

DATA LOGGER

UCAM-60B

INSTRUCTION MANUAL

Thank you for purchasing KYOWA's product UCAM-60B Data Logger.
Read this Instruction Manual carefully in order to make full use of the high
performance of the product.
Do not use the product in methods other than described in this Manual.

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TYPES

UCAM-60B Data Logger (hereinafter referred to as the UCAM-60B) has the following 2 types according to the power supply specifications.

UCAM-60B-AC	Dedicated for AC power supply	85 to 264 VAC, 50/60 Hz
UCAM-60B-DC	Dedicated for DC power supply	10 to 16 VDC

STANDARD ACCESSORIES

The following accessories are enclosed with the UCAM-60B. Upon unpacking, check to be sure all the items are enclosed.

• Instruction Manual (CD-R).....	1
• Simplified Instruction Manual	1
• AC Power Cable P-18	(For AC power supply dedicated unit)..... 1
• 3P-2P Conversion Adaptor CM-32	(For AC power supply dedicated unit)..... 1
• AC Power Fuse	(For AC power supply dedicated unit)..... 1
• DC Power Cable P-57	(For DC power supply dedicated unit)..... 1
• DC Power Fuse	(For DC power supply dedicated unit)..... 1
• Recording Paper UCAM-60A-RP (Thermal paper)	1 roll
• Magnet Driver.....	1
• Grounding Conductor	1
• Test Certificate	1
• Warranty.....	1

OPTIONAL GOODS

The following optional goods are prepared for the UCAM-60B. Select optional items appropriate for the measurement.

-
- USS-61B Dedicated Scanning Unit (Compatible with TEDS)
 - USS-62B Dedicated Scanning Unit (With NDIS connector, Compatible with TEDS)
 - USS-63B Dedicated Scanning Unit (With Lightning surge protector, Compatible with TEDS)
 - UCS-60A Control Software
 - USI-65A Scanner Interface for USB-50/51 Series Scanners
 - USI-67A Scanner Interface for USB-70 Series Scanners
 - UIO-60A External Input/Output Unit
 - SA-130A AC adaptor (AC power cable and DC power cable attached)
-

The following scanners are applicable for other UCAM series data loggers

Read the scanner attached instruction manual and use them according to this Instruction Manual.

- USB-70 series Scanners
- USB-50A, USB-50D, USB-51A, USB-51AT Scanners
- USB-65A Scanner (Dedicated scanner for LVDT Linear Variable Differential Transformer transducer and Sliding Resistance Transducer: Custom made)

SAFETY PRECAUTIONS

PRIOR TO USE

For safe use of the UCAM-60B, be sure to read the following safety precautions.

KYOWA ELECTRONIC INSTRUMENTS CO., LTD. assumes no liability for damages resulting from usage made against the safety precautions and voids warranty of products handled improperly.

SAFETY SYMBOLS

The following symbols are used in the UCAM-60B to call operator's attention when operating the product.

 GND	Indicates "Protective Ground Terminal." Always connect to ground before operating the product.
--	--

For safety operation of the UCAM-60B, the following "**WARNING**" and "**CAUTION**" symbols are used in "Safety Precautions" of this Instruction Manual.

 WARNING	Improper operation of the system may result in death or severe injury of the operator.
 CAUTION	Improper operation of the system may result in injury of the operator and physical damage of the system.



WARNING

Protective Ground

To prevent an electric shock hazard, be sure to connect protective ground before connecting the AC power cable.

Always connect a GND terminal to the ground.

For Electrical Operator Safety

To prevent an electric shock hazard, operators must be cautioned not to cut the protective grounding conductor or disconnect it from the GND terminal.

Confirmation of Protective Ground

To prevent an electric shock hazard, be sure to confirm safe protective ground before operating the UCAM-60B. If anything seems abnormal in the protective ground, fuse holders, etc., do not operate the UCAM-60B.

Power Supply

To prevent a fire hazard, before connecting the AC power cable, be sure to confirm the local line voltage is matched with the operating voltage specified for the UCAM-60B.

Power Cable and Power Outlet

To prevent electric shock or fire hazards, use the accessory power cable and 3P-2P conversion adaptor and use as much as possible a power wall outlet with ground terminal.

If a 3-prong power cable is used, always use a 3-prong wall outlet with ground terminal.

If a power extension cable with no grounding conductor is used, protective operation shall be disabled.

Connect the power cable after connecting the ground terminal.

Disconnect the power cable before disconnecting the ground terminal.

Operators must be cautioned that grounding should be made during the measurement.

Fuse

To prevent a fire hazard, be sure to use a fuse providing the rating (current, voltage, type) as specified for the UCAM-60B.

Do not use any fuse other than specified. Also do not short-circuit the fuse holder.

When replacing the fuse, disconnect the AC power cable from the wall outlet in advance.

External Connection

To prevent an electric shock hazard, ensure the safe protective ground of all concerned instruments and then, connect the UCAM-60B to the measuring objects and external devices, PC, etc.

Inflammable Gaseous Environment

To prevent fire and explosion hazards, do not operate the UCAM-60B where it is exposed to inflammable gases, vapors or dust.

To prevent troubles and accidents due to erroneous handling and installation and to let the UCAM-60B safely perform to the specifications, be sure to read the following instructions.



CAUTION

- 1) **Do not turn OFF the power or extract the card while reading/writing the data file.**
 - Or, the data file may be damaged or erased.
- 2) **After the power OFF, wait more than 5 seconds to power ON again.**
 - If the power switch is repeatedly turned ON and OFF within 5 seconds, fuse may be blown out due to rush current generated by switching the power ON and the UCAM-65B reliable function may not be guaranteed.
- 3) **Use the UCAM-60B in the specified operating temperature range of 0 to 50 °C.**
 - Use at temperatures exceeding the specified range may lower the performance and cause troubles.
 - If the UCAM-60B is unavoidably used under direct sunlight or in a cold district, prepare a sunscreen or take proper measures to keep it warm.
- 4) **Do not seal ventilator hole.**
 - If there is not enough space to radiate heat, temperature in the UCAM-60B may increase to lower the performance and cause troubles.
- 5) **Use the UCAM-60B in the specified operating humidity range or 20 to 85%RH.**
 - Use in a humid place exceeding the specified range or where it is exposed to splashing water may lower the performance and cause troubles.
- 6) **Immediately stop the UCAM-60B if the operating environment changes abruptly.**
 - Leave the UCAM-60B as it is until it is adaptable to the environment.
 - Abrupt change in ambient temperature due to transportation, etc. may cause dew condensation, which may result in lowered performance and troubles.
- 7) **Do not use the UCAM-60B under dusty environment.**
 - Use the UCAM-60B under environment where a PC may be used.
- 8) **Do not use the PREVIOUS DISPLAY where it is subjected to vibration or impact.**
 - Use the UCAM-60B where it is not affected by vibration or impact.
 - A continuous vibration or severe impact may lower the performance and cause troubles.
- 9) **Do not use the UCAM-60B in strong electromagnetic field.**
 - Use the UCAM-60B in a magnetic field environment where a PC may be used.
 - Performance may be lowered and erroneous operation and troubles may result if it is used near a telemetry system, microwave oven, electric furnace or any other equipment generating a strong magnetic field
- 10) **Do not use the UCAM-60B under poor power condition.**
 - Operate the UCAM-60B with the specified 85 to 264 VAC, 50/60 Hz, with no instantaneous power failure and noise.
- 11) **Do not pull cord and cables.**
 - Lay cords and cables with a certain allowance so that any unreasonable force may not be applied to the connections.
 - Pulling or unreasonable force may cause troubles or interrupt measurement.
- 12) **Preheat the UCAM-60B before use.**
 - Preheat the UCAM-60B for 30 to 60 minutes after the power ON.

NOTATIONS USED IN THE INSTRUCTION MANUAL

For convenience, the following notations are used in this Instruction Manual for convenience.

- **Operating panel keys, menu options and set or selected items are expressed as follows:**

Operating panel keys are enclosed with rectangle frames.

Ex.) OK, ZERO keys, etc.

Menu items are expressed in brackets [].

Ex.) [MEAS Condition], etc.

Other items are expressed in double quotation marks “.”

Ex.) “First CH,” etc.

- **Precautions**

Precautions for safe operation and reference information for correct handling are expressed as follows.

Example :

NOTE

Describes essential instructions for handling the UCAM-60B.

MEMO

Describes reference information for handling the UCAM-60B.

1. PRODUCT OUTLINE

1-1 PRODUCT OUTLINE

The UCAM-60B Data Logger is an all-in-one type measuring instrument that is designed for highly accurate measurement in high speed. Bright and easy-to-view fluorescent display tube is adopted to help you acquire the measured results in easy-to-understand English. As objects of measurement, various measuring instruments are connected to the UCAM-60B such as strain gages, strain gage transducer, civil engineering transducers with temperature measuring function, potentiometer sensors, DC voltage, thermocouples and platinum resistance thermometer sensors.

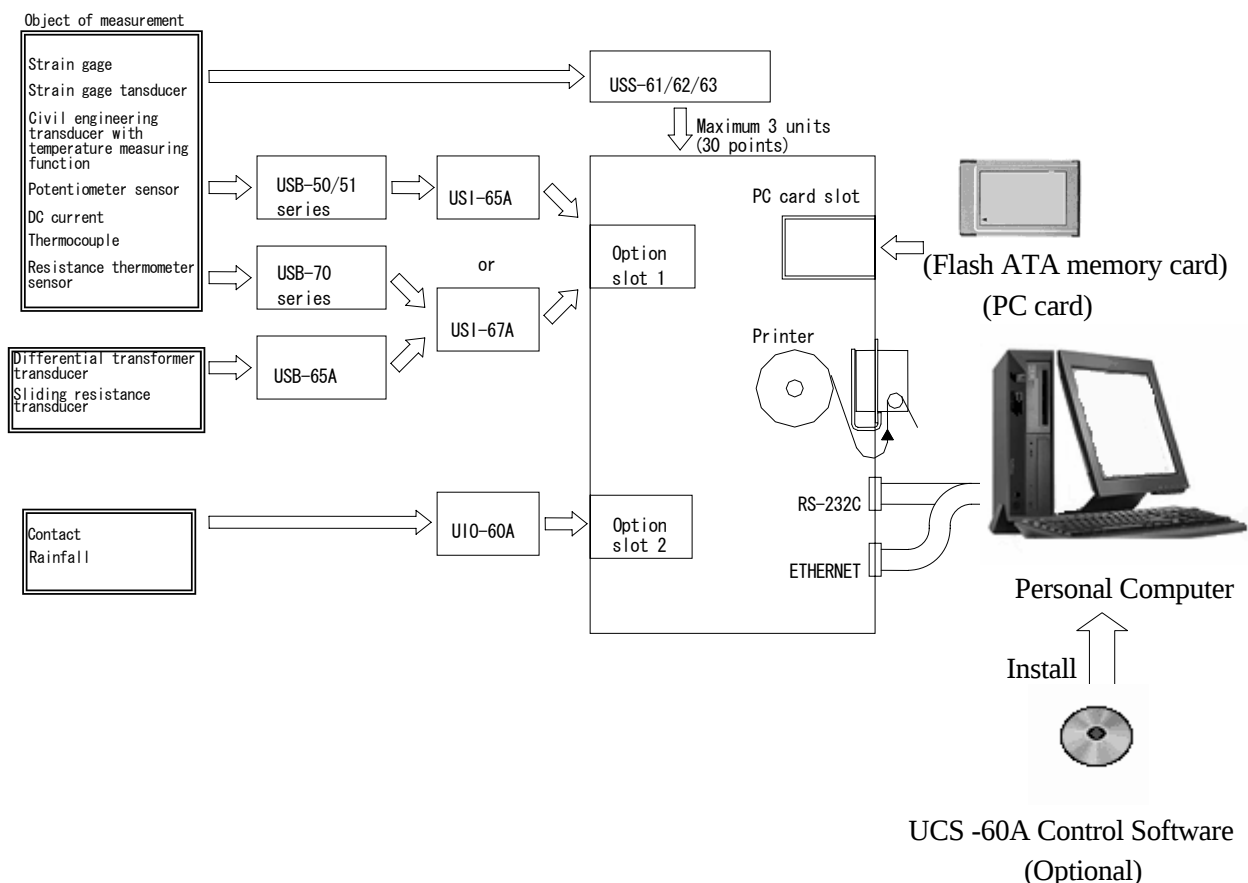
Since the UCAM-60B can be equipped with scanning units of maximum 30 CHs, for a small-scale measurement, the UCAM-60B can independently respond to the need solely by itself. For large-scale multipoint measurement, the UCAM-60B can measure up to 1000 CHs by connecting external scanners including USB-70 series scanners..

Measured data is stored into ATA flash memory card in the PC card slot.

A standard type UCAM-60B is equipped with a printer so as to record the measured results immediately after the measurement.

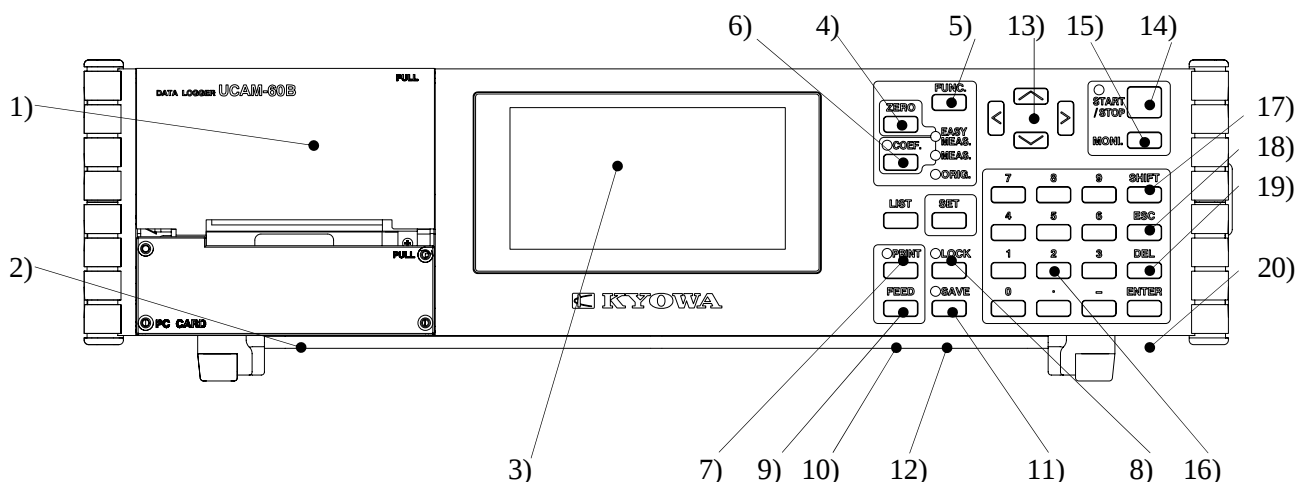
In addition, since LAN or RS-232C interface is prepared as standard equipment, the UCAM-60B can be controlled from the PC using a control software UCS-60A (Optional). Also, the measured data can be directly collected into the PC to be analyzed.

1-2 SYSTEM CONFIGURATION



2. CONTROLS AND INDICATORS

2-1 FRONT PANEL



- 1) Printer
- 2) PC card slot: Entry for inserting flash ATA memory card (PC card).
- 3) Display
- 4) **ZERO** key: When measuring function is set to “EASY MEAS,” press this **ZERO** key more than 3 seconds to measure the “ZERO” value.
- 5) **FUNC** key: Set measuring function.
- 6) **COEF** Key: Select whether or not coefficient calculation is conducted.
Press the **COEF** key more than approximately 3 seconds. LED lights up to conduct coefficient calculation.
Press the **COEF** key more than approximately 3 seconds once again in the above state. Then, the LED lights out to be in a state not conducting the coefficient calculation.
- 7) **LIST** key: Print out a list of various settings to the built-in printer.
- 8) **SET** key: Used for setting various items.
Pressing this key indicates the menus of the setting items.
- 9) **PRINT** key: Selects whether or not measured data is printed out.
Data is printed out with the **PRINT** LED lit.
- 10) **FEED** key: Press this key to feed the recording paper to the printer.
- 11) **LOCK** key: Press this key continuously for approximately 3 seconds to be in keylock state. The LED lights up during the keylock state.
Press the **LOCK** key once again. The **LOCK** LED light out and the keylock state is cancelled.
- 12) **SAVE** key: Selects whether or not measured data is saved.
Press the **SAVE** key more than approximately 3 seconds to save the measured data. The LED lights up to be in measured data saving state.
Press the **SAVE** key in the above state once again for more than approximately 3 seconds. Then, the **SAVE** LEDs lights out to be in measured data not saving state.

13) Cursor keys (, , , ): Moves the cursor up, down, right, and left.

Pressing the  key more than approximately 3 seconds lights out the window to be in keylock state.

Pressing the  key more than approximately 3 seconds displays the light out window and cancels the keylock state.

14)  key: Press this key for starting or stopping the real-time measurement. The LED lights up during the measurement.

15)  Key: Monitor measurement is continuously conducted until the  key of the preset monitor CH is pressed once again.

16) Numeric keys ( to , , ): Numeric input keys.

17)  key: Used together with other keys for settings.

