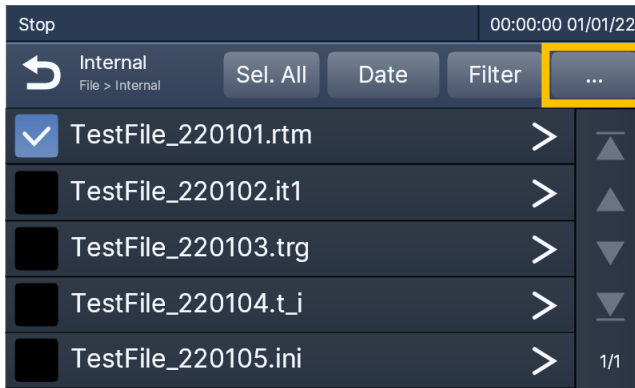
1. Tap **File** on the **Menu** screen.



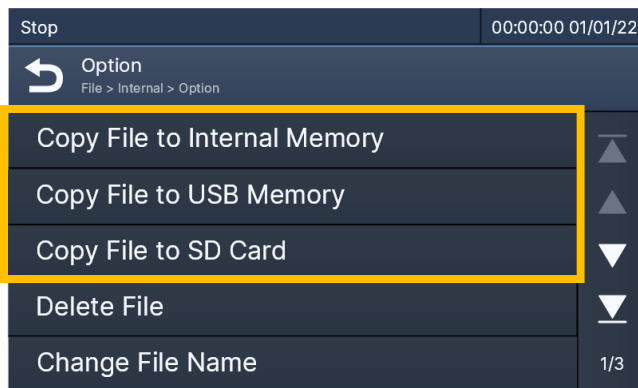
2. Tap the memory location containing the file to copy.



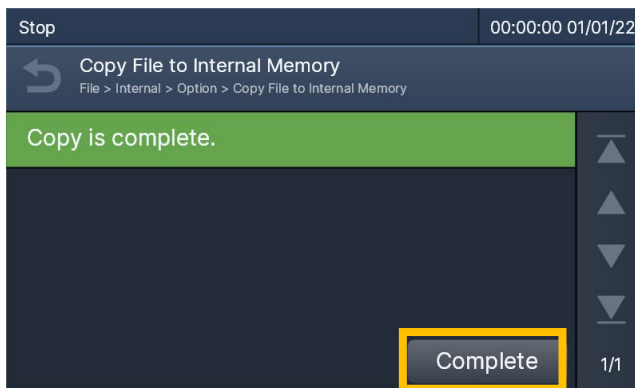
3. Tap the check box of the file to copy.



4. Tap the Option button.



5. Tap the memory location in which to save the copy.



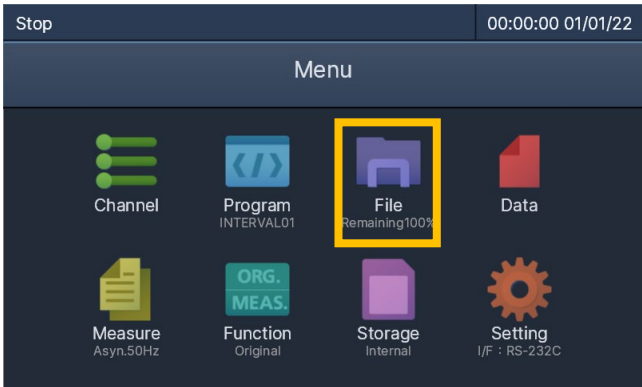
6. Once copying is complete, tap Complete.



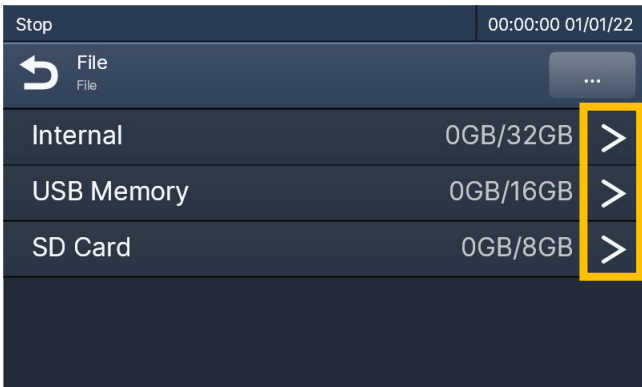
CAUTION

- Wait until copying is finished before removing the USB memory device or SD card.
- Wait until copying is finished before turning the power of this device OFF.

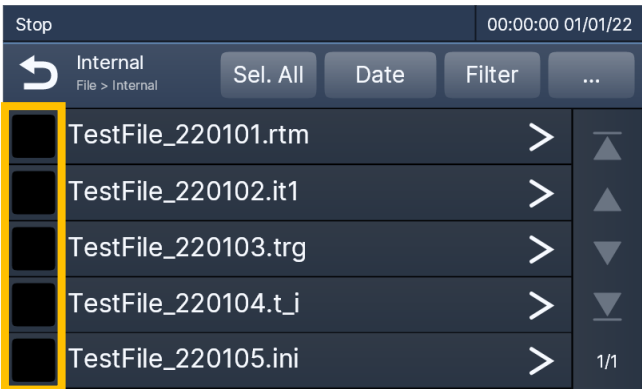
(2) Deleting a file



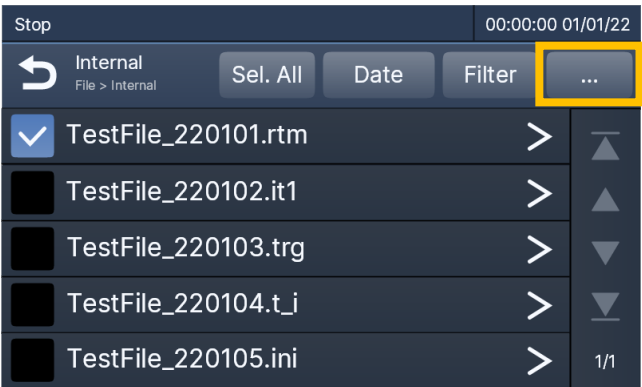
1. Tap **File** on the **Menu** screen.



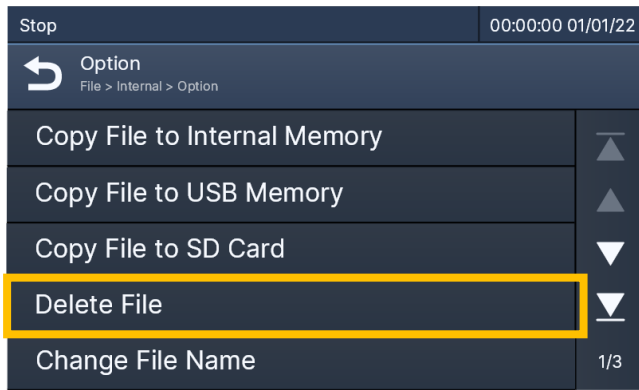
2. Tap the memory location containing the file to delete.



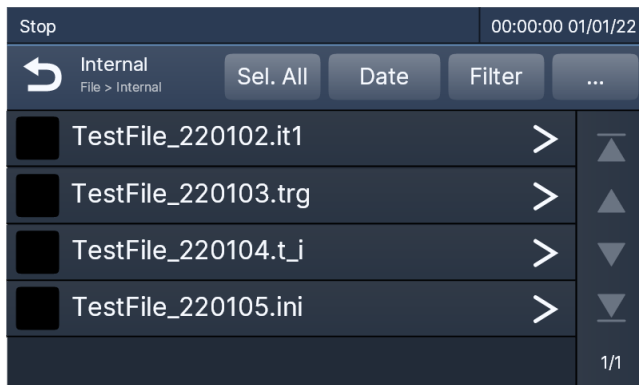
3. Tap the check box of the file to delete.



4. Tap the Option button.



5. Tap **Delete File**.



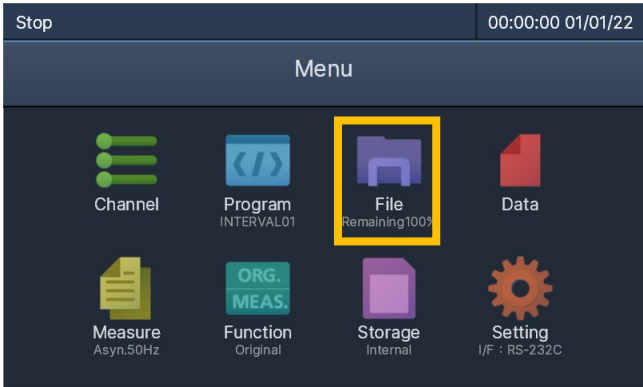
6. The file is deleted.



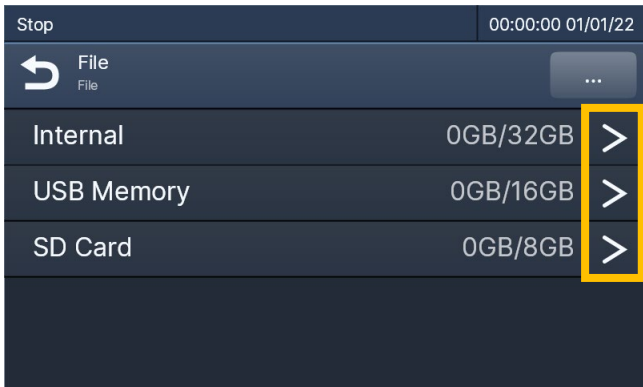
CAUTION

- Wait until deleting is finished before removing the USB memory device or SD card.
- Wait until deleting is finished before turning the power of this device OFF.

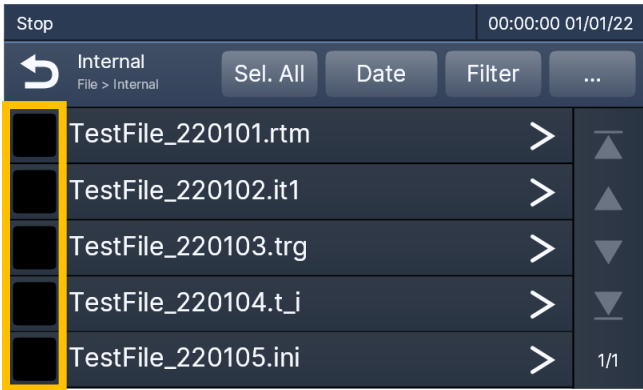
(3) Renaming a file



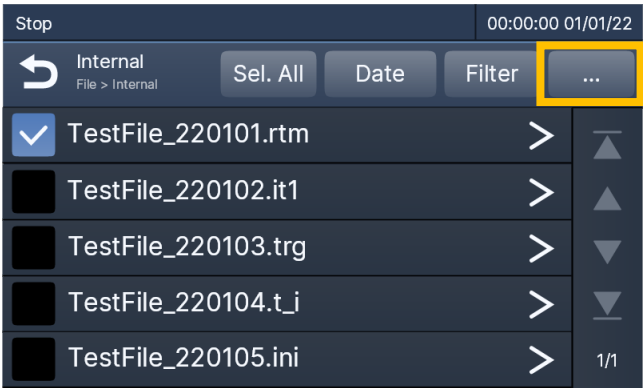
1. Tap **File** on the **Menu** screen.



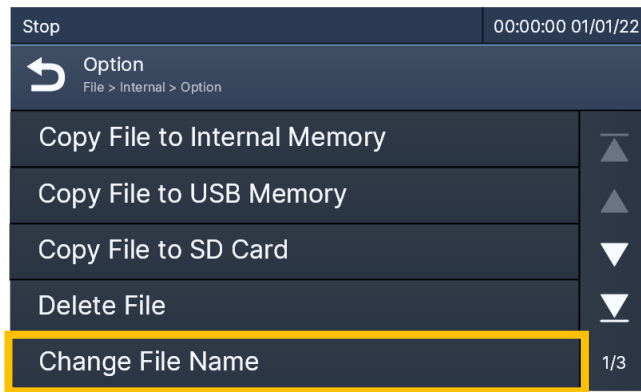
2. Tap the memory location containing the file to change.



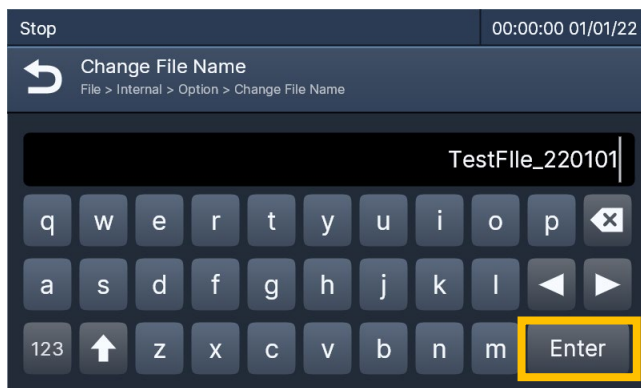
3. Tap the check box of the file to change.



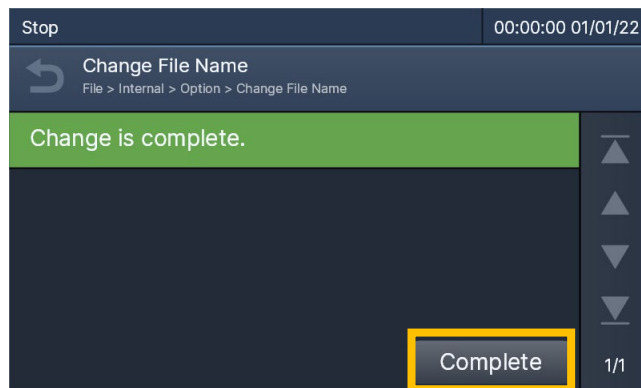
4. Tap the Option button.



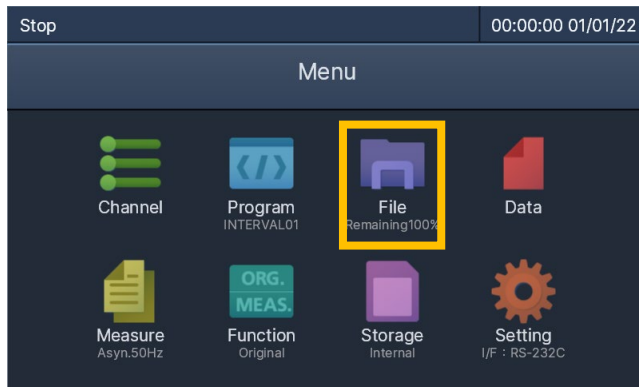
5. Tap **Change File Name**.



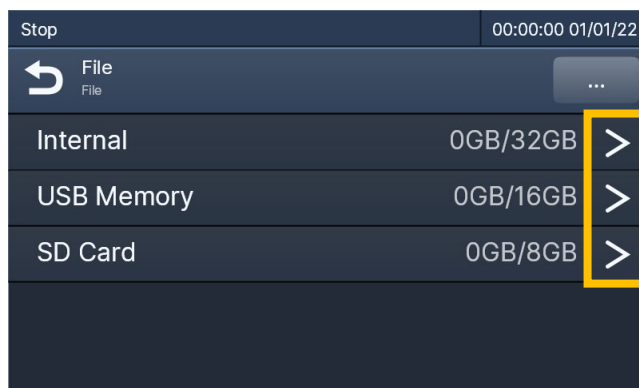
6. Enter the file name and then tap **Enter**.



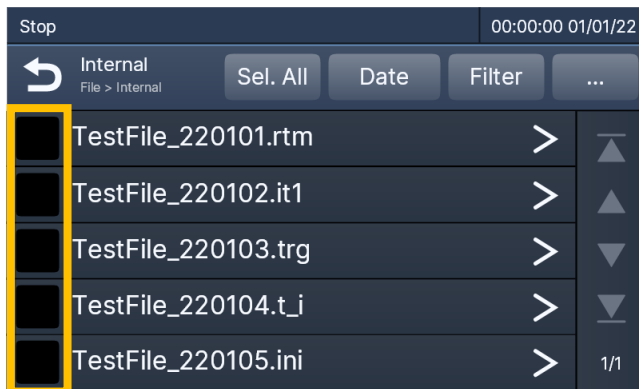
7. Once changing is complete, tap **Complete**.

(4) Converting a file to CSV

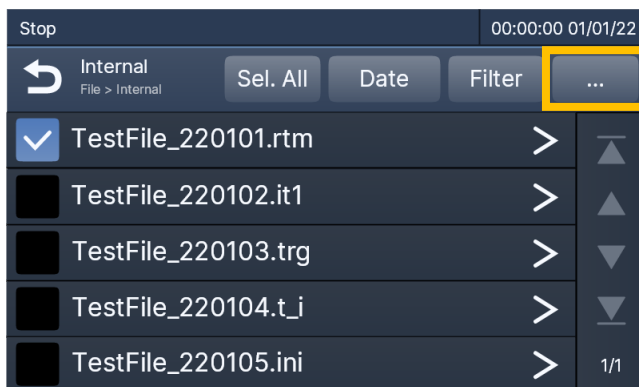
1. Tap **File** on the **Menu** screen.



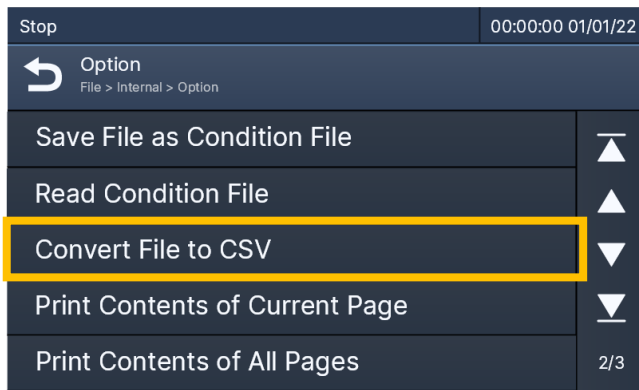
2. Tap the memory location containing the file to convert.



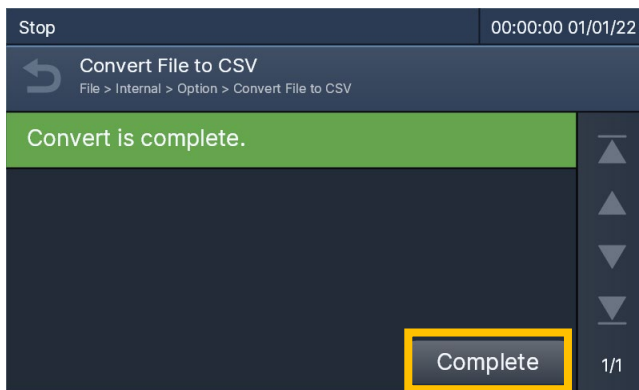
3. Tap the check box of the file to convert.



4. Tap the Option button.



5. Tap **Convert File to CSV**.



6. Once conversion is complete, tap **Complete**.

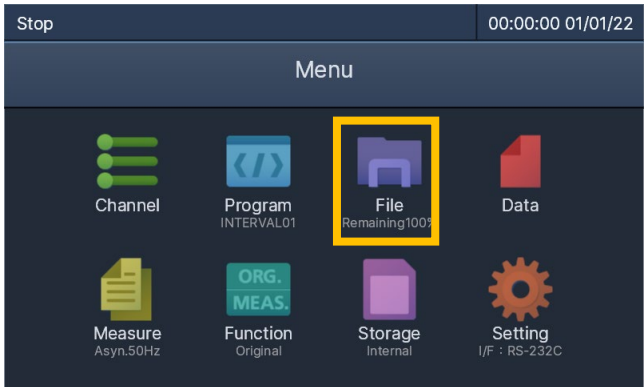
The CSV file will be created in the same location as the original file.



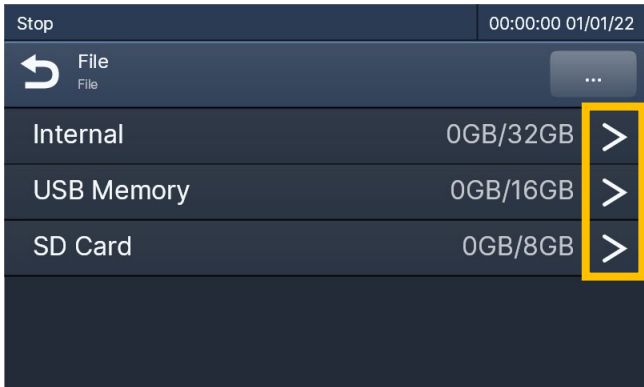
CAUTION

- Wait until conversion is completed before removing the USB memory device or SD card.
- Wait until conversion is completed before turning the power of this device OFF.

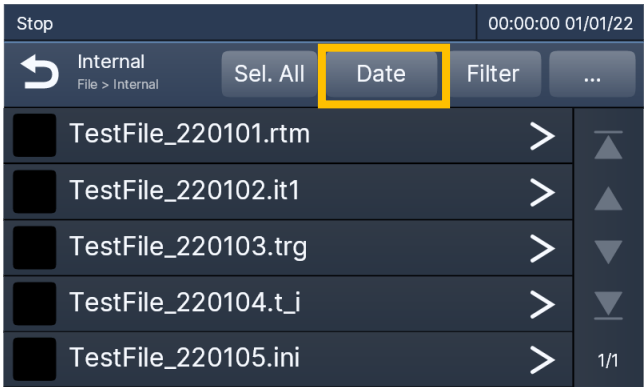
(5) Sorting files



1. Tap **File** on the **Menu** screen.



2. Tap the memory location containing the file.

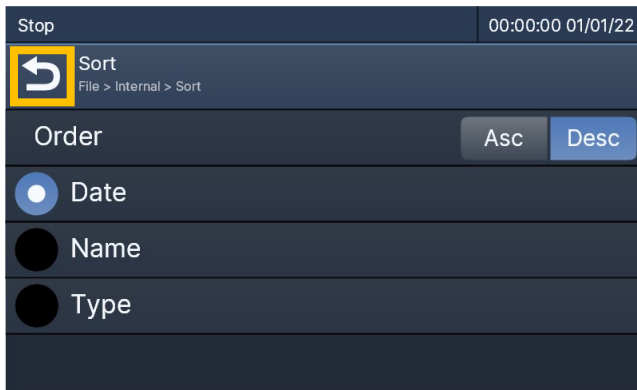


3. Tap **Date**.



4. Select the sort order and condition.

Order:
Select ascending/descending
Date:
Sort by file update date
Name: Sort by file name
Type: Sort by file extension



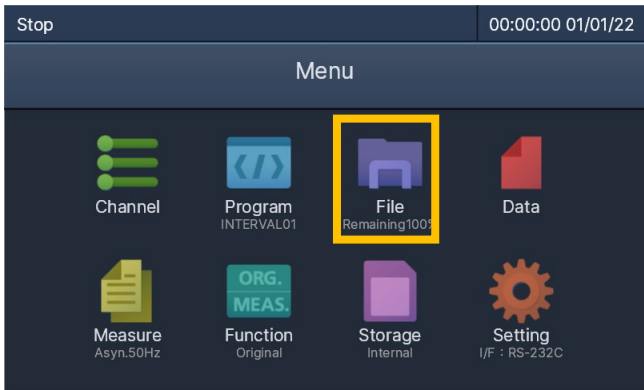
5. Tap the Back button to use the selected order and condition for sorting.



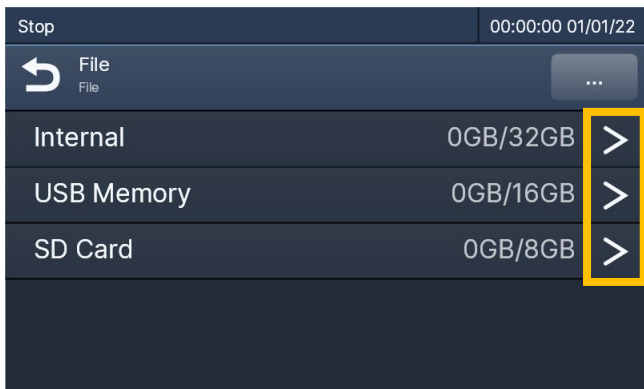
If a file is copied from one memory location to another memory location, the file update date will change.

For example, if a file is copied from internal memory to a USB memory device, sorting by update date in internal memory and sorting by update date in USB memory device may have different results.

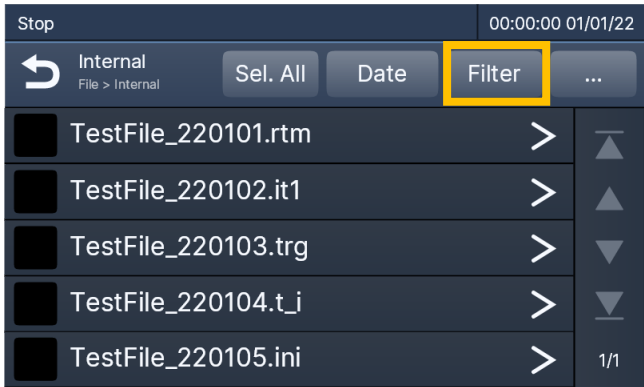
(6) Displaying only certain extensions



1. Tap **File** on the **Menu** screen.



2. Tap the memory location containing the file.



3. Tap **Filter**.



4. Tap the extension to display.



5. Tap the Back button to use the selected extension to display files.

6. FUNCTIONS

6-1. STROKE CHANGE

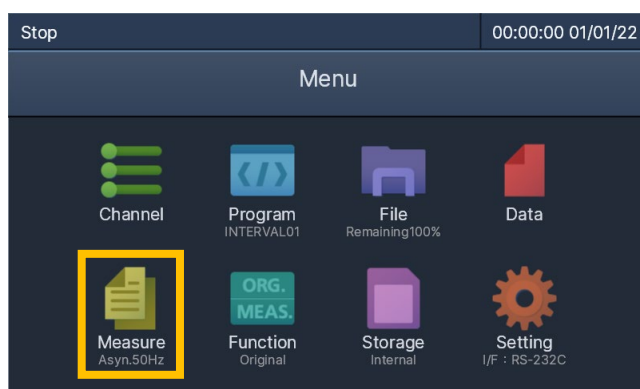
The stroke change function is used to measure displacement in excess of the rated capacity of a displacement meter.

Displacement can be measured even after the rated capacity is exceeded, by performing stroke change each time displacement reaches the rated capacity. Stroke change is performed on a channel basis.

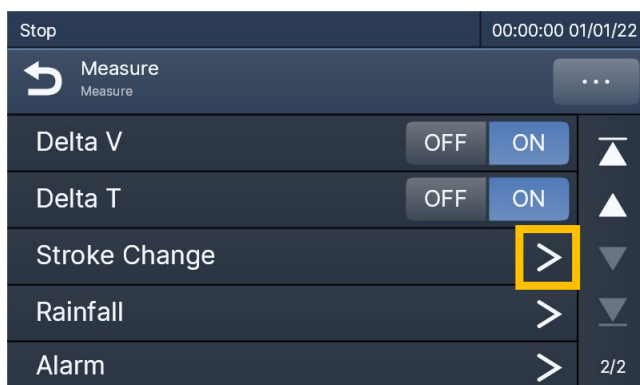


CAUTION

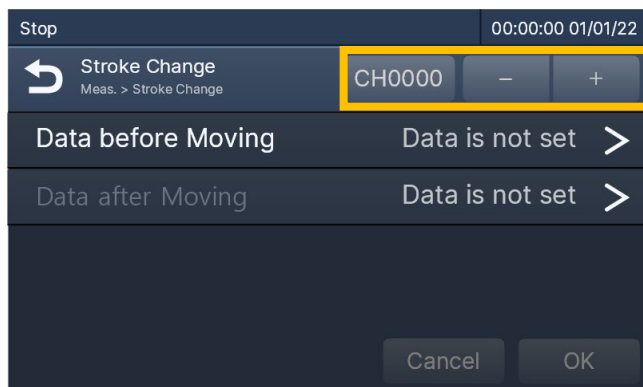
- Performing stroke change on a channel will change its initial value. If the initial value before performing stroke change is off by a large amount and the initial value after performing stroke change exceeds the measuring range, measurement will not be performed properly.
- If using stroke change, ensure that the measurement value setting is set to "measured value."
Refer to "5-3. MEASUREMENT VALUE SETTINGS" for details on measurement value settings.
- Temporarily stop measurement prior to using stroke change.
Stroke change cannot be performed during measurement.



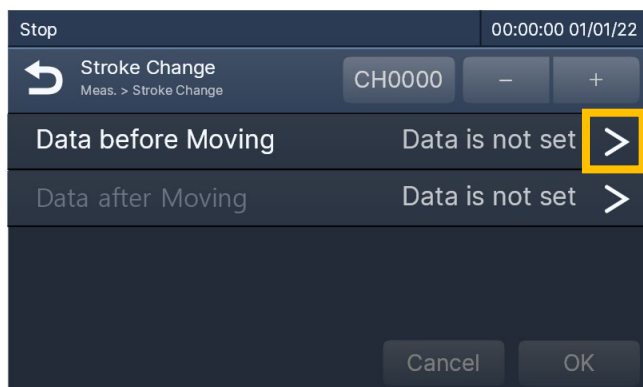
1. Tap **Measure** on the **Menu** screen.



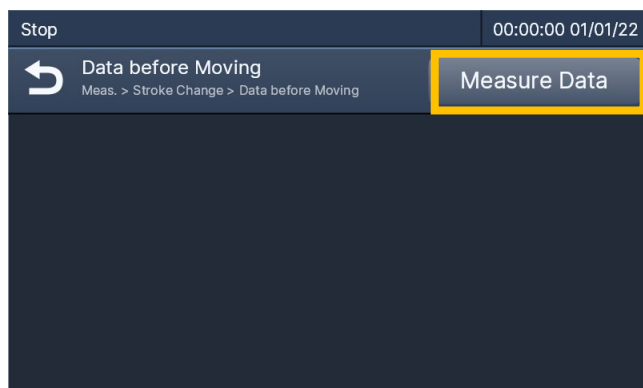
2. Tap **Stroke change**.



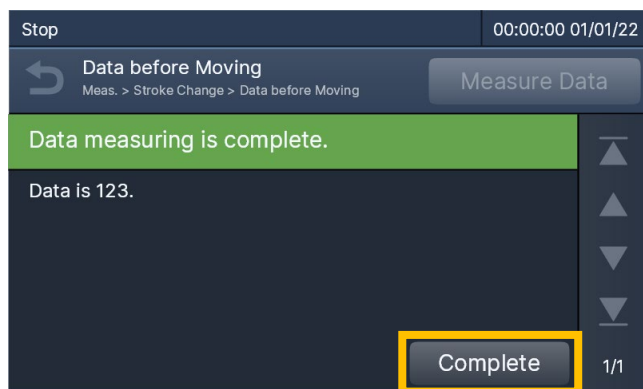
3. Select the channel to perform stroke change.



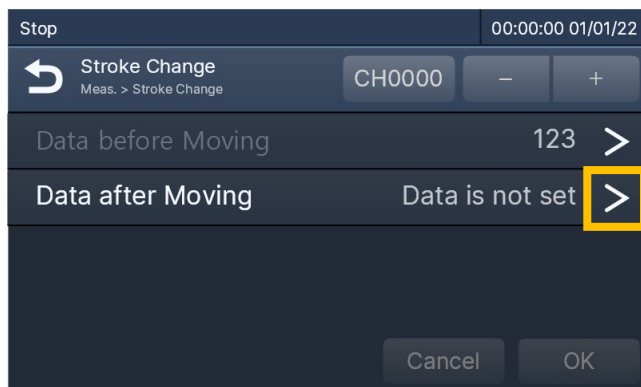
4. Tap **Data before Moving**.