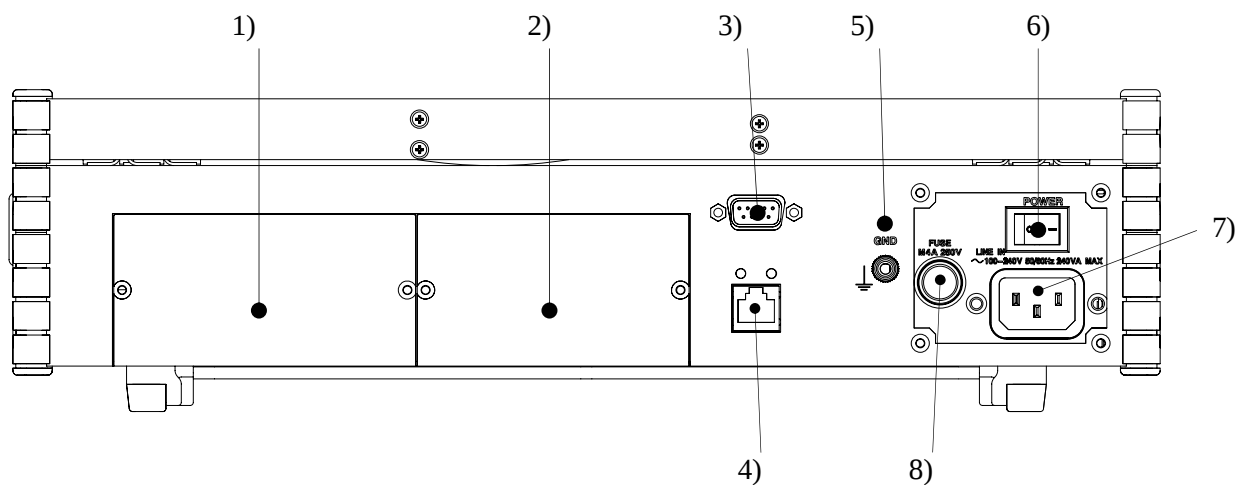
18)  key: Goes back to the one step previous display.

19)  key: Deletes one character or one line.

20)  key: Determines and executes the selected item.

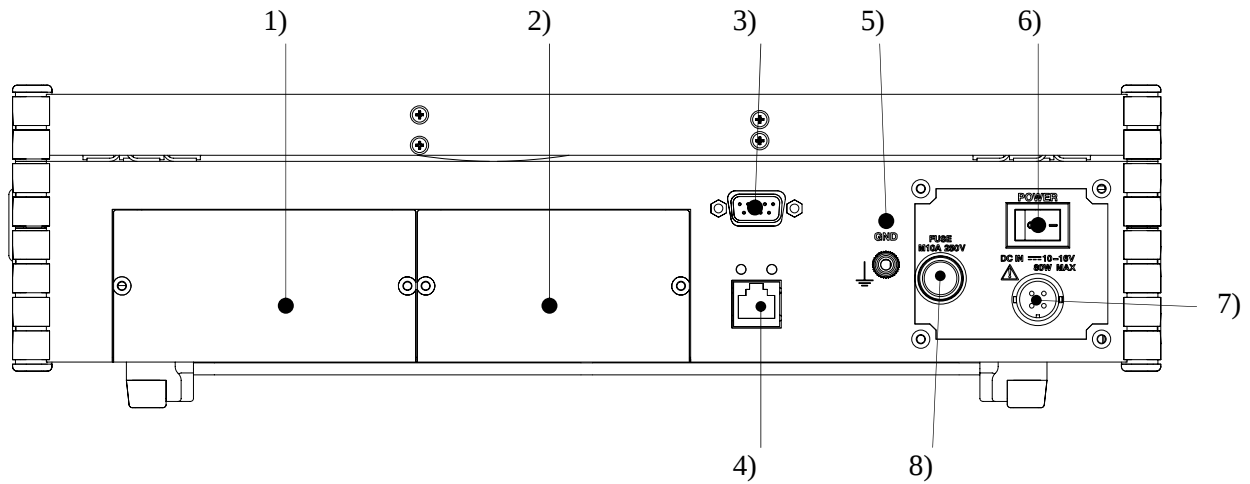
2-2 REAR PANEL

(1) AC power supply dedicated unit



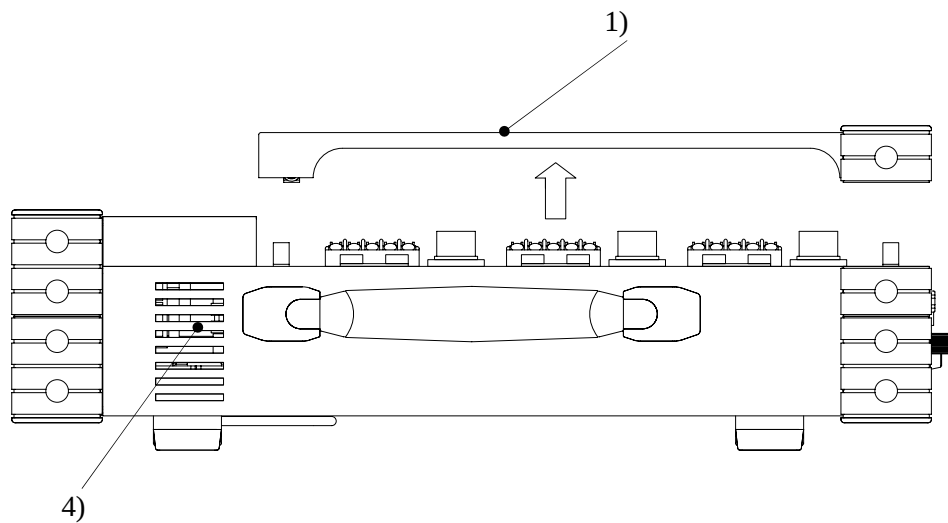
- 1) Option slot 1: Scanner interface USI-65A or USI-67A is inserted into this slot.
- 2) Option slot 2: External input/output unit UIO-60A is inserted into this slot.
- 3) "RS-232C" connector :..... RS-232C interface connector
- 4) "Ethernet" connector: LAN interface connector
- 5) "GND" terminal: UCAM-60B ground terminal
- 6) "POWER" switch: Power switch
- 7) "LINE IN": Power cable connecting plug
- 8) "FUSE" holder: Power supply fuse
Use time lag fuse 4A.

(2) DC power supply dedicated unit

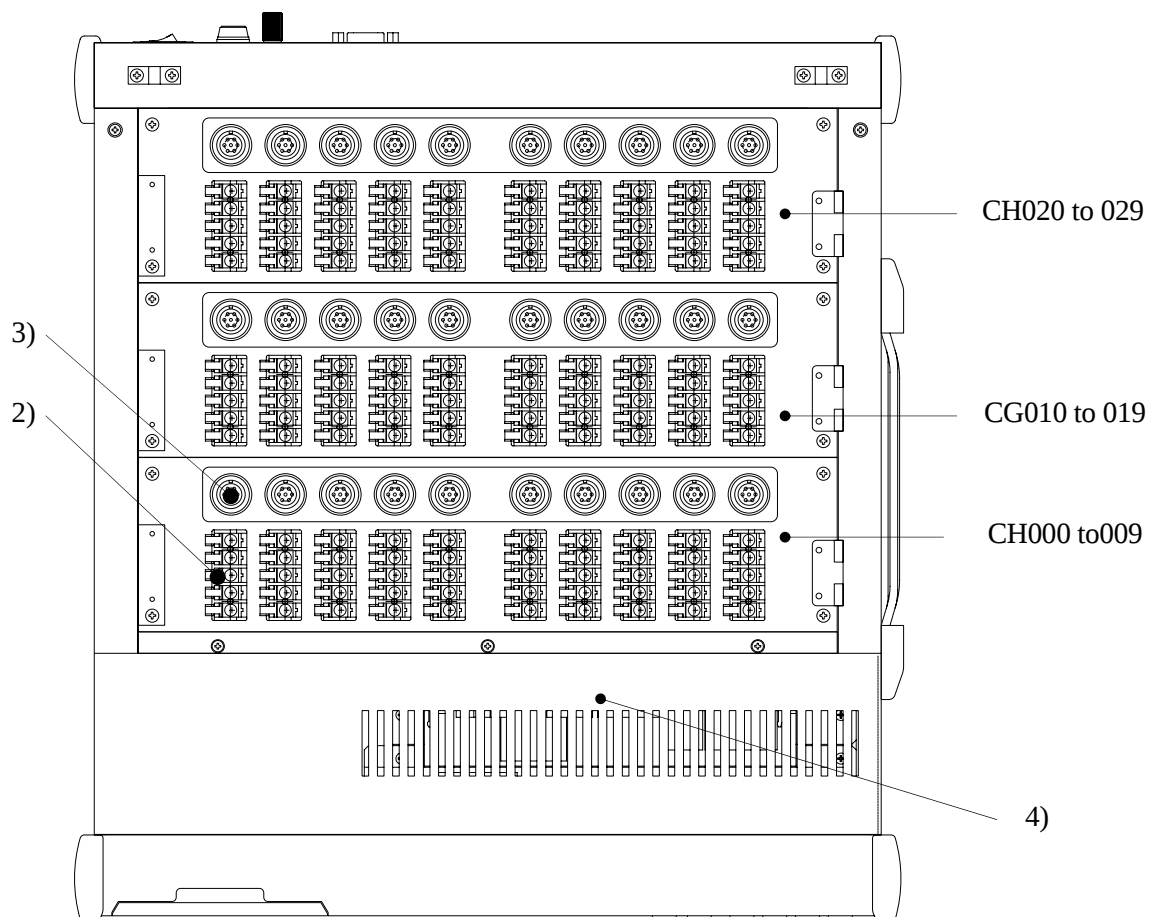


- 1) Option slot 1: Scanner interface USI-65A or USI-67A is inserted into this slot.
- 2) Option slot 2: External input/output unit UIO-60A is inserted into this slot.
- 3) "RS-232C" connector: RS-232C interface connector
- 4) "Ethernet" connector : Ethernet interface connector
- 5) "GND" terminal :..... UCAM-60B ground terminal
- 6) "POWER" switch: Power switch
- 7) "DC IN" connector: DC power cable connecting connector
- 8) "FUSE" holder: Power supply fuse
Use time lag fuse 10A

2-3 TOP



* To remove the top cover, hoist up the rear side of the UCAM-60B and remove the top cover to the arrow direction.



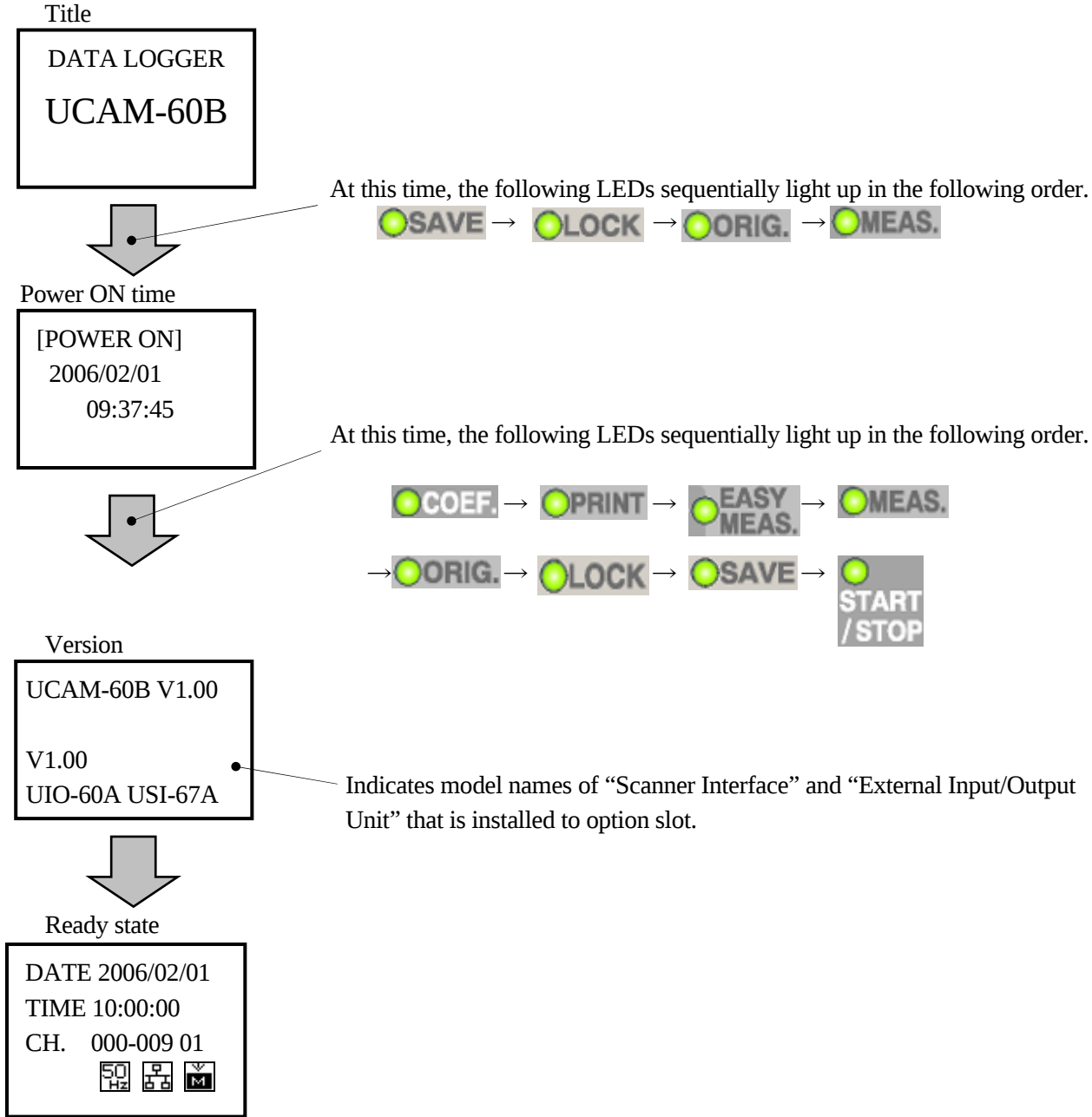
- 1) Top cover
- 2) Input terminal board
- 3) NDIS standard connector (Provided only for USS-62B scanning unit)
- 4) Ventilating hole (Do not seal this hole during operation.)

* The above figure is an example installed with three USS-62Bs.

2-4 DESCRIPTION OF DISPLAY WINDOW

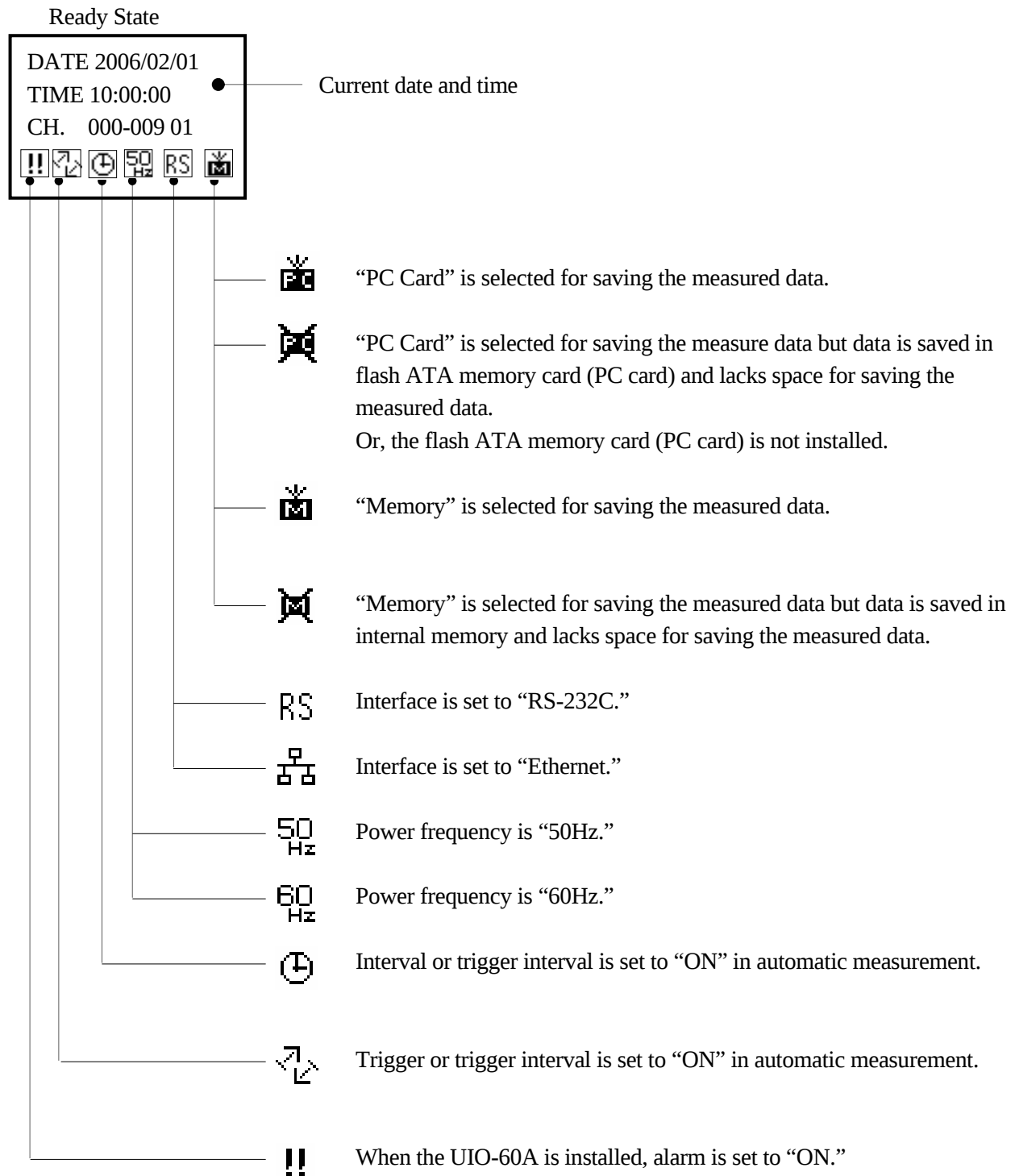
2-4-1 Display Window When the Power ON

Power ON the UCAM-60B and the display window changes as shown in the following.