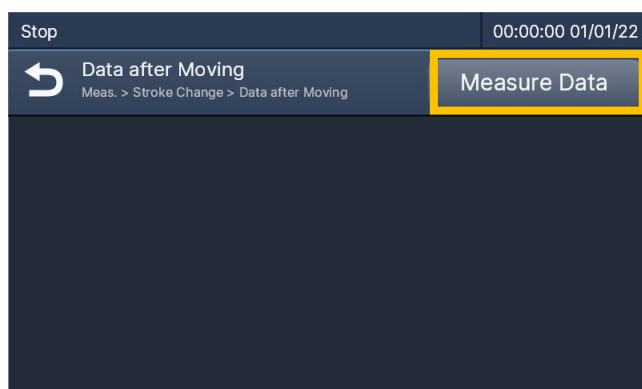
5. Before moving the displacement meter, tap **Measure Data**.



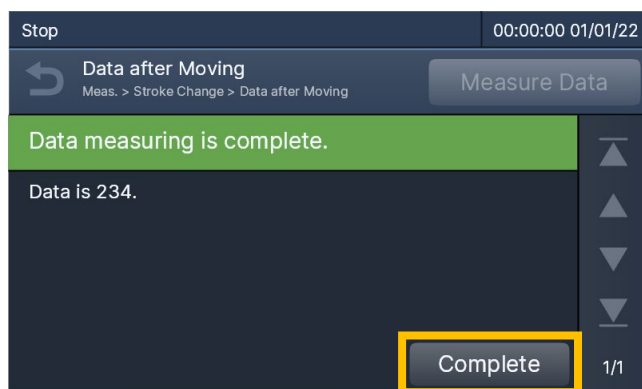
6. Tap **Complete**.



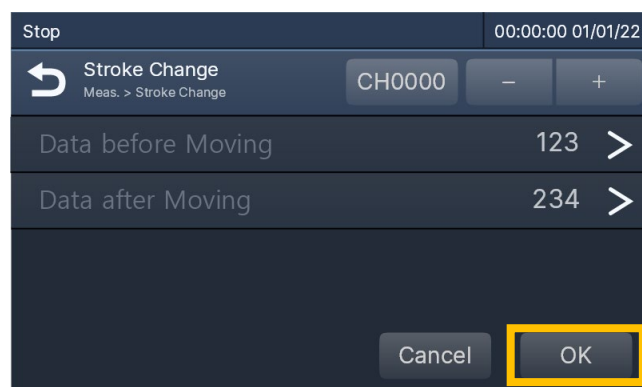
7. Tap **Data after Moving**.



8. After moving the displacement meter, tap **Measure Data**.



9. Tap **Complete**.

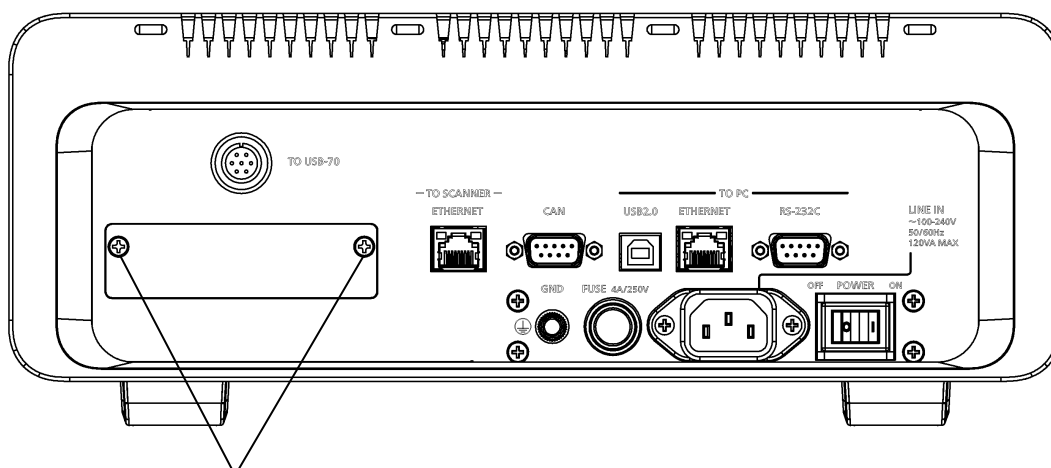


10. Tap **OK**. Stroke change is completed. To cancel stroke change, tap **Cancel**.

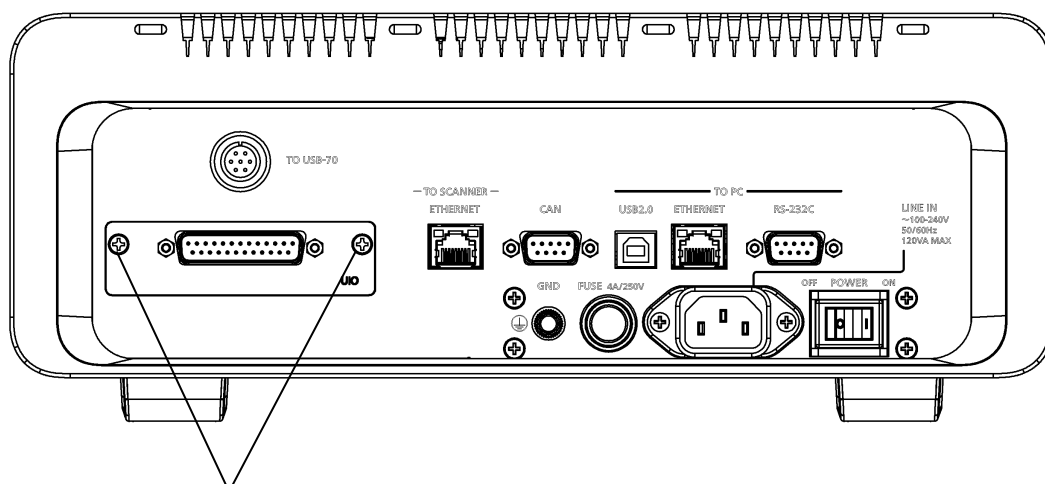
6-2.(OPTIONAL) UIO-80A External I/O Unit FUNCTIONS

Installing an optional UIO-80A External I/O Unit allows this device to perform rainfall input, alarm output, external start/stop input, and reset input.

6-2-1. Procedure for Adding UIO-80A



Remove the two screws on the back, and then remove the dummy panel.



Install UIO-80A, and then attach the two included screws.

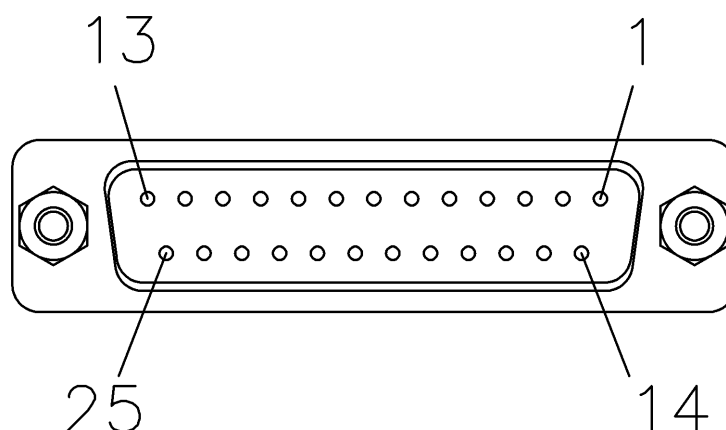


PROHIBITED

Always turn the power of this device OFF before installing or removing UIO-80A. Installing or removing UIO-80A with the power of this device turned ON could result in electric shock, worsen performance, or cause failure.

6-2-2. Connector Pin Assignment

The pin assignment of the external input/output connector on UIO-80A is shown below.



Pin No.	Name	Description	Pin No.	Name	Description
1	RESET	RESET input	14	ISOCOM	Common potential for RESET input
2	STOP	STOP input	15	ISOCOM	Common potential for STOP input
3	START	START input	16	ISOCOM	Common potential for START input
4	Rainfall +	Rainfall input	17	Rainfall -	Common potential for rainfall input
5	BUSY	BUSY output	18	BUSY-COM	Common potential for BUSY output
6	ALM-L4	Alarm 4 Low output	19	ALM-COM4	Common potential for alarm 4
7	ALM-H4	Alarm 4 Hi output	20	NC	Do not connect
8	ALM-L3	Alarm 3 Low output	21	ALM-COM3	Common potential for alarm 3
9	ALM-H3	Alarm 3 Hi output	22	NC	Do not connect
10	ALM-L2	Alarm 2 Low output	23	ALM-COM2	Common potential for alarm 2
11	ALM-H2	Alarm 2 Hi output	24	NC	Do not connect
12	ALM-L1	Alarm 1 Low output	25	ALM-COM1	Common potential for alarm 1
13	ALM-H1	Alarm 1 Hi output			



The connector model and applicable plug are listed below.

Model: XM3B-2522-501 (manufacturer: OMRON)

Applicable plug: XM3A-2521 (manufacturer: OMRON)

6-2-3. Rainfall Input

The optional UIO-80A External I/O Unit is capable of inputting a rainfall meter pulse.

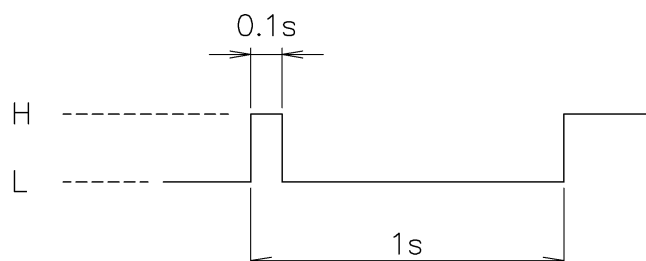


CAUTION

- Each time the pulse falls, the pulse count value increases by 1.
- Once the pulse count value reaches 65535, it will reset to 0.
- When **Rainfall** is set to **OFF**, the pulse count value returns to 0.

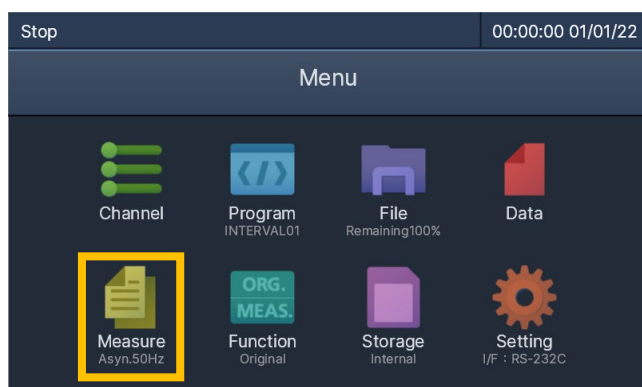


- The rainfall pulse must have a pulse width of at least 0.1 seconds and a pulse interval of at least 1 second. Note that this cannot be used with a fast pulse counter, etc.

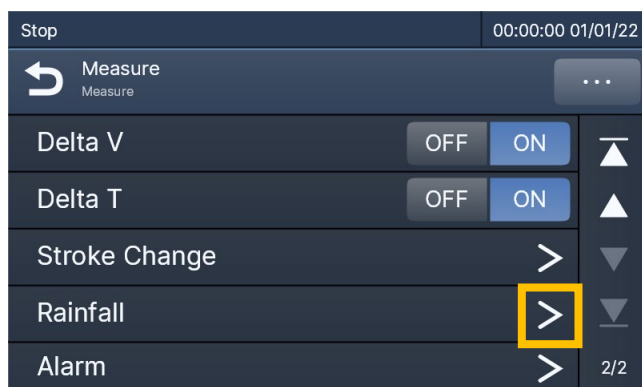


- Rainfall pulses will be counted even when the power of this device is OFF.
- If the rainfall count is reset while the power supply is OFF, the internal battery will need to be replaced. Contact KYOWA sales personnel or your nearest dealer.

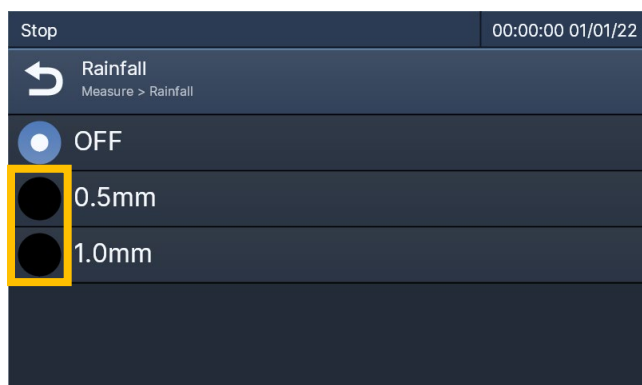
In order to use a rainfall meter, rainfall input must be set.



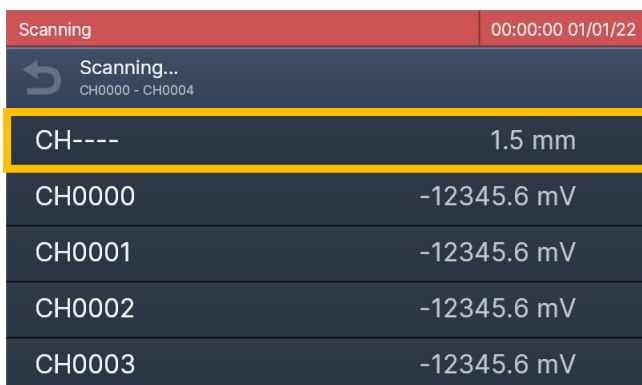
1. Tap **Measure** on the **Menu** screen.



2. Tap **Rainfall**.



3. Tap **0.5 mm** or **1.0 mm**.



4. Measurement value CH---- for the rainfall meter during measurement is displayed.

The value and unit displayed for the rainfall meter will vary depending on the measurement value setting. The relationships between rainfall meter display values and measurement value settings are shown below.

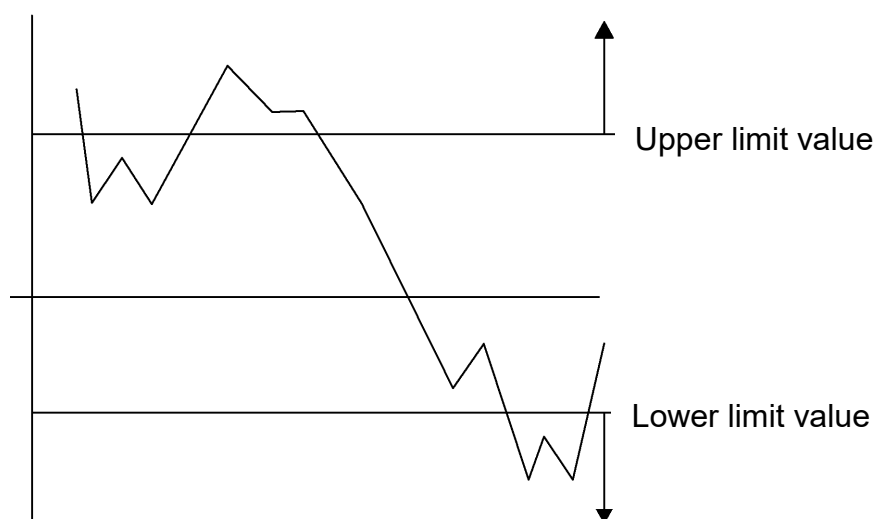
Measurement Value Setting	Calibration Coefficient Calculation	Rainfall Input	Rainfall Meter Display Value and Unit
Original value	OFF	0.5 mm Or 1.0 mm	Display value: Rainfall meter pulse count value Unit: None
Original value	ON	0.5 mm	Display value: Rainfall meter pulse count value $\times$ 0.5 Unit: mm
Original value	ON	1.0 mm	Display value: Rainfall meter pulse count value $\times$ 1.0 Unit: mm
Measured value	OFF	0.5 mm Or 1.0 mm	Display value: Rainfall meter pulse count value Unit: None
Measured value	ON	0.5 mm	Display value: Rainfall meter pulse count value $\times$ 0.5 Unit: mm
Measured value	ON	1.0 mm	Display value: Rainfall meter pulse count value $\times$ 1.0 Unit: mm



- During monitoring, rainfall meter measurement values will not be displayed.
- Performing initial value measurement will not affect rainfall meter measurement values.

6-2-4. Alarms

The alarm function outputs a signal from the set alarm channel once the measurement value exceeds the upper limit value or lower limit value.



Important points when using alarms

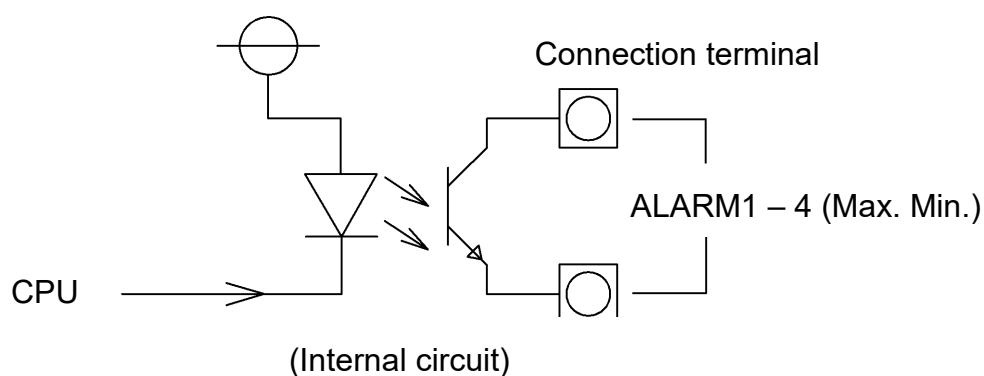
The circuit diagram for alarm output is shown below.

Alarm output is photocoupler insulated open collector output.

The output rating is 30 Vdc (max), 10 mA (max). It is important not to exceed the rating when connecting contacts.

If required, add an external spark killer, etc. to the protection circuit.

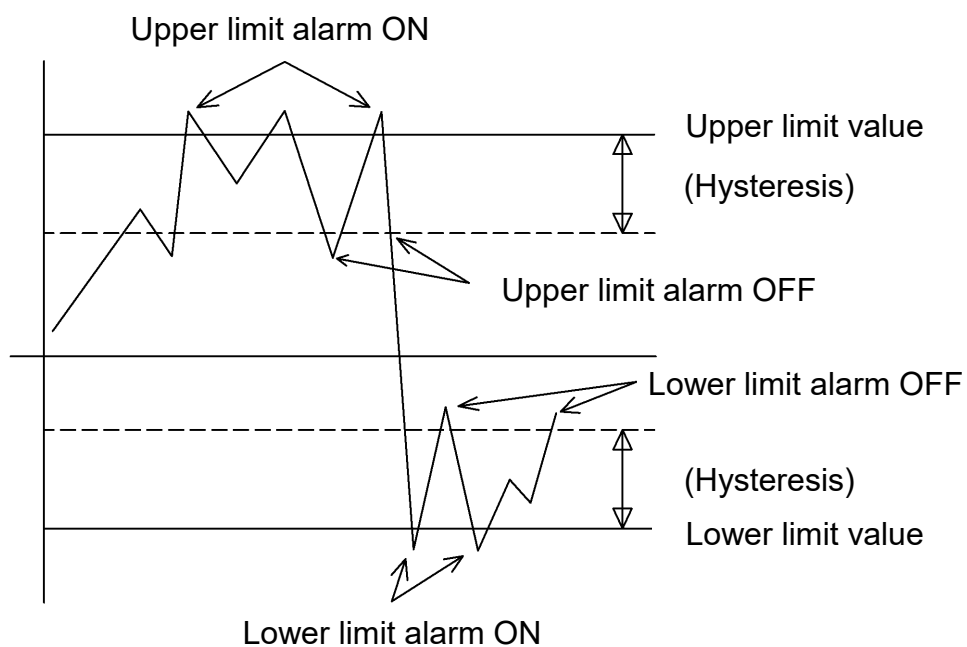
If using this to open/close the AC line, an external relay must be added.



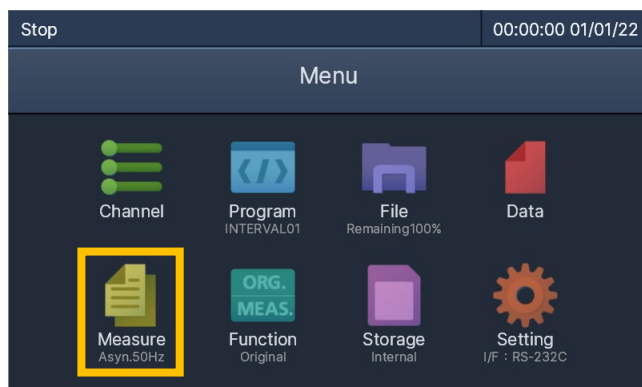
Alarm hysteresis

Hysteresis can be set at the upper/lower limit level of the alarm.

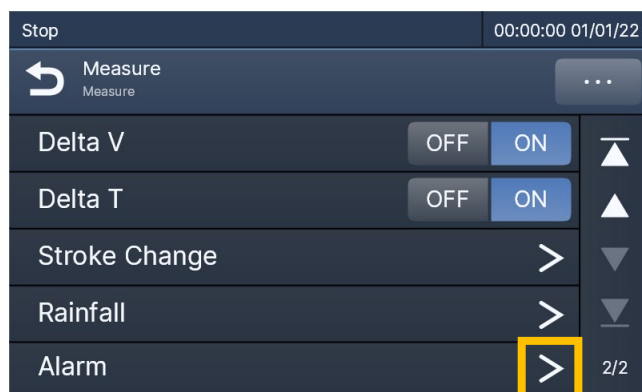
Hysteresis can be set from 000.00 to 999.99 for the upper/lower limit value.



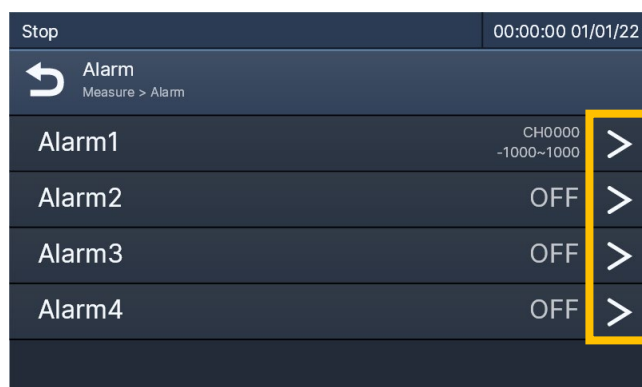
If using an External I/O Unit alarm, configure the alarm.



1. Tap **Measure** on the **Menu** screen.



2. Tap **Alarm**.



3. Tap the alarm to configure.



4. Tap **ON**.

Stop 00:00:00 01/01/22

Alarm1
Measure > Alarm > Alarm1

Alarm OFF ON

Channel No. 0000 >

Max 1000 >

Min -1000 >

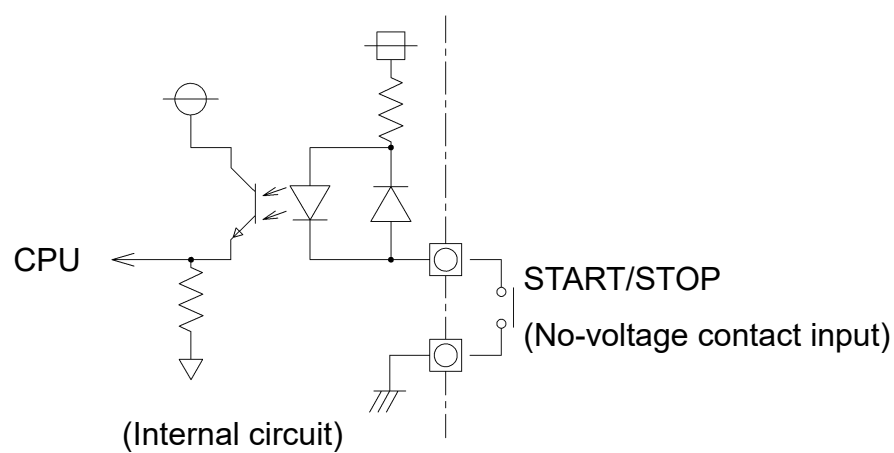
Hysteresis 10 > 1/1

5. Configure the alarm channel, upper limit, lower limit, and hysteresis.

6-2-5. External Start/Stop Operations

While the **Menu** screen is shown on the screen of this device, real-time measurement can be started by turning the START signal ON (shorted). Measurement can be stopped by turning the STOP signal ON (shorted) during measurement. BUSY output can be checked to confirm whether this device is currently measuring.

The circuit diagram for external start/stop input is shown below.

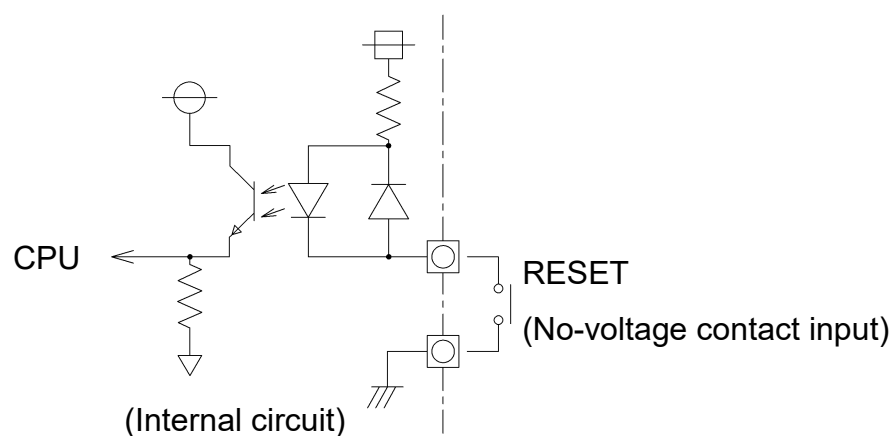


- The START/STOP input pulse must have a pulse width of at least 100 ms.
- Ensure that there is no chattering on the START/STOP input pulse.

6-2-6. Reset Operation

Turning the RESET signal ON (shorted) and then OFF (open) will restart this device.

The circuit diagram for reset input is shown below.



- This device will not start while RESET is ON (shorted). Confirm that the RESET signal turns OFF (open) when the power supply is turned ON.
- The RESET ON signal must have a width of at least 100 ms.
- Ensure that there is no chattering on RESET input.

6-3. CHANNEL CHECK FUNCTIONS

This device provides functions for checking channels.

(1) Disconnection/burnout check

Checks for disconnections in the wiring from the strain gage sensor or thermocouple to the input of this device.

(2) Input/Output resistance check

Measures the input/output resistance of the strain gage and strain gage sensor.

(3) Insulation check

Measures the insulation between the strain gage sensor input/output wiring and the E terminal of this device.

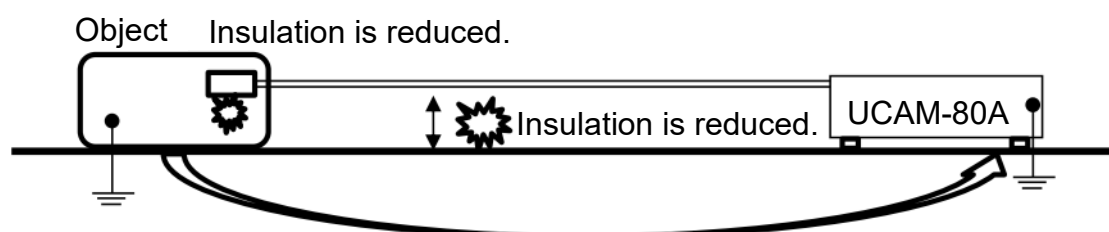
Sensors used over a long time in the field (such as for strain gage civil engineering transducers) may suffer reduced insulation due to moisture entering, etc., and measurement values may become unstable.

This function is used to simply measure sensor insulation resistance, in order to detect such faults.



PROHIBITED

The insulation check function used by this device simply checks the insulation performance of sensors or gages connected to this device, by applying 15 V between the E and B terminals of the scanning unit. When performing the insulation check, be sure to ground both the object being tested and this device, as shown below. To accurately measure the insulation resistance value of a gage, use a separate insulation resistance tester (megohmmeter). Note that a standard insulation resistance tester measures insulation resistance by applying high voltage to the measured object. If this device is left connected to the gage when doing this, high voltage will be applied to this device, resulting in failure. When using an insulation resistance tester, be sure to remove the gage from the terminal block of this device. Contact the sensor manufacturer for information on how to accurately measure the insulation resistance of the sensor.



(4) Mode detection

Detects the bridge configuration for strain measurement and displays the applicable mode.

(5) Terminal temperature check

Displays the measurement value of the reference junction temperature used for temperature measurement by a thermocouple.

When measuring temperature, you will need to measure the temperature of the input terminal block serving as the reference junction, in order to obtain the measurement value (thermocouple output from 0°C).

A thermometer for this purpose is built into the scanning unit. This function is used to display the temperature measured by this thermometer to check for any faults.

(6) BV2V check

Measures bridge excitation voltage (2 V) for strain measurement.

(7) BV5V check

Measures bridge excitation voltage (5 V) for strain measurement.

The following table summarizes check function limitations.

○ indicates checking is possible. ▲ indicates checking is possible only for certain channel modes. × indicates checking is not possible.

Check Function	Scanning Unit		External Scanner	
	General Use	Civil Engineering	General Use	Civil Engineering
	USM-81A USM-82A USS-61B USS-62B	USM-83A USS-63B	USB-80A-10 USB-80A-20 USB-70A/B-10 USB-70A/B-20	USB-80A-30 USB-70A/B-30
Disconnection ^{*1}	▲	▲	▲	▲
Burnout ^{*2}	▲	▲	▲	▲
Input/Output resistance	○	○	×	×
Insulation ^{*1}	▲	▲	▲	▲
Mode detection ^{*3}	▲	▲	×	×
Terminal temperature	○	○	○	○
BV2V	○	○	○	○
BV5V	○	○	×	×

*1) Checking is possible only in channel modes where strain is the measured object.

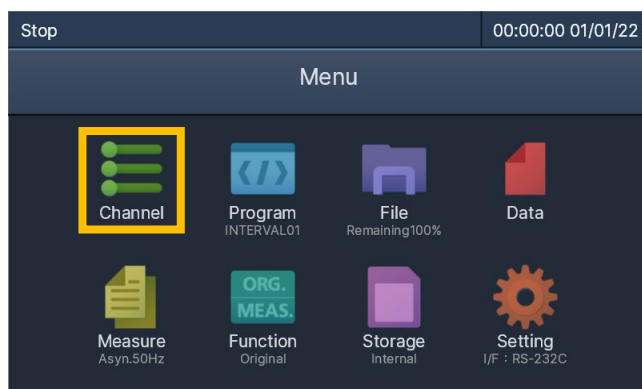
Refer to "5-2-6. Channel Mode Settings" for details on measured objects.

*2) Checking is possible only in "thermocouple K/T/E/J/R" channel modes where temperature is the measured object.

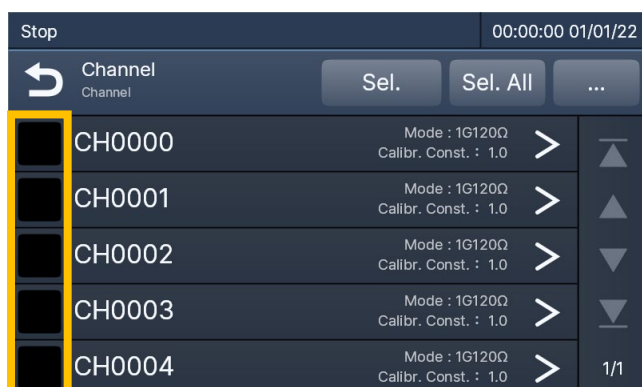
Refer to "5-2-6. Channel Mode Settings" for details on measured objects.

*3) Detection is possible only in channel modes related to strain measurement.

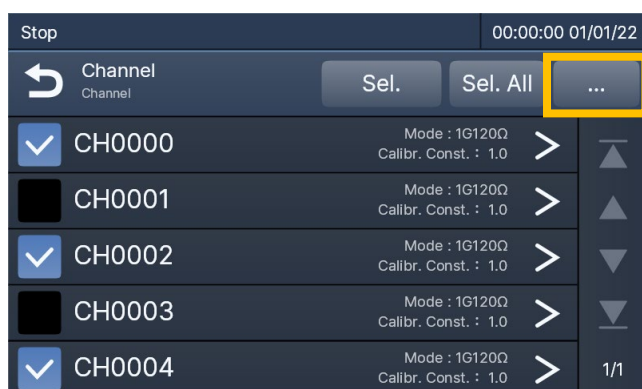
Refer to "6-3-4. Mode Detection" for details.



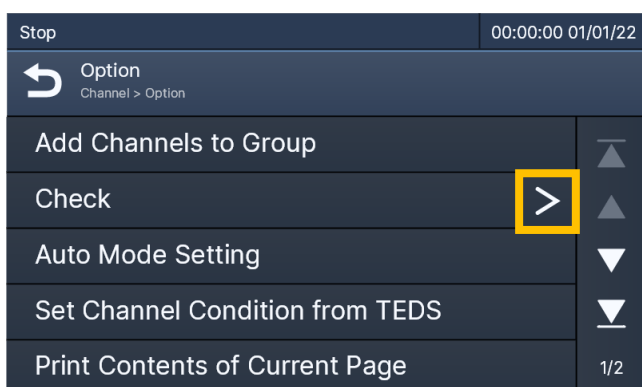
1. Tap **Channel** on the **Menu** screen.



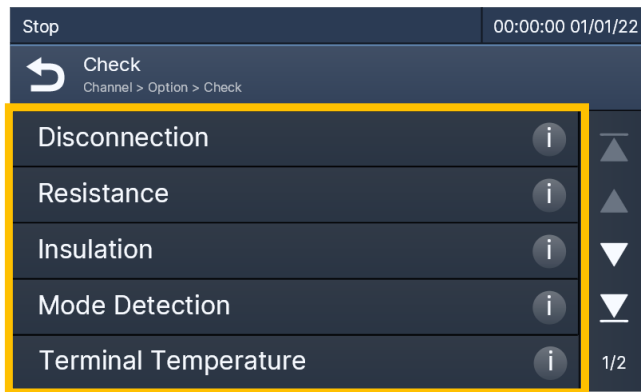
2. Tap the radio button of the channel to check.



3. Tap the Option button.



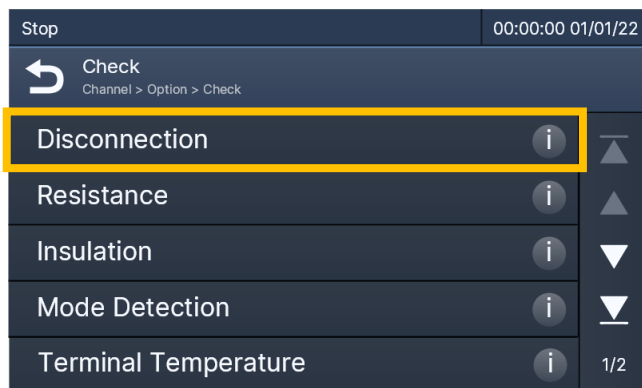
4. Tap **Check**.



5. Tap the check function to run.

Tapping an i button will display a description of that function.

6-3-1. Disconnection/Burnout Check



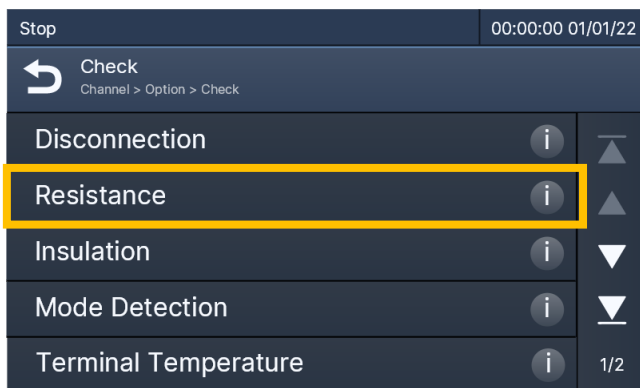
1. Tap **Disconnection**.



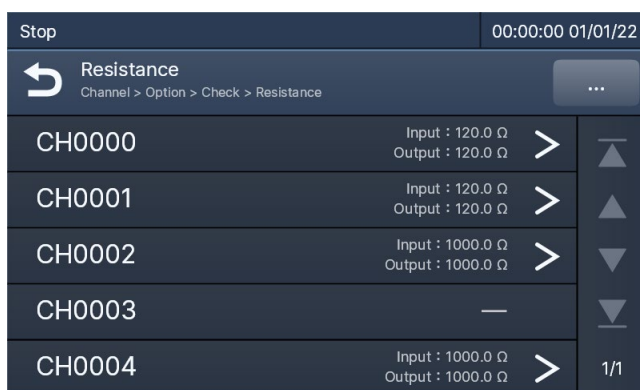
2. Once the check has completed, the check result will be displayed.

Check Result	Meaning
OK	Normal
NG	Disconnection or burnout detected
-	Channel mode that cannot be checked

6-3-2. Input/Output Resistance Check



1. Tap **Resistance**.



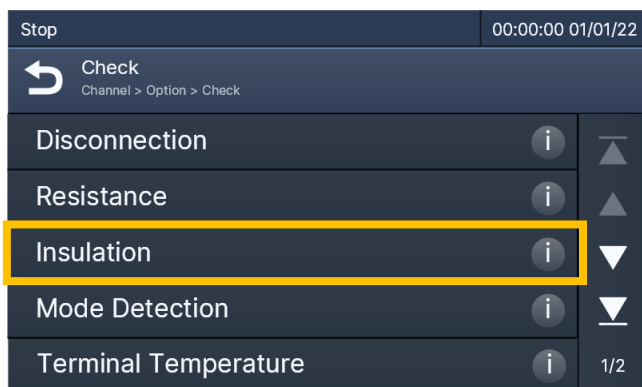
2. Once the check has completed, the input/output resistance values are displayed.

Input indicates an input resistance value.

Output indicates an output resistance value.

- indicates a channel mode that cannot be checked.

6-3-3. Insulation Check



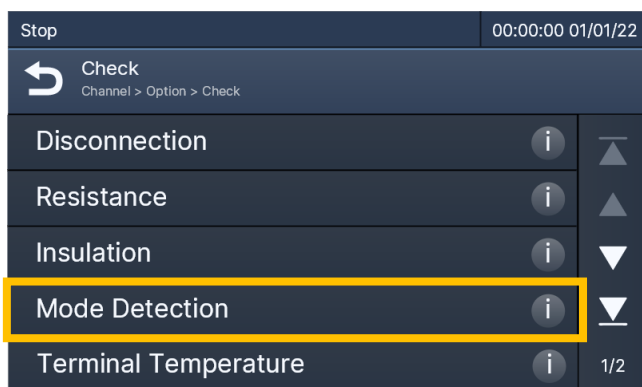
1. Tap **Insulation**.



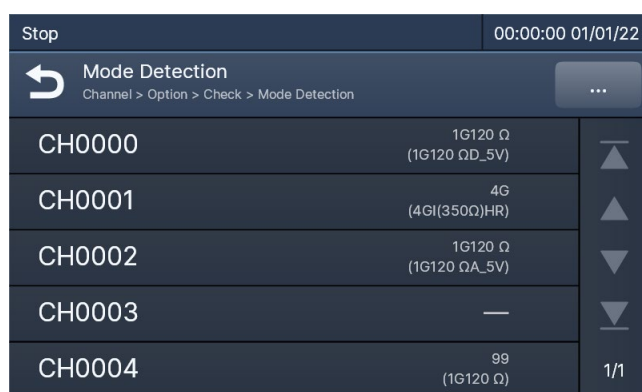
2. Once the check has completed, the check result will be displayed.

Check Result	Meaning
High	Insulation resistance value is higher than 100.0 MΩ
Low	Insulation resistance value is lower than 1.0 MΩ
-	Channel mode that cannot be checked
Other than above	Insulation resistance value is displayed in MΩ unit

6-3-4. Mode Detection



1. Tap **Mode Detection**.



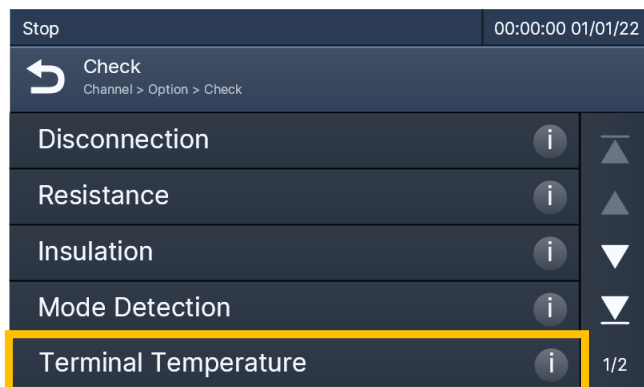
2. Once the check has completed, the detection result is displayed.

The upper row displays the mode detection result.

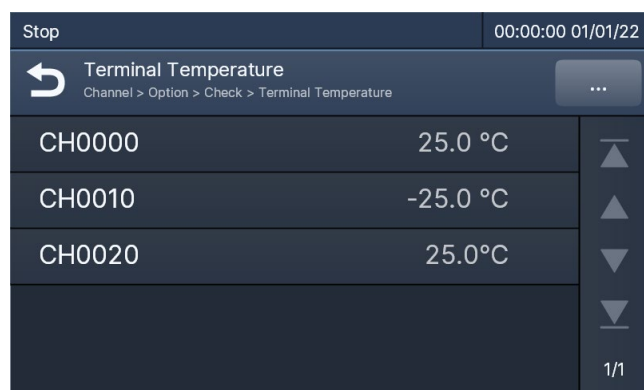
The lower row displays the currently set channel mode in parentheses.

Detection Result	Meaning
1-gage 120 Ω 1-gage 240 Ω 1-gage 350 Ω	1-gage connection
2-gage A-A	2-gage connection
4-gage	4-gage connection
4-gage T	Civil engineering transducer with temperature measuring function
99	Unable to detect channel mode (Channel mode with measured object of strain set)
-	Unable to detect channel mode (Channel mode with measured object other than strain set)

6-3-5. Terminal Temperature Check



1. Tap **Terminal Temperature**.

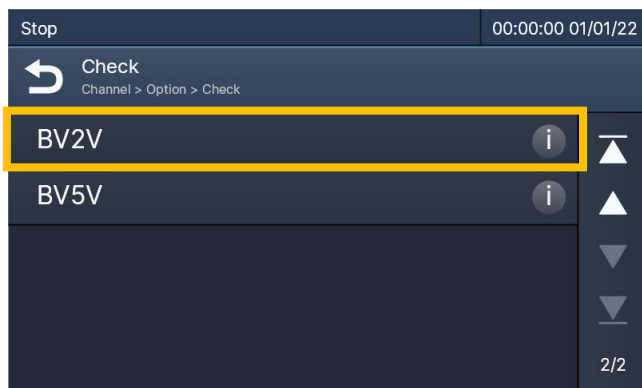


2. Once the check has completed, the terminal temperature is displayed.



The terminal temperature is checked for each scanning unit. Therefore, the check result channel number will be the first channel of the scanning unit.

6-3-6. BV2V Check

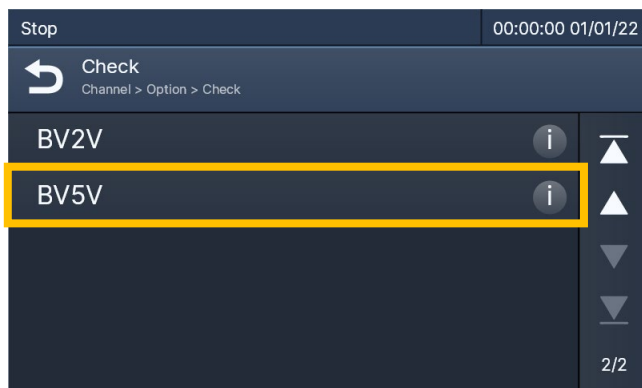


1. Tap **BV2V**.



2. Once the check has completed, the bridge voltage measurement result will be displayed.

6-3-7. BV5V Check



1. Tap **BV5V**.



2. Once the check has completed, the bridge voltage measurement result will be displayed.

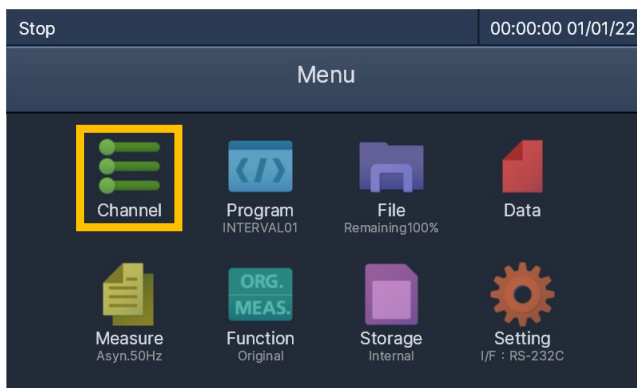
6-4. AUTOMATIC MODE SETTING

The automatic mode setting is a function that detects the channel mode for the connected sensor, and sets the mode automatically for each channel.

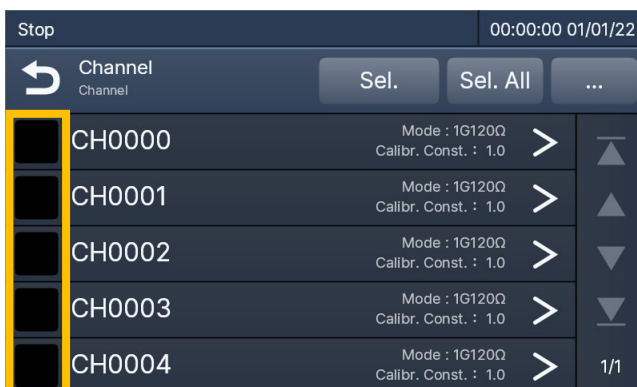


CAUTION

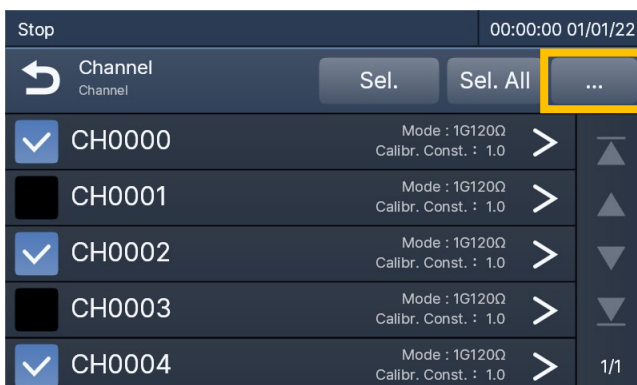
The automatic mode setting cannot be used for external scanner channels.



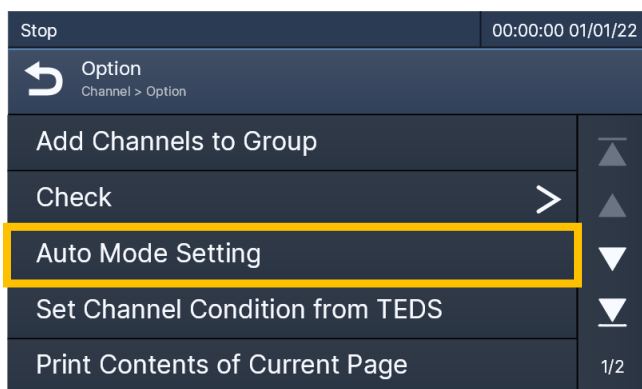
1. Tap **Channel** on the **Menu** screen.



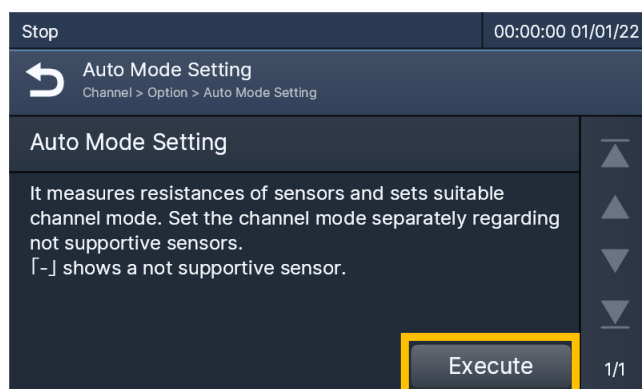
2. Tap the radio button of the channel to set.



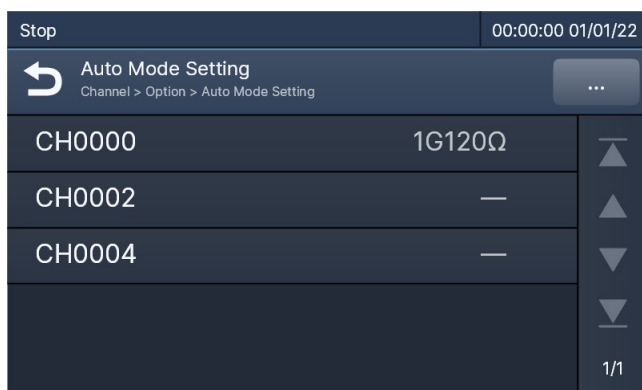
3. Tap the Option button.



4. Tap **Auto Mode Setting**.



5. Tap **Execute**.



6. Once setting is complete, the setting results are displayed.

Setting Result	Meaning
-	Unable to detect channel mode. The channel mode will not be changed for any item with "-" indicated as the setting result. Manual configuration is required.
Other than above	The channel mode that was automatically set is displayed.

The following channel modes can be set using automatic mode setting.

- 1-gage connection: 1-gage 120 Ω , 1-gage 240 Ω , 1-gage 350 Ω
- 2-gage connection: 2-gage A-A
- 4-gage connection: 4-gage
- Civil engineering transducer with temperature measuring function: 4-gage T

However, if the same type of channel mode has already been set, the channel mode prior to automatic mode setting will be retained. Refer to the table below for details.

Channel Mode Prior to Automatic Mode Setting	Channel Mode Detected by This Device	Channel Mode Set
1-gage 120 Ω	1-gage 120 Ω	1-gage 120 Ω
1-gage 120 Ω D	1-gage 120 Ω	1-gage 120 Ω D
1-gage 120 Ω A	1-gage 120 Ω	1-gage 120 Ω A
1-gage 120 Ω _5 V	1-gage 120 Ω	1-gage 120 Ω _5 V
1-gage 120 Ω D_5 V	1-gage 120 Ω	1-gage 120 Ω D_5 V
1-gage 120 Ω A_5 V	1-gage 120 Ω	1-gage 120 Ω A_5 V
1-gage 240 Ω	1-gage 240 Ω	1-gage 240 Ω
1-gage 240 Ω _5 V	1-gage 240 Ω	1-gage 240 Ω _5 V
1-gage 350 Ω	1-gage 350 Ω	1-gage 350 Ω
1-gage 350 Ω D	1-gage 350 Ω	1-gage 350 Ω D
1-gage 350 Ω A	1-gage 350 Ω	1-gage 350 Ω A
1-gage 350 Ω _5 V	1-gage 350 Ω	1-gage 350 Ω _5 V
1-gage 350 Ω D_5 V	1-gage 350 Ω	1-gage 350 Ω D_5 V
1-gage 350 Ω A_5 V	1-gage 350 Ω	1-gage 350 Ω A_5 V
2-gage A-D	2-gage A-A	2-gage A-D
2-gage A-A	2-gage A-A	2-gage A-A
2-gage A-D_5 V	2-gage A-A	2-gage A-D_5 V
2-gage A-A_5 V	2-gage A-A	2-gage A-A_5 V

Channel Mode Prior to Automatic Mode Setting	Channel Mode Detected by This Device	Channel Mode Set
4-gage	4-gage	4-gage
4-gage A-A	4-gage	4-gage A-A
4-gage HR	4-gage	4-gage HR
4-gage I (120 Ω)	4-gage	4-gage I (120 Ω)
4-gage I (350 Ω)	4-gage	4-gage I (350 Ω)
4-gage I (350 Ω)_HR	4-gage	4-gage I (350 Ω)_HR
4-gage T	4-gage T	4-gage T

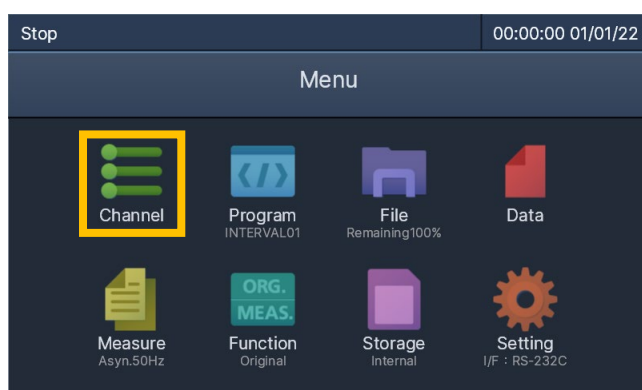
6-5. SETTING CHANNEL CONDITIONS FROM TEDS INFORMATION

The channel mode, calibration coefficient, decimal point position, and unit can be set automatically from information read from a Transducer Electronic Data Sheet (TEDS) sensor.

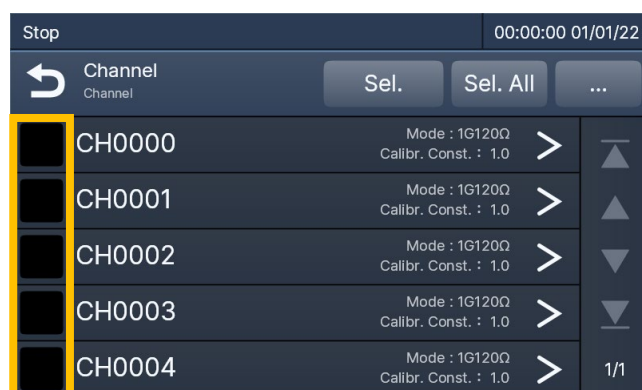


CAUTION

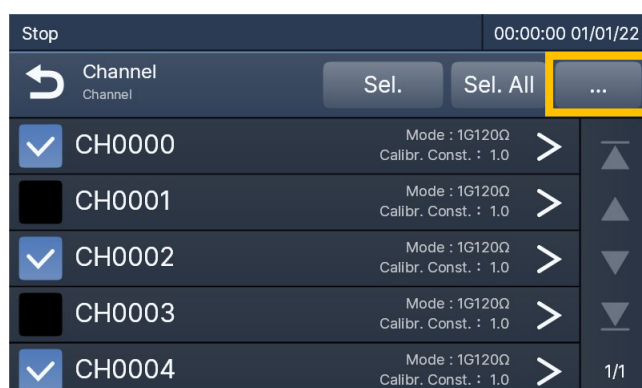
- It is not possible to read all information from a TEDS sensor.
- Information cannot be read from a TEDS sensor connected to an external scanner.
- Information can only be read from a TEDS sensor with a template ID of 33.



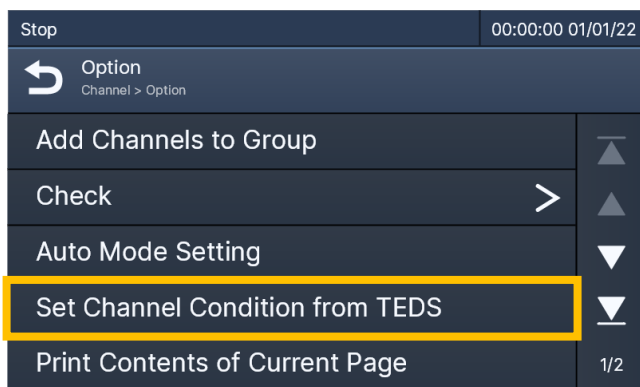
1. Tap **Channel** on the **Menu** screen.



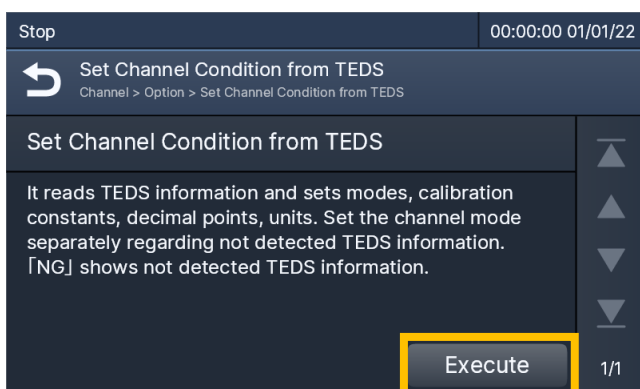
2. Tap the radio button of the channel to read.



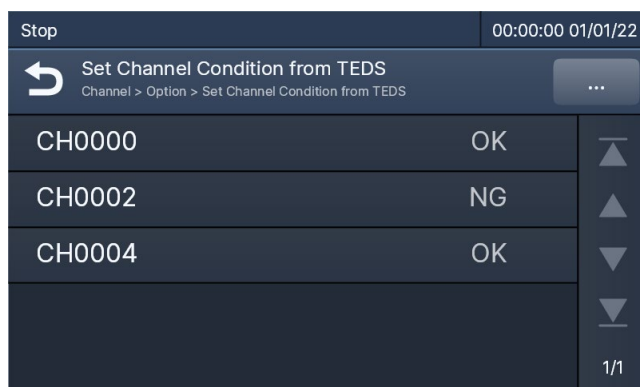
3. Tap the Option button.



4. Tap **Set Channel Conditions from TEDS**.



5. Tap **Execute**.



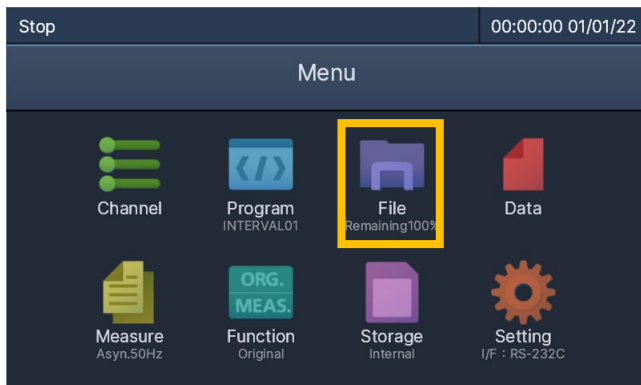
6. Once setting is complete, the setting results are displayed.

Result	Meaning
OK	Information was successfully read from the TEDS sensor.
NG	Information could not be read from the TEDS sensor. Manual configuration is required.

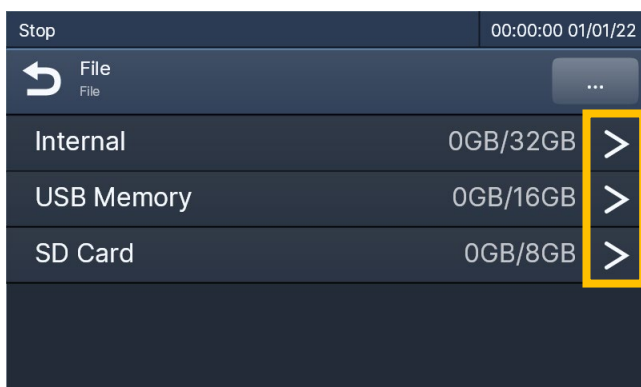
6-6. CONDITION FILES

6-6-1. Condition File Saving

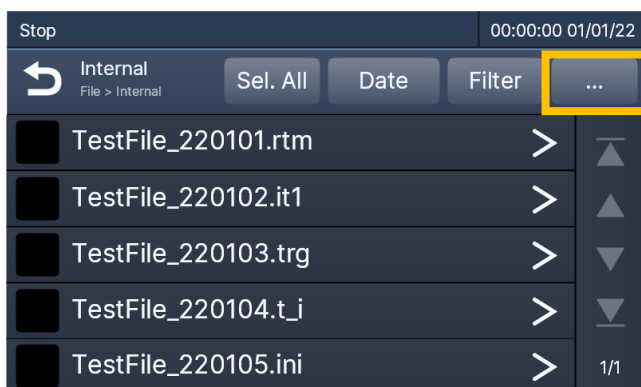
The settings of this device can be saved as a condition file.



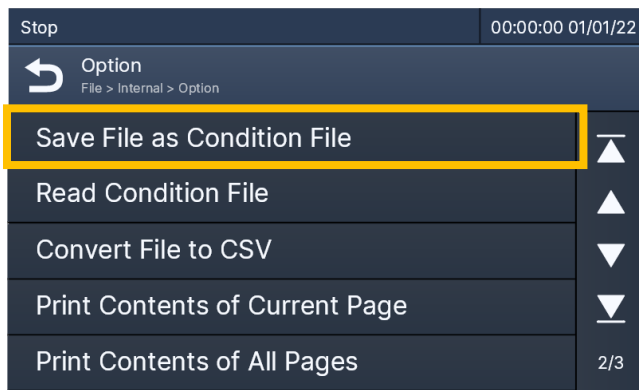
1. Tap **File** on the **Menu** screen.



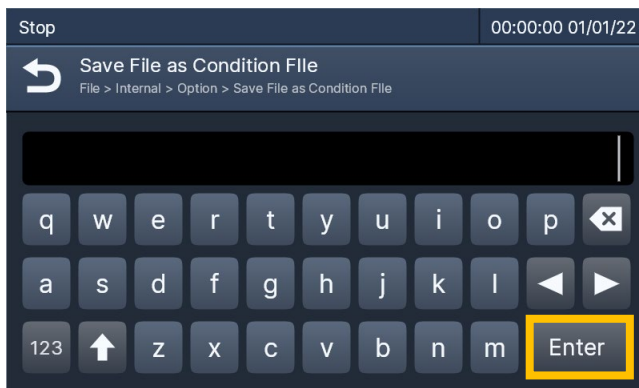
2. Tap the memory location in which to save the condition file.



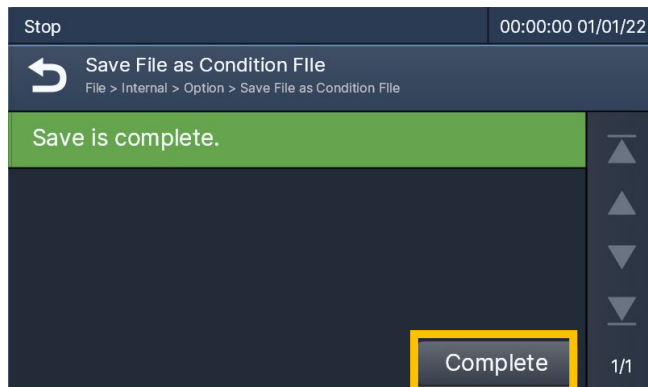
3. Tap the Option button.



4. Tap **Save File as Condition File**.



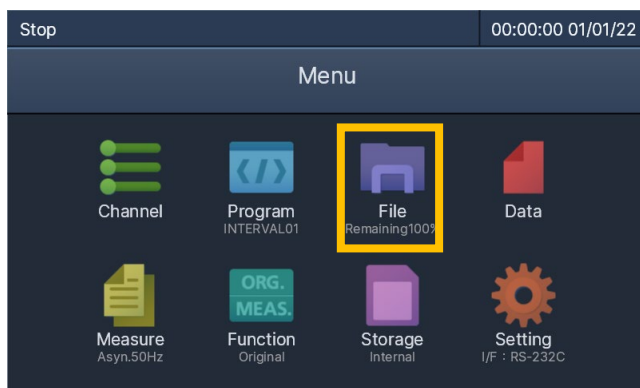
5. Enter the name of the condition file, and then tap **Enter**.