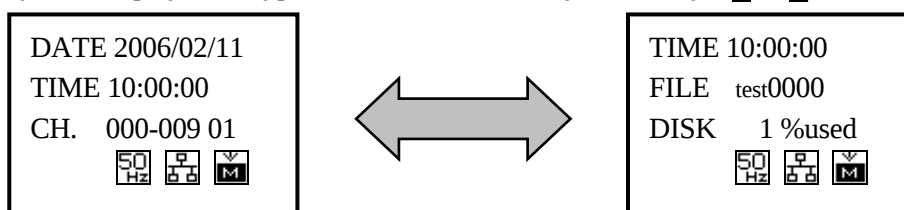


2-4-2 Ready Sate

The following types of icons are displayed on the ready state to indicate the current setting state of the UCAM-60B



Ready state display has 2 types that can be selected by cursor keys (← or →).



3. CONNECTING DEVICES & PREPARING FOR MEASUREMENT

3-1 SYSTEM INSTALLATION

3-1-1 Grounding

Do not forget to ground the GND terminal to prevent the UCAM-60B from being affected by noise as well as electric shock due to leaks in the electric current from the power supply noise filter. For wire rods, it is recommended to use green color vinyl coated wire having a diameter of more than 0.75 mm^2 .

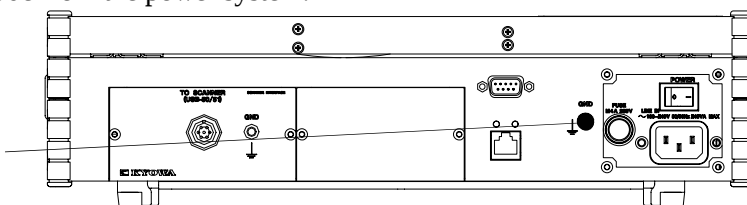
Grounding standard is not in the same way according to the operating environment. See the following grounding examples and ground the GND terminal so as to reduce adverse effect from noise and to enable a stable measurement.

Basics of the grounding is one-point grounding. If the grounding is made at more than 2 points, it should be noted that a loop may be formed resulting to cause the UCAM-60B easily affected by noise.

Grounding should be independently made from the power system.

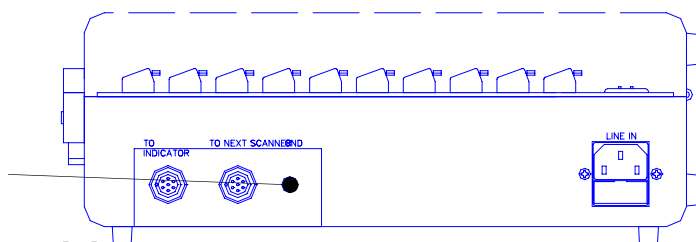
- UCAM-60B rear panel

“GND” terminal



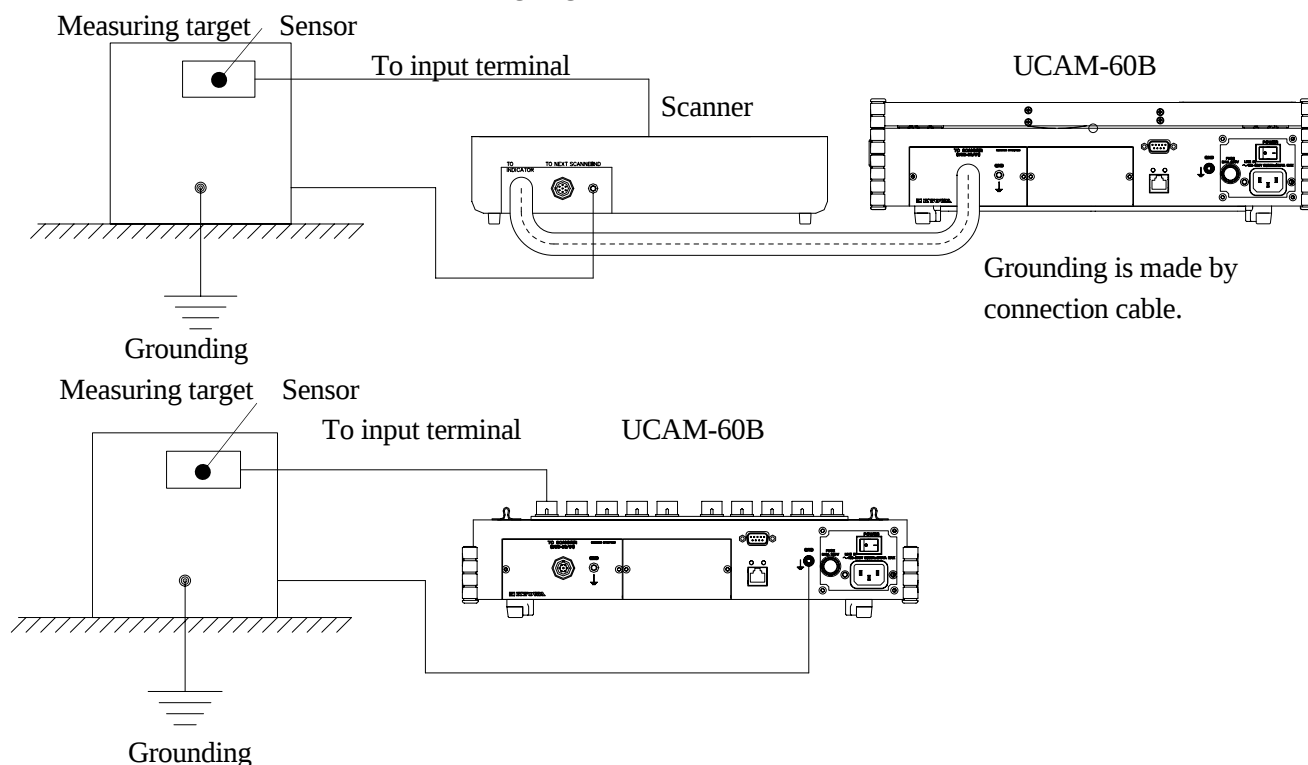
- Scanner rear face

“GND” terminal



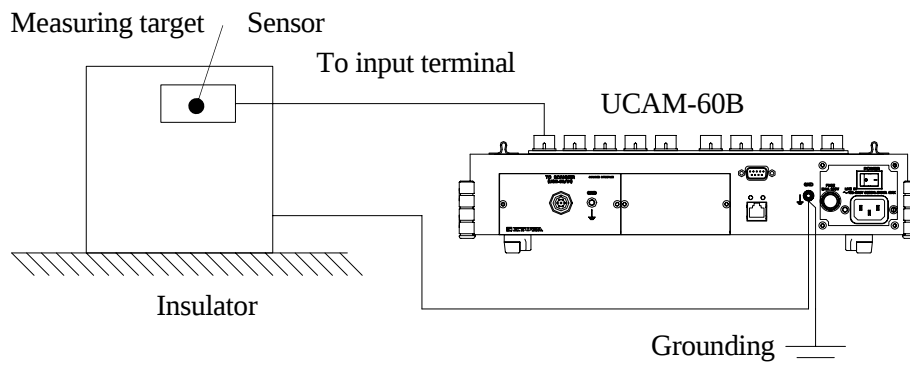
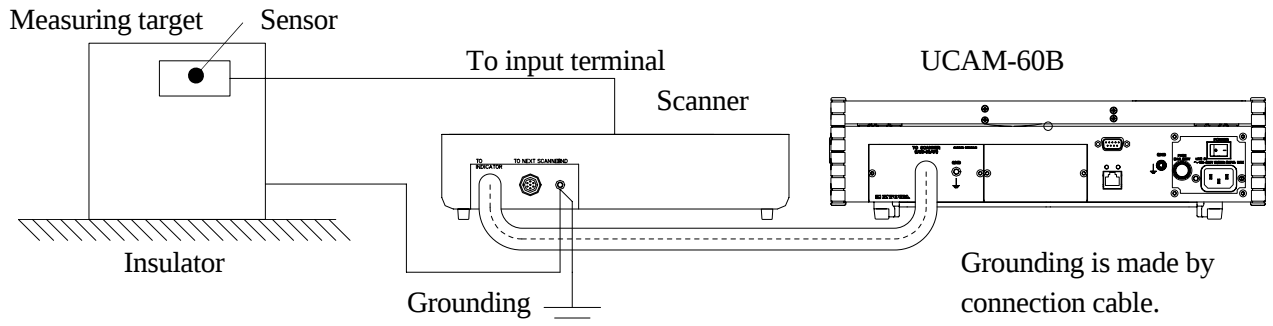
3-1-1-1 When Measuring Target is Grounded

- (1) Connect the measuring target to “GND” terminals of scanners such as USB-70 series, etc. scanners
- (2) If no scanner is used, connect the measuring target to a “GND” terminal of the UCAM-60B.



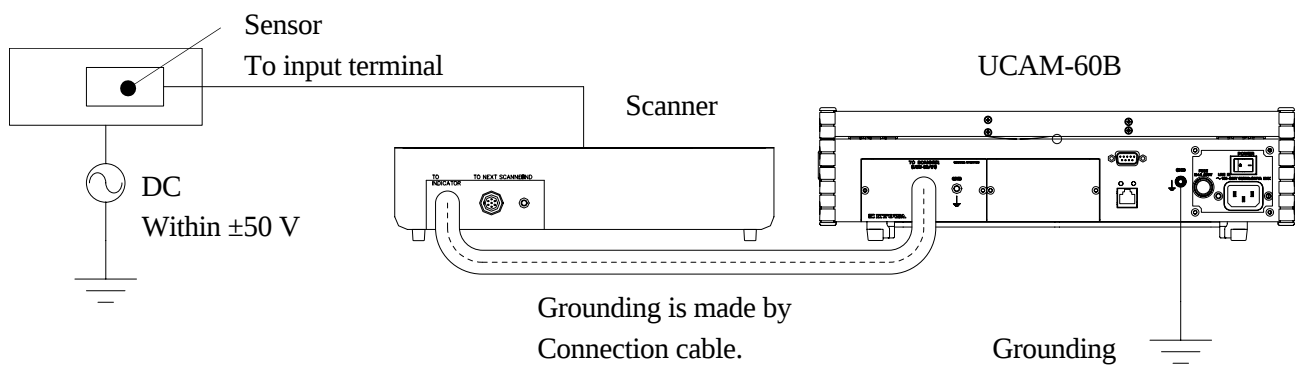
3-1-1-2 When Measuring Target is Insulated From the Ground

- (1) Connect the measuring target to “GND” terminals of scanners such as USB-70 series, etc.
- (2) If no scanner is used, connect the measuring target to a “GND” terminal of the UCAM-60B.
- (3) Ground either one of “GND” terminals of scanners such as USB-70 series, etc., or of the UCAM-60B.



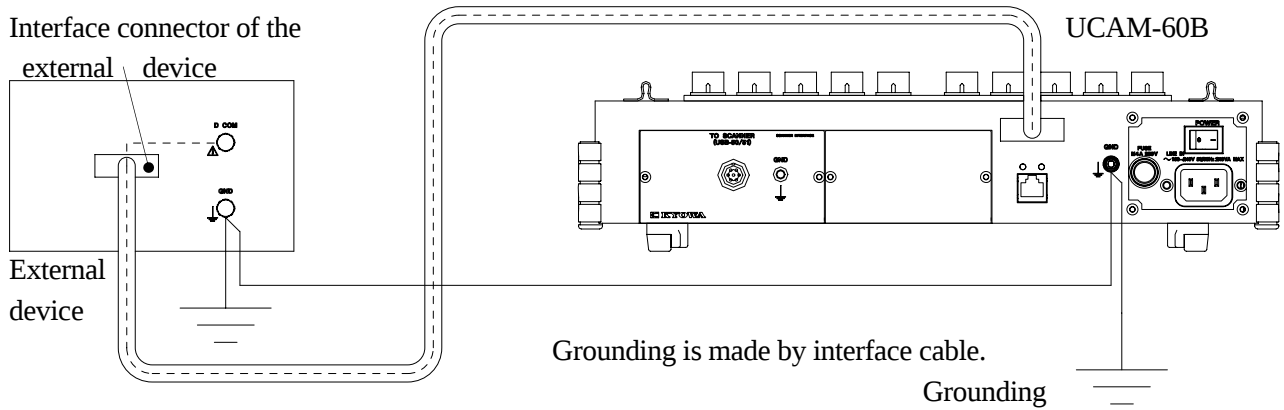
3-1-1-3 When Measuring Target has Potential to the Ground

- (1) Ground either one of “GND” terminals of scanners such as USB-70 series, etc., or of the UCAM-60B.



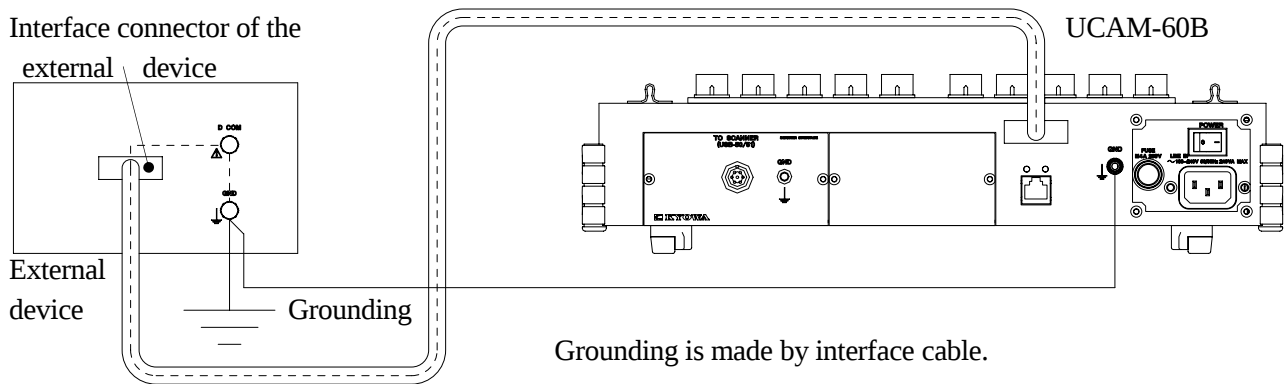
3-1-1-4 When Connecting to External Device with Digital Common not Connected to GND Terminal

- (1) Connect a UCAM-60B “GND” terminal to GND terminal of the external device.
- (2) Ground either the UCAM-60B “GND” terminal or GND terminal of the external device.



3-1-1-5 When Connecting to External Device with Digital Common Connected to GND Terminal (or Chassis)

- (1) Connect a UCAM-60B “GND” terminal to GND terminal of the external device.
- (2) Connect the GND terminal of the external device to the ground.



3-1-2 Connecting Grounding Conductor for Lightning Surge Protection

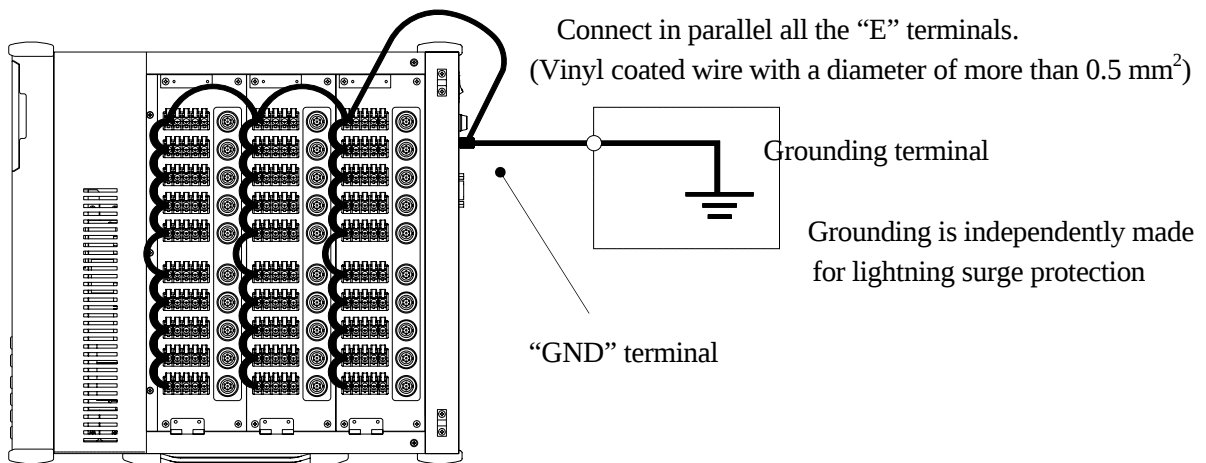
To protect the UCAM-60B or scanners from lightning surge, do not forget to connect a grounding conductor for lightning surge protection to “E” terminals of each of the input terminals and to the “GND” terminal

For lightning surge protection, grounding should be independently made.