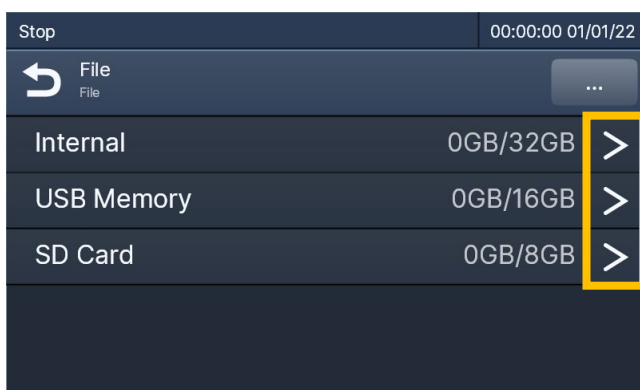
6. Once saving is complete, tap **Complete**.

6-6-2. Condition File Loading

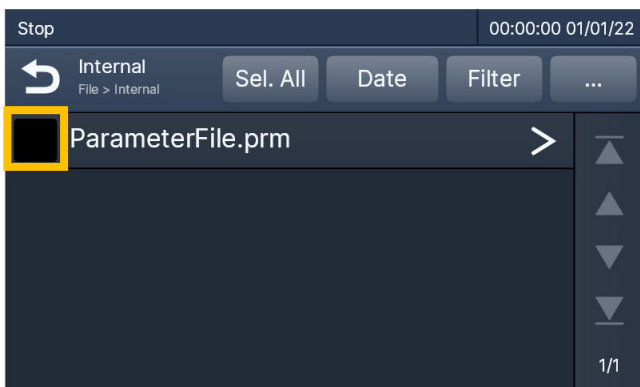
This device can be configured by loading an existing condition file.



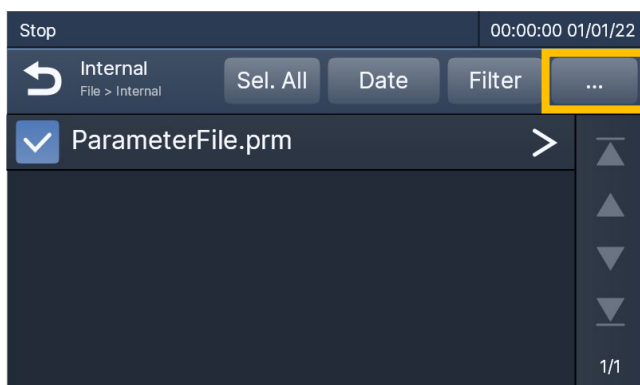
1. Tap **File** on the **Menu** screen.



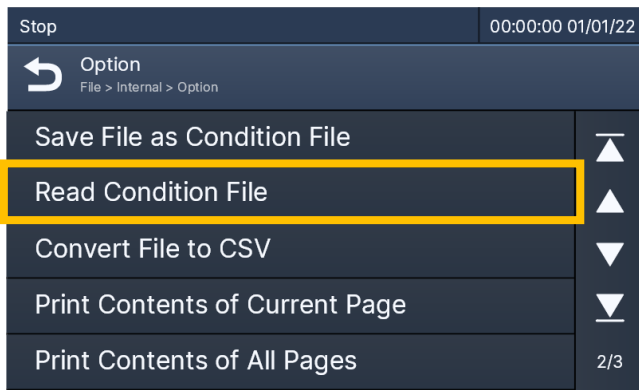
2. Tap the memory location containing the condition file.



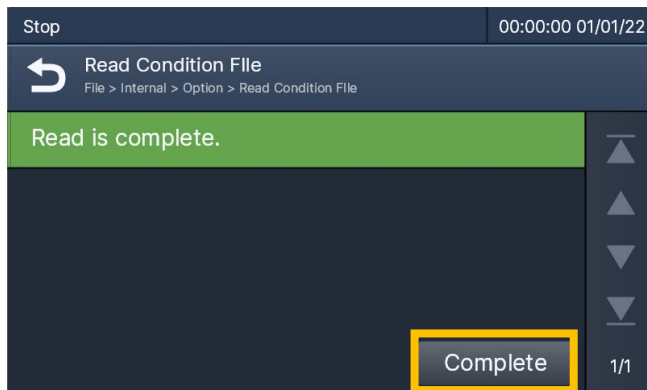
3. Tap the check box of the condition file to load.



4. Tap the Option button.



5. Tap **Read Condition File**.



6. Once loading is complete, tap **Complete**.



CAUTION

UCAM-80A cannot load a condition file saved on UCAM-60C.

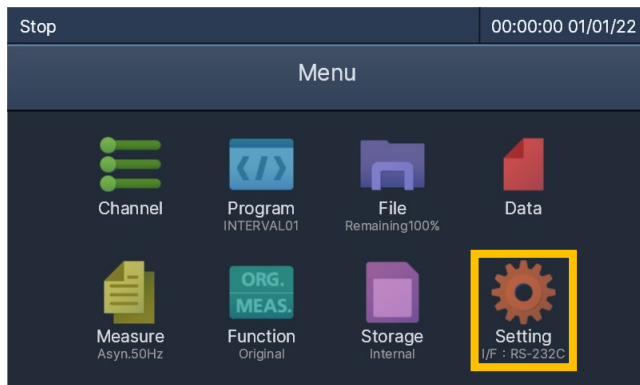


Loading a condition file will not change the following settings.

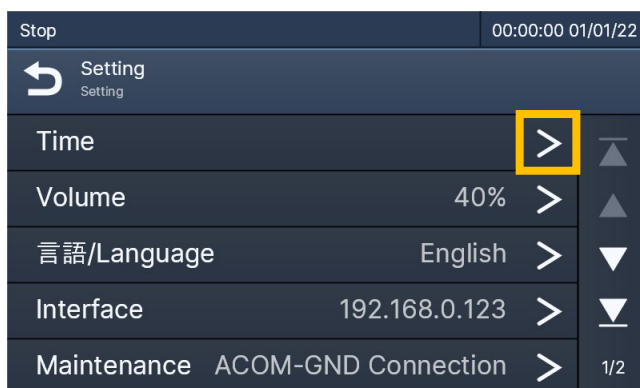
- Date and time
- Language
- IP address, subnet mask, default gateway
- Version information

6-7. DATE AND TIME SETTINGS

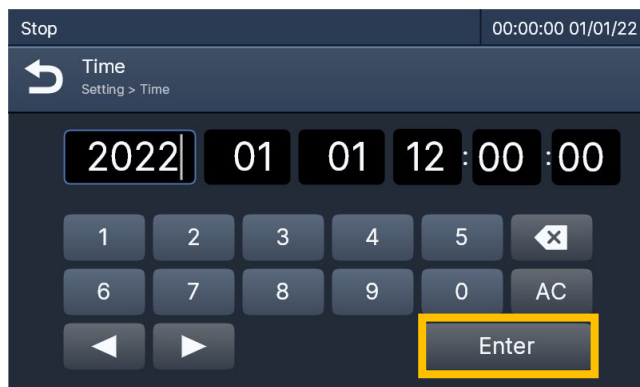
Set the date and time of this device.



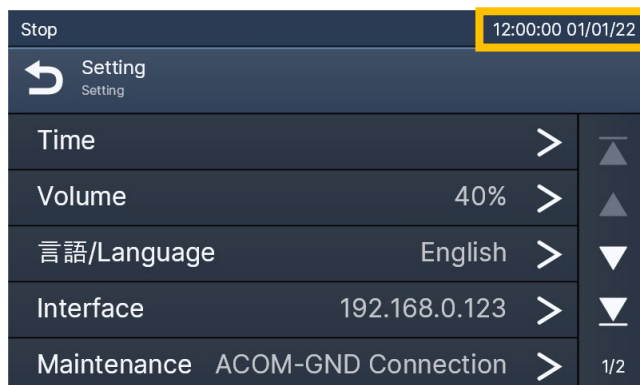
1. Tap **Setting** on the **Menu** screen.



2. Tap **Time**.



3. Enter the date and time, and then tap **Enter**.



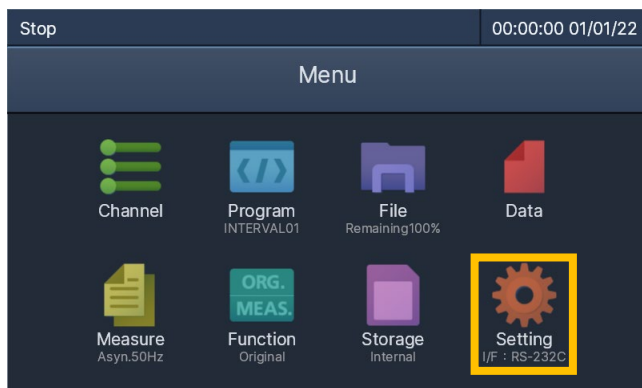
4. The date and time are set.

**CAUTION**

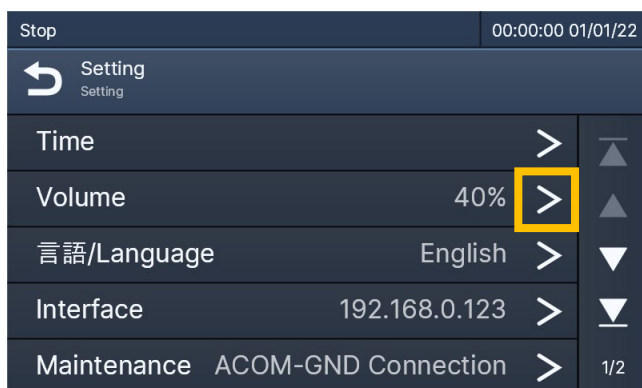
- The date and time of this device are displayed in Japan Standard Time.
- The date and time can be set up to December 31, 2037 23:59:59.
- Do not use this device after January 19, 2038.

6-8. VOLUME SETTINGS

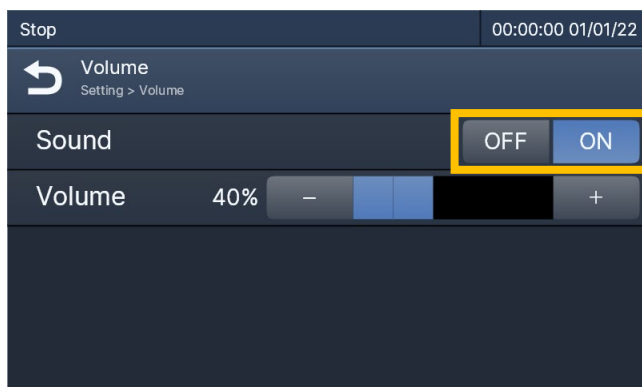
Set the volume.



1. Tap **Setting** on the **Menu** screen.

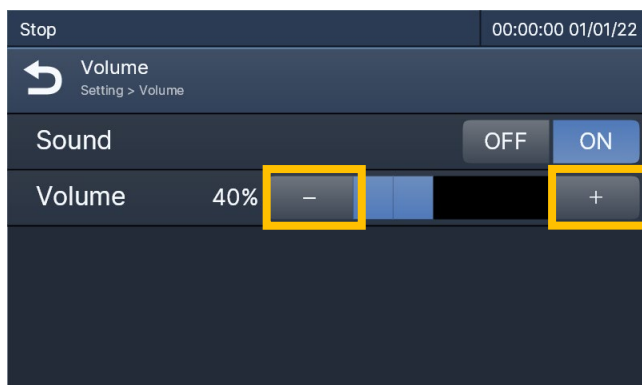


2. Tap **Volume**.



3. Tapping **OFF** for **Sound** will mute this device.

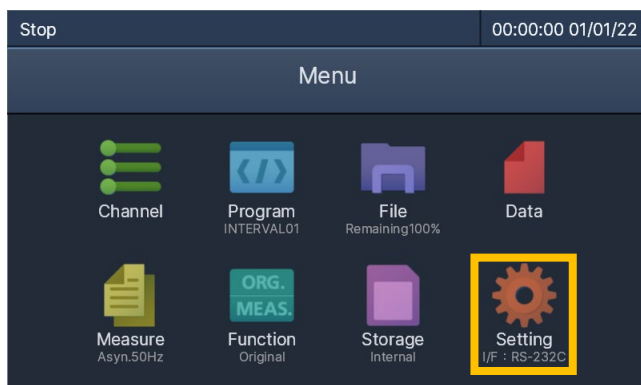
Tapping **ON** for **Sound** will enable sound from this device.



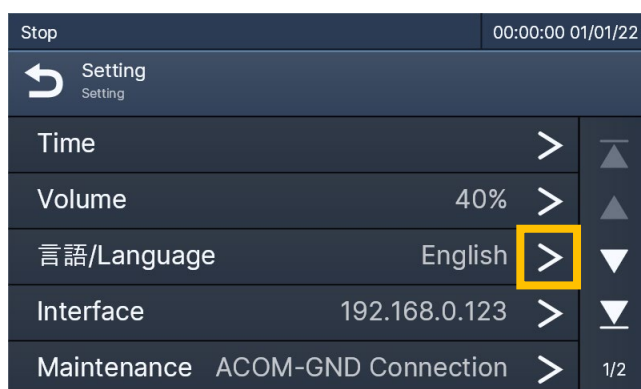
4. Tapping **+** will increase the volume. Tapping **-** will decrease the volume. The volume can be set to any of several levels (20/40/60/80/100%).

6-9. LANGUAGE SWITCHING

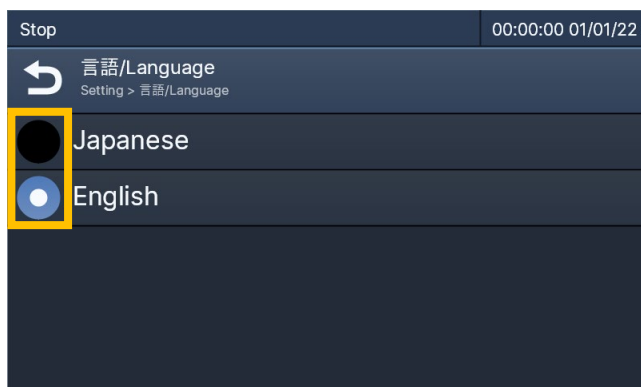
The language can be switched between Japanese and English.



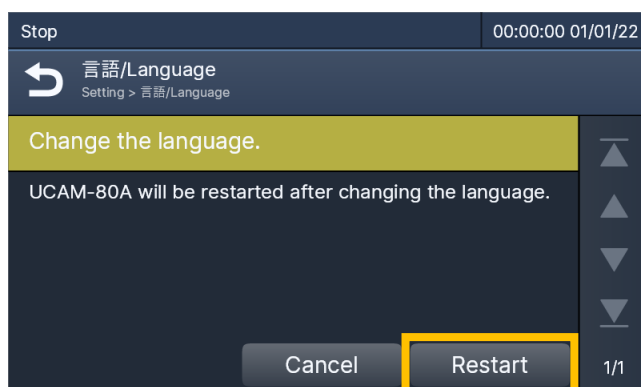
1. Tap **Setting** on the **Menu** screen.



2. Tap **Language**.



3. Tap either **Japanese** or **English**.



4. Tap **Restart**.



5. After this device restarts, the language will be switched.

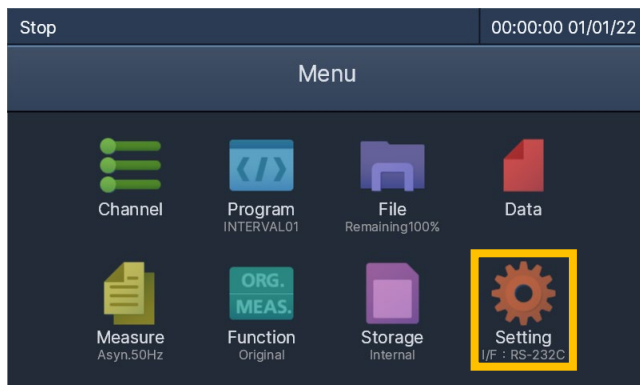


Tapping Restart will restart this device.

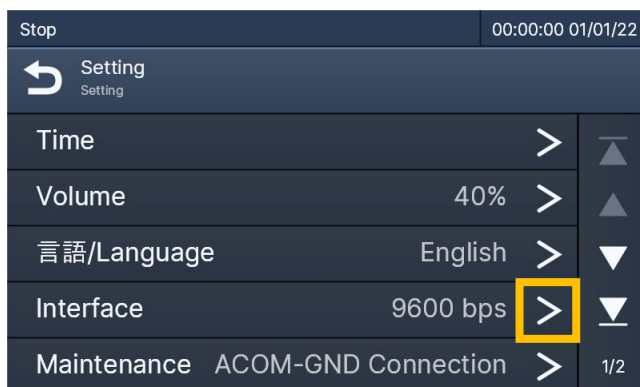
The language will be switched once it has restarted.

6-10. INTERFACE SETTINGS

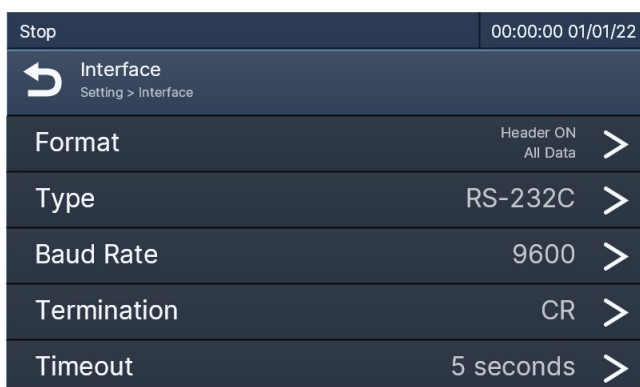
Configure settings related to the communication interface between this device and the PC.



1. Tap **Setting** on the **Menu** screen.



2. Tap **Interface**.



3. The **Interface** screen is displayed.

The **Interface** screen is used to configure the communication interface.

The following functions are available on the **Interface** screen.

	Stop	00:00:00 01/01/22
	Interface Setting > Interface	
(1)	Format	Header ON All Data >
(2)	Type	RS-232C >
(3)	Baud Rate	9600 >
(4)	Termination	CR >
(5)	Timeout	5 seconds >

Type: RS-232C or USB

	Stop	00:00:00 01/01/22
	Interface Setting > Interface	
	Format	Header ON All Data >
	Type	Ethernet >
(6)	IP Address	192.168.0.80 >
(7)	Subnet Mask	255.255.255.0 >
(8)	Gateway	0.0.0.0 >

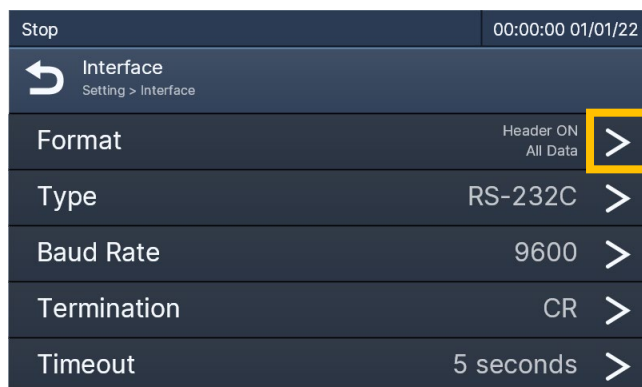
Type: Ethernet

Number	Name	Function	Reference Page
1	Format	Output format settings	6-10-1
2	Type	Communication interface selection	6-10-2
3	Baud Rate	Communication speed settings	6-10-3
4	Termination	Termination character settings	6-10-4
5	Timeout	Timeout period settings	6-10-5
6	IP Address	IP address settings	6-10-6
7	Subnet Mask	Subnet mask settings	6-10-6
8	Gateway	Default gateway settings	6-10-6

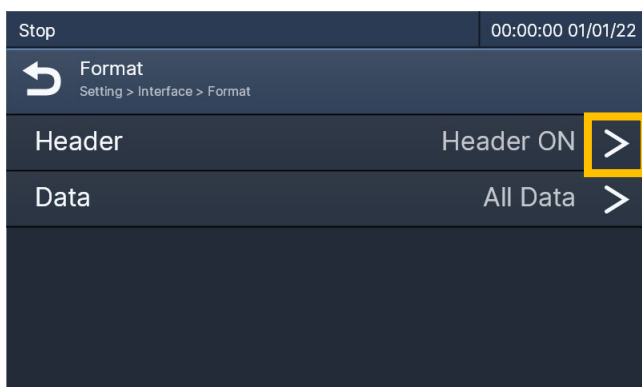
6-10-1. Output Format

Set the output format for measurement values sent from this device to the PC, when sending/receiving control commands.

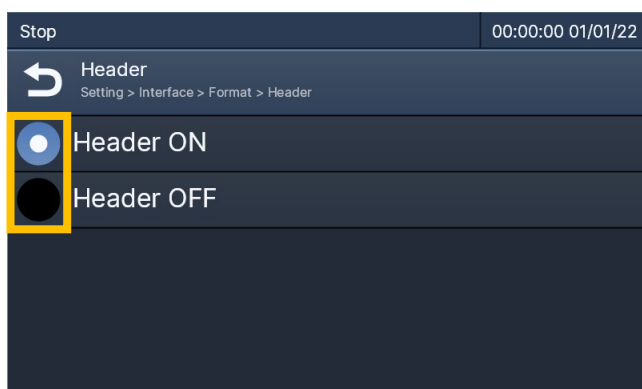
Refer to the Control Command Instruction Manual for details on control commands.



1. Tap **Format**.

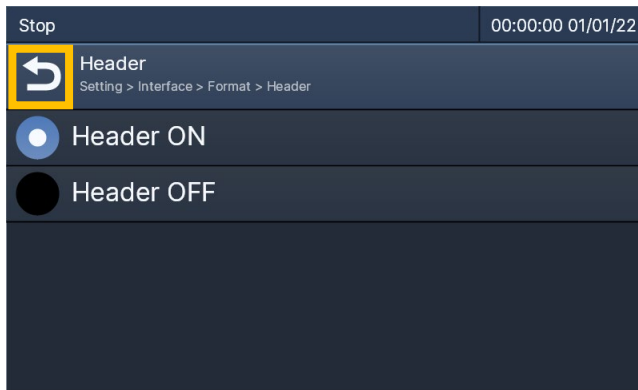


2. Tap **Header**.

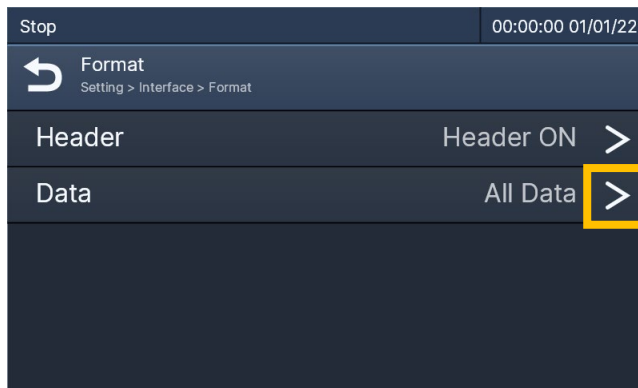


3. Tap **Header ON** or **Header OFF**.

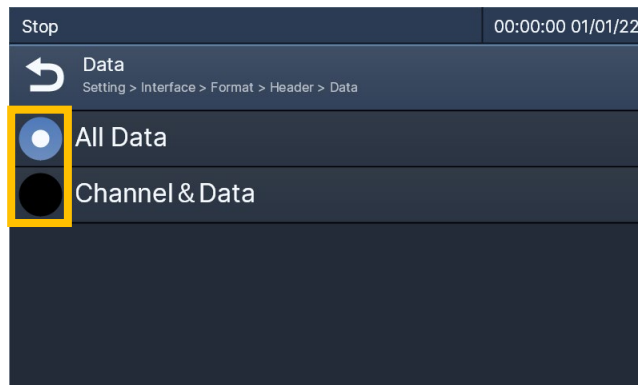
Header	Description
ON	Output a header with measurement values.
OFF	Output only measurement values.



4. Tap the Back button.



5. Tap **Data**.

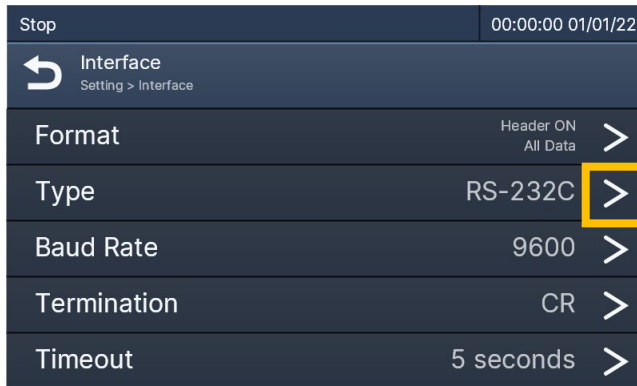


6. Tap **All Data** or **Channel & Data**.

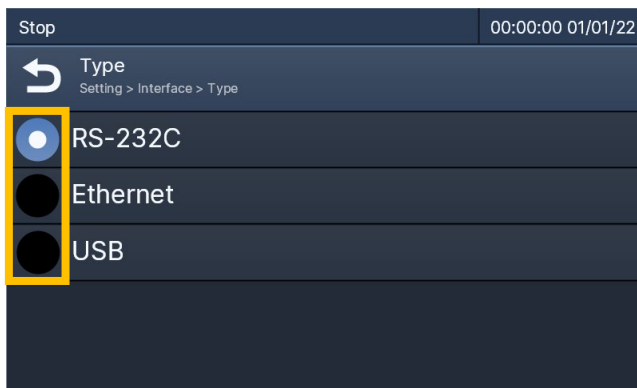
Data	Description
All Data	Output data for all items.
Channel & Data	Output only channel numbers and measurement values.

6-10-2. Type

Select the communication interface.



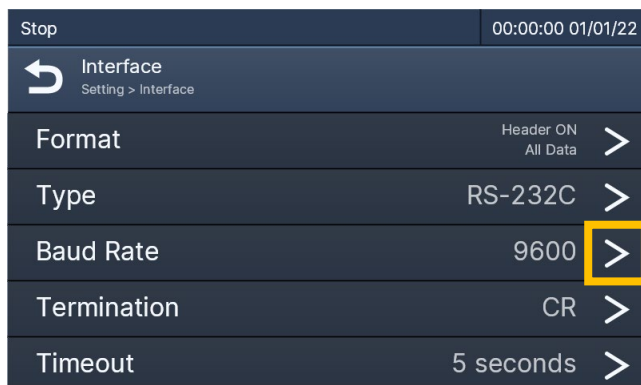
1. Tap **Type**.



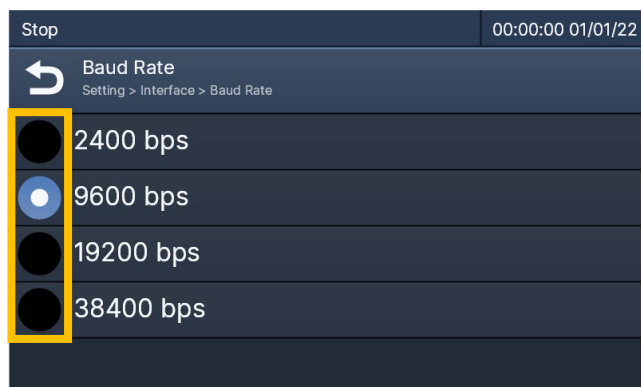
2. Tap the communication interface to use.

6-10-3. Baud Rate

Set the communication speed when using RS-232C.



1. Tap **Baud Rate**.



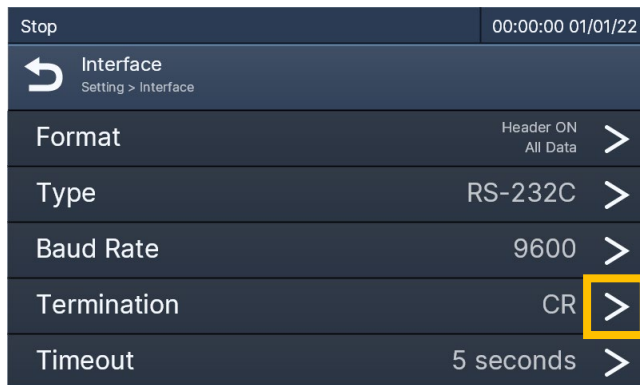
2. Tap the communication speed to use.



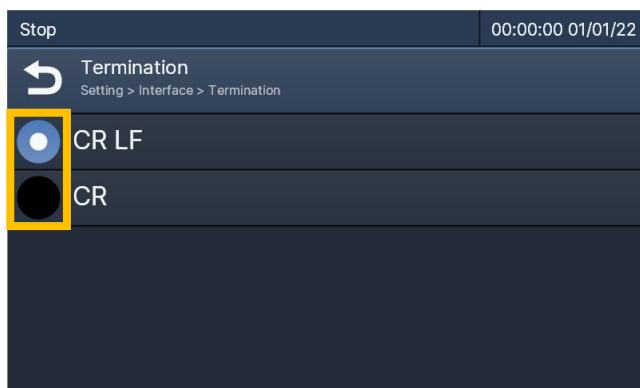
The baud rate cannot be set for Ethernet or USB.

6-10-4. Termination

Set the termination code for when using RS-232C.



1. Tap **Termination**.



2. Tap the termination code to use.

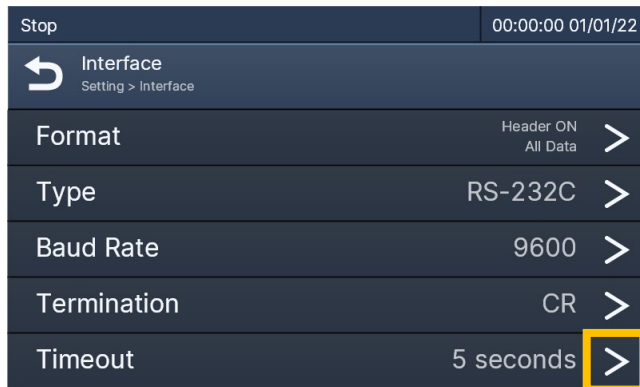
Refer to the Control Command Instruction Manual for details on termination codes.



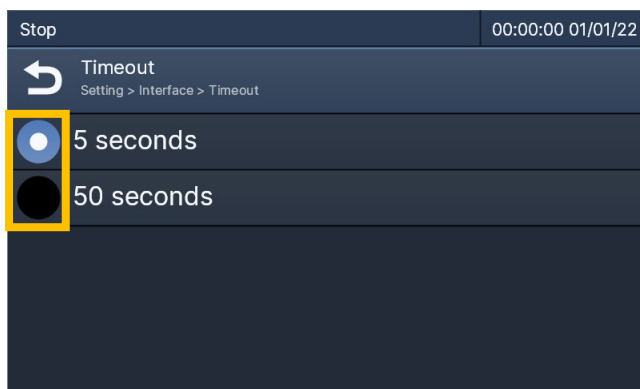
Termination cannot be set for Ethernet or USB.

6-10-5. Timeout

Set the timeout period (the time that this device will wait to receive a control command from the PC) for when using RS-232C or USB.



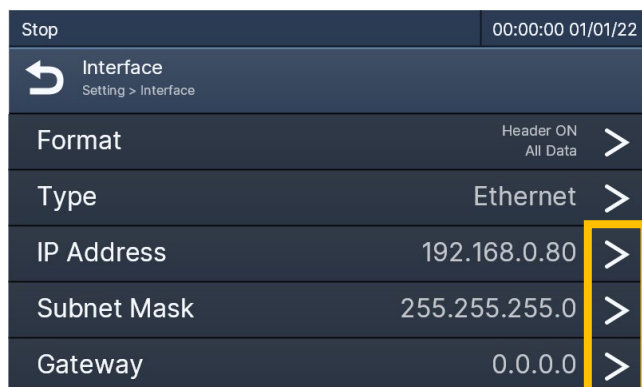
1. Tap **Timeout**.



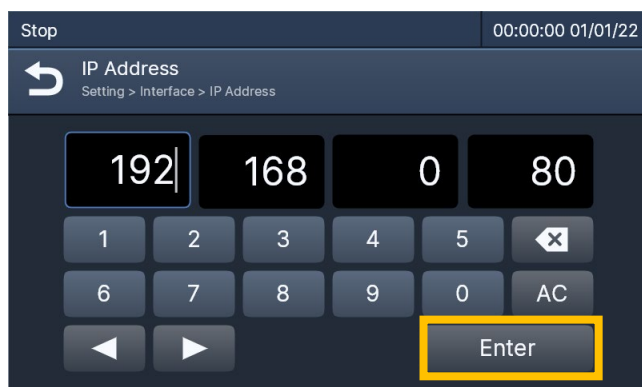
2. Set the timeout period to either **5 seconds** or **50 seconds**.

6-10-6. IP Address, Subnet Mask, Default Gateway

Set the IP address, subnet mask, or default gateway.



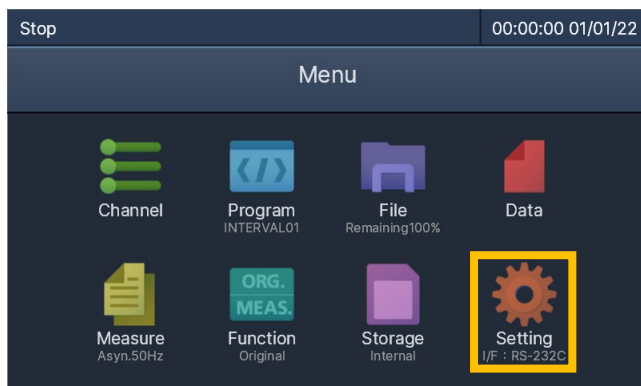
1. Tap the item to set.



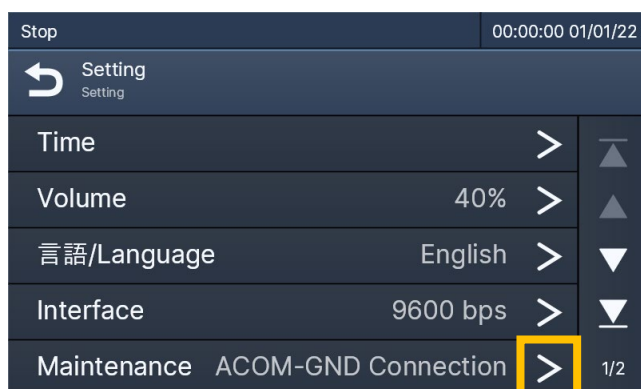
2. Enter the value to set, and then tap **Enter**.

6-11. MAINTENANCE SETTING

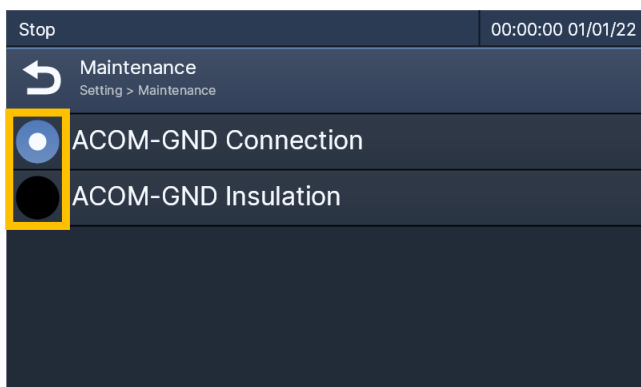
The maintenance setting is used for performing maintenance.



1. Tap **Setting** on the **Menu** screen.



2. Tap **Maintenance**.

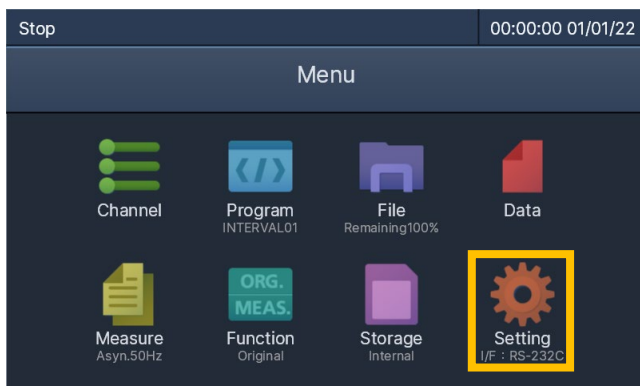


3. Tap the maintenance setting to use.

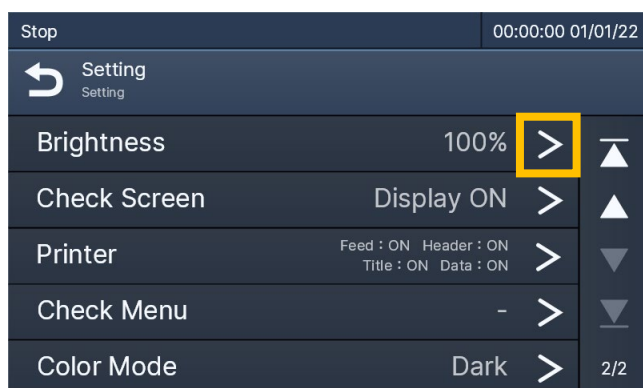
Maintenance	Description
ACOM-GND Connection	Connect ACOM and GND inside this device. This should normally be set to Connect ACOM-GND.
ACOM-GND Insulation	Insulate ACOM and GND inside this device. Set this to Insulate ACOM-GND if noise is having a negative effect. Doing so may improve the situation.

6-12. SCREEN BRIGHTNESS SETTINGS

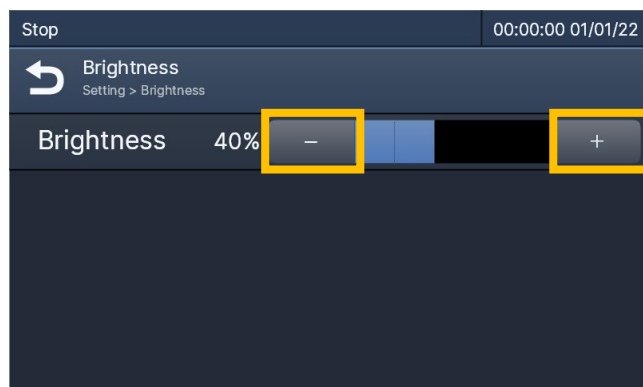
Set the brightness of the screen.



1. Tap **Setting** on the **Menu** screen.



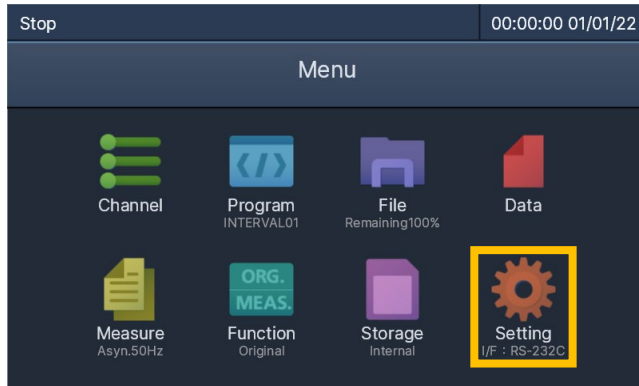
2. Tap **Brightness**.



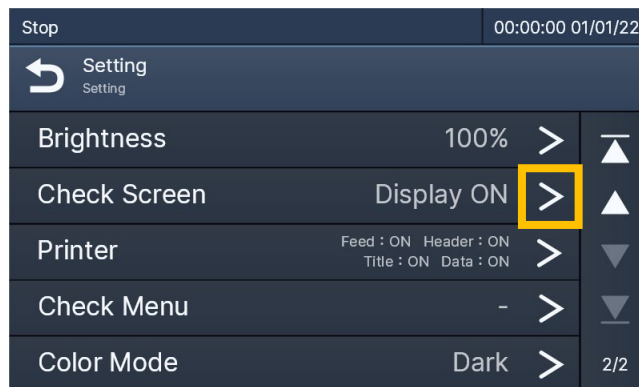
3. Tapping **+** will increase the brightness.
Tapping **-** will decrease the brightness.
The brightness can be set to any of several levels (20/40/60/80/100%).

6-13. CONFIRMATION SCREEN ON/OFF

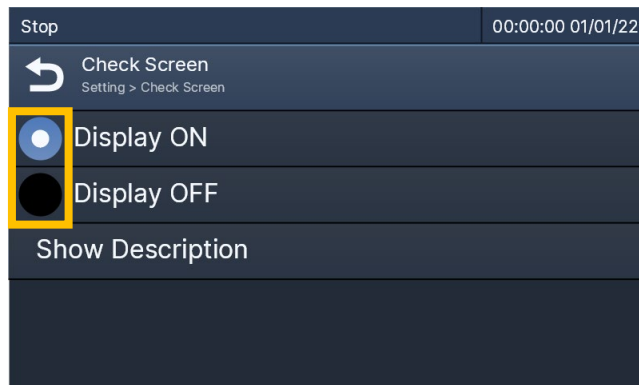
Select whether to display confirmation screens when deleting files, etc.



1. Tap **Setting** on the **Menu** screen.



2. Tap **Check Screen**.

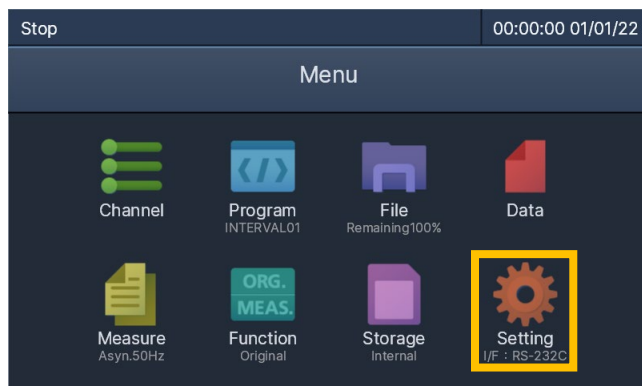


3. Tap either **Display ON** or **Display OFF**.

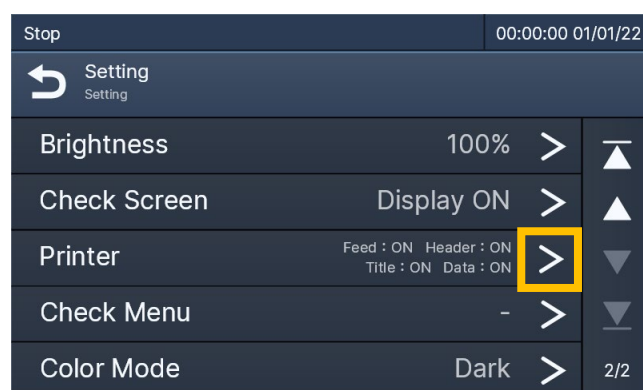
Check Screen	Description
Display ON	Display confirmation screens when deleting files, etc.
Display OFF	Do not display confirmation screens when deleting files, etc.

6-14. PRINTING SETTINGS

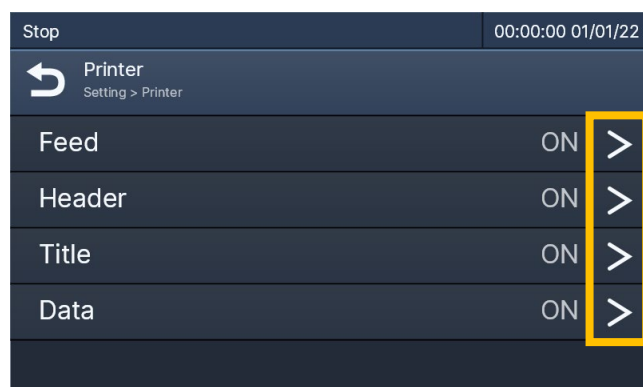
Set what to print to recording paper.



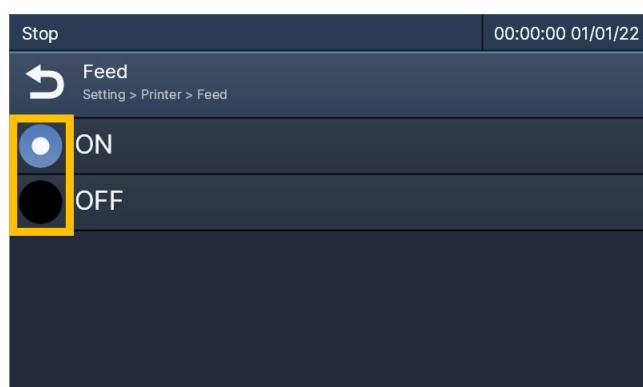
1. Tap **Setting** on the **Menu** screen.



2. Tap **Printer**.



3. Tap the item to set.



4. Select ON or OFF.

Item		Description
Feed	ON	Print with space between the "End of printing" and "Next header."
	OFF	Print without any space between the "End of printing" and "Next header."
Header	ON	Print the header when printing measurement values, etc.
	OFF	Do not print the header when printing measurement values, etc.
Title	ON	Print the title when printing measurement values, etc.
	OFF	Do not print the title when printing measurement values, etc.
Data	ON	Print character strings received from the PC.
	OFF	Do not print anything when a character string is received from the PC.

The diagram shows a printed output with the following structure:

- Header:** A box labeled "Header" points to the text "Scan Original".
- Title:** A box labeled "Title" points to the date and time "21/11/22 13:00:00".
- Data Fields:** A box labeled "Data" points to the header row of the measurement table, which includes "ST", "CH", "Data", and "Unit".

The printed content is as follows:

```

                '21/11/22 13:00:00
Scan
Original
ST CH      Data      Unit
00 0000 :  -123456 ×10^-6strain
00 0001 : -12345.6 ×10^-6strain
          :    123 °C
00 0002 :   123456 mV
00 0003 :   12345.6 mV
01 1000 :   999999 ×10^-6strain

```

The example above is of printing measurement values. The printed content is described below.

Content		Description
ST	Status number	This number indicates the status of the measurement value. Refer to the following page for details.
CH	Channel number	The channel number of the measurement value.
Data	Measurement value	The measurement value.
Unit	Unit	The unit of the measurement value.

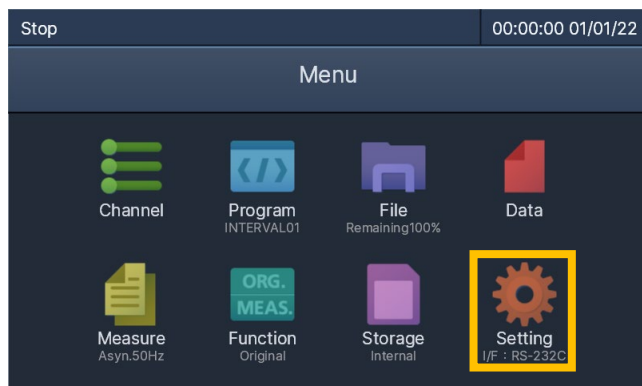
The status number indicates the status of the measurement value. If the status number is any number other than 00, the measurement value will be 999999.

Number	Status	Cause & Solution
00	Normal data	
01	Measurement value exceeded	The measurement value has been exceeded. → Check the following for failure in the sensor or this device. • Is there an excessive load on the sensor? • Is the sensor connected properly? • Is normal measurement possible on another channel? • Is the channel mode correct?
02	Initial value exceeded	The initial value has been exceeded. → Perform initial value measurement again. Or, set the correct initial value.
03	Display/print digits exceeded	When performing calibration coefficient calculation, the number of resulting integer digits exceeded the decimal point position. → Check the calibration coefficient and decimal point position.
04	Unusable channel mode	The channel mode cannot be used. → Check the channel mode.
05	Measurement temperature range exceeded	The measurement temperature range was exceeded. → Check whether the input voltage exceeds the electromotive force range of the thermocouple during thermocouple measurement.
06	No common dummy. Dummy channel measurement value is abnormal.	There is no dummy channel during true dummy measurement. → Check the channel mode. The dummy channel measurement value is erroneous. → Check whether the dummy channel sensor is normal. Check whether the initial value of the dummy channel is normal.
07	Thermocouple measurement terminal temperature abnormal	The terminal temperature exceeded the temperature range. → Confirm by running the terminal temperature check.
08	Skipped channel	Measurement is OFF for this channel.

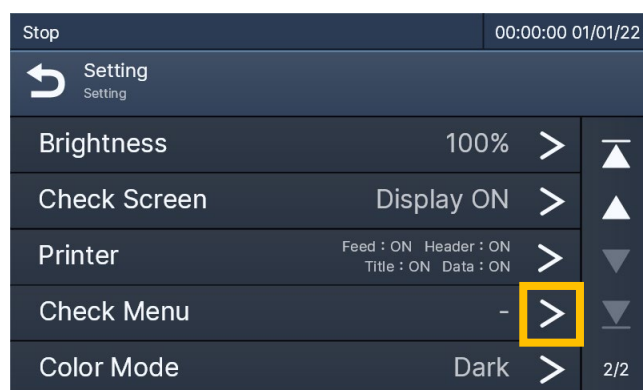
Number	Status	Cause & Solution
09	Disconnection error	The B and D terminals may be disconnected. → Check that the B and D terminals are connected properly. Check for a disconnection.
11	A/D converter fault	The A/D converter is faulty. → Remeasure and check whether this error occurs again. → If this occurs frequently, request service from KYOWA.
30	Device and USB-80/70 Series channel mode mismatch	The channel mode of this device does not match that of USB-80/70 Series. → Check the channel mode of this device or USB-70A. → Check the MODE SET switch on USB-70A.
31	Scanner recognition not possible	→ If this error occurs frequently regardless of whether a scanning unit or external scanner is installed, request service from KYOWA.

6-15. CHECK MENU

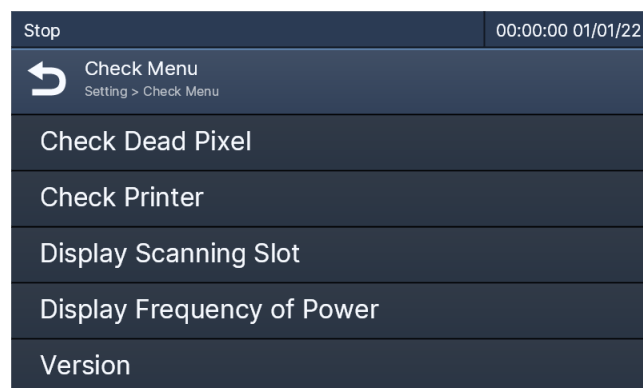
Check various settings, etc.



1. Tap **Setting** on the **Menu** screen.



2. Tap **Check Menu**.



3. The **Check Menu** screen is displayed.

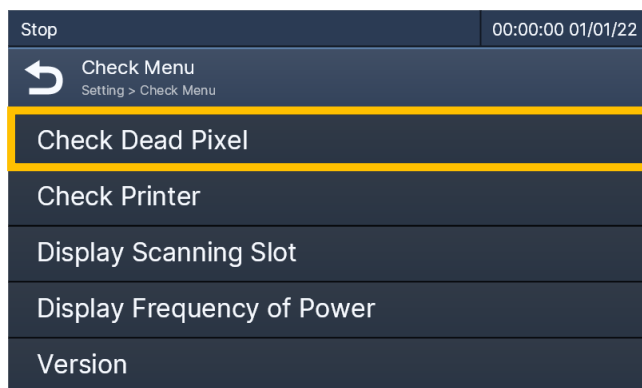
The following functions are available on the Check menu screen.

	Stop	00:00:00 01/01/22
	 Check Menu Setting > Check Menu	
(1)	Check Dead Pixel	
(2)	Check Printer	
(3)	Display Scanning Slot	
(4)	Display Frequency of Power	
(5)	Version	

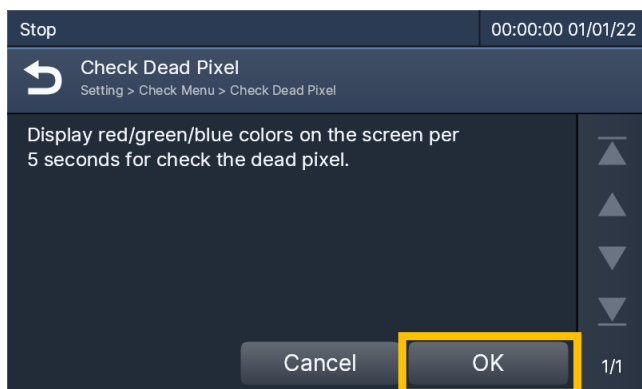
Number	Name	Reference Page
1	Check Dead Pixel	6-15-1
2	Check Printer	6-15-2
3	Display Scanning Slot	6-15-3
4	Display Frequency of Power	6-15-4
5	Version	6-15-5

6-15-1. Check for Dead Pixels on Screen

Display red/green/blue screens to check for dead pixels.



1. Tap **Check Dead Pixel**.



2. Tap **OK**.



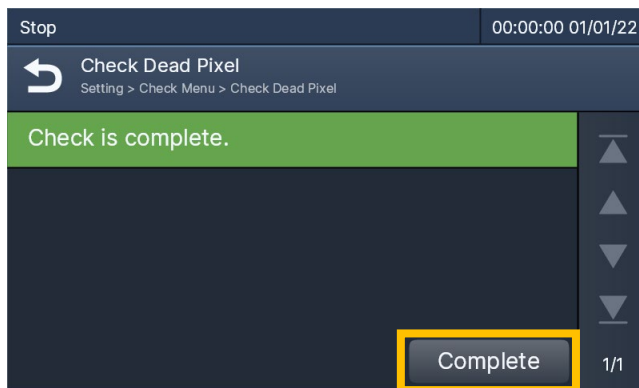
3. A red screen is displayed.



4. A green screen is displayed.



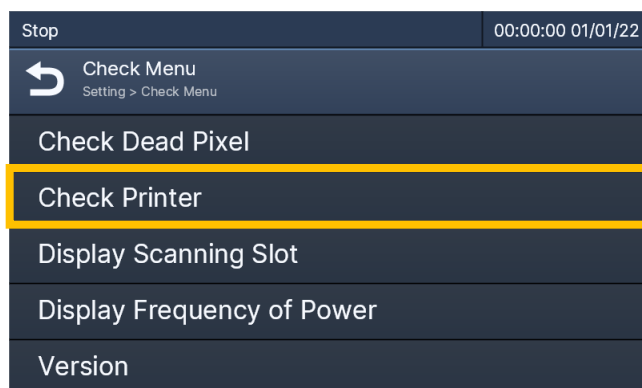
5. A blue screen is displayed.



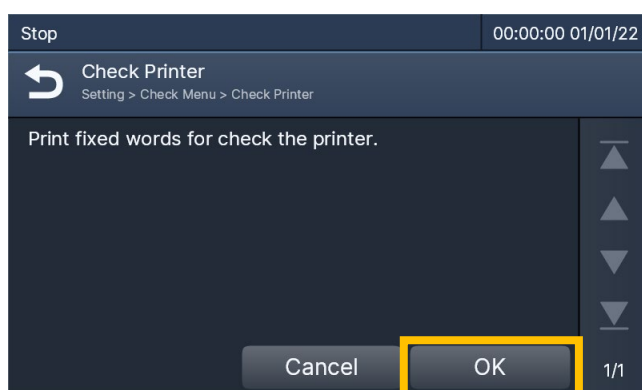
6. After checking, Tap Complete.

6-15-2. Check Print Quality

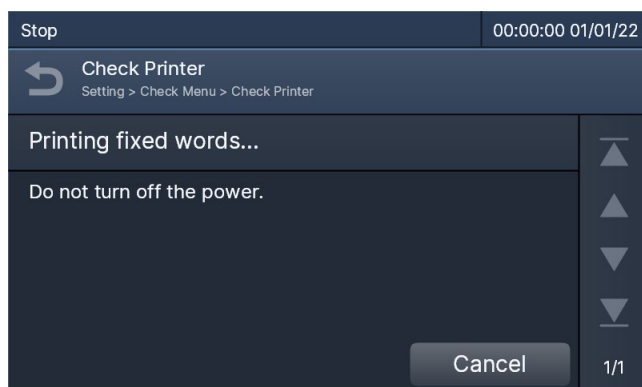
Print certain characters on recording paper to check printer soundness.



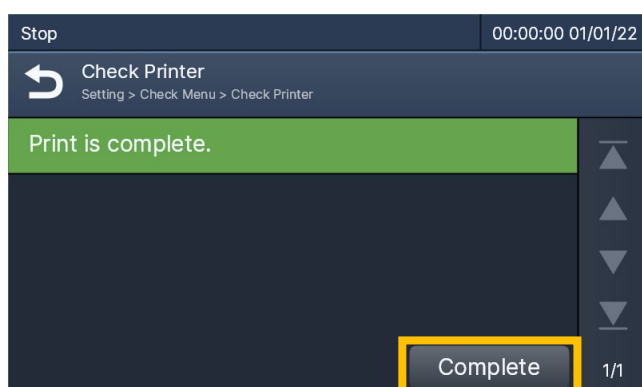
1. Tap **Check Printer**.



2. Tap **OK**.



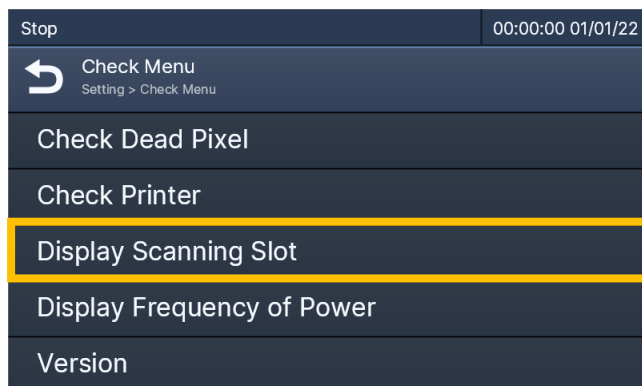
3. Printing starts.



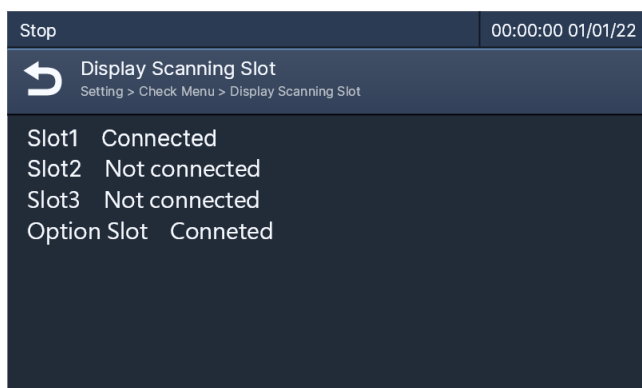
4. After checking, Tap **Complete**.

6-15-3. Display Scanning Unit Slots

Display any scanning units connected to this device.



1. Tap **Display Scanning Slot**.



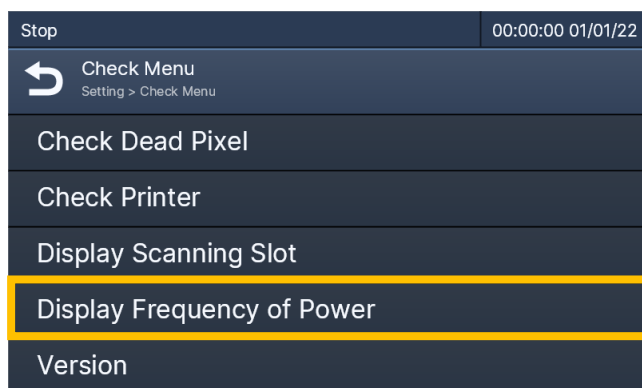
2. Any scanning units are displayed.



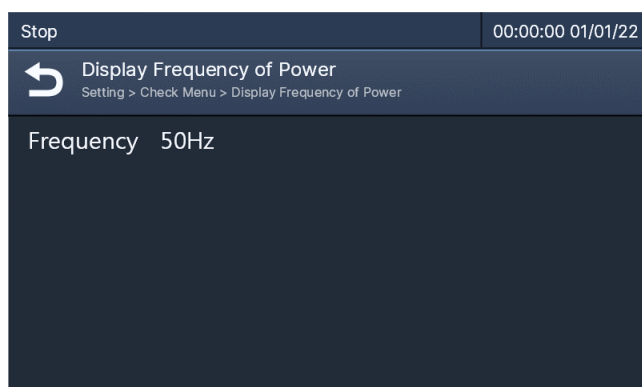
Optional slot indicates whether an External I/O Unit is present.

6-15-4. Display Power Frequency Detection Result

Display the power frequency detected when this device started.



1. Tap **Display Frequency of Power**.

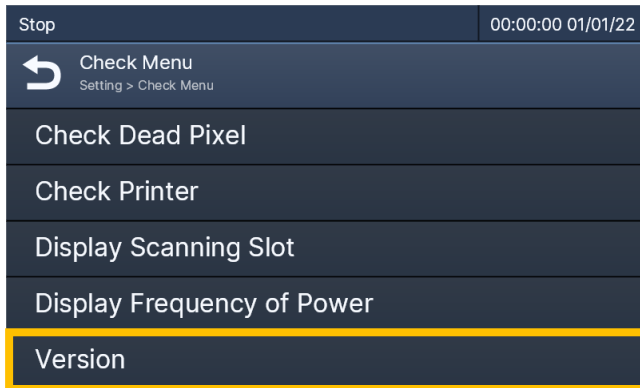


2. The power frequency detection result is displayed.

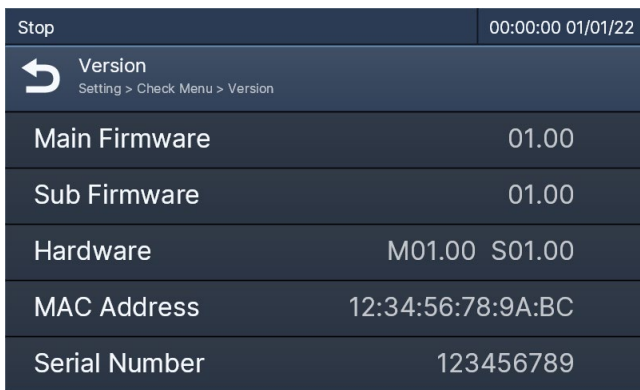
Result	Meaning
50 Hz	Indicates that 50 Hz was detected.
60 Hz	Indicates that 60 Hz was detected.
Unknown	Indicates that the power frequency could not be detected. The power frequency cannot be detected. Set the measurement timing to power non-synchronized. There may be power frequency detection circuit failure.

6-15-5. Display Version Information

Display version information, etc. for this device.