The effect of the lightning surge protection depends on whether grounding and wiring are sufficiently made.

Connect between the “GND” terminal and lightning surge protecting ground with as short as possible green color vinyl coated wire having a diameter of 1.25 mm^2 .

3-1-2-1 Connecting Grounding Conductor for Protecting UCAM-60B & Scanner From Lightning Surge

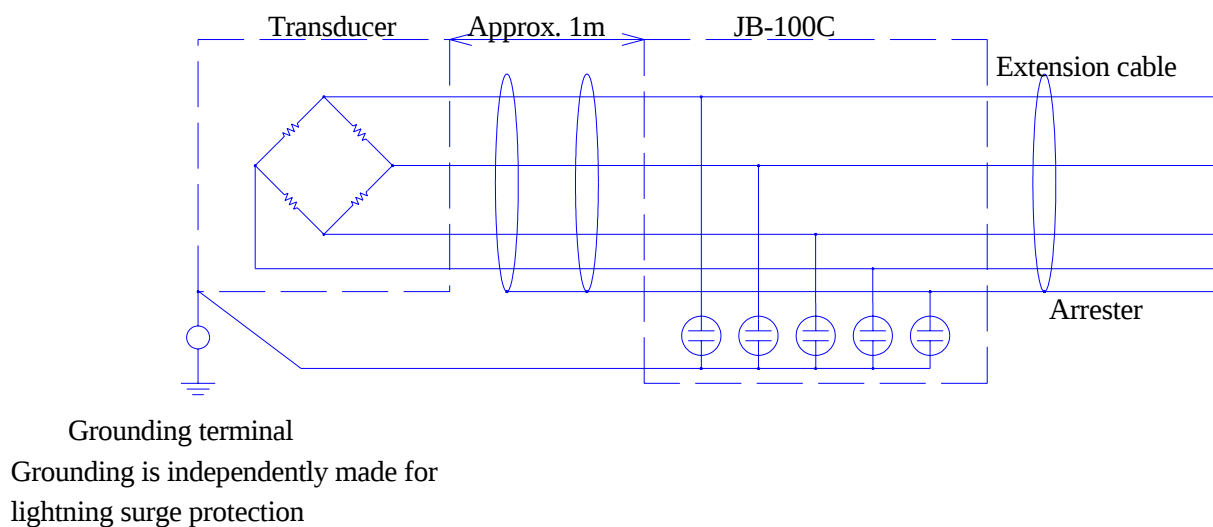


3-1-2-2 Connecting Grounding Conductor for Protecting Sensor From Lightning Surge

(1) When KYOWA’s strain gage transducer is used.

Connect KYOWA’s cable splicing kit with arrester JB-100C near to (about 1m) transducers and connect a grounding conductor that is independently arranged for lightning surge protection.

(For details, refer to JB-100C Instruction Manual.)



(2) When other sensors are used

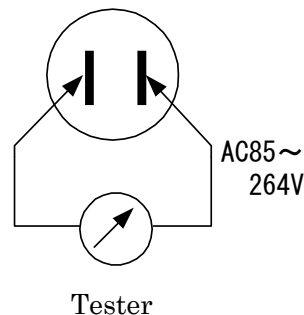
Take appropriate measures for protecting sensors from lightning surge according to instruction manual of sensors as well as manufacturer’s instructions.

3-1-3 Connecting Power Cable

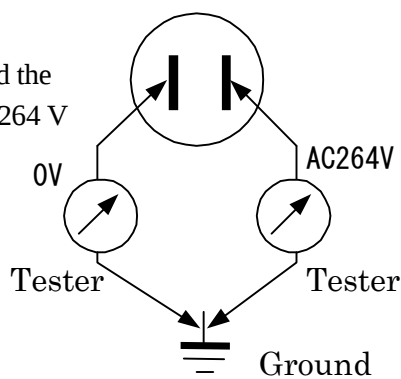
Power supply specification of the UCAM-60B requires 85 to 264 VAC, 50/60 Hz. (For AC power supply dedicated unit)

Before connecting the power cable, do not forget to confirm the following items.

- (1) Measure voltage between 2-prong wall outlet with a tester and confirm it is provided with power voltage from 85 to 264 V.



- (2) Measure voltage between each end of the 2-prong wall outlet and the ground with a tester and confirm one end has 0 V and the other, 264 V or less.



- (3) If the UCAM-60B is operated in an environment where noise generating instruments such as induction motor, welding machine, etc. are used, power supply state may be insufficient due to noise. It is recommended to use KYOWA's insulation transformer UPT-300B.

MEMO

KYOWA's Insulation Transformer UPT-300B

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

- (1) If the power voltage excessively varies, it is recommended to use a stabilized power supply unit.
- (2) Do not operate the UCAM-60B with power supply having unstable frequency or square-wave output. Or, erroneous operation may result.

NOTE

- Create voltage of 100 VAC with Uninterruptible Power Supply Unit (UPS) or battery. Always use the UPS with sine wave for operating the UCAM-60B.
- AC output of some low-cost UPSs may not be sine wave but rectangular wave.
On selecting the UPS, take care and confirm the UPS specifications.
When the UPS produces rectangular wave, operation of the UCAM-60B and measurement may become unstable.

3-1-4 Connecting DC Power Supply

The UCAM-60B is operated on 10 to 16 DCV. (For DC power supply dedicated unit)

Before connecting the DC power supply, do not forget to confirm the following items.

- (1) Check that the DC power supply voltage has 10 to 16 VDC.

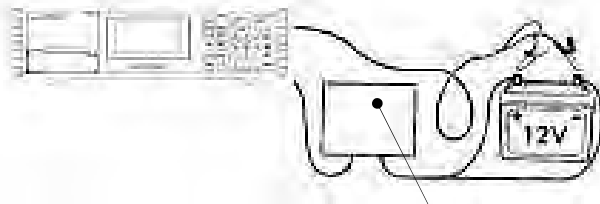
If the UCAM-60B is used with power voltage other than the above, it may lower the performance and cause trouble.

- (2) Connect the grounding conductor to the “GND” terminal on the UCAM-60B rear panel

- (3) Take special care for the polarity and correctly connect the DC power cable (P-57) to the DC power supply.

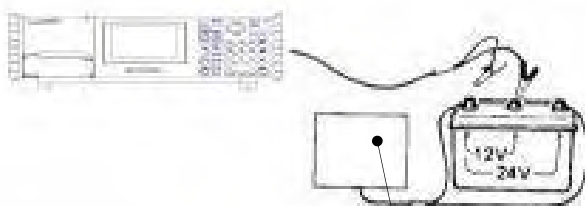
MEMO

- The ‘-’ side of the UCAM-60B DC power connector is connected to the ground. Therefore, do NOT connect the UCAM-60B to measuring instruments of which ‘+’ sides are connected to the ground or do NOT let the UCAM-60B contact or connect the ‘+’ side of the power supply connector. Or, performance of the UCAM-60B is lowered and cause trouble.



Measuring instrument with ‘+’ side connected to the ground

- Do NOT connect to the ‘-’ side of the UCAM-60B DC power connector (=GND or DCOM) from halfway potential of power voltage.



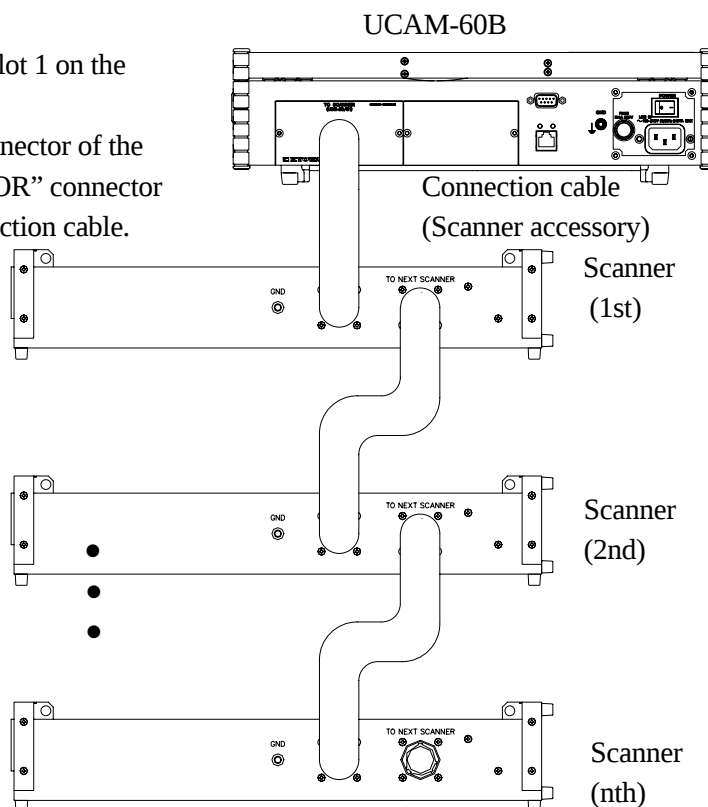
Other measuring instruments, etc.

3-2 CONNECTING EXTERNAL DEVICES

3-2-1 Connecting Scanners USB-50A/50D/51A/51AT

For connecting external scanners such as USB-50A, etc. to the UCAM-60B, it is required to use a scanner interface USI-65A. (Optional).

- (1) Install USI-65A scanner interface to an option slot 1 on the rear panel.
- (2) Connect a “TO SCANNER(USB-50/51)” connector of the USI-65A scanner interface and “TO INDICATOR” connector of the scanner with the scanner accessory connection cable.
- (3) For connecting on and after the 2nd scanners, sequentially connect “TO NEXT SCANNER” connectors of scanners and “TO INDICATOR” connectors of the succeeding scanners.



MEMO

Maximum number of connectable scanners and maximum extension length of the cable are as follows.

- Connection cable can be extended up to 200 meters with maximum 20 scanners connected.
- Maximum 19 internal scanners are used.

When extending distance between the UCAM-60B and scanners or when the UCAM-60B and scanners are used in environment that is adversely affected by external noise, etc., it is preferable to connect an end terminal resistor unit H-10061 (Optional) to a “TO NEXT SCANNER” connector of the lastly connected scanner.

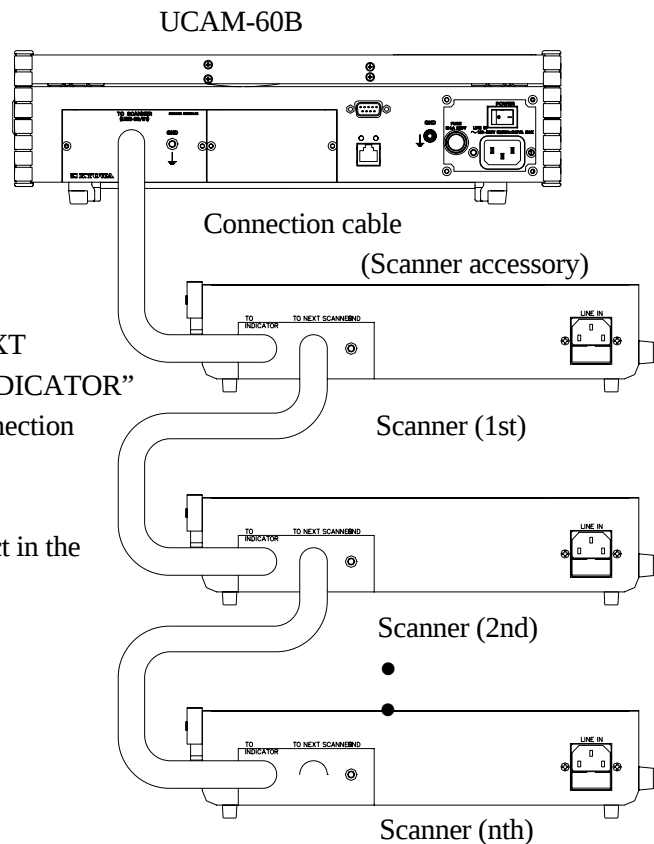
NOTE

Before installing the scanner interface to an option slot 1, do not forget to turn OFF the UCAM-60B.

3-2-2 Connecting USB-70 Series Scanners

For connecting external scanners of USB-70 series to the UCAM-60B, it is required to use a scanner interface USI-67A (Optional).

- (1) Install the scanner interface USI-67A to an optional Slot 1 on the rear panel.
- (2) Connect the “TO SCANNER” (USB-70) of the USI-67A and “TO INDICATOR” connector of the USB-70 series scanners with the scanner accessory connection cable.
- (3) For connecting the 2n scanner, connect the “TO NEXT SCANNER” connector of the 1st scanner to “TO INDICATOR” connector of the 2nd scanner with the accessory connection cable.
- (4) For connecting on and after the 2nd scanners, connect in the same manner as indicated in item (3).



MEMO

For using USB-70 series scanners with the following connection, it is required to install AC power supply unit UPS-70A/70B (Optional) to all the scanners.

- When '1' USB-70 series scanner is used and the cable is extended to 240 m or more.
- When '2' USB-70 series scanners are used and the total extension of the cable exceeds 120 m or more.
- When '3' USB-70 series scanners are used and the total extension of the cable exceeds 60 m or more.
- When more than '4' USB-70 series scanners are used.

MEMO

When USB-70A series scanner equipped with an AC power supply unit (UPS-70A/B) is used, the maximum number of scanners that can be connected to the UCAM-60B and the maximum extension length of the connection cable are as follows.

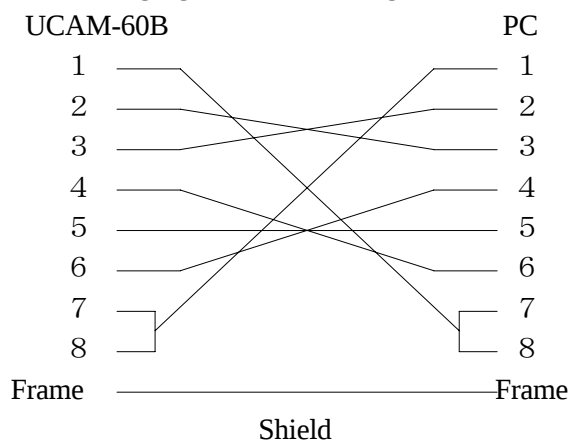
- Connection cable can be extended up to 1 km with maximum 20 scanners connected.
- Maximum 20 internal scanners

NOTE

Before installing the scanner interface to an option slot 1, do not forget to turn OFF the UCAM-60B.

3-2-3 Connecting RS-232C Interface

RS-232C interface connector is provided on the rear panel of the UCAM-60B.
See the following figure for connecting the UCAM-60B to the PC.



MEMO

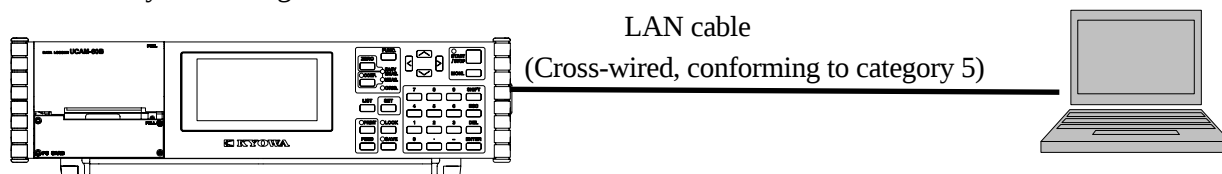
Applicable cable

RS-232C cable (Cross cable) KRS-403XF3K (3m), etc.(SANWA SUPPLY CORP. made)

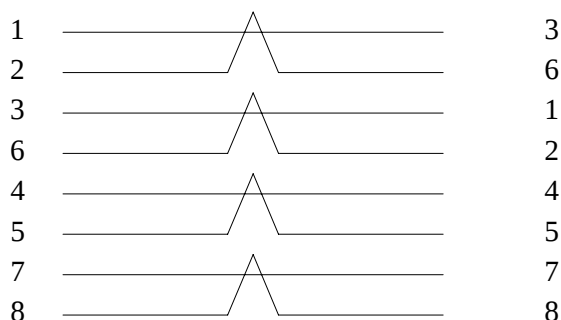
3-2-4 Connecting Ethernet

Ethernet interface connector (LAN connector) is provided on the rear panel of the UCAM-60B.
Cables connecting the UCAM-60B to the PC, etc. vary with the connection method.

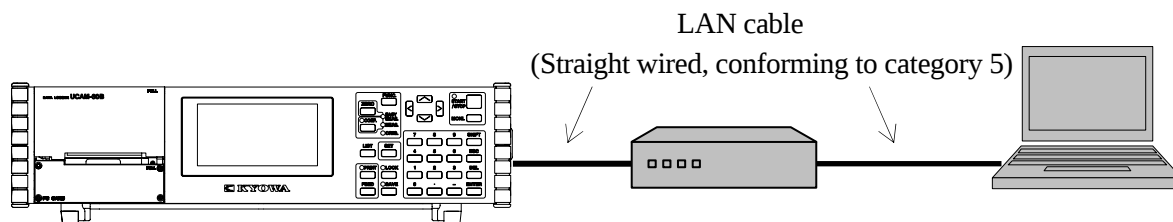
(1) When directly connecting the UCAM-60B to the PC



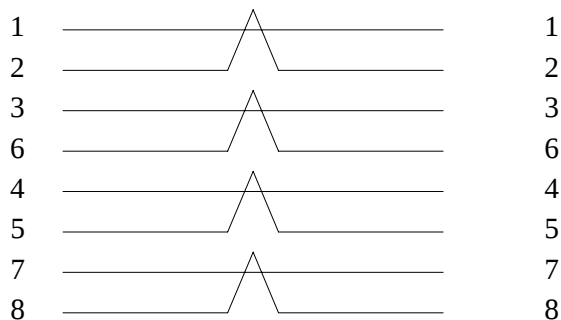
- Use a cross-wired LAN cable of category 5 or higher.
- Schematic drawing of cross wire connection is described in the following.



(2) When connecting to network via hub



- Use a straight-wired LAN cable of category 5 cable or higher.
- Schematic drawing of straight wire connection is described in the following.



NOTE

- When connecting to network, set the IP address in advance. See “10. SETTING INTERFACE” for setting interface.
- For details of setting IP address, etc., confirm the relevant ‘Network Administrator’ of the connected network.
- Note that the UCAM-60B is not provided with such functions as ‘Fire Wall’ function. Take special care when connecting to the network.

3-3 SETTING IP ADDRESS

Set the IP address before connecting the UCAM-60B to the PC.

This section describes a method of setting and matching the IP addresses of the UCAM-60B and the PC.

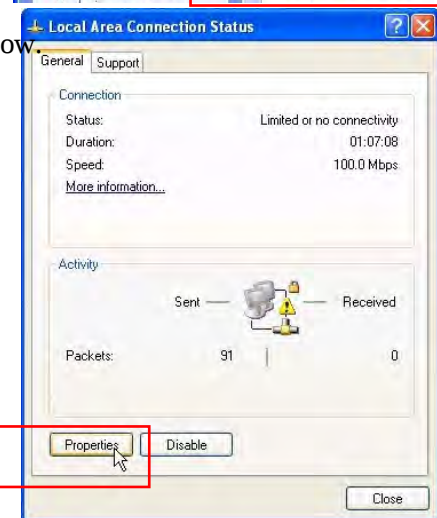
3-3-1 Checking IP Address on PC Side

Firstly, check the IP address on the PC side.

- (1) Select [Network Connections] from the [Control Panel].
[Network Connections] window opens.

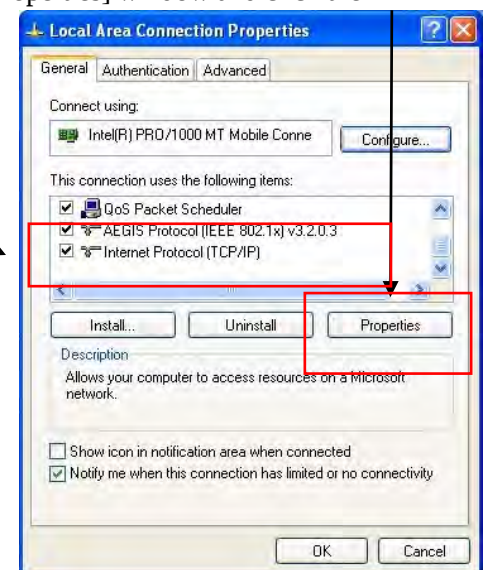


- (2) Select [Local Area Connection] on the [Network Connections] window.
[Local Area Connected State] window opens.

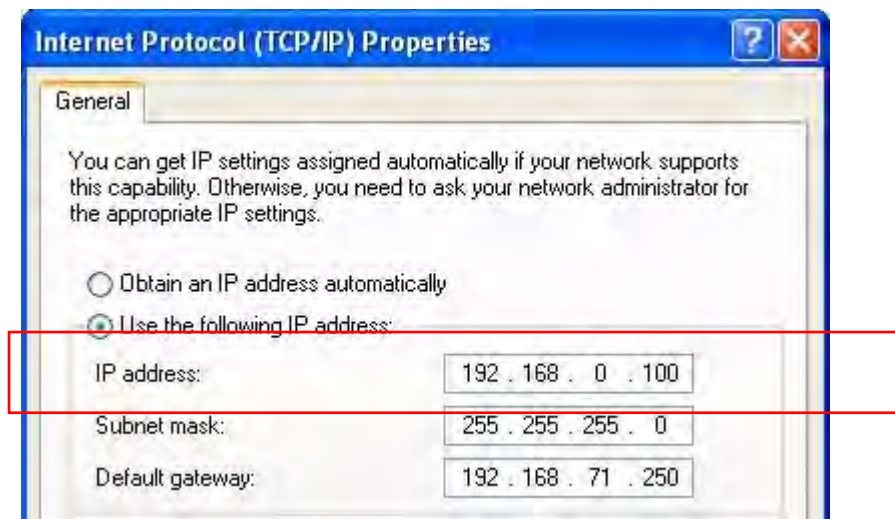


- (3) Click the [Properties] button on the [Local Area Connection State] window.

- (4) Select [Internet Protocol (TCP/IP)] on the [Local Area Connection Properties] window and click the [Properties] button.



- (5) On the [Internet Protocol (TCP/IP) Properties] window, check the IP address.
(Example)



IP address of the above example is 192. 168. 0. 100.



3-3-2 Setting IP Address on UCAM-60B

- 1) Set the IP address on the UCAM-60B to 192. 168. 0. ***.

High-place 3 sets have the same numbers. Input numbers different from that of the PC in the 4th place. Check the IP address and take care not to overlap the numbers in the same Ethernet environment where other PCs and instruments are connected.

In addition, when other PCs or other devices are connected in the same LAN environment, input different figures not to overlap the figures in '***.'

- 2) For how to set the IP address of the UCAM-60B, see "10-4 Setting Ethernet."

When connecting the UCAM-60B to PC with LAN or Ethernet cable, check the connection by the following.

(1) Confirmation by Hardware

The Ethernet port of the UCAM-60B provides 2 LED lamps, which enable confirmation of correct connection by hardware. Turn ON the UCAM-60B. If Ethernet connection is correct, one LED lights up and the other flickers (irregularly). If not, check the LAN cable and bug.

(2) Confirmation by Software

Check by Ping command

Send a ping command from the PC's command prompt. If the UCAM-60B corresponds to the command, the Ethernet connection is correct.

1) Start the command prompt

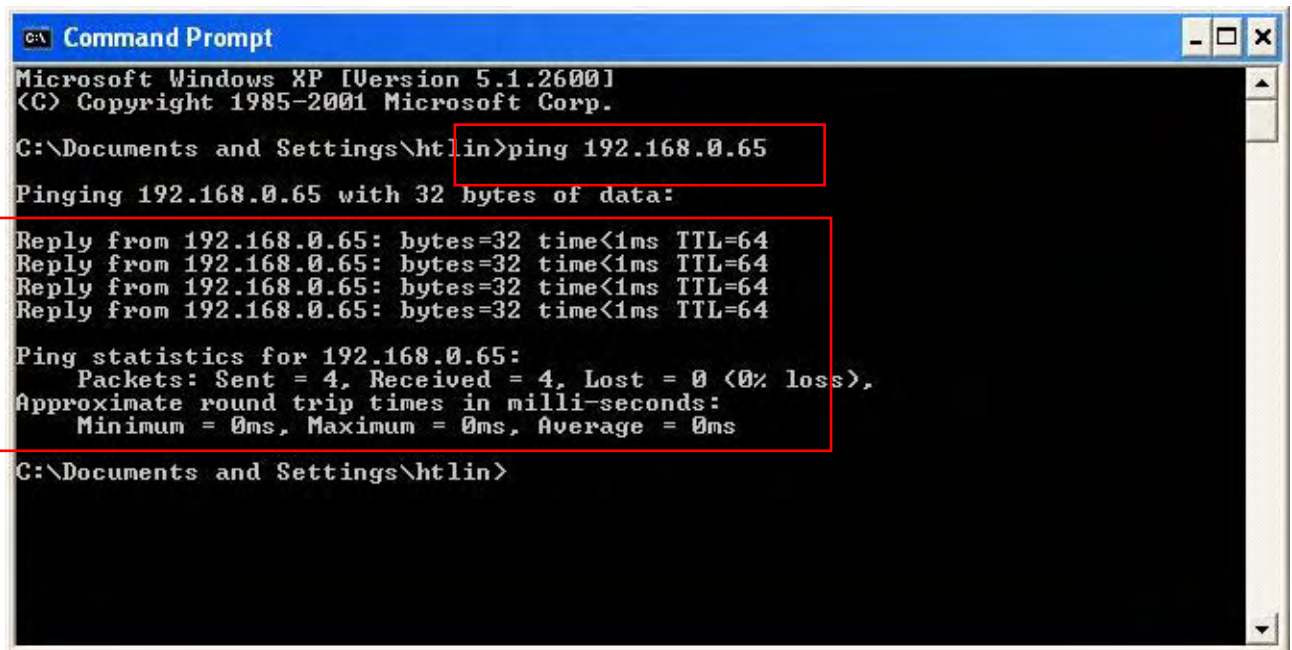
Point to "Start" and select "All Programs" - "Accessories" - and "Command Prompt."

2) Input Ping command.

Input "ping_IP address of UCAM-60B" and press the Enter key.

3) Communication is carried out 4 times and the results are displayed on the window.

If it resulted as shown in the following (0% loss), the communication is normal and network connection is correctly set.



```
C:\ Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\htlin>ping 192.168.0.65

Pinging 192.168.0.65 with 32 bytes of data:

Reply from 192.168.0.65: bytes=32 time<1ms TTL=64
Reply from 192.168.0.65: bytes=32 time<1ms TTL=64
Reply from 192.168.0.65: bytes=32 time<1ms TTL=64
Reply from 192.168.0.65: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.0.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\htlin>
```

- (3) If correct connection for Ethernet communication is confirmed by both Hardware and Software but control on a practical application is not available,
- 1) Check setting condition of the current application.
 - 2) Check with the security software Firewall removed.
 - 3) Ethernet communication is not available if the communications port (9001) is set to a state where it is always closed.

(Supplementary)

How to check the PC's IP address

- 1) Startup the command prompt
Point to "Start" and select "All Programs" - "Accessories" - and "Command Prompt."
- 1) Input IPCONFIG command
Input 'ipconfig' and press the Enter key.
- 2) The present PC's IP address is displayed as follows.

```
C:\ Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\htlin>ipconfig

Windows IP Configuration

Ethernet adapter Wireless Network Connection 2:

    Media State . . . . . : Media disconnected

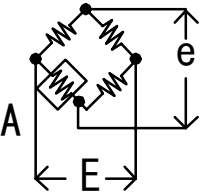
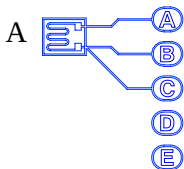
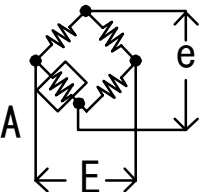
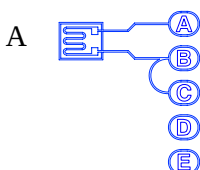
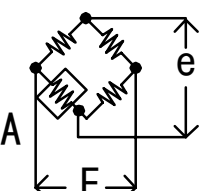
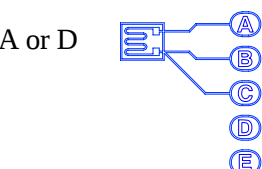
Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . : 
    IP Address. . . . . : 192.168.0.100
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 

C:\Documents and Settings\htlin>
```

3-4 CONNECTING SENSORS

3-4-1 Connecting Strain Gages and Strain Gage Transducers

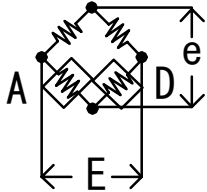
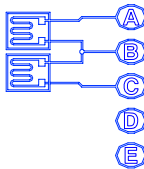
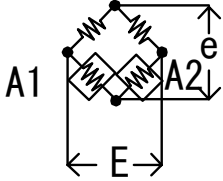
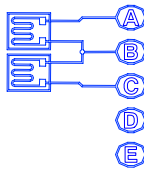
Measuring Method	Bridge Circuit	Connection Method	CH Mode
	 : Strain gage  : Built-in fixed resistor A : Active gage D : Dummy gage E : Bridge exciter e : Bridge output	A : Active gage D : Dummy gage	
1-gage method (3-wire system connection) Gage resistance 120 Ω 240 Ω 350 Ω			1G 120 (BV 2 V) 1G 240 (BV 2 V) 1G 350 (BV 2 V) 1G 120_5 V ^(*) 1G 240_5 V ^(*) 1G 350_5 V ^(*)
1-gage method (2-wire system connection) Gage resistance 120 Ω 240 Ω 350 Ω			1G 120 (BV 2 V) 1G 240 (BV 2 V) 1G 350 (BV 2 V) 1G 120_5 V ^(*) 1G 240_5 V ^(*) 1G 350_5 V ^(*)
1-gage method (True-dummy method) Gage resistance 120 Ω 350 Ω			1G120/D (BV 2 V) 1G 350/D (BV 2 V) 1G 120/A (BV 2 V) 1G 350/A (BV 2 V) 1G 120D_5 V ^(*) 1G 350D_5 V ^(*) 1G 120A_5 V ^(*) 1G 350A_5 V ^(*)

■ (*) is not available for external scanners.

■ (*) is BV 5 V.

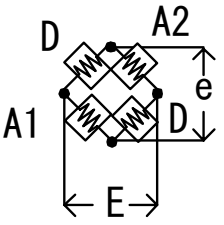
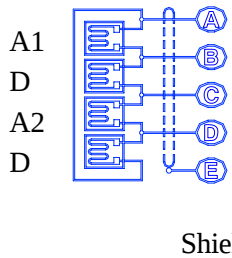
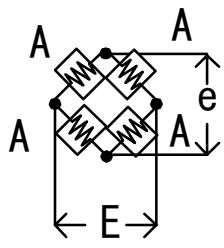
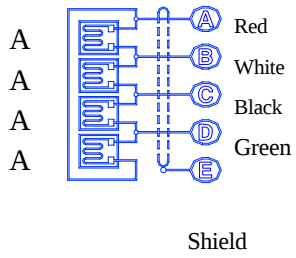
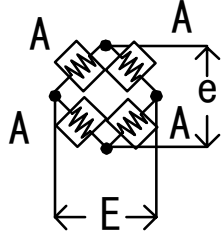
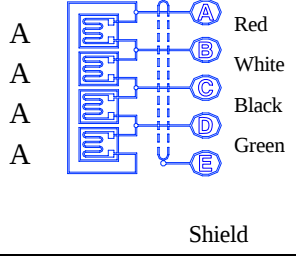
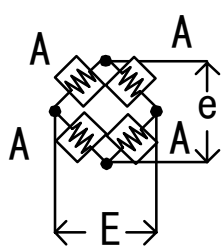
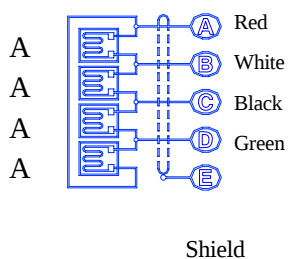
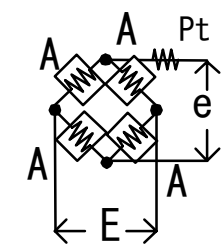
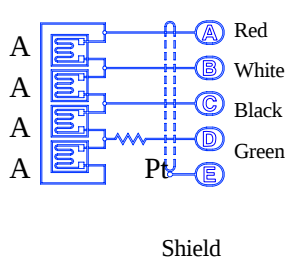
MEMO

- For 1-gage connection, it is recommended to adopt a “3-wire system” connection method that has less error factors such as temperature influence due to gage lead wire, dislocation of the initial value, etc.
- When measurement is conducted in environment with exceeding noise, use KYOWA’s low-noise lead wire (L-13/14/15/16).

Measuring Method	Bridge Circuit	Connection Method	CH 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 (Active-dummy method) Gage resistance 60 Ω to 1 K Ω		A D 	2G/A-D (BV 2 V) 2G/A-D_5 V (*1)
2-gage method (Active-active method) Gage resistance 60 Ω to 1 K Ω		A A: 	2G/A-A (BV 2 V) 2G/A-A_5 V ^(*1)

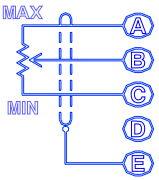
■ (*1) is not available for external scanners.

■ (*1) is BV 5 V.

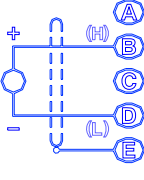
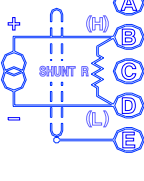
Measuring Method	Bridge Circuit	Connection Method	CH Mode
	 : Strain gage  : Built-in fixed resistor A : Active gage D : Dummy gage E : Bridge exciter e : Bridge output	A : Active gage D : Dummy gage	
4-gage method (Opposite side active method) Gage resistance 60 Ω to 1 K Ω (*2)			4G/A-A
4-gage method Full-bridge method Strain gage transducer Bridge resistance 60 Ω to 1 K Ω High resolution 120 Ω to 1000 Ω			4G 4G_HR
4-gage method (Constant current excitation) Full-bridge method Strain gage transducer Bridge resistance 120 Ω			4G/I (120)
4-gage method (Constant current excitation) Full-bridge method Strain gage transducer Bridge resistance 350 Ω			4G/I (350) 4G/I_HR
4-gage method Full-bridge method Civil engineering transducer with temperature measuring function Bridge resistance 350 Ω			4G/T

■ (*2) Nonlinearity of bridge resistance is compensated.

3-4-2 Connecting Potentiometer Sensors

Measuring Method	Connection Method	CH Mode
Potentiometer sensor Potentiometer resistance $1\text{ k}\Omega$ to $10\text{ k}\Omega$	 Shield	POT.