1. Tap **Version**.

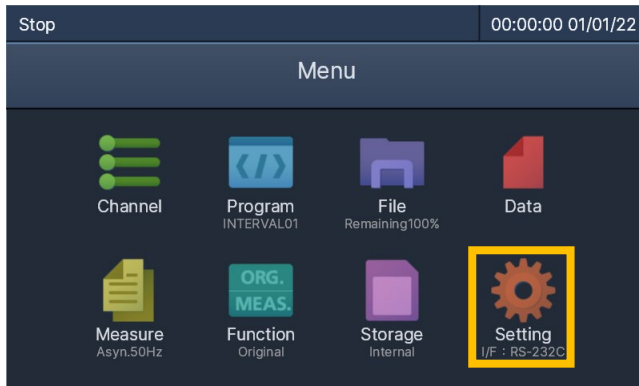


2. The version information is displayed.

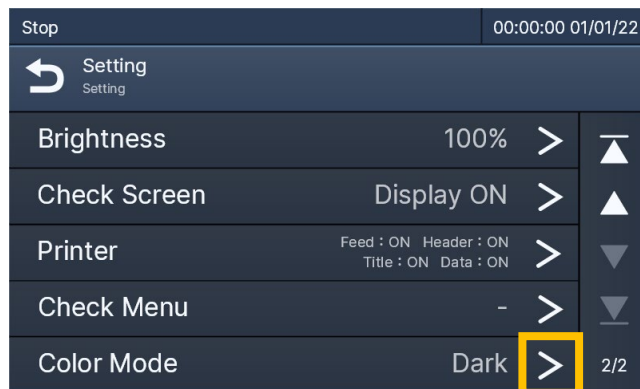
Version	Description
Main Firmware	Displays the main firmware version of this device.
Sub Firmware	Displays the sub firmware version of this device.
Hardware	Displays the FPGA version of this device.
MAC Address	Displays the MAC address of this device.
Serial Number	Displays the manufacturing number of this device.

6-16. COLOR MODE SWITCHING

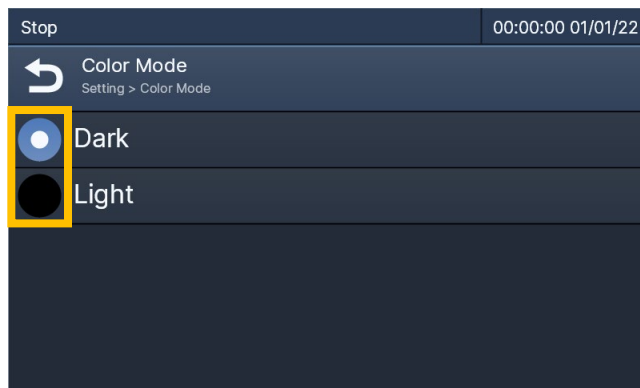
Switch between a dark or light color mode.



1. Tap **Setting** on the **Menu** screen.



2. Tap **Color Mode**.

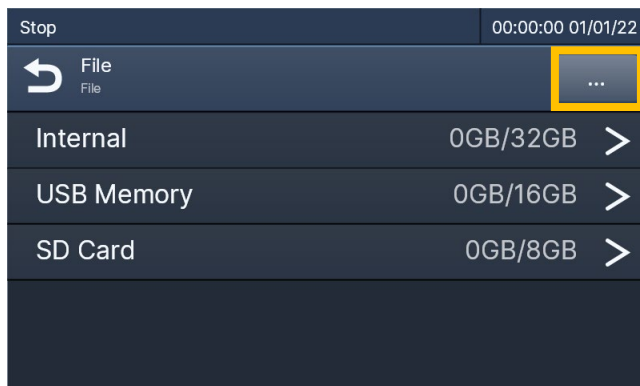


3. Tap the color mode to set.

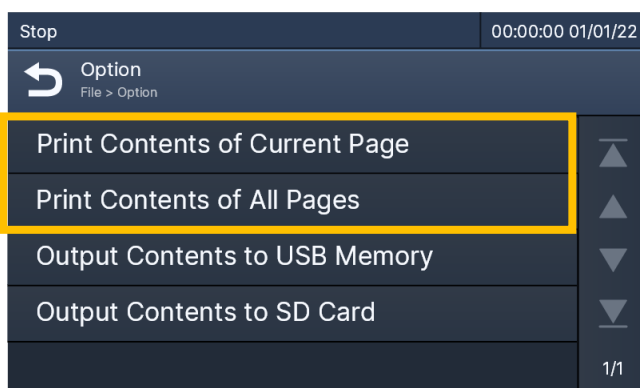
Color Mode	Description
Dark	Screen colors will have a darker tone.
Light	Screen colors will have a lighter tone.

6-17. SCREEN CONTENT PRINTING

Screens that include an Option button can be printed.

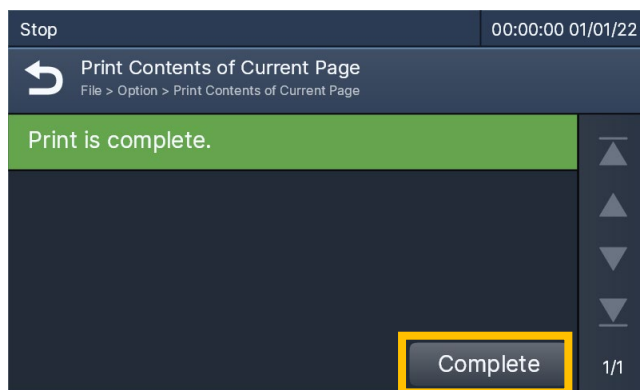


1. Tap the Option button.

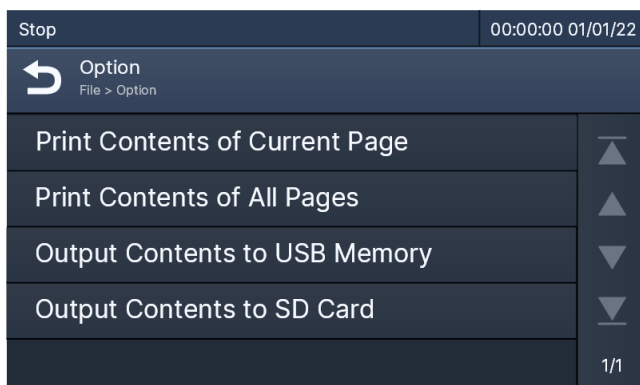


2. Tap **Print Contents of Current Page** to print the page displayed on the previous screen.

Tap **Print Contents of All Pages** to print all pages from the previous screen.



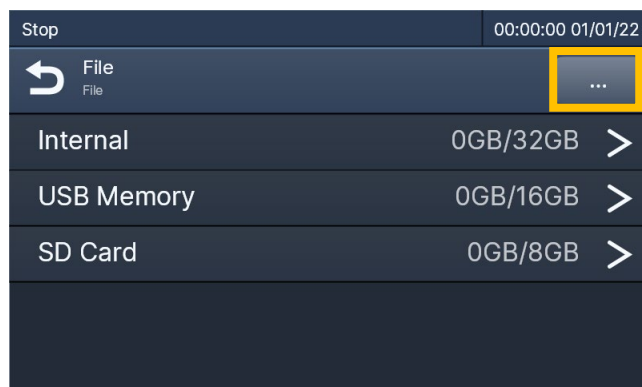
3. Once printing is complete, tap **Complete**.



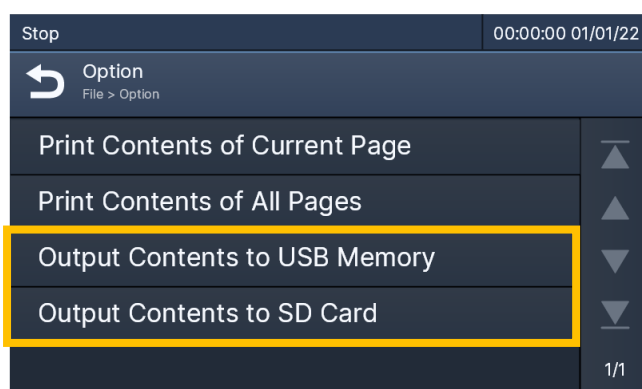
4. The display returns to the **Option** screen.

6-18. SCREEN CONTENT OUTPUT TO EXTERNAL MEMORY DEVICE

Screens that include an Option button can be output to an external memory device. Screens will be output as text files.



1. Tap the Option button.



2. Output Contents to USB Memory
Tap this to output a text file to the USB memory device connected to this device.

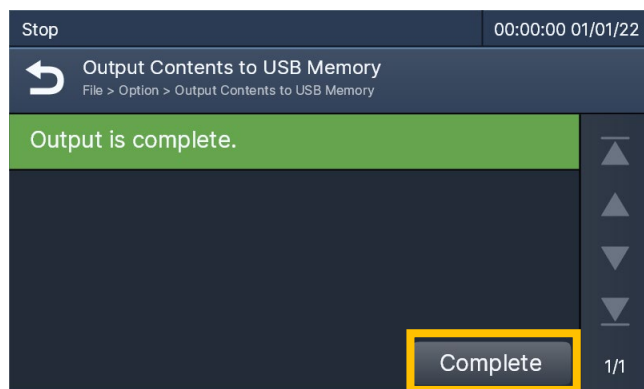
Output Contents to SD Card

Tap this to output a text file to the SD card inserted into this device.

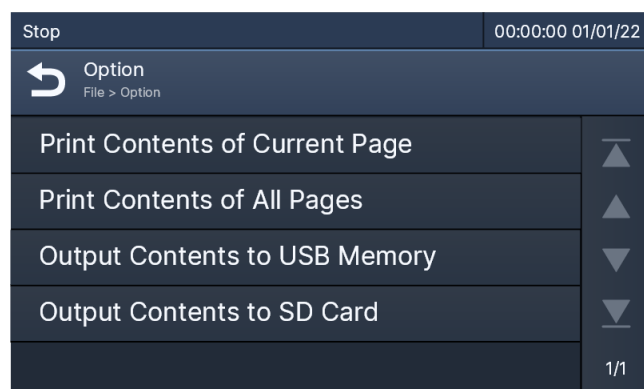


CAUTION

- Wait until text file output is complete before removing the external memory device.
- Wait until text file output is complete before turning the power of this device OFF.



3. Once output is complete, tap **Complete**.



4. The display returns to the **Option** screen.



- Text files will be output to the "ucam" in the root directory (highest level directory) of the external memory device.
- If there is no "ucam" folder, it will be automatically created by this device.

6-19. MEASUREMENT DATA FILE AUTOMATIC COLLECTION USING USB MEMORY DEVICE

A USB memory device (containing a certain folder) can be connected to this device, in order to automatically collect measurement data files stored in internal memory. The automatic collection procedure is shown below.



CAUTION

- Do not remove the USB memory device during automatic collection.
- Do not turn the power of this device OFF during automatic collection.
- If automatic measurement scanning starts during automatic collection, these measurement values will be skipped.
To avoid skipping these, perform automatic collection outside of automatic measurement scanning.
- If the USB memory device is connected and automatic collection is performed after already performing automatic collection, measurement data files will be overwritten.

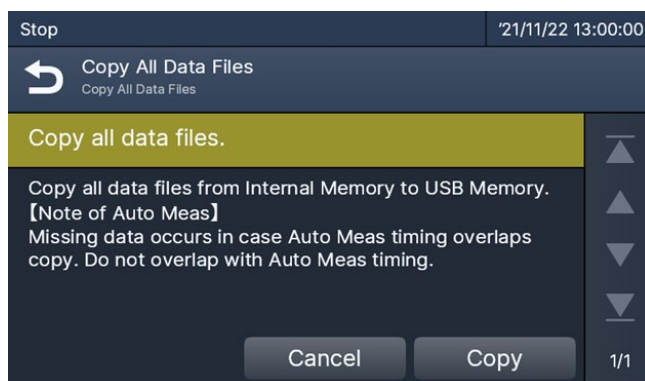
(1) Prepare the following.

- PC
- USB memory device (with capacity of 32 GB or less, and using a file format of FAT32)

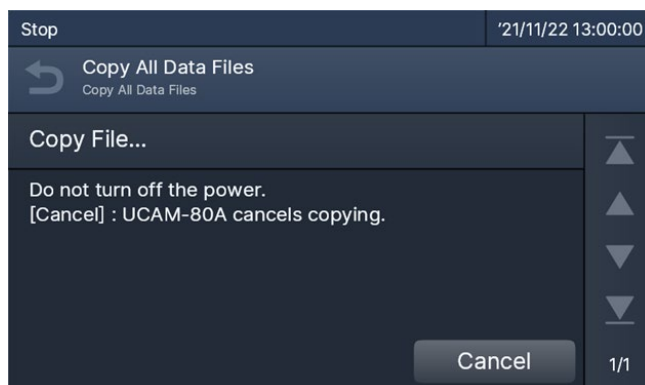
(2) Access the root directory (highest level directory) of the USB memory device, and create a folder (called "_ucam_backup_sddata").

(3) Start this device and wait for the Menu screen to be displayed. Connect the USB memory device.

- (4) The following screen is displayed. Tap [Copy] to start automatic collection.
Tap [Cancel] to return to the Menu screen.



- (5) The following screen is displayed during automatic collection. Tapping [Cancel] will cancel automatic collection.



- (6) Once automatic collection is complete, the display will return to the Menu screen.
- (7) Remove the USB memory device. The "_ucam_backup_sddata" folder now contains copies of the measurement data files.

7. MAINTENANCE

7-1. MAINTENANCE DETAILS

Maintenance includes procedures such as calibrating the device or replacing limited lifespan parts. These are described below.

It is recommended to perform maintenance as described below.

Device Calibration

Item	Details	Schedule
Device operation confirmation	In order to ensure the operation of this device, it is recommended to perform periodic inspections. Devices will be collected by KYOWA for periodic inspection.	Once per year

Limited Lifespan Part Replacement

Item	Details	Schedule
Backup battery	The internal backup battery is used to operate the clock function when the power supply is OFF. The backup battery will last 7 years when used at room temperature (20 to 30°C). It should be replaced approximately every 7 years. Devices will be collected by KYOWA for battery replacement. The lifespan will be around 4 years if an optional UIO-80A is installed. If not using for a long period of time, disconnect UIO-80A from this device and store it somewhere safe.	Once every 7 years Or Once every 4 years
Screen	Liquid crystals will last approximately 10 years.	Once every 10 years

The information above assumes 8 hours of use per day, 365 days per year. The schedule above is only a recommendation, and is not a guarantee that failure will not occur or that repair will be provided free of charge during the period described above.

In order for the product to be used reliably, parts must be replaced through periodic maintenance.

Parts will need to be replaced sooner if used continuously for a long time, in order to maintain safety.

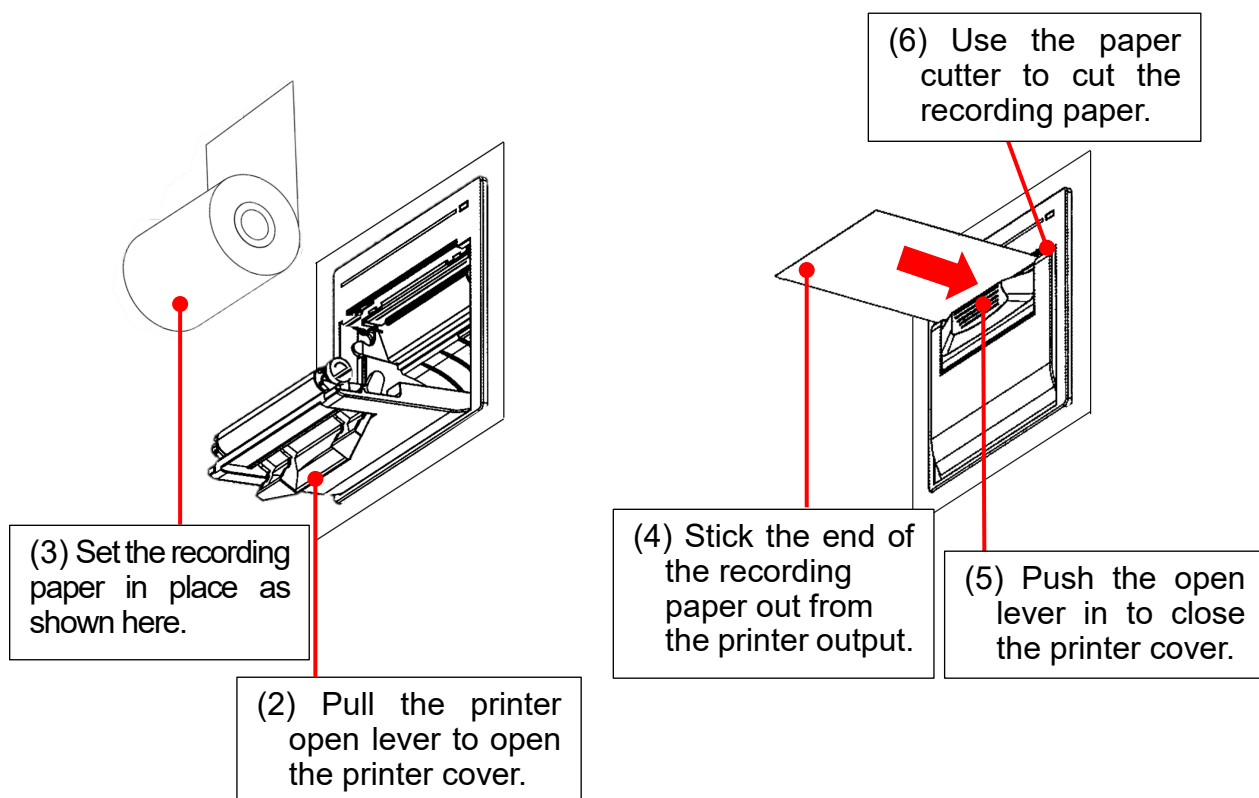
7-2. UCAM-80A INITIALIZATION

This can be initialized to factory settings by sending a control command from a PC to this device. Refer to the Control Command Instruction Manual for details.

7-3. RECORDING PAPER REPLACEMENT

Follow the procedure below to replace recording paper in the printer built into this device.

- (1) Open the printer lid.
- (2) Pull the printer open lever to open the printer cover.
- (3) Set the recording paper in place as shown here.
- (4) Stick the end of the recording paper out from the printer output.
- (5) Push the open lever in to close the printer cover.
- (6) Lift the recording paper upward, and use the paper cutter on the top of the printer to cut the recording paper.
- (7) Close the printer lid.



Use the following recording paper.

Model: TP-S245L-1

Thermal type

Width: 58 mm, Length: 19 m

7-4. FUSE REPLACEMENT

Follow the procedure below to replace the fuse in this device.

- (1) Turn the power of this device OFF, and then disconnect the AC power supply cable.
- (2) Rotate and remove the FUSE holder on the back.
- (3) Use a tester or other device to check whether the fuse inserted into the FUSE holder is blown. If it is blown, replace it with a spare fuse.
- (4) Attach the FUSE holder to the rear.



UCAM-80A recommended fuse

Model: 217 004 MXP (Littelfuse)

Fusing characteristic: Fast-blow type

Rated voltage: 250 V, Rated current: 4 A

Dimensions: $\phi 5 \times 20$ mm

Follow the procedure below to replace the fuse in USB-80A.

- (1) Turn the power of this device OFF, and then disconnect the AC power supply cable from USB-80A LINE IN connector.
- (2) Unplug the cable from the TO INDICATOR connector and TO NEXT SCANNER connector on the USB-80A.
- (3) Pull the FUSE holder located below the LINE IN connector on the rear of the USB-80A toward you and remove the FUSE holder.
- (4) Use a tester or other device to check whether the fuse inserted into the FUSE holder is blown. If it is blown, replace it with a spare fuse.
- (5) Attach the FUSE holder to the bottom of the LINE IN connector on the back of the USB-80A.



USB-80A recommended fuse

Model: ET3.15A (SOC)

Fusing characteristic: Time-lag type

Rated voltage: 250 V, Rated current: 3.15 A

Dimensions: $\phi 5 \times 20$ mm

7-5. INTERNAL BACKUP BATTERY

This device uses an internal backup battery to store the date and time when the power supply is OFF.

The internal backup battery last approximately 7 years. Note that the internal backup battery will last approximately 4 years if a UIO-80A External I/O Unit is installed.



- Devices will be collected by KYOWA for battery replacement.
- The internal backup battery is not used when the power of this device is ON.

8. ERROR MESSAGES

A message will be displayed on the screen when an error occurs. These messages are described below.

If an error message is displayed, follow the instructions provided.

Code	Message
E001	A value outside the settable range was entered.
E002	There is a blank entry field. Fill out the blank entry field.
E003	A built-in scanner and external scanner share the same channel. Configure so that they are different.
E004	Enter a value from 0 to 29 for the built-in scanner.
E005	The last channel number must be larger than the first channel number.
E006	There are more than 50 channels to add to the group. Change the group to add.
E007	The power frequency cannot be detected. Set this to power non-synchronized. There may be power frequency detection circuit failure.
E008	No more programs can be registered. Up to 15 programs can be registered.
E009	A program with the same name has already been registered. Use a different program name.
E010	A file with the same name already exists. Use a different file name.
E011	There is no printer paper. Set printer paper (model: TP-S245L-1) correctly.
E012	No USB memory device was recognized. Confirm that the USB memory device is inserted properly.
E013	No SD card was recognized. Confirm that the SD card is inserted properly.
E014	Insufficient memory. Unable to copy.
E015	Insufficient memory. Unable to create file.
E016	Insufficient memory. Unable to convert to CSV.

E017	Unable to convert to CSV. File data is abnormal.
E018	An overheat error has occurred in the printer. Wait a short while and then try printing again.

9. BEFORE CONCLUDING THAT THE PRODUCT IS DEFECTIVE

If the device does not work as expected or operates unreliably, check whether there might be external causes before concluding that the product is defective.

This table explains what to check and provides possible solutions for issues. If operation continues to be problematic, contact KYOWA sales personnel or your nearest dealer. Note that a repair request may be denied if the device was damaged through use not described in this Instruction Manual or if the device was disassembled or modified by the user.

9-1. FOR UCAM-80A

Issue	Check	Solution
The device does not turn ON.	Is the voltage from the outlet from 100 to 240 VAC?	Use a tester, etc. to check.
	Is the power cable fully inserted?	Ensure that the power cable is fully inserted.
	Is power supply capacitance sufficient?	Use a power supply with sufficient capacitance.
	Is the fuse blown?	A spare fuse is included with the device. If the fuse is blown, determine whether this is the cause and replace it.
The measurement timing (power frequency) cannot be detected.	Is the power frequency stable at 50 Hz or 60 Hz?	Use a power supply stabilized at either 50 Hz or 60 Hz.
Operation stops, and the device does not respond to any operations.	Is there any external noise causing a fault in the operation of this device?	Try restarting this device. If external noise causes the issue to occur again, implement noise prevention measures in the area, on the power supply, etc.
Measurement values fluctuate.	Are the measured object (object being tested) and the GND terminal of this device grounded properly?	Ensure that grounding is installed properly.
	Is there any external noise causing a fault in the operation of this device?	Implement noise prevention measures in the area, on the power supply, etc.
	Are the input lead wires and cables connected properly to the input terminals?	Unstable connections (soldering, screws) to input terminals can cause measurement value fluctuation. Check connections.

Issue	Check	Solution
Strain measurement values are abnormal.	Refer to "6-3-6. BV2V Check" and "6-3-7. BV5V Check." Perform the same BV check for the channel mode, and check whether the stipulated BV voltage is output.	If the BV voltage is abnormal, the sensor may be faulty. If the BV voltage is abnormal even without the sensor connected, the BV circuit may have failed. Contact KYOWA sales personnel or your nearest dealer.
	Refer to "6-3-2. Input/Output Resistance Check." Perform an input/output resistance check and check whether the resistance value is the same as that of the connected sensor and gage.	If input/output resistance differs from the resistance value of the connected sensor or gage, the sensor or gage may be faulty. Contact KYOWA sales personnel or your nearest dealer.
	The measurement value is 999999, and the LED on the scanning unit does not light up.	Is the measurement channel set correctly? Is the scanning unit set to the "Do not use" setting? If the LED on the scanning unit does not light up, measurement will not be performed for the channel on the scanning unit.
	Does the measurement value setting match the measurement target?	• Original measurement: Set whether to perform calibration coefficient calculation. The original value, which is the sum of the initial value (initial unbalance value) of the sensor and current sensor load, will be measured. • Measured value measurement: Set whether to perform calibration coefficient calculation. Initial value measurement will be performed prior to the sensor load, so the initial value will be subtracted. This allows the current sensor load only to be measured.
	Is a sensor compatible with remote sensing being used?	This device is not compatible with remote sensing. Using a sensor compatible with remote sensing will result in abnormal values, such as a value roughly half that of the measurement value. Cutting the remote sensing terminal F and G lines will result in normal values.

Issue	Check	Solution
Voltage measurement values are abnormal.	Is the Delta V function enabled, and is an abnormal value entered for the initial value?	Voltage/temperature will generally be the original value (raw data) if calibration coefficient or initial value calculation is not performed. However, the Delta V (voltage) or Delta T (temperature) function can be enabled to perform measurement using measured values.
	Is FV-1A (NDIS connector and BNC conversion connector) being used?	FV-1A cannot be used with this device.
Thermocouple measurement values are abnormal.	Refer to "6-3-5. Terminal Temperature Check." Perform a terminal temperature check and confirm that the results are roughly the same as the ambient temperature (this device generates heat, so a temperature a few °C higher than the ambient temperature will be displayed).	If the result differs, the terminal temperature measurement terminal has failed. Contact KYOWA sales personnel or your nearest dealer.
	Is the thermocouple disconnected? Refer to "6-3-1. Disconnection/Burnout Check." Perform a burnout check.	If the result is not OK, the thermocouple is disconnected. If the end of the thermocouple is not insulated and the measured object has potential, normal measurement cannot be performed. Either cover the end of the thermocouple with an insulator, or use a sheathed thermocouple. It may be possible to resolve this by grounding the measured object (or removing ground if it is already grounded).
	Do the channel mode and connected thermocouple type (K, T, etc.) match?	Set the appropriate channel mode.
	Was measurement started immediately after connecting the thermocouple to the terminal block?	After connecting a thermocouple, wait a short while for the connection area of the terminal block to reach temperature equilibrium, before starting measurement. It will take around 15 minutes for the connection point to reach temperature equilibrium after connecting a thermocouple to the terminal block.

Issue	Check	Solution
Thermocouple measurement values are abnormal.	Was this device sufficiently warmed up?	Measurement values will drift if this device is not sufficiently warmed up. Warm up this device for around 30 to 60 minutes.
	Is the thermocouple attached appropriately?	If the thermocouple is moved by wind, etc., or wind strikes the terminal block, the output of the thermocouple may become unstable. Take measures to prevent this, such as securing the thermocouple firmly in place so that it does not move, or installing measures to prevent wind from striking the terminal block.
	Is this device being used in an environment near a heat source?	Use it away from heat sources.
	Check the scanning speed setting.	Setting the scanning speed to 0.28 sec or more will reduce variations in measurement values.

Issue	Check	Solution
Measurement values become unstable when using sensor over a long time in the field (such as a strain gage civil engineering transducer).	Refer to "6-3-1. Disconnection/Burnout Check." Perform an insulation check.	If the result is LOW, or measured insulation resistance is lower than the value given for the sensor, sensor insulation may have been reduced due to moisture, etc., causing measurement values to become unstable. Contact the sensor manufacturer for information on the sensor insulation resistance. It is recommended to replace the sensor. If this is impossible, setting a slower scanning speed may stabilize measurement values.
Control cannot be performed over a LAN.	There are two LEDs on the Ethernet connector on this device. These can be checked to determine whether the physical connection is normal. If the connection is normal, one LED will light up, and the other LED will flash (irregularly).	If this is not the case, check the LAN cable and hub. Old information may be stored in the hub, causing communication issues. Turn the hub power OFF and then ON again, or remove and then insert the LAN cable. If the CPU in this device was replaced during repair, the MAC address will be different. If access to your network environment is controlled based on MAC address, you will need to contact your network administrator.
Printing does not work.	Is recording paper inserted? If recording paper is not inserted, the printer LED will light up.	Insert recording paper. The printer LED will turn OFF once recording paper is inserted.
	Is the printer LED flashing?	This will flash if the printer is hot. Wait a short while and then try printing again. If the LED continues to flash even after waiting a while, contact KYOWA sales personnel or your nearest dealer.

Issue	Check	Solution
An SD card or USB memory device cannot be recognized.	Is the SD card or USB memory device inserted? Is there sufficient free space on the SD card or USB memory device?	Insert an SD card or USB memory device with sufficient free space.
	Is the SD card or USB memory device formatted in FAT32 format?	Format it prior to use.
	Is the SD card an SDHC card?	Make sure to use only SDHC cards. SDXC cards cannot be used.
An external scanner cannot be used for measurement.	Are the external scanner and connection cable connected firmly?	Try reconnecting the cable.
	Is the number of connected external scanners within the specified number? Refer to "2-5-1. Connection with USB-80/70 Series Units" for details.	If a number of units exceeding the specified number is connected, supply AC power to the external scanners.
Cannot connect to a PC over USB.	Is the USB driver installed?	Install the USB driver.
	Is the USB cable connected firmly?	Try reconnecting the USB cable.
	Is the interface type set to USB?	Set the interface type to USB.
Turning the power OFF causes the time to drift.	The built-in battery is no longer working.	Contact KYOWA sales personnel or your nearest dealer for information on replacing limited lifespan parts.

9-2. FOR UIO-80A

Issue	Check	Solution
This device does not recognize UIO-80A.	Was the screw tightened after inserting UIO-80A into this device?	Insert UIO-80A into this device, and then tighten the screw.
No signal is output. No signal is input.	Is the connector wiring and pin assignment correct?	Ensure that the connector wiring and pin assignment are correct.
The rainfall count is reset while the power supply is OFF.	The built-in battery is no longer working.	Contact KYOWA sales personnel or your nearest dealer for information on replacing limited lifespan parts.

10. PRODUCT SPECIFICATIONS

10-1. UCAM-80A PRODUCT SPECIFICATIONS

- (1) Model UCAM-80A
- (2) Type Data Logger
- (3) Measuring Targets and Connectable Scanners
 - Measuring Targets Strain gages, strain gage transducers, civil engineering transducers with a thermal sensor, DC voltage-output or DC current-output instruments, potentiometer sensors, thermal sensors(Thermocouples and platinum resistance thermometer bulbs)
 - Connectable Scanning Units(mounted on top of the UCAM-80A)
USM-81A,USM-82A,USM-83A
 - Connectable Scanners USB-80/70 series

•Measuring Targets and Connectable Scanners

Scanners			Scanning Units	External Scanners	
				General purpose	Civil engineering
Measuring Targets			USM-81A		
			USM-82A	USB-80A-10	
			USM-83A	USB-80A-20	USB-80A-30
			USS-61B(*3)	USB-70A/B-10	USB-70A/B-30
			USS-62B(*3)	USB-70A/B-20	
			USS-63B(*3)		
Strain gages and Strain-gage transducers (*1)	Quarter bridge system	120 Ω	○	○	○
		240 Ω	○	○	○
		350 Ω	○	○	○
	Quarter bridge system (true-dummy system)	120 Ω	○	○	○
		350 Ω	○	○	○
	Half bridge system 60 to 1000 Ω	Active dummy system	○	○	○
		Active Active system	○	○	○
		Common Dummy system	—	○	○
	Full bridge system 60 to 1000 Ω(*2)	Opposite-leg active system	○	○	○
		Full bridge system	○	○	○
Civil engineering transducers	Full bridge system 120 Ω	Constant-current excitation	○	—	—
	Full bridge system 350 Ω	Constant-current excitation	○	○	○
		Transducers with a thermal sensor	○	—	○

*1. Can not use remote sensing sensor directly.

*2. 120 to 1000 Ω in high-resolution mode.