3-4-3 Connecting Voltage and Current Output Type Transducers.

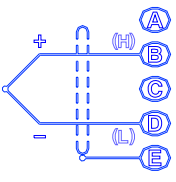
Measuring Method	Connection Method	CH Mode
Voltage measurement	 Shield	V/500 mV V/50 V
Current measurement $R = 250\ \Omega$ Highly accurate resistor	 Shield	I/50 mV

MEMO

Recommended high accuracy resistor for measuring electric current

- When it is used within range from 0 to $\pm 50\text{ mA}$: VSR4 250R00 $\pm 0.02\%$ (VISHAY made)
- When it is used within range from 0 to $\pm 30\text{ mA}$: VSH1 250RTC (VISHAY made)

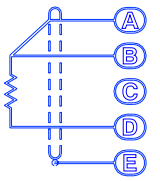
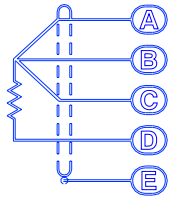
3-4-4 Connecting Thermocouple

Measuring Method	Connection Method	CH Mode
Thermocouple temperature measurement	 Shield	TC/K TC/T TC/E TC/J TC/R

MEMO

- When measuring temperature, do not forget to put a terminal cover on the terminal portion to have the terminal portion adapted to and equivalent to room temperature.
Do not expose the terminal portion to air-conditioner wind or direct light.
If thermal gradient is generated, measurement error may occur.
- Locate the scanner on a flat surface. If it is set against the wall, thermal gradient may generate to cause erroneous measurement.
- Use a twisted pair shield type cable for thermocouple measurement.
If a parallel or non-shield type cable is used, it may be affected by external noise to cause erroneous measurement.
- Do not directly connect the thermocouple to a measuring target having larger potential than the ground that may lower the performance and generate erroneous measurement.

3-4-5 Connecting Resistance Thermocouple Sensor

Measuring Method	Connection Method	CH Mode
Platinum resistance thermometer sensor 3-wire system	 Shield	Pt100 JPt100
Small-size thermometer BTS-100AT	 Shield	Pt100

3-5 REPLACING RECORDING SHEET

A UCAM-60B built-in printer is provided with an auto-loading function.

Replace the recording sheet according to following procedures.

- 1) Push down the fitting metal.
- 2) Set the recording sheet.
- 3) Slot in the edge of the recording sheet into the printer as shown in figure (b).

Then, the printer automatically starts loading the recording sheet

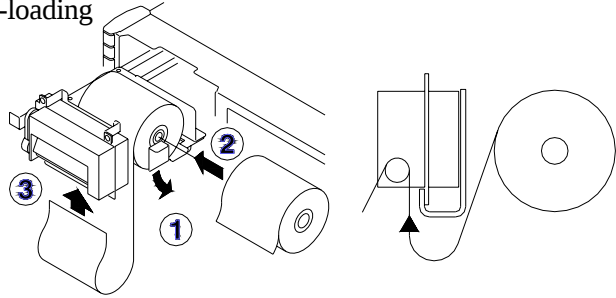


Figure (a)

Figure (b)

MEMO

Note that the auto loading function does not operate when the HOLD lever on the printer left side is UP.

3-6 INSERTING/EXTRACTING FLASH ATA MEMORY CARD (PC CARD)

- How to insert a flash ATA memory card into the PC card drive.
Locate the flash ATA memory card with the label face up and insert it into the PC card drive according to the arrow on the label surface.
- How to extract the flash ATA memory card from the PC card drive.
Press the eject button of the PC card slot and extract the flash ATA memory card.

4.HOW TO OPERATE UCAM-60B

4-1 OPERATIONAL FLOW

This section describes basic procedures for operating the UCAM-60B.

(1) Installing the UCAM-60B and connecting scanners

Connect the UCAM-60B to scanners and connect the GND terminal to the ground.

For details, see “3. CONNECTING DEVICES AND PREPARING FOR MEASUREMENT.”

(2) Connecting sensors

Connect sensors.

For wiring, see “3-3 CONNECTING SENSORS.”

(3) Setting required measuring conditions

Set required conditions for the measurement. Basic setting contents are described in the following section.

For details, see “5. BASIC SETTING FOR MEASUREMENT.”

(4) Setting a method for recording measured results

Measured results are indicated on the window. In addition, they can be printed out on the built-in printer and saved in the internal memory or flash ATA memory card.

For saving the measured results into the memory, see “6. FILE OPERATION.”

(5) Saving measuring conditions

Preset measuring conditions are saved into the internal memory or flash ATA memory card.

For details, see “6. FILE OPERATION.”

(6) Measurement

Conduct measurement.

For how to start the measurement, see “7. MONITOR AND REALTIME MEASUREMENT” and “8. ATUO-MEASUREMENT.”

4-2 SETTING VARIOUS ITEMS FOR MEASUREMENT

Outline and basic setting items of measurement are listed in the following table.

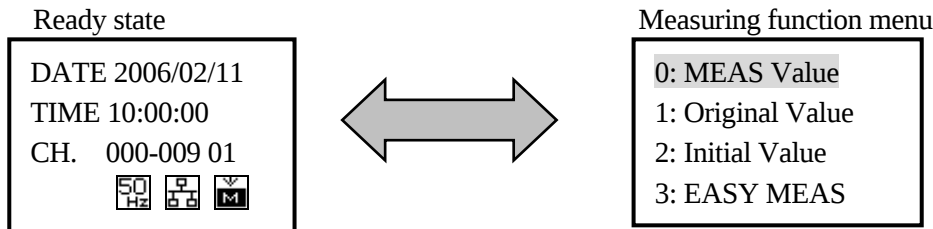
Setting Items		Details	Key Operation	Reference
Main items	Sub-items			
System	Internal scanner	Set whether or not internal scanner is used.	SET→7→1→0	5-1-1 Setting Internal scanner
	Scanning speed	Collectively set scanning speed of measurement to all CHs from measurement start to end CHs. *1	SET→7→1→1	5-1-2 Setting Scanning Speed
	Cold junction compensation	When thermocouple is used, set a method for cold junction compensation.	SET→7→1→3	5-1-3 Setting Cold Junction Compensation
	Power frequency	- Basically, setting of power frequency is not required for AC power unit. It is automatically detecting the power frequency. - Set the power frequency of the operating environment for the DC power unit.	SET→7→1→4	5-1-4 Setting Power Frequency.”
MEAS condition	Measuring CH	Set start and end CHs of the measurement.	SET→0→0	5-2-1 Setting Measuring CH
	Repeat times	Set the number of measurement repeat times with 1 measurement operation.	SET→0→1	5-2-2 Setting Repeat Times
CH condition	Automatically set CH mode	Automatically detect and set the CH mode corresponding to the connected sensors.	SET→1→1	5-3-2 Automatically Setting CH Mode
	Manually set CH mode	Manually set the CH mode corresponding to the connected sensors.	SET→1→0	5-3-1 Manually Setting CH Mode
	Scanning speed	Set scanning speed of measurement for every CH. *1	SET→1→8	5-3-3 Setting Scanning Speed
	CAL coefficient	Set coefficient for converting measured value into physical value.	SET→1→2	5-3-4 Setting Calibration Coefficient
	Number of digits below decimal point	Set a decimal point position for indicating physical value converted value.	SET→1→3	5-3-5 Setting Digits Below Decimal Point
	Unit	Set unit for indicating physical value converted value.	SET→1→4	5-3-6 Setting Unit
	Offset	Set offset value for converting the measured value into physical value.	SET→1→5	
	Reference resistance value	Set resistance value when temperature of a platinum resistance thermometer sensor or KYOWA's transducer with temperature measuring function is set to 0 °C.	SET→1→6	5-3-7 Setting Reference Resistance Value

* 1: The last set item are enabled.

4-3 HOW TO SET

4-3-1 Indicating Menu Items

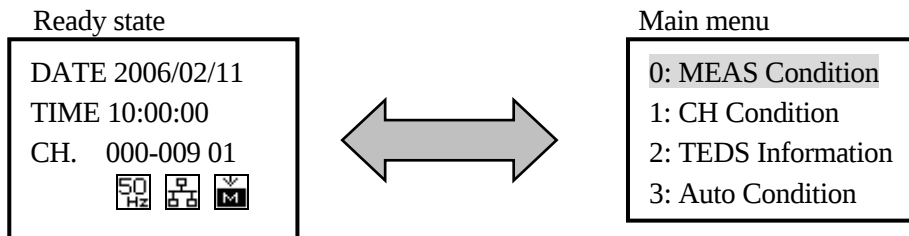
When the UCAM-60B is in ready state, press the  key. Menu items on measuring function appear. Set the required measuring function and the indication returns to the ready state.



Press the  key with the ready state displayed. Then, a menu for setting various items (main menu) appears.

Select the desired menu by moving the cursor key ( or ) and press the  key. In addition, the desired menu items can be selected by the keys (Numeric keys such as , , etc.) that are corresponding to indications in front of the menu items.

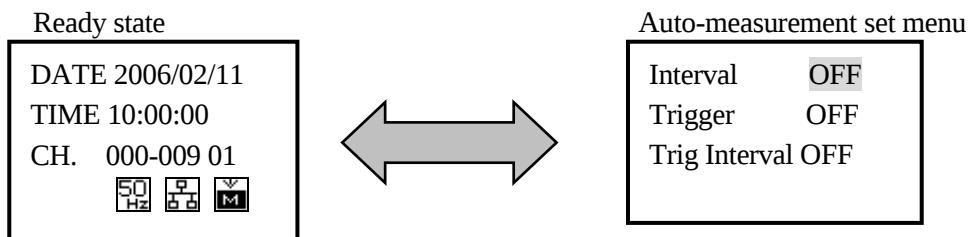
Press the  key and the setting items are stored and indication returns to the ready state.



Press the  key while pressing the  key with the ready state. And items required for auto-measurement are displayed.

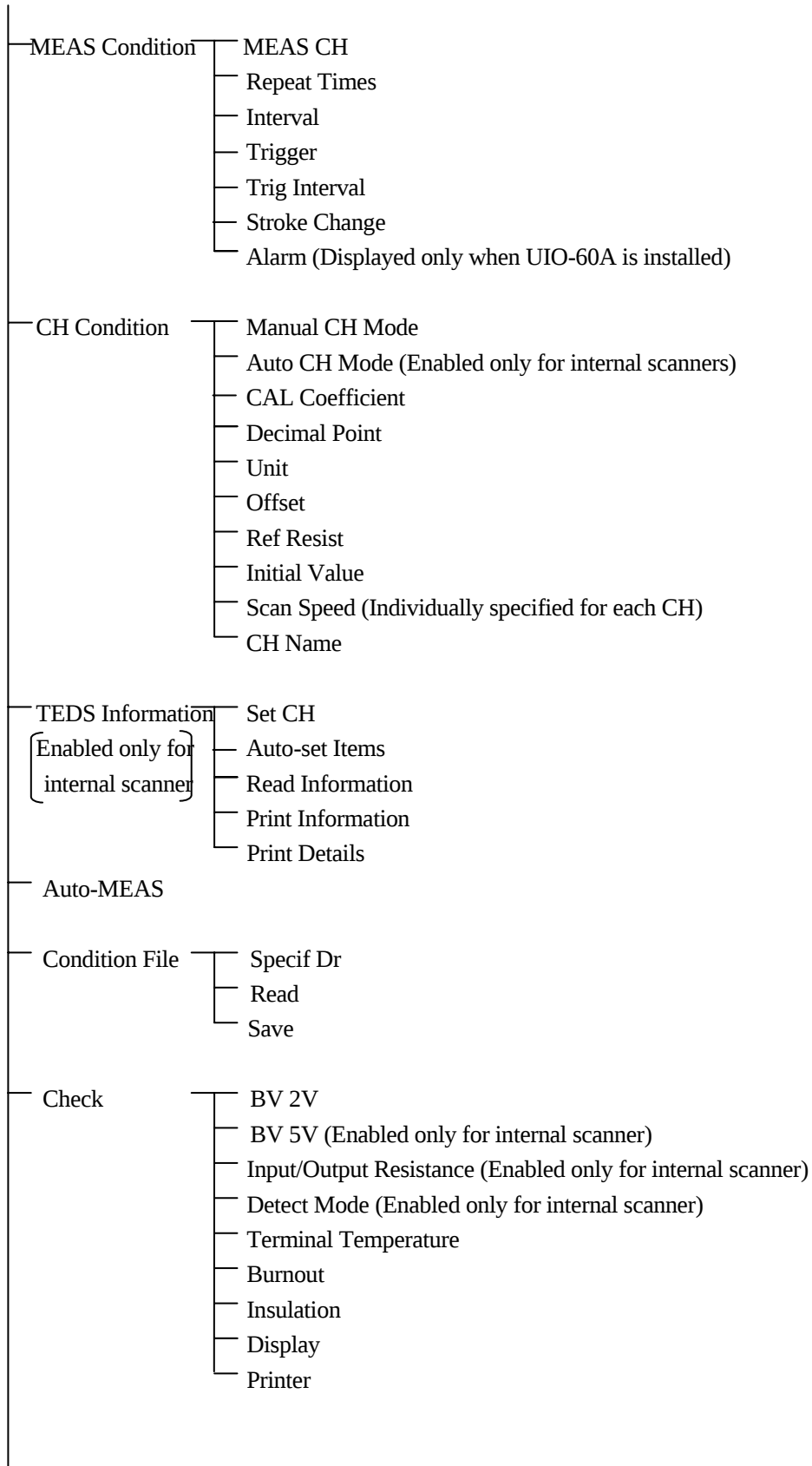
Set the auto-measurement to ON and press the  key to start the auto-measurement.

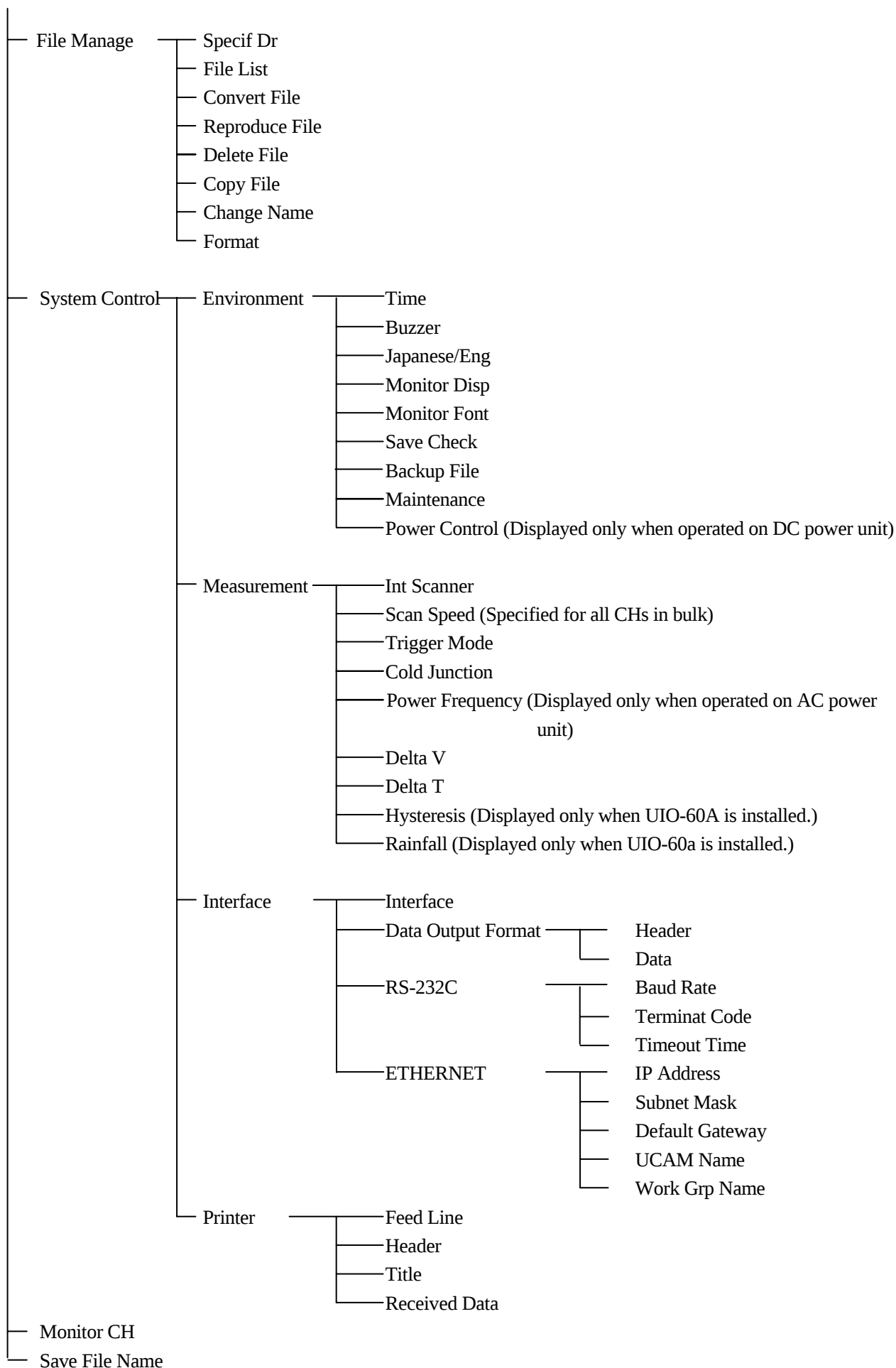
Press the  key to return to the ready state.



4-4 MENU LIST

Items determined by pressing the  key are in the following tree structure. To return to the previous menu, press the  key.





5. BASIC SETTING FOR MEASUREMENT

This Chapter is related to basic settings required for the measurement.

5-1 SYSTEM CONTROL

Set items included in [1: Measurement] in the [7: System Control] main menu.

Procedures for indicating the selected item are described in the following.

4: Condition file
5: Check
6: File Manage
7: System Control

Press the key on the main menu or the move the cursor key (or) to have the cursor on the [7: System Control] and then, press the key.

0: Environment
1: Measurement
2: Interface
3: Printer

Press the key with the screen on the left [System Control] menu or press the cursor key (or) with the cursor on the [1: Measurement] and then, press the key.

0: Int Scanner
1: Scan Speed
2: Trigger Mode
3: Cold Junction

[Measurement] menu items are displayed.

5-1-1 Setting Internal Scanners

Set whether or not internal scanners is used.

Procedures for using the internal scanners are described in the following.

0: Int Scanner
1: Scan Speed
2: Trigger Mode
3: Cold Junction

Press the key on the [Measurement] menu or press the key with the cursor on the [0: Int Scanner].

Int Scanner
Use
(1: Use)
(0: Not use)

Pressing the key changes the display to indicate the "Use." Press the key with the above state to determine the use of the internal scanner and the indication returns to the [Measurement] menu.

NOTE

- When the internal scanner is set to “Use,” CH Nos. from 000 to 029 are allotted to the internal scanner.
 - When the external scanner is used, set CH No. of external scanner to the No. other than set for the internal scanner.
- (1) When using scanners of USB-70 series, set the scanner CH switch to more than 03.
(A scanner unit with its CH switch set to 03 is allotted with CHs from 030 to 039.)
- (2) When using scanners USB-50/51, set the BOX No. to more than 1. (A scanner unit with its BOX No. set to 1 is allotted with CHs from 050 to 099.)

5-1-2 Setting Scanning Speed

The UCAM-60B is capable of various measurements while switching the CHs. The time required for measuring 1 CH is called the scanning speed (or time) which is expressed with time/CH.

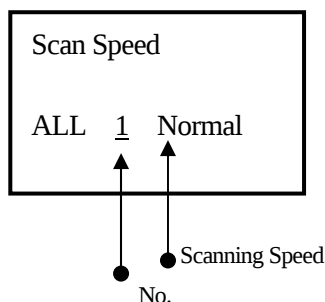
The following 8 types of scanning speed can be selected in the UCAM-60B.

0: High speed	Enabled only for internal scanners with 20 ms/CH. Preset CH mode has the priority. For details, see message in MEMO.
1: Normal	Standard scanning speed. However, varies with CH modes and scanners. For details, see messages in MEMO.
2: 0.28 sec	0.28 sec/CH
3: 0.5 sec	0.5 sec/CH
4: 1 sec	1 sec/CH
5: 2 sec	2 sec/CH
6: 5 sec	5 sec/CH
7: 10 sec	10 sec/CH

Operations required for collectively setting all CHs to ‘Normal’ scanning speed are described in the following.

0: Int Scanner
1: Scan Speed
2: Trigger Mode
3: Conld Junction

Press the **1** key on the [Measurement] menu or press the **ENTER** key with the cursor on the [1: Scan Speed]. And then, a number that sets the scanning speed and the scanning speed appear.



Press the **1** key to change the indication to “Normal.” Press the **ENTER** key in the above state to determine the “Normal.”

Or, press the cursor key (**<** or **>**) while pressing the **SHIFT** key to sequentially change the scanning speed display. Therefore, select the “Normal” and press the **ENTER** key. Thereafter, press the **ESC** key to return the indication to the [Measurement] menu.

MEMO

This menu is specified for setting the scanning speed.

For details of the scanning speed, see “5-3-2 Setting Scanning Speed” and confirm the scanning speed menu for every CH.

When the [Scan Speed] is set to “High Speed,” the UCAM-60B is always conducting preliminary measurement except when it is monitoring data.

While the UCAM-60B is conducting the preliminary measurement, scanning unit LED is flickering.

In addition, since results of preliminary measurement are used for the actual measurement, take special care for handling the connected sensors, etc.

MEMO

- CH mode and scanning speed

Settings of the CH mode has priority over the scanning speed. Therefore, CHs that are set to high resolution mode (4G_HR, 4GI_HR) cannot be faster than 0.28 sec/CH.

In addition, the CH mode 4G/T is not corresponding to high speed mode.

- Scanning speed and scanners

Scanning speed “High Speed” is enabled only for the UCAM-60B internal scanners.

Do NOT set the “High Speed” to external scanners.

The following describes the scanner state when the scanning speed is set to “Normal.”

Internal scanner = 50 ms /CH (High resolution mode: 0.28 sec/CH)

USB-70 series = 60 ms/CH (When power frequency is 60 Hz: 58.4 ms/CH)

USB-50/51 series= 80 ms/CH (When power frequency is 60 Hz: 66.7 ms/CH)

5-1-3 Setting Cold Junction Compensation

When using a method for cold-junction compensation that measures the temperature by thermocouple instrument, select either one from the following 2 selections.

0: Internal (Internal cold junction compensation is conducted by the UCAM-60B.)

1: External (Cold junction compensation is conducted by other than the UCAM-60B and the output results are entered into the scanner.)

No internal cold junction compensation is conducted by the UCAM-60B.

Operations required for setting cold junction compensation in the UCAM-60B are described in the following.

0: Int Scanner
1: Scan Speed
2: Trigger Mode
3: Cold Junction

Press the **3** key on the [Measurement] menu or press the **ENTER** key with the cursor on the [3: Cold Junction].

Cold Junction
Internal
(1: External)
(0: Internal)

Press the **0** key to change the indication to [Internal]. Pressing the **ENTER** key in this state determines the selected [Internal] and the indication returns to the [Measurement] menu.

5-1-4 Setting Power Frequency

Power frequency required for operating the UCAM-60B is described.

MEMO

- For AC power supply device
 1. Not required to set the power frequency if the “MEAS Timing” is set to “Synchronous.”
The required power frequency is automatically detected and set.
 2. Do not forget to set the power frequency if the “MEAS Timing” is set to “Asynchronous.”
- For DC power supply device
 1. Do not forget to set the power frequency.

NOTE

- Always set the local power frequency matched with the operating voltage specified for the UCAM-60B.
- Or, measured values may be fluctuated and cause trouble.

Operation method when the power frequency is set to 50 Hz is described in the following.

1: Scan Speed
2: Trig Mode
3: Cold Junction
4: Power Frequency

Press the **4** key on the [Measurement] menu or press the **ENTER** key with the cursor on the [4. Power Frequency].

Power Frequency
50Hz
(1:60Hz)
(0:50Hz)

Press the **0** key to change the indication to [50 Hz]. Press the **ENTER** key in this state to determine the selected [50 Hz] and the indication returns to the [Measurement] menu.

5-2 SETTING MEASURING CONDITIONS

This section describes various items included in [0: MEAS Condition] of the main menu.

Procedures for indicating the above items are described in the following.

0: MEAS Condition

1: CH Condition

2: TEDS Information

3: Auto-MEAS

Press the **0** key on the main menu or press the cursor key (**▲** or **▼**) to have the cursor on the [0: MEAS Condition] and then, press the **ENTER** key.”

0: MEAS CH

1: Repeat Times

2: Interval

3: Trigger

[MEAS Condition] menu items are displayed.

5-2-1 Setting MEAS CH

Set the “First CH” and the “Last CH” of the measuring CHs (MEAS CH). The UCAM-60B conducts measurement of CHs between the above first and last CHs.

Operation of measurement from 000 to 009 CHs are described in the following.

0: MEAS CH

1: Repeat Times

2: Interval

3: Trigger

Press the **0** key on the [MEAS Condition] setting menu or press the cursor key (**▲** or **▼**) to have the cursor on the [0 :MEAS CH] and then, press the **ENTER** key.

MEAS CH

First CH:000

Last CH:009

(000~999)

Input the “First CH” and “Last CH” with numeric keys (**0** to **9**). To change the CH numbers, move the cursor to the required position and re-input the changed data.

Pressing the **ENTER** key determines the changed CH No. and the indication returns to the [MEAS Condition] setting menu.

5-2-2 Setting Repeat Times

Set the number of times to be measured at 1 measurement start operation between the “First CH” and “Last CH.” If it is set to N times (1 to 99), CHs preset between the “First CH” and “Last CH” are measured for N times. In addition, if it is set to ‘00’ times, the measurement is continued until it is stopped.

Operation of measurement with the number of measuring times set to ‘1’ is described in the following.

0: MEAS CH
1: Repeat Times
2: Interval
3: Trigger

Repeat Times
Times :01
(01~99=Times)
(00=Infinite)

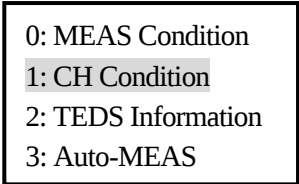
Press the **1** key on the [MEAS Condition] setting menu or press the cursor key (**▲** or **▼**) to have the cursor on the [1: Repeat Times] and then, press the **ENTER** key.

Input the desired repeat times with numeric keys (**0** to **9**).
To change the repeat times, move the cursor to the required position with the cursor key (**◀** or **▶**) and input the changed numeric once again.

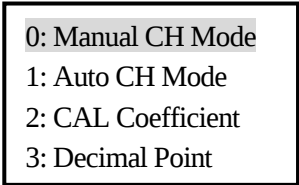
Pressing the **ENTER** key determines the required repeat times and the indication returns to the [MEAS Condition] setting menu.

5-3 SETTING CH CONDITIONS

This section describes various items included in [1: CH Condition] of the main menu.
Procedures for indicating the above items are described in the following.



Press the **1** key on the main menu or press the cursor key (**▲** or **▼**) to have the cursor on the [1: CH Condition] and then, press the **ENTER** key.



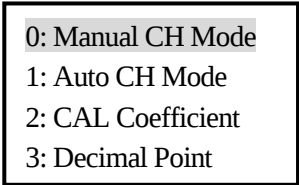
Menu items on the [CH Condition] setting menu are displayed.

5-3-1 Manually Setting CH Mode

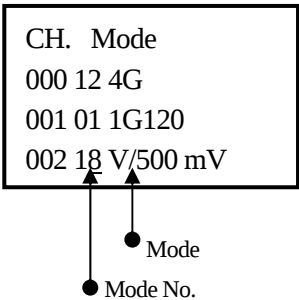
CH modes corresponding to connected sensors are set for every CH.

(1) Basic method for setting CH mode

CH mode setting operation is described in the following.



Press the **0** key on the [CH Condition] setting menu or press the cursor key (**▲** or **▼**) to have the cursor on the [0 : Manual CH Mode] and then, press the **ENTER** key.



Numbers for setting the CH mode (Mode No.) and the CH mode are displayed.

Input the desired mode No. with numeric keys (**0** to **9**). (See the list of CH modes for correspondence between the mode Nos. and CH modes.)

Press the **ENTER** key to determine the mode entered into the [CH] and the cursor moves to the next [CH].

Pressing the **ESC** key returns the indication to the [CH Condition] setting menu.

How to input the mode No. can be conducted by methods other than the above. See the succeeding pages.

- (2) Selecting and setting an arbitrary CH
You can select and set an arbitrary CH.

```
CH Mode
007 12 4G
008 12 4G
009 12 4G
```

Press the cursor key  to move the cursor to the [CH]. Input an arbitrary CH No. of the measuring CH.
Next, input the desired numeric with the numeric keys ( to ) and press the  key. Then, the specified CH is determined and

- (3) Mode No. can be increased or decreased and selected
Mode No. is increased or decreased to change the CH mode.

```
CH Mode
007 12 4G
008 12 4G
009 12 4G
```

Press the  key while pressing the  key with the cursor on the mode No. to increase the mode No. Pressing the  key in this state determines the incremented CH No.

In the same manner, press the  while pressing the  key.
Then, the mode No. decreases.

- (4) Copying the mode No.
Mode No. is copied to enable multi-CH settings.

```
CH Mode
000 12 4G
001 01 1G120
002 18 V/500mV
```

Press the  key or  key with the cursor set on the mode No. and press the  key. Then, CH mode copy screen is displayed

```
CH Mode
000 12 4G
Copy from :000
Copy to:001~009
```

Input CH No. of the copy destination and press the  key.
Then, the copying CH No. is determined to update the indication.

- Copy from: CH No.
- Copy to: CH No.

```
CH Mode
000 12 4G
001 12 4G
002 12 4G
```

■ List of CH Modes

Mode No.	CH Mode
00(SKIP)	Skip
01(1G120)	1-gage (120 Ω , BV 2V)
02(1G240)	1-gage (240 Ω , BV 2 V)
03(1G350)	1-gage 350 Ω , BV 2 V)
04(1G120/D)	1-gage 120 Ω , Dummy, BV 2 V)
05(1G120/A)	1-gage (120 Ω , Active, BV 2 V)
06(1G350/D)	1-gage (350 Ω , Dummy, BV 2 V)
07(1G350/A)	1-gage (350 Ω , Active, BV 2 V)
08(2G/A-D)	2-gage (Active-dummy, BV 2 V)
09(2G/A-A)	2-gage (Active-active, BV 2 V)
10(2G/COM-D)	2-gage (Common dummy, BV 2 V)
	*: Not available for internal scanner
11(4G/A-A)	4-gage (Opposite side active, BV 2V)
12(4G)	4-gage (Constant voltage, BV 2V)
13(4G_HR)	4-gage (Constant voltage, BV 5V) High resolution mode
14(4G/I(120))	4-gage (Constant current, 120 Ω)
15(4G/I(350))	4-gage (Constant current, 350 Ω)
16(4G/I_HR)	4-gage (Constant current, (350 Ω) High resolution mode
17(4G/T)	Transducer with temperature measuring function
18(V/500mV)	Voltage (500 mV)
19(V/50V)	Voltage (50 V)
20(I/50mA)	Current (50 mA)
21(TC/K)	Thermocouple (K)
22(TC/T)	Thermocouple (T)
23(TC/E)	Thermocouple (E)
24(TC/J)	Thermocouple (J)
25(TC/R)	Thermocouple (R)
26(Pt100)	Platinum resistance thermometer sensor 100 Ω (New JIS)
27(JPt100)	Platinum resistance thermometer sensor 100 Ω (Old JIS)
28(POT.)	Potentiometer sensor
29(1G120_5V)	1-gage (120 Ω , BV 5V)
30(1G240_5V)	1-gage (240 Ω , BV 5V)
31(1G350_5V)	1-gage (350 Ω , BV 5V)
32(1G120/D_5V)	1-gage (120 Ω , Dummy, BV 5V)
33(1G120/A_5V)	1-gage (120 Ω , Active, BV 5V)
34(1G350/D_5V)	1-gage (350 Ω , Dummy, BV 2 V)
35(1G350/A_5V)	1-gage (350 Ω , Active, BV 5V)
36(2G/A-D_5V)	2-gage (Active-dummy, BV 5V)
37(2G/A-A_5V)	2-gage (Active-active, BV 5V)
38(LVDT)	Linear variable differential transformer transducer
	*: Not available for internal scanner.
39(LVDT/T)	LVDT transducer with resistance thermometer sensor
	*: Not available for internal scanner.
40(POT./A)	Sliding resistance transducer (A section only)
	*: Not available for internal scanner.
41(POT./AB)	Sliding resistance transducer (Measures A and B sections)
	*: Not available for internal scanner.
42(USB-70A-S)	Using scanner USB-70A in "SCANNER" mode.
	*: Not available for internal scanner.
43(USB-50/51)	Using scanner USB-50/51 series
	*: Not available for internal scanner.

■ CH Mode Setting Available to Scanning Unit and External Scanner

- CH Mode can be set regardless of scanners or scanning units.
- Internal scanner installed scanning unit

CH Mode No.	Usable Scanning Unit and Scanner
01 to 09, 11 to 37	USS-61A/62A/63A USS-61B/62B/63B
10, 38 to 43	Cannot use

- USB-70A (When scanner “MODE SET” switch is set to “REMOTE.”)

USB-70B

USB-65A

CH Mode	Usable Scanning Unit and Scanner
01 to 12, 15, 18 to 25, 28	USB-70A-10/20/30 USB-70B-10/20/30
17, 26, 27	USB-70A-30 USB-70A-30
13, 14, 16, 29 to 43	Cannot use
38, 39, 40, 41	Generally not used. (Only when custom made USB-65A is used)

- USB-70A (When scanner “MODE SET” switch is set to “SCANNER.”)
Set the CH No. to ‘42’ and set the desired mode with the digital switch on the scanner side.
- USB-50/51 series
Set the CH No. to ‘43’ and set the desired mode with the digital switch on the scanner side.

5-3-2 Automatically Setting CH Mode

CH modes corresponding to connected sensors (strain) are automatically detected and set for every CH.

0: Manual CH Mode
1: Auto CH Mode
 2: CAL Coefficient
 3: Decimal Point

Press the **0** key on the [CH Condition] setting menu or press the cursor key (**▲** or **▼**) to have the cursor on the [1 : Auto CH Mode] and then, press the **ENTER** key.

Detect and set CH Mode
 Start: **START/STOP**
 Pause: **START/STOP**
 Return: **ESC**

Press the **START/STOP** key to start automatically setting the CH mode. While operating, press the **START/STOP** once again to stop the operation.