*3. Accessory terminal cover not attachable.

When mounted on the UCAM-80A, calibration is required.(with charge)

Measuring Targets			Scanning Units	External Scanners	
				General	Civil
				purpose	engineering
				USB-80A-10	USB-80A-30
				USB-80A-20	
USB-70A/B-10	USB-70A/B-30				
USB-70A/B-20					
Voltage	DC voltage-output instruments		○	○	○
Current	DC current-output instruments		○	○	○
Temperature	Thermocouples	K (CA)	○	○	○
		T (CC)	○	○	○
		E (CRC)	○	○	○
		J (IC)	○	○	○
		R	○	○	○
	Platinum Resistance Thermometer bulbs	Pt100(new JIS)	○	—	○
		JPt100(old JIS)	○	—	○
Potentiometer sensors			○	○	○
Built-in lighting arresters			USM-83A USS-63B only	—	○

(4) Input Channels

Max 30 with Scanning Units

Max 1000 with External Scanners connected

Max 1000 with Scanning Units and External Scanners connected

(5) Scanning speed

Scanners \ Line Frequencies	50 Hz Zone	60 Hz Zone
Scanning Units (standard mode)	50 ms/ channel	
Scanning Units (High-resolution mode)	280 ms/ channel	
Scanning Units (High-speed mode)	20 ms/channel	16.7 ms/channel
USB-80/70 series (standard mode only)	60 ms/channel	58.4 ms/channel

Notes:

- Scanning speeds stated above are standard maximum speeds in respective modes. Besides these, the following speeds are set for each individual channel: 0.28 s, 0.5 s, 1 s, 2 s, 5 s, and 10 s.
- Repeat measurement interval time = (Number of Measuring channels * scanning speed)
+ data processing time (Less than 5 seconds)
Data processing time is indeterminate, changed by measurement setting and environment.
Data processing time is when the printer is set to not print.
- Standard mode and High-resolution mode can be set for each channel.
- High-speed mode is only collective switching for all channels of Scanning Units.

Scanning speed \ Measuring Targets	Standard Mode	High-resolution Mode	High-speed Mode
Strain(Gage & transducer)	○	○	○
Voltage/current-output sensor	○	×	○
Civil engineering transducer	○	×	×
Temperature sensor (TC, Pt)	○	×	×
Potentiometer sensor	○	×	○

Notes:

- High-resolution mode and high-speed mode can be measured only with the Scanning Units, not with the USB-80/70 series.
- In high-resolution mode and high-speed mode, strain mode is Full bridge system only.

(6) Operating Modes

Real-time, monitor, and automatic

(7) Measurement Functions

- Initial
- Original
- Measure

Initial values are measured and stored in internal memory.
Raw values are measured without subtraction of initial values.
Initial values are subtracted from original values.
Notes: The selected function is applied to all channels.

- (8) Coefficient Calculation Function Multiplication by calibration coefficient, calibration by TEDS, conversion of measured values to physical quantities, scaling and correction
59 units
- (9) Unit
- (10) Automatic Measurement Function
- Trigger Measurement
A relative value (certain changing quantity) or an absolute value triggers measurement.
 - Interval Measurement
Measurement is automatically performed at preset time intervals.
 - Trigger Interval Measurement
Combination of trigger measurement and interval measurement.
- (11) Change stroke measurement Single channel only
- (12) Storage Internal memory, approx. 1.8 GB
- (13) Strain Measurement(Standard Mode)
- Constant voltage excitation Approx. 2 or 5 VDC
 - Constant current excitation Approx. 5.7 mA(Bridge resistance 350 Ω)
- Approx. 16.7 mA(Bridge resistance 120 Ω)
- Scanning speed 50 ms/channel
 - Gage factor 2.00 fixed (Coefficient calculation function enables correction with 2.00/Ks)
 - Initial value memory range Same as measuring range
 - Measuring range, Resolution and Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 50k \times 10^{-6}$ strain	1×10^{-6} strain	In case of Scanning Units $\pm (0.05 \% \text{ of reading} + 1) \times 10^{-6}$ strain In case of USB-80/70 $\pm (0.07 \% \text{ of reading} + 2) \times 10^{-6}$ strain
$\pm 50k$ to $\pm 500k \times 10^{-6}$ strain	10×10^{-6} strain	In case of Scanning Units $\pm (0.05 \% \text{ of reading} + 10) \times 10^{-6}$ strain In case of USB-80/70 $\pm (0.07 \% \text{ of reading} + 20) \times 10^{-6}$ strain

Notes:

1.Resolution and accuracy be automatically change by Autorange function.

2.Constant voltage bridge excitation approx. 5 VDC can only be Available with Scanning Units.

(14) Strain Measurement(High-Resolution Mode)

- Constant voltage excitation Approx. 5 VDC
- Constant current excitation Approx. 14.3 mA(Bridge resistance 350 Ω)
- Scanning speed 0.28 s/channel
- Gage factor 2.00 fixed
(Coefficient calculation function enables correction with 2.00/Ks)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 20k \times 10^{-6}$ strain	0.1×10^{-6} strain	$\pm (0.05 \% \text{ of reading} + 0.3) \times 10^{-6}$ strain
$\pm 20k$ to $\pm 200k \times 10^{-6}$ strain	1×10^{-6} strain	$\pm (0.05 \% \text{ of reading} + 3) \times 10^{-6}$ strain

Notes:

- 1.Available only with full bridges system.
- 2.Bridge resistance should be 120 to 1000 Ω for bridge excitation with constant voltage.
- 3.For constant current excitation, bridge resistance 350 Ω only.
- 4.Available only with Scanning Units.
- 5.Resolution and accuracy be automatically change by Autorange function.

(15) Strain Measurement(High-speed Mode)

- Constant voltage excitation Approx. 2 VDC
- Constant current excitation Approx. 5.7 mA(Bridge resistance 350 Ω)
Approx. 16.7 mA(Bridge resistance 120 Ω)
- Scanning speed 20 ms/channel(50 Hz Zone), 16.7 ms/channel(60 Hz Zone)
- Gage factor 2.00 fixed
(Coefficient calculation function enables correction with 2.00/Ks)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 50k \times 10^{-6}$ strain	1×10^{-6} strain	$\pm (0.08 \% \text{ of reading} + 3) \times 10^{-6}$ strain
$\pm 50k$ to $\pm 500k \times 10^{-6}$ strain	10×10^{-6} strain	$\pm (0.08 \% \text{ of reading} + 30) \times 10^{-6}$ strain

Notes:

- 1.Available only with full bridges system(120 to 1000 Ω)
- 2.Available only with Scanning Units.
- 3.Resolution and accuracy be automatically change by Autorange function.

(16) Voltage Measurement(Standard Mode)

- Scanning speed 50 ms/channel
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Range Mode	Measuring Range	Resolution	Accuracy	Input Resistance
V/500 mV	0 to ± 50.000 mV	1 μ V	In case of Scanning Units $\pm(0.05 \% \text{ of reading} + 0.003)\text{mV}$ In case of USB-80/70 $\pm(0.07 \% \text{ of reading} + 0.004)\text{mV}$	10 M Ω or more
	± 50.00 to ± 500.00 mV	10 μ V	In case of Scanning Units $\pm(0.05 \% \text{ of reading} + 0.03)\text{mV}$ In case of USB-80/70 $\pm(0.07 \% \text{ of reading} + 0.04)\text{mV}$	
V/50 V	0 to ± 5.0000 V	100 μ V	In case of Scanning Units $\pm(0.05 \% \text{ of reading} + 0.0002)\text{V}$ In case of USB-80/70 $\pm(0.07 \% \text{ of reading} + 0.0003)\text{V}$	1 M Ω or more
	± 5.000 to ± 50.000 V	1 mV	In case of Scanning Units $\pm(0.05 \% \text{ of reading} + 0.002)\text{V}$ In case of USB-80/70 $\pm(0.07 \% \text{ of reading} + 0.003)\text{V}$	

Notes: Resolution and accuracy be automatically change by Autorange function.

(17) Voltage Measurement(High-speed Mode)

- Scanning speed 20 ms/channel(50 Hz Zone), 16.7 ms/channel(60 Hz one)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Range Mode	Measuring Range	Resolution	Accuracy	Input Resistance
V/500 mV	0 to ± 50.000 mV	1 μ V	$\pm(0.08 \% \text{ of reading} + 0.006)\text{mV}$	10 M Ω or more
	± 50.00 to ± 500.00 mV	10 μ V	$\pm(0.08 \% \text{ of reading} + 0.06)\text{mV}$	
V/50 V	0 to ± 5.0000 V	100 μ V	$\pm(0.08 \% \text{ of reading} + 0.0006)\text{V}$	1 M Ω or more
	± 5.000 to ± 50.000 V	1 mV	$\pm(0.08 \% \text{ of reading} + 0.006)\text{V}$	

Notes:

- 1.Available only with Scanning Units.
2. Resolution and accuracy be automatically change by Autorange function.

(18) Current Measurement(Standard Mode)

- Scanning speed 50 ms/channel
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring Range	Resolution	Accuracy
I/50 mA	0 to ± 50.00 mA	10 μ A	In case of Scanning Units $\pm(0.05 \% \text{ of reading} + 0.01) \text{ mA}$ In case of USB-80/70 $\pm(0.07 \% \text{ of reading} + 0.02) \text{ mA}$

Notes:

1. External shunt resistor (High-accuracy 250 Ω) is required.
2. Accuracy does not include resistance error of external shunt resistor.

(19) Current Measurement (High-speed Mode)

- Scanning speed 20 ms/channel(50 Hz Zone), 16.7 ms/channel(60 Hz one)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring Range	Resolution	Accuracy
I/50 mA	0 to ± 50.00 mA	10 μ A	$\pm(0.08 \% \text{ of reading} + 0.01) \text{ mA}$

Notes:

1. Available only with Scanning Units.
2. External shunt resistor (High-accuracy 250 Ω) is required.
3. Accuracy does not include resistance error of external shunt resistor.

(20) Temperature Measurement with Thermocouple (Standard Mode)

- Scanning speed 50 ms/channel
- Measuring range, Resolution and Accuracy

Type	Measuring range	Resolution	Accuracy External reference junction compensator *1	Accuracy Internal reference junction compensator *2
K	-200.0 to 1230.0 °C	0.1 °C	In case of Scanning Units • Above -50°C $\pm(0.05\% \text{ of reading} + 0.4\text{ °C})$ • Below -50°C $\pm(0.1\% \text{ of reading} + 0.5\text{ °C})$ In case of USB-80/70 • Above -50°C $\pm(0.07\% \text{ of reading} + 0.6\text{ °C})$ • Below -50°C $\pm(0.14\% \text{ of reading} + 0.7\text{ °C})$	● Ambient temperature 15 to 35 °C In case of Scanning Units • Above -50 °C $\pm(0.05\% \text{ of reading} + 0.9\text{ °C})$ • Below -50 °C $\pm(0.1\% \text{ of reading} + 1.0\text{ °C})$ In case of USB-80/70 • Above -50 °C $\pm(0.07\% \text{ of reading} + 1.1\text{ °C})$ • Below -50 °C $\pm(0.14\% \text{ of reading} + 1.2\text{ °C})$
T	-200.0 to 400.0 °C			● Ambient temperature 0 to 50°C In case of Scanning Units • Above -50 °C $\pm(0.05\% \text{ of reading} + 1.9\text{ °C})$ • Below -50 °C $\pm(0.1\% \text{ of reading} + 2.0\text{ °C})$ In case of USB-80/70 • Above -50 °C $\pm(0.07\% \text{ of reading} + 2.1\text{ °C})$ • Below -50 °C $\pm(0.14\% \text{ of reading} + 2.2\text{ °C})$
E	-200.0 to 660.0 °C			
J	-200.0 to 870.0 °C			
R	0 to 1760.0 °C		In case of Scanning Units • Above+150 °C $\pm(0.05\% \text{ of reading} + 1.4\text{ °C})$ • Below+150 °C $\pm(0.1\% \text{ of reading} + 2.0\text{ °C})$ In case of USB-80/70 • Above+150 °C $\pm(0.07\% \text{ of reading} + 2.0\text{ °C})$ • Below+150 °C $\pm(0.14\% \text{ of reading} + 2.8\text{ °C})$	● Ambient temperature 15 to 35 °C In case of Scanning Units • Above+150 °C $\pm(0.05\% \text{ of reading} + 1.9\text{ °C})$ • Below+150°C $\pm(0.1\% \text{ of reading} + 2.5\text{ °C})$ In case of USB-80/70 • Above+150 °C $\pm(0.07\% \text{ of reading} + 2.5\text{ °C})$ • Below+150 °C $\pm(0.14\% \text{ of reading} + 3.3\text{ °C})$ ● Ambient temperature 0 to 50 °C In case of Scanning Units • Above +150 °C $\pm(0.05\% \text{ of reading} + 2.9\text{ °C})$ • Below+150 °C $\pm(0.1\% \text{ of reading} + 3.5\text{ °C})$ In case of USB-80/70 • Above+150 °C $\pm(0.07\% \text{ of reading} + 3.5\text{ °C})$ • Below+150°C $\pm(0.14\% \text{ of reading} + 4.3\text{ °C})$

*1 Accuracies do not include the internal reference junction compensator accuracy.

*2 With input terminal temperature balanced in an ambient.

Notes:

1 The reference junction compensator is switchable between internal and external.

2 Thermocouple resistance should be 1 kΩ or less.

3 JIS C1602:2015, IEC 60584-1 : 2013

(21) Temperature Measurement with Civil Engineering Transducers with a thermal sensor (Standard Mode)

- Scanning speed 50 ms/channel
- Measuring range, Resolution and Accuracy

Measuring range	Resolution	Accuracy
-50.0 to 200.0 °C	0.1 °C	In case of Scanning Units Within ± 0.5 °C
		In case of USB-80/70 Within ± 0.7 °C

- Notes: 1. Target physical quantity and temperature are measured in a single channel.
2. Strain measuring range are the same as in strain measurement in standard mode.

(22) Temperature Measurement with Platinum Resistance Thermometer Bulb (Standard Mode)

- Scanning speed 50 ms/channel
- Measuring range, Resolution and Accuracy

Type	Measuring range	Resolution	Accuracy
Pt100	- 200.0 to 850.0 °C	0.1 °C	In case of Scanning Units Within ± 0.3 °C
JPt100	- 200.0 to 510.0 °C		In case of USB-80/70 Within ± 0.4 °C

- Notes: Connection is 3-wire system
JIS C1604:2013、IEC60751 : 2008
JIS C1604:1989 (JPt100)

(23) Measurement with Potentiometer sensor (Standard Mode)

- Scanning speed 50 ms/channel
- Initial value memory range Same as measuring range
- Sensor power supply Approx. 2VDC
- Potentiometer resistance 1 k Ω to 10 k Ω
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring range	Resolution	Accuracy
POT.	0 to ± 50.00 %	0.01 %	In case of Scanning Units Within ± 0.1 %FS
			In case of USB-80/70 Within ± 0.14 %FS

(24) Measurement with Potentiometer sensor(High-speed Mode)

- Scanning speed 20 ms/channel(50 Hz Zone), 16.7 ms/channel(60 Hz one)
- Initial value memory range Same as measuring range
- Sensor power supply Approx. 2 VDC
- Potentiometer resistance 1 k Ω to 10 k Ω
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring range	Resolution	Accuracy
POT.	0 to ± 50.00 %	0.01 %	Within ± 0.1 %FS

Notes: Available only with Scanning Units.

(25) Temperature Stability

Zero point :

Strain Measurement (Full bridge system)	Within $\pm 0.1 \times 10^{-6}$ strain/ $^{\circ}\text{C}$
Voltage Measurement(V/500mV)	Within $\pm 0.1 \mu\text{V}/^{\circ}\text{C}$
Voltage Measurement(V/50 V)	Within $\pm 10 \mu\text{V}/^{\circ}\text{C}$
Temperature Measuremnt with Thermocouple(K,T,E,J)	Within $\pm 0.02^{\circ}\text{C}/^{\circ}\text{C}$
Temperature Measuremnt with Thermocouple(R)	Within $\pm 0.14^{\circ}\text{C}/^{\circ}\text{C}$
Temperature Measurement with Platinum Resistance Thermometer Bulb	Within $\pm 0.01^{\circ}\text{C}/^{\circ}\text{C}$
Measurement with Potentiometer sensor	Within $\pm 0.001\%/^{\circ}\text{C}$
Sensitivity	Within $\pm 0.01\%/^{\circ}\text{C}$

- (26) Internal Timer Real time clock is Built-in (Battery backup)
Accuracy:20 s /month(Ambient temperature 25 $^{\circ}\text{C}$)
- (27) Display 5-inch color display (TFT)
Capactive touch panel
Status LED
- (28) Speaker Sounds when operated or when an error occurs
- (29) Printer Printing Thermal
Paper width 58 mm (32characters/line)

(30) Interface

- To PC interface :

RS-232C

LAN (10BASE-T/100BASE-TX)

USB2.0

- Other Interfaces :

NDIS4102(7pin)(To USB-80/70 series interface)

SD card slot(SD card can be used to store data from the internal memory.or back up the recorded data to SD card. Compatible SDHC card)

Notes: 1 SD Card Capacity:32GB or less FileFormat:FAT32

Notes: 2 The following SD card has been tested by KYOWA.

Manufacturer	: HAGIWARA Solutions
Model	: NSDB-004GS(N24SEI
Capacity	: 4 GB

USB2.0 (collect measurement data by USB Flash Drive)

Notes: 1 Measurement data cannot be saved directly to USB memory.

Notes: 2 USB Flash Drives Capacity:32GB or less FileFormat:FAT32

Notes: 3 The following USB memory device has been tested by KYOWA.

Manufacturer	: Green house
Model	: GH-UFI-XSD2G
Capacity:	2 GB

(31) File Conversion Measurement data can be converted to CSV.

(32) Self –diagnosis Function Checks display, printer, bridge excitation, lead-wire-off, input/output resistance, insulation resistance, mode, terminal temperature

(33) TEDS

- Interface

IEEE1451.4 Mixed mode Transducer Interface Class2

- Applicable sensor

Should have information written in accordance with IEEE template No.33

Cable length should be 30 m or less

(With Scanning Units USM-81A, USM-82A, USM-83A, USS-61B, USS-62B, USS-63B)

(34) Operating Temperature 0 to 50 °C

Operating Humidity 20 to 85 % (Non-condensing)

(35) Storage Temperature -20 to 60 °C

(36) Setting Maintenance Function

ACOM at measurement circuit is switchable between floating and GND connect.

(37) Power Supply	AC 100 to 240 V 50/60 Hz
(38) Current Consumption	0.5 A or less: 100 VAC (With 3 Scanning Units mounted)
(39) Degrees of Protection	IP20 (JIS C 0920/IEC 60529)
(40) Dimensions	290(W)× 115(H)× 430(D) mm (Excluding protrusions)
(41) Weight	Approx. 6.2 kg (Excluding Scanning Units) Approx. 8.7 kg (With 3 Scanning Units USM-82A mounted, Excluding terminal cover)
(42) Compliance	Directive 2014/30/EU (EMC) Directive 2014/35/EU (LVD) Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS)

Standard Accessories

“READ BEFORE USING THE PRODUCT”	1
“Terms and Conditions of Product Warranty”	1
AC power cable P-18(With 2-pin conversion plug CM-52)	1
Recording paper TP-S245L-1	1
Screwdriver	1
Spare fuse	1
CD-R (Instruction Manual)	1
Ground wire P-72	1
LAN connector caps	1
D-sub connector caps	1

Optional Accessories

Dummy Panel	UD-80A
Recording paper	TP-S245L-1
Control Software	UCS-80A

10-2. USM-81A/82A/83A PRODUCT SPECIFICATIONS

(1) Models	USM-81A(For general measurement, TEDS compatible) USM-82A(For general measurement, With NDIS4102(7 pins) connectors, TEDS compatible) USM-83A(For civil engineering measurement, TEDS compatible, with lightning arresters)
(2) Type	Scanning Unit
(3) Number of Mountable Units	3 units can be mounted on UCAM-80A
(4) Switching Terminal	Semiconductor Relays
(5) Channels	10 / Unit
(6) Input Terminals	Connect to lead wire by either soldering of screwing NDIS4102(7 pins) connectors (USM-82A)
(7) Operating Temperature range	0 to 50 °C
Operating Humidity range	20 to 85% (Non-condensing)
(8) Dimensions	320 (W) × 28 (H) × 80 (D) mm (Excluding protrusions)
(9) Weight	USM-81A Approx. 0.8 kg USM-82A Approx. 0.9 kg USM-83A Approx. 0.9 kg (Including terminal cover)
(10) Compliance	Directive 2014/30/EU (EMC) Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS)

Standard Accessory

“READ BEFORE USING THE PRODUCT”	1
“Terms and Conditions of Product Warranty”	1
NDIS4102(7 pins) connectors caps(USM-82A only)	10
Terminal cover	1
Channel label	1
Short bar ML-1000-3H1	10

Optional Accessories

One-touch terminal block (JT-1A)

10-3. UIO-80A PRODUCT SPECIFICATIONS

(1) Model	UIO-80A								
(2) Type	External I/O Unit								
(3) Contact Output	<table> <tr> <td>Alarm signal</td><td>4 channels</td></tr> <tr> <td>Busy signal</td><td>1 channel</td></tr> <tr> <td>Output mode</td><td>Photocoupler-isolated open collector output</td></tr> <tr> <td>Rated output</td><td>30 V_{DC} max., 10 mA max. (resistance load)</td></tr> </table>	Alarm signal	4 channels	Busy signal	1 channel	Output mode	Photocoupler-isolated open collector output	Rated output	30 V _{DC} max., 10 mA max. (resistance load)
Alarm signal	4 channels								
Busy signal	1 channel								
Output mode	Photocoupler-isolated open collector output								
Rated output	30 V _{DC} max., 10 mA max. (resistance load)								
(4) Contact Input	<table> <tr> <td>Start signal</td><td>1 channel</td></tr> <tr> <td>Stop signal</td><td>1 channel</td></tr> <tr> <td>Reset signal</td><td>1 channel</td></tr> <tr> <td>Input mode</td><td>No-voltage contact input</td></tr> </table>	Start signal	1 channel	Stop signal	1 channel	Reset signal	1 channel	Input mode	No-voltage contact input
Start signal	1 channel								
Stop signal	1 channel								
Reset signal	1 channel								
Input mode	No-voltage contact input								
(5) Pulse Input	<table> <tr> <td>Rainfall signal</td><td>1 channel</td></tr> </table> (Contact Input, Pulse width: 0.1 s or more, Pulse interval: 1 s or more)	Rainfall signal	1 channel						
Rainfall signal	1 channel								
(6) Signal Connection	D-sub 25-pin connector								
(7) Operating Temperature range	0 to 50 °C								
Operating Humidity range	20 to 85 % (Non-condensing)								
(8) Dimensions	85 (W) × 23 (H) × 114.1 (D) mm (Excluding protrusions)								
(9) Weight	Approx. 64 g								
(10) Compliance	Directive 2014/30/EU (EMC) Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS)								

Standard Accessory

“READ BEFORE USING THE PRODUCT”	1
“Terms and Conditions of Product Warranty”	1
D-sub 25-pin connector XM3A-2521	1

10-4. USB-80A PRODUCT SPECIFICATIONS

(1) Model	USB-80A-10 (For general measurement)
	USB-80A-20 (For general measurement, with NDIS4102(7 pins) connectors)
	USB-80A-30 (For civil engineering measurement, with lightning arresters)
(2) Type	External Scanner
(3) Measuring Targets	Strain gages
	Strain-gage transducers
	DC voltage
	DC current
	Thermocouples
	Civil engineering transducers with a thermal sensor (USB-80A-30)
	Platinum resistance thermometer bulbs Pt100, JPt100 (USB-80A-30)
(4) Input Channels	Potentiometer sensors
	50/unit
(5) Connection data loggers	UCAM-80A, UCAM-60C M14, UCAM-65C M14
	When connecting UCAM-60C or UCAM-65C, an optional scanner interface (USI-67A) is required.
(6) Number of Connection	Up to 20
	19 if there are 30 channels in the data logger
(7) Input Terminals	Screw-soldering terminal blocks (M3 screw with washer)
	NDIS4102 (7 pins) connectors (USB-80A-20)
	Receptacle PRC90-231BR10-7F
	Applicable plug ex. PRC03-12A10-7M10.5
	Built-in lightning arresters (USB-80A-30)
(8) Channel Mode	Every channels set by the data logger
(9) Measuring Channel Number	The upper 2-digit from every 10 channels are set with digital switches
(10) Power Supply	Supplied from data logger.
	if the cable is extended or if 4 or more scanners are connected, an optional UPS-80A should be mounted into the scanners.

(11) Degrees of Protection	IP30 (JIS C 0920/IEC 60529)
(12) Dimensions	302(W) × 107(H) × 500(D) mm (Excluding protrusions)
(13) Weight	USB-80A-10: Approx. 7.0 kg (Excluding UPS-80A) USB-80A-20: Approx. 8.0 kg (Excluding UPS-80A) USB-80A-30: Approx. 7.3 kg (Excluding UPS-80A)
(14) Compliance	Directive 2014/30/EU (EMC) Directive 2014/35/EU (LVD) Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS)

Standard Accessory

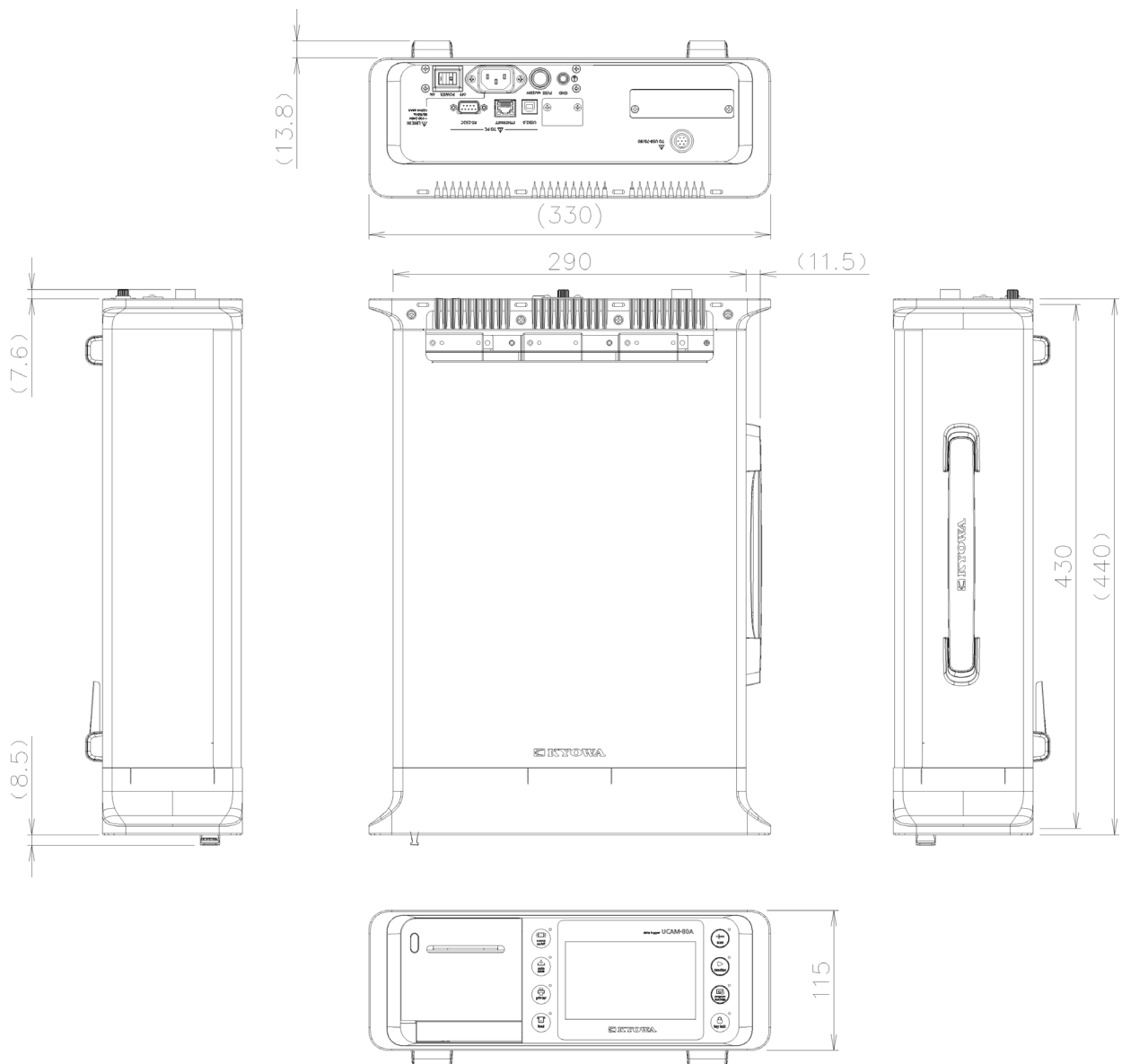
“READ BEFORE USING THE PRODUCT”	1
“Terms and Conditions of Product Warranty”	1
Screwdriver	1
Connection cable N-24(Approx. 1.0 m)	1
NDIS4102(7 pins) connectors caps(USB-80A-20 only)	50

Option

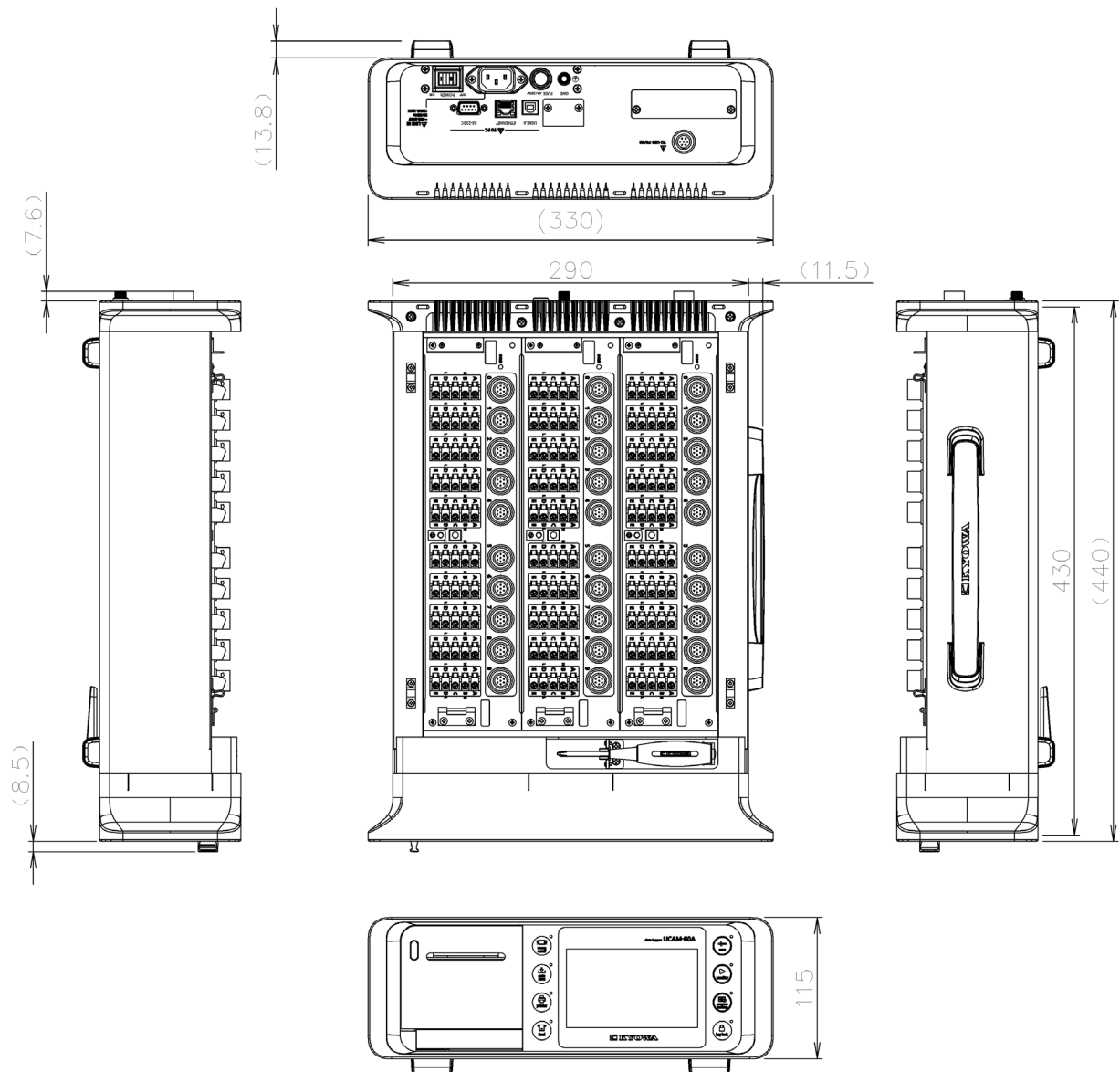
Built-in AC Power Unit	UPS-80A (100 to 240 VAC 50/60Hz, Approx. 30VA) • UPS-80A is used built into USB-80A. • If incorporating UPS-80A, specify when ordering USB-80A. • If incorporating UPS-80A later, USB-80A must be taken back.
Connection cables	N-25 to 35 (Approx. 2.0 to 1000 m)

11. APPEARANCE

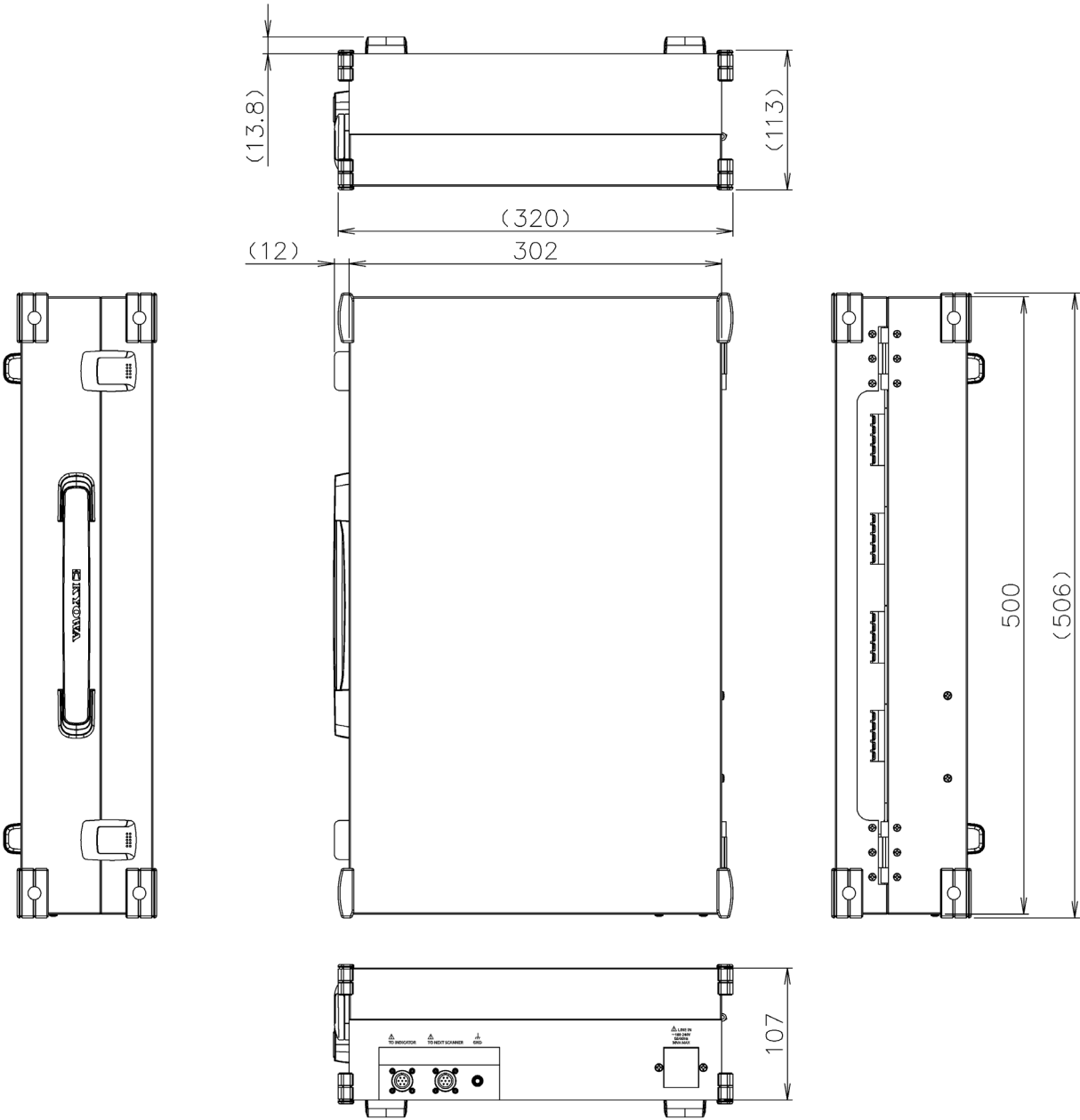
11-1. UCAM-80A OUTLINE DRAWINGS



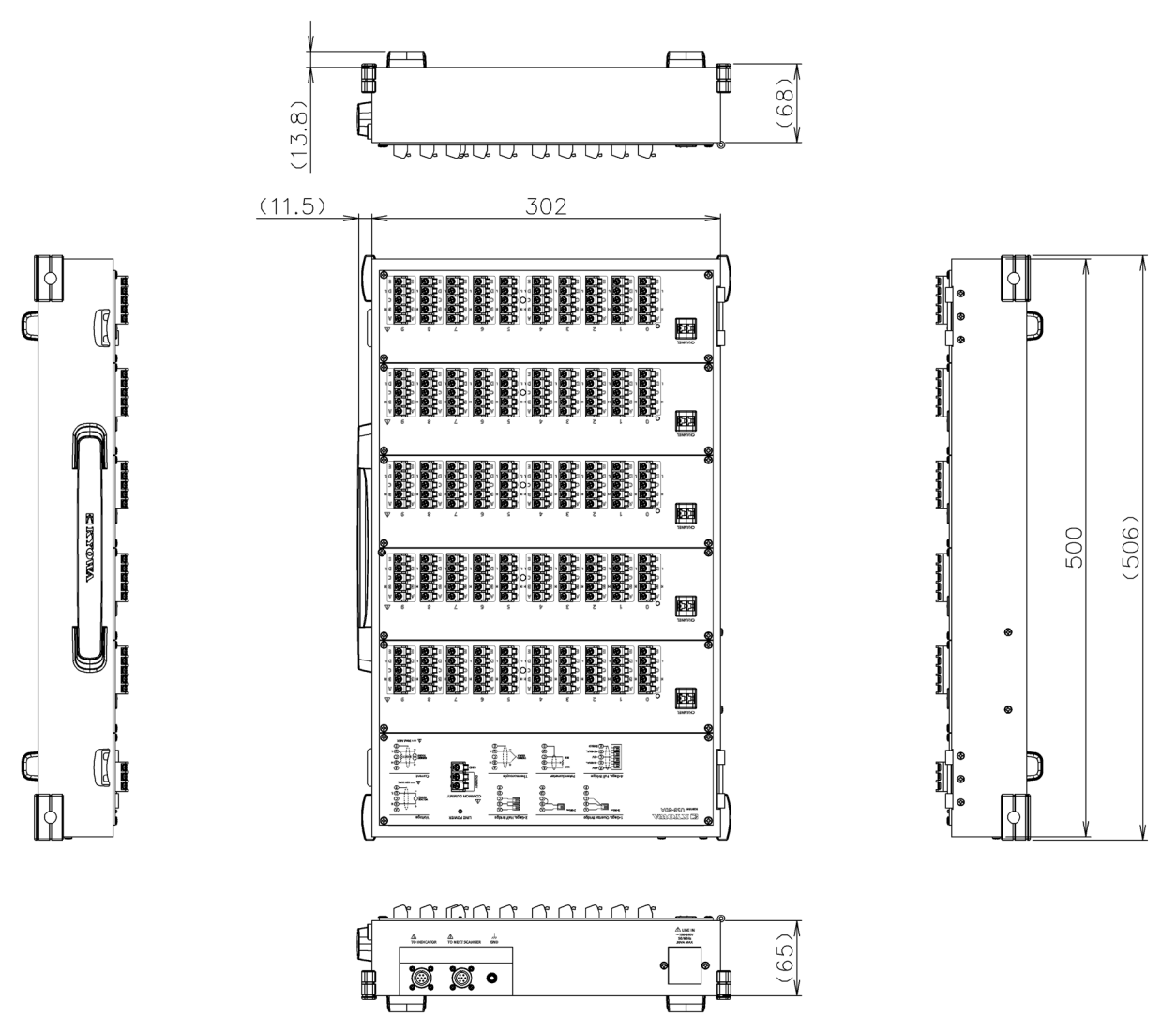
11-2. UCAM-80A OUTLINE DRAWINGS (3 USM-82A UNITS INSTALLED)



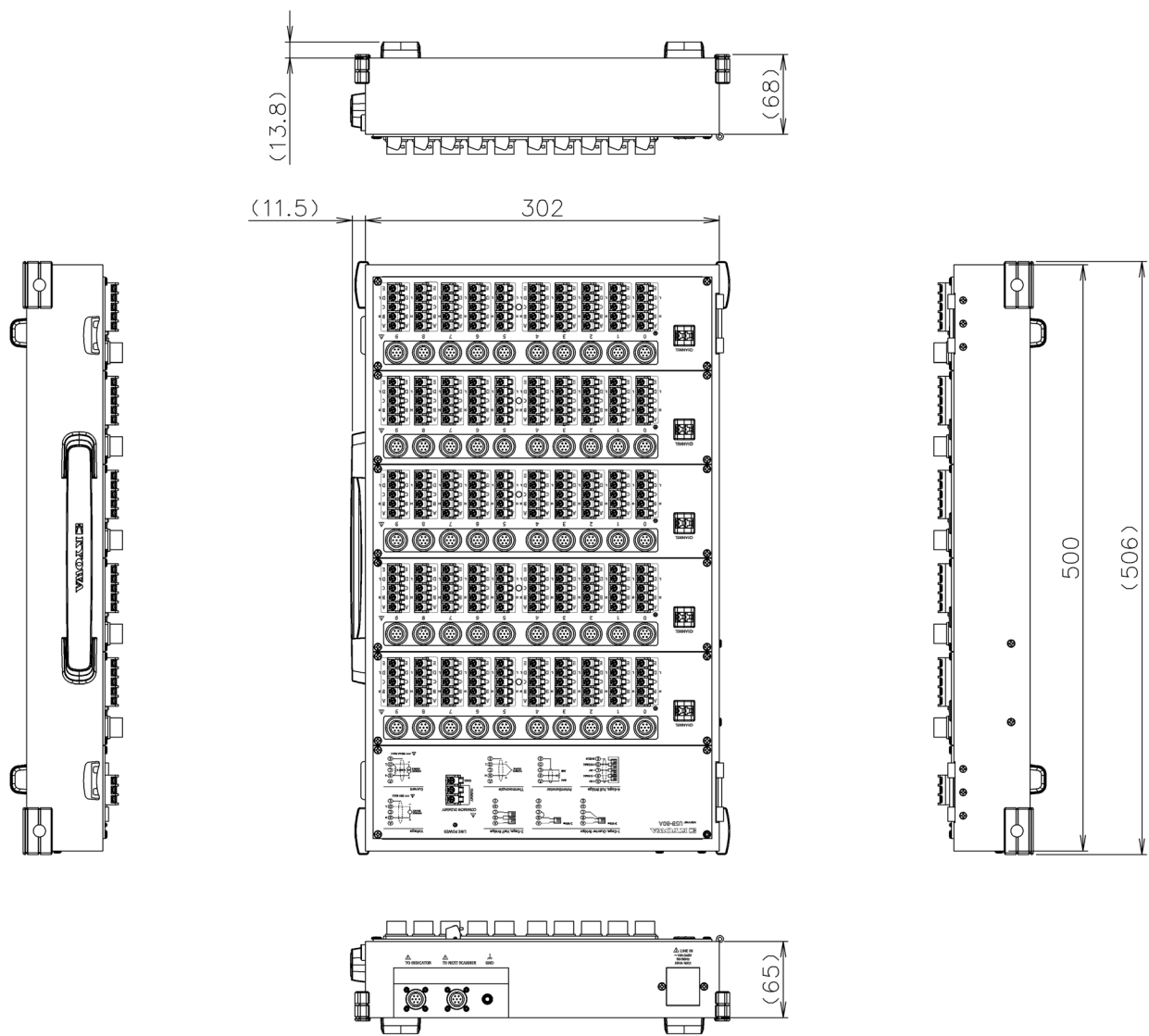
11-3. USB-80A-10/20/30 OUTLINE DRAWINGS



11-4. USB-80A-10/30 OUTLINE DRAWINGS (No cover)



11-5. USB-80A-20 OUTLINE DRAWINGS (No cover)



12. TECHNICAL INFORMATION NECESSARY FOR MEASUREMENT

12-1. STRAIN GAGE NONLINEARITY

The ideal bridge output for strain measurement is:

Output voltage $e = \frac{1}{4} K_s \cdot \varepsilon \cdot E$.

Ks: Gage factor

ε : Strain value

E: Voltage applied to bridge

If one side of a wheatstone bridge is used as the strain gage and only that side changes, there will be nonlinearity generated in the relationship between the strain value and output voltage.

The output voltage will then be $e = \frac{\varepsilon}{1 + \varepsilon}$, and the following error will be introduced.

True Strain Value	Error
1000×10^{-6}	-0.1 %
10000×10^{-6}	-1.0 %
100000×10^{-6}	-9.1 %

This device calculates compensation for the output voltage ($\varepsilon = \frac{e}{1 - e}$), in order to calculate the true strain value. This nonlinearity also occurs when using the active-dummy method / the opposite side active method.



Indicates something that could be of reference during use.

1. When performing scanning unit measurement on this device, nonlinearity compensation is not required for the 1-gage method.
2. When performing scanning unit measurement, 2-gage method (active-dummy method) and 4-gage method (opposite side active method) require nonlinearity compensation, so compensation processing is performed internally.
3. When performing external scanner measurement, 1-gage method, 2-gage method (active-dummy method), and 4-gage method (opposite side active method) require nonlinearity compensation, so compensation processing is processed internally.

A table listing compensation equations is included on the following page.

The following table lists compensation equations for each channel mode during strain measurement

Measurement Method	Channel Mode	Compensation Equation	Scanning Unit	External Scanner
1-gage method (3-wire system) (2-wire system)	1-gage 120 1-gage 240 1-gage 350	$\varepsilon = \frac{e}{1-e}$	Without compensation (*1)	With compensation
1-gage method (True dummy method)	1-gage 120D 1-gage 120A 1-gage 350D 1-gage 350A	$\varepsilon = \frac{e}{1-e}$	Without compensation (*1)	With compensation
2-gage method (Active-dummy method)	2-gage A-D 2-gage COM-D	$\varepsilon = \frac{e}{1-e}$	With compensation	With compensation
2-gage method (Active-active method)	2-gage A-A	$\varepsilon = e$	Without compensation	Without compensation
4-gage method (Opposite side active method)	4-gage A-A	$\varepsilon = \frac{2e}{2-e}$	With compensation	With compensation
4-gage method (Full bridge method)	4-gage 4-gage HR 4-gage I (120 Ω) 4-gage I (350 Ω) 4-gage I (350 Ω)_HR 4-gage T	$\varepsilon = e$	Without compensation	Without compensation

(*1) When using a scanning unit to perform the 1-gauge method, the bridge power supply is constant current, so no compensation is required.

12-2. DUMMY GAGE USAGE

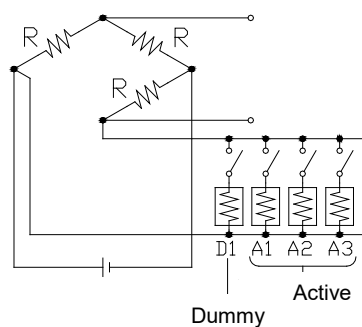
The true dummy method is used by KYOWA UCAM Series Data Loggers. This method uses software to effectively eliminate apparent strain caused by the linear expansion coefficient of the measured object (object being tested) when the ambient temperature changes.

This method allows for accurate compensation if the temperature between both gages is the same, even if a single dummy gage is used to perform temperature compensation for multiple active gages. This can result in a true dummy gage even when using a material with poor thermal conductivity (such as plastic, composite material, or concrete) for strain measurement, and can greatly improve measurement accuracy.

There is normally no need for the true dummy method when using a SELCOM gage. However, this method is very effective if a SELCOM gage suitable for the linear expansion coefficient of the measured object (object being tested) cannot be obtained.

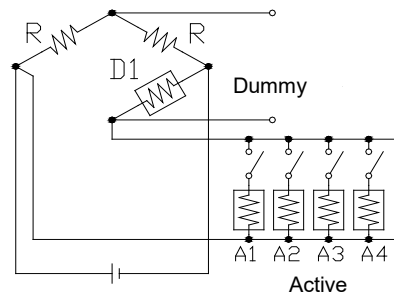
(1) True dummy method

Attach a single dummy gage within a group with the same temperature conditions, measure under the same conditions as the active gage, and record each set of data to memory. The software will perform subtraction processing and temperature compensation. This allows for temperature compensation to be performed without any impact from self-generated heat, even when there is only a single dummy gage and multiple active gages, making even more accurate strain measurement possible.



(2) Common dummy method

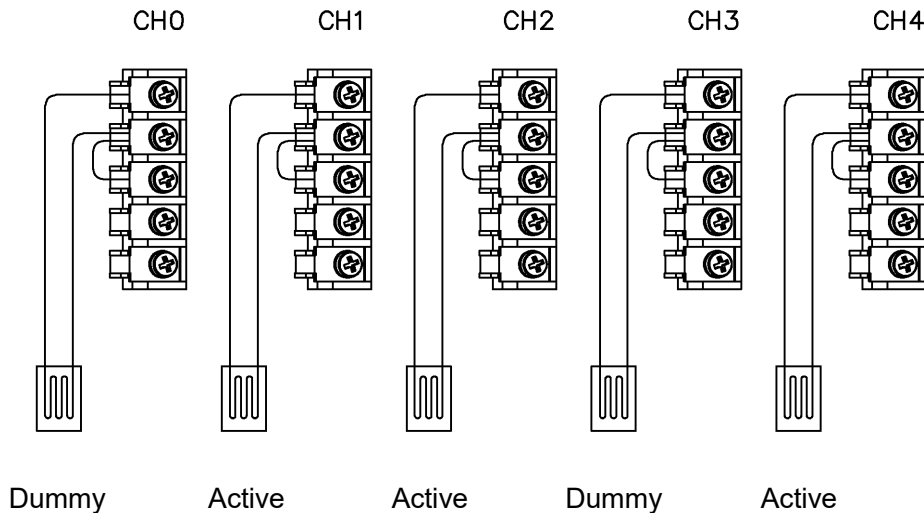
In this method, the active gages are switched in sequence and bridge excitation voltage is applied only when measurement is performed. On the other hand, bridge excitation voltage is applied to the dummy gage every time an active gage is measured. The impact of self-generated heat therefore will be different between the active and dummy gages, making it difficult to provide complete temperature compensation.



*** Calculations when setting true dummy**

For the active gage, compensation is performed using the dummy gage nearest that active gage (that is, with the smaller measurement channel number).

Example: 1-gage 120 Ω _D set to CH0 and CH3, 1-gage 120 Ω _A set to CH1/CH2/CH4, and then measurement performed



The measurement values of CH1 and CH2 (active gage) will be compensated using the measurement value of CH0 (dummy gage). The measurement value of CH4 (active gage) will be compensated using the measurement value of CH3 (dummy gage). Measurement values are compensated using the following formula.

Measurement value setting is "measured value":

$$\varepsilon_M = (\varepsilon_{AM} - \varepsilon_{AI}) - (\varepsilon_{DM} - \varepsilon_{DI})$$

Measurement value setting is "original value":

$$\varepsilon_O = \varepsilon_{AO} - (\varepsilon_{DO} - \varepsilon_{DI})$$

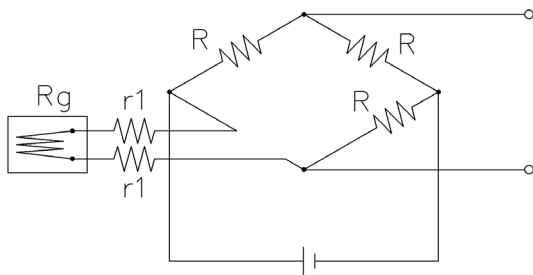
- ε_{AM} : Active gage measured value
- ε_{AI} : Active gage initial value
- ε_{DM} : Dummy gage measured value
- ε_{DI} : Dummy gage initial value
- ε_{AO} : Active gage original value
- ε_{DO} : Dummy gage original value



- In order to measure the active gage, at least one dummy gage is required.
- After setting the mode to true dummy mode, make sure to measure the initial value.

12-3. LEAD WIRE TEMPERATURE EFFECT COMPENSATION METHOD (3-WIRE SYSTEM CONNECTION METHOD)

When using a SELCOM gage, if the lead wire from the gage to the bridge circuit is long, the change in the resistance of the lead wire due to temperature will show as apparent strain. In this case, the SELCOM gage will not function as intended. Apparent strain caused by the lead wire temperature effect in the following diagram can be expressed as follows.



$$\varepsilon = \frac{\Delta R}{R} \cdot \frac{1}{K_s} = \frac{r1 \cdot 2l \cdot \alpha \cdot \Delta t}{Rg + r1 \cdot 2l} \cdot \frac{1}{K_s}$$

R_g : Gage resistance (Ω)

α : Resistance temperature coefficient of lead wire ($1/^\circ\text{C}$)

Δt : Change in temperature ($^\circ\text{C}$)

l : Lead wire length (m)

$r1$: Resistance value per 1 m of lead wire (Ω/m)

K_s : Gage factor

For example, if the one-way length of a parallel vinyl wire with cross section of 0.3 mm^2 (resistance value $0.062 \text{ } \Omega/\text{m}$, resistance temperature coefficient $3.93 \times 10^{-3}/^\circ\text{C}$) is 10 m, the apparent strain per temperature change of 1°C can be calculated as follows.

$$\varepsilon = \frac{0.062 \times 2 \times 10 \times 3.93 \times 10^{-3} \times 1}{120 + 0.062 \times 2 \times 10} \times \frac{1}{2} \div 20 \times 10^{-6} \quad \text{Strain / } ^\circ\text{C}$$

Similarly, apparent strain for 20 m or 50 m can be calculated as follows.

20 m: $40 \times 10^{-6} \text{ strain}/^\circ\text{C}$

50 m: $100 \times 10^{-6} \text{ strain}/^\circ\text{C}$

This would be an extremely large error.

If the same calculation is performed using a parallel vinyl wire with cross section of 0.08 mm² (resistance value 0.239 Ω/m, resistance temperature coefficient $3.93 \times 10^{-3}/^{\circ}\text{C}$), the results are as follows.

10 m: 145×10^{-6} strain/ $^{\circ}\text{C}$

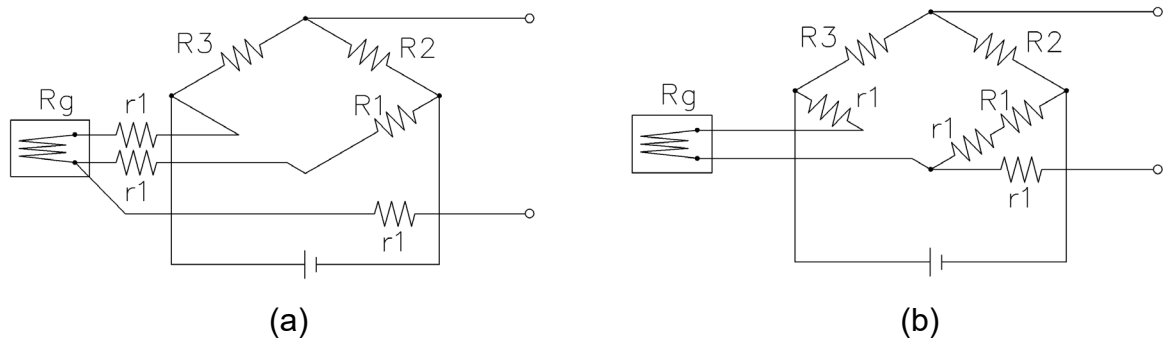
20 m: 290×10^{-6} strain/ $^{\circ}\text{C}$

50 m: 725×10^{-6} strain/ $^{\circ}\text{C}$

An even larger apparent strain is generated than with the parallel vinyl wire with cross section of 0.3 mm².

A lead wire with a smaller cross section and greater length will therefore have a larger temperature effect. The method most commonly used with static strain measuring instruments to eliminate this lead wire temperature effect is the 3-wire system connection method. The following diagrams show how this works.

R_g is the strain gage, R₁, R₂, and R₃ are the internal fixed resistance, and r₁ is the concentrated lead wire resistance. Diagram (b) is a simplified version of the basic circuit show in Diagram (a). Here, three lead wires extend from the strain gage, with the lead wire resistance of one of these entering the adjacent side. Using this 3-wire system connection method will cancel out the lead wire temperature effect so that it can be ignored. When using the 3-wire system connection method, note that the three lead wires must have the same type, length, cross section, and covering color, so that the lead wire temperature effect is the same for all. A 3-lead-wire parallel vinyl wire is suitable for this.



12-4. GAGE FACTOR COMPENSATION

This device performs measurement with a gage factor of 2.00. If the gage factor of the strain gage being used is not 2.00, compensation will need to be performed. Compensation can be performed using the following formula.

$$\text{True strain} = \text{Measured strain value} \times \frac{2.0}{\text{Gage factor of the used strain gage}}$$

12-5. COMPENSATION WHEN LEAD WIRE OR CABLE IS LONG

If a long lead wire is used for 1-gage method or 2-gage method connections, a bridge circuit will be created where the resistance of the unnecessary lead wire will be introduced in series with the strain gage, reducing the apparent gage factor.

$$\text{True strain} = \text{Measured strain value} \times \frac{\text{Gage resistance value} + \text{Lead wire resistance value}}{\text{Gage resistance value}}$$

The resistance value of the lead wire in the above formula is the resistance value (reciprocating resistance value) of the entire lead wire.

However, if using the 3-wire system connection method, substitute this with one-way resistance.

Note that compensation is not required if using 1-gage method of a scanning unit.

If a long cable is used for a 4-gage method (full bridge, transducer, bridge box) and constant voltage (4-gage A-A, 4-gage, 4-gage HR) connection, a circuit will be created where unnecessary cable resistance is introduced in series with the bridge, reducing bridge voltage and lowering sensitivity.

$$\text{True strain} = \text{Measured strain value} \times \frac{\text{Bridge resistance value} + \text{Cable resistance value}}{\text{Bridge resistance value}}$$

The resistance value of the cable in the above formula is the resistance value (reciprocating resistance value) of the entire cable.

These formulas can also be calculated using the coefficient calculation function.

The following table lists typical reciprocating resistance values per 1 m for various types of lead wires and cables.

These will vary slightly based on the electrical wire being used, so accurate values should be used if it is possible to confirm the resistance value of the electrical wire that will actually be used.

Cross Section (mm ²)	No. of Strands / Strand Diameter	Reciprocating Resistance per 10 m (Ω)	Notes
0.08	7/0.12	4.4	L-6, 17
0.11	10/0.12	3.2	L-9, 10
0.3	12/0.18	1.17	L-2
0.5	20/0.18	0.7	L-5
0.5		0.8	4-conductor shield cabtire cable

12-6. BRIDGE RESISTANCE COMPENSATION

If a long cable is used for a 4-gage method and constant current connection, lowering sensitivity due to a long cable does not occur. However, the error due to input bridge resistance will occur.

$$\text{True strain} = \text{Measured strain value} \times \frac{\text{Nominal bridge resistance value}}{\text{Input bridge resistance value}}$$

The nominal bridge resistances are as follows:

UCAM-80A :

4-gage I (120 Ω)	: 120 Ω
4-gage I (350 Ω)	: 350 Ω
4-gage I (350 Ω)_HR	: 350 Ω
4-gage T	: 350 Ω

USB-80 Series :

4-gage I (350 Ω)	: 350 Ω
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USB-70 Series :

4-gage I (350 Ω)	: 350.1 Ω
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13. APPENDIX

13-1. INTERNAL MEMORY DATA AMOUNT

The amount of data for a single scan can be calculated using the following simplified formula.

$$\text{Data amount (bytes)} = 29 \text{ (bytes)} + [\text{No. of channels}] \times 26 \text{ (bytes)}$$

Diagram illustrating the components of the formula:

- 29 (bytes) → Header information: 29 bytes used each time
- [No. of channels] → Number of channels with measurement ON
- 26 (bytes) → 26 bytes used per channel
- Overall formula → Amount of data (bytes) used for a single scan



CAUTION

- The above example is for one file in internal memory.
If multiple files are saved, excess sectors may be used in memory and the number of measurements may decrease.
- If the "4-gage T" channel mode is used, this will be two channels with "strain" + "temperature" per channel.

13-2. FIRMWARE/FPGA UPDATES

The procedure for updating the firmware and FPGA of this device is described below.



PROHIBITED

- Do not turn the power of this device OFF while updating.
- Do not remove the USB memory device while updating.
- If an External I/O Unit is connected to this device, do not input the reset signal of an External I/O Unit while updating.
- Failure to follow the above warnings may cause this device to fail.
If this device fails, repairing it will require it to be collected by KYOWA for paid service.

(1) Prepare the following.

- PC
- USB memory device (with capacity of 32 GB or less, and using a file format of FAT32)
- Update file
(Download the latest version of the file from the KYOWA website)

(2) Access the root directory (highest level directory) of the USB memory device.
Expand the downloaded folder ("ucam_update") and copy it here.

(3) Confirm that the following files are located in the "ucam_update" folder on the USB memory device.

- | | |
|-----------------------------------|---------------|
| • linux_ucam80_main_v****.bin.gz: | Firmware file |
| • romfs_ucam80_main_v****.img.gz: | Firmware file |
| • fpga_main_v****_ucam80.jam: | FPGA file |
| • fpga_scacon_v****_ucam80.jam: | FPGA file |
- (**** will be the version number)

(4) Start this device and wait for the Menu screen to be displayed. Connect the USB memory device.

(5) Tap the **Yes** button on the screen to start the update.

To cancel the update, tap the **No** button on the screen, and then remove the USB memory device. This device will restart.



It will take approximately 7 minutes to update.

(6) Once updating has completed, the following message will be displayed on the screen.

//_/ update result report _/_/_/

Update linux userland image ... OK

Update linux kernel image ... OK

Update fpga scacon image ... OK

Please restart by removing the USB memory.

(7) Remove the USB memory device. This device will restart.



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