02/11 13:24:10
 CH. 000 ←
 Checking

Currently checking CH No. is indicated.

Preset CH Mode
 CH. CH Mode
 000 12 4G
 001 01 1G120

Checked results are displayed on the screen.
LIST key: Prints out the checked results.
▲ and **▼** keys: Moves the CH.
ESC key: Go back to the previous screen.

MEMO

The following 6 types of CH mode are automatically set selecting "Auto CH Mode.2

- 1-gage connection 1G 120 Ω, 1G 240 Ω, 1g 350 Ω
- 2-gage connection 2G/A-A
- 4-gage connection 4G
- Civil engineering transducer with temperature measuring function 4G/T
- Sensors other than the above Displayed with '99----.'
 Setting of this CH is not available. Manually set the CH mode.

5-3-3 Setting Scanning Speed

There are 2 ways to set the scanning speed, that is, by collectively setting the scanning speed for all CHs as described in “5-1-2” and by setting the same for every CH as described in this section. In either ways, the set items can be confirmed only on the window described in this section.

How to set the scanning speed is described in the following.

5: Offset
6: Ref Resistance
7: Initial Value
8: Scan Speed

Press the **8** key on the [CH Condition] setting menu or press the cursor key (**▲** or **▼**) to have the cursor on the [8: Scan Speed] and then, press the **ENTER** key.

CH Scan Speed
000 **1** Normal
001 1 Normal
002 1 Normal

Preset items of measuring CH are displayed.

Numbers corresponding to the scanning speed can be entered with numeric keys (**0** to **7**). Pressing the **ENTER** key determines the scanning speed entered into the [CH] and the cursor moves to the next [CH].

Pressing the **ESC** key returns the indication to the [CH Condition] menu.

0: High speed	Enabled only for internal scanners with 20 ms/CH. However, preset CH mode has priority. For details, see messages in “MEMO 2.”
1: Normal	Normal scanning speed. The scanning speed varies with CH mode and scanners. For details, see messages in “MEMO 2.”
2: 0.28 sec	0.28 sec/CH
3: 0.5 sec	0.5 sec/CH
4: 1 sec	1 sec/CH
5: 2 sec	2 sec/CH
6: 5 sec	5 sec/CH
7: 10 sec	10 sec/CH

MEMO 1

The scanning speed setting operation is capable of the following key operations as same as the CH mode setting operation.

- Press the cursor key  and move the cursor to the [CH]. Input and indicate the desired channel No. and press the  key to indicate the indicated value of the selected CH.
- Press cursor key ( or ) while pressing the  key to change the scanning speed display.
- Press the  key or press the  key while pressing the  key to copy the determined scanning speed

MEMO 2

- Channel mode and scanning speed

Settings of channel mode has priority over scanning speed. Therefore, the scanning speed of a channel with high resolution mode (4G_HR, 4G/L_HR) cannot be faster than 0.28 sec/channel.

In addition, channel mode 4G/T is not corresponding to the “High Speed” mode.

- Scanning speed and scanner

Scanning speed of “High speed” is effective only for UCAM-60B built-in internal scanners. Do not set the “High speed” to external scanners.

If the scanning speed is set to “Normal,” scanners shall be as follows.

- Internal scanner = 50 ms/CH (High resolution mode: 0.28 sec/CH)
- USB-70A series = 60 ms/CH (With power frequency 60 Hz: 58.4 msec/CH)
- USB-50/51 series = 80 ms/CH (With power frequency 60 Hz: 66.7 msec/CH)

5-3-4 Setting Calibration Coefficient

Coefficient used for converting a measured value into physical value is called a calibration coefficient. The calibration coefficient is set for every CH.

The calibration coefficient is set in a range from 1.0000E-9 to 9.9999E+9 and from -1.0000E-9 to -9.9999E+9.

There are 2 ways to input the calibration coefficient.

(1) Entering calibration coefficient with exponent

Example of entering '1.2345E+2' is described in the following.

0: Manual CH Mode
1: Auto CH Mode
2: CAL Coef
3: Decimal Point

Press the **[2]** key on the [CH Condition] setting menu or press the cursor key (**[↑]** or **[↓]**) to locate the cursor on the [2: CAL Coef] and then, press the **[ENTER]** key.

CH.	CAL Coef
000	1.2345E+2
001	1.0000E+0
002	1.0000E+0

Preset items of the measuring CH are displayed.

Input calibration coefficient with numeric keys (**[0]** to **[9]**). However, it is not necessary to input a decimal point or a letter **[E]**. In addition, input a "+" sign with the **[0]** key and, "-" sign with the **[+/-]** key.

Press the **[ENTER]** key to determine the calibration coefficient that is then entered to the [CH] and then, the cursor moves to the next [CH]. Press the **[ESC]** key and the indication returns to the [CH Condition] menu.

(2) Entering calibration coefficient without exponent

Example of entering '123.45' is described in the following.

0: Manual CH Mode
1: Auto CH Mode
2: CAL Coef
3: Decimal Point

Press the **[2]** key on the [CH Condition] setting menu or press the cursor key (**[↑]** or **[↓]**) to locate the cursor on the [2: CAL Coef] and then, press the **[ENTER]** key.

CH.	CAL Coef
000	123.45
001	1.0000E+0
002	1.0000E+0

Preset items of the measuring channel are displayed.

Press the **[DEL]** key to delete the portion to input the calibration coefficient.

In the above state, input numeric keys **[1]**, **[2]**, **[3]**, **[.]**, **[4]**, and **[5]** and press the **[ENTER]** key. Then, indication of the calibration coefficient is converted into exponent display and the cursor moves to the next [CH].

Press the **[ESC]** key and the indication returns to the [CH Condition] setting menu.

CH.	CAL Coef
000	1.2345E+2
001	1.0000E+0
002	1.0000E+0

MEMO

- Calibration coefficient is enabled (when the measured value is converted into physical value) when the measuring function is set to “MEAS.,” “EASY MEAS,” and “ORIG.,” and when the **COEF** key LED is lighted up.
- The **COEF** key LED turns ON/OFF every time the **COEF** key is pressed.

MEMO

The calibration coefficient setting operation is capable of the following key operations as same as the CH mode setting operation.

- Press the cursor key  and move the cursor to [CH]. Input and display the required channel No. and press the ENTER key to display the set value of the selected CH.
- Press the  key or press the **ENTER** key while pressing the **SHIFT** key to copy the determined calibration coefficient.

5-3-5 Setting Digits Below Decimal Point

When measured value is indicated in physical value, a decimal point position can be set by referring to the following.

0: (#####)	No decimal point
1: (#####.#)	Displays 1 digit below decimal point
2: (#####.##)	Displays 2 digits below decimal point
3: (#####.###)	Displays 3 digits below decimal point
4: (#####.####)	Displays 4 digits below decimal point
5: (#####.#####)	Displays 5 digits below decimal point

How to set numeric with 3 digits below decimal point is described in the following.

0: Manual CH Mode
1: Auto CH Mode
2: CAL Coef
3: Decimal Point

Press the **3** key on the [CH Condition] setting menu or press the cursor key (**▲** or **▼**) to locate the cursor on the [3: Decimal Point] and then, press the **ENTER** key.

CH. Decimal Point
000 **3** (#####)
001 0 (#####)
002 0 (#####)

Preset contents of the measuring channel are displayed.
Input a numeric key **3**.
Press the **ENTER** key to determine the decimal point entered for the [CH] and the cursor moves the succeeding [CH].
Press the **ESC** and the indication returns to the [CH Condition] setting menu.

MEMO

The decimal point position setting operation is capable of the following key operation as same as the CH mode setting operation.

- Press the cursor key **◀** and move the cursor to [CH]. Press the **ENTER** key to display the set value of the selected channel No.
- Press the cursor key (**◀** or **▶**) while pressing the **SHIFT** key to change the decimal point position.
- Press the  key or press the **ENTER** key while pressing the **SHIFT** key copy the determined decimal point position.

5-3-6 Setting Unit

Units for indicating measured values in physical values are described.

Required unit is entered with the unit No. (See the following “List of Unit Nos.”)

1: Auto CH Mode
2: CAL Coef
3: Decimal Point
4: Unit

Press the **4** key on the [CH Condition] setting menu or press the cursor key (**▲** or **▼**) to locate the cursor on the [4: Unit] and then, press the **ENTER** key.

CH. Unit
000 00 (με)
001 00 (με)
002 00 (με)

Preset contents of the measuring channel are displayed.

Input the desired unit No. with numeric keys (**0** to **9**).

Pressing the **ENTER** key determines the unit No. entered in the [CH] and the cursor moves to the succeeding [CH].

Press the **ESC** key and the indication returns to the [CH Condition] setting menu.

List of Unit Nos.

Unit No.	Unit	Unit No.	Unit	Unit No.	Unit
00	με	20	cm/s ²	40	m/s
01	Mm/m	21	m/s ²	41	m/min
02	mN	22	G	42	km/h
03	N	23	g	43	Hz
04	kN	24	kg	44	kHz
05	MN	25	t	45	MHz
06	N · m	26	ms	46	rpm
07	kN · m	27	s	47	Ω
08	N · cm	28	min	48	kΩ
09	Pa	29	h	49	MΩ
10	hPa	30	mV	50	mW
11	kPa	31	V	51	W
12	MPa	32	mA	52	kW
13	N/mm ²	33	A	53	dB
14	N/m ²	34	K	54	%
15	mmHg	35	°C	55	ppm
16	kgf/cm ²	36	rad	56	pH
17	mm	37	°	57	R
18	cm	38	rad/s	58	(Blank)
19	m	39	cm/s		

MEMO

The unit setting operation is capable of the following key operation as same as the CH mode setting operation.

- Press the cursor key  and move the cursor to the desired [CH]. Input the CH No. and press the  key to display the set value of the selected CH.
- Press the cursor key ( or ) while pressing the  key to change the indicated unit.
- Press the  key or press the  key while pressing the  key to copy the determined unit.

5-3-7 Setting Reference Resistance Value

When a resistance thermometer sensor or KYOWA's transducer with temperature measuring function is used, input resistance value of 0°C of a sensor in use.

3: Decimal Point
4: Unit
5: Offset
6: Ref Resist

Press the  key on the [CH Condition] setting menu or press the cursor key ( or ) to locate the cursor on the [6: Ref Resist] and then, press the  key.

CH. Ref Resist
000 -----
001 -----
002 100.00 Ω

Preset contents of the measuring channel are displayed. (For reference resistance value of other than the resistance thermometer sensor and transducer with temperature measuring function, it is indicated as “---.”)

Input resistance value with numeric keys ( to ).

Pressing the  key determines the resistance value entered for the [CH] and the cursor moves to the succeeding [CH].

Press the  key and the indication returns to the [CH Condition] setting menu.

NOTE

- Always correctly set the resistance value of 0 °C or, it may erroneous measured value may result.
- If the reference resistance value is unknown, set “100.00.”

NOTE

The reference resistance value setting operation is capable of the following key operation as same as the CH mode setting operation.

- Press the cursor key  to move the cursor key to the desired [CH]. Input the CH No. and press the  key to display the set value of the selected CH.
- Press the  key or press the  key while pressing the  key to copy the determined reference resistance value.

5-4 SETTING REQUIRED CONDITIOS BY TEDS INFORMATION

The UCAM-60B is designed to read TEDS (Transducer Electronic Data Sheet) information and automatically set the appropriate CH mode, CAL coefficient, decimal point, and unit.

5-4-1 Corresponding Sensors

NOTE

- Reading all the TEDS sensor information are not available.
- Reading TEDS sensor information of external scanners is not available.
- Only sensors connected to internal scanner can read the TEDS sensor information.

Reading available TEDS sensor template ID and dedicated scanning unit are described in the following.

Dedicated Scanning Unit	Reading	Template ID	Sensor Type
USS-61B	Enable	33	Strain gage sensor
USS-62B	Enable	33	Strain gage sensor
USS-63B	Enable	33	Strain gage sensor
USS-21A/61A	Disable	-----	-----
USS-22A/62A	Disable	-----	-----
USS-23A/63A	Disable	-----	-----

5-4-2 TEDS Information

Set menu items in [2: TEDS Information] on the main menu.

See the following for selecting the TEDS information.

0: MEAS Condition
1: CH Condition
2: TEDS Information
3: Auto-MEAS

Press the **2** key on the main menu or press the cursor key (**▲** or **▼**) to locate the cursor on the [2: TEDS Information] and then, press the **ENTER** key.

0: Set CH
1: Auto-set Items
2: Read Information
3: Print Information

[TEDS Information] menus are displayed.

5-4-2-1 Setting Set CH

Set whether or not the connected TEDS sensor information are read for every CH.

0: Set CH

1: Auto-set Items

2: Read Information

3: Print Information

Press the **0** key on the [TEDS Information] menu or press the cursor key (**▲** or **▼**) to locate the cursor on the [0: Set CH] and then, press the **ENTER** key.

CH	Setting
000	1 ON
001	1 ON
002	0 OFF

Input numeric key (**0** or **1**).

- 1: ON TEDS sensor information is read.
- 0: OFF TEDS sensor information is not read.

Press the **ENTER** key to determine the CH setting and the cursor moves to the next CH.

Press the **ESC** key to return the indication to the [TEDS Information] menu.

MEMO

The setting CH operation is capable of the following key operation as same as the [CH Mode] setting operation.

- Press the cursor key **◀** key to the desired [CH]. Input the CH No. and press the **ENTER** key to display the set value of the selected CH.
- Press the  key or press the **ENTER** key while pressing the **SHIFT** key to copy the determined set value.

5-4-2-2 Setting Auto-Set Items

After reading TEDS sensor information, items reflecting to CH condition are set.

This setting is collectively set to all the CHs and not individually set for every CH.

0: Set CH

1: Auto-set Items

2: Read Information

3: Print Information

Press the **1** key on the main menu or press the cursor key (**▲** or **▼**) to locate the cursor on the [1: Auto-set Items] and then, press the **ENTER** key.

CH Mode	ON
CAL Coef	ON
Decimal Point	ON
Unit	ON

Move the cursor to the desired item on the [Auto-set Items] menu and press the cursor key (**◀** or **▶**) to set either “ON” or “OFF.”

- “ON”: Reflected
- “OFF”: Not reflected.

Press the **ENTER** key to determine the setting and the indication returns to the [TEDS Information] menu.

Press the **ESC** key to return the indication to the [TEDS Information] menu without determining the setting.

5-4-2-3 Reading TEDS Information

After reading TEDS sensor information, the TEDS information is reflected to CH conditions.

0: Set CH
1: Auto-set Items
2: Read Information
3: Print Information

Press the **2** key on the [TED Information] menu or press the cursor key (**↑**) or (**↓**) to locate the cursor on the [2: Read Information] and then, press the **ENTER** key.

Read TDS Information
Start: START/STOP
Pause: START/STOP
Return: ESC

Execute key appears.

Press the  key to start reading the TEDS information.

Press the  key once again to stop the operation.

02/11 13:24:10
CH. 000
Reading

CH No. currently reading the TEDS information is displayed.

Read TEDS Information
CH. Results
000 OK
001 OK

After reading the TEDS information, the read results are displayed on the window.

Press the **LIST** key to printout the read results.

Press the **ESC** key to return to the previous display.

MEMO

- Read result display
 - “ON”: Normal
 - “NG”: Faulty (TEDS sensor not connected, etc.)
 - “_ _”: Set CH is set to “OFF.”

Set CH is set to “ON”								
Read Results	Auto-set Items							
	CH Mode		CAL Coefficient		Decimal Point		Unit	
	ON	OFF	ON	OFF	ON	OFF	ON	OFF
OK	○	-	○	-	○	-	○	-
NG	-	-	-	-	-	-	-	-
--	-	-	-	-	-	-	-	-

○: Reflected to CH condition.

-: Not reflected to CH condition. (Remains as it is)

5-4-2-4 Printing TEDS Information

TEDS sensor information of the correctly CH is printed out.

0: Set CH
1: Auto-set Items
2: Read Information
3: Print Information

Press the **3** key on the [TED Information] menu or press the cursor key (**↑**) or (**↓**) to locate the cursor on the [3: Print Information] and then, press the **ENTER** key.

Print TEDS
Information
Print CH: 000

Input the desired CH No with numeric key (**0** to **9**). Press the **ENTER** key to print out the selected TEDS information.
Press the **ESC** key to return the indication to [TEDS Information] menu.

- Printing Example

```
< Sensor Info >
CH No.
:8
Model Number
:58 (KYOWA)
Version Letter
:99
Version Number
:A
Serial Number
:5
Selector
:4123456
```

MEMO

- TEDS information of the incorrectly read CH is not printed out.
- For details of the TEDS information, refer to TEDS sensor manufacturing company.

5-4-2-5 Printing Detailed TEDS Information

TEDS information of the correctly read CH is printed out in details.

1: Auto-set Items
2: Read Information
3: Print Information
4: Print Details

Press the **4** key on the [TEDS Information] menu or press the cursor key (**▲** or **▼**) to locate the cursor on the [4: Print Details] and then, press the **ENTER** key.

Print TEDS Information
In Details
Print CH: 000

Input the desired CH No with numeric key (**0** to **9**). Press the **ENTER** key to print out the selected detailed TEDS information.
Press the **ESC** key to return the indication to [TEDS Information] menu.

- Printing Example

```

< Sensor Info >
CH No.
:8
Unique Registration
Number
:2DFE7D1800000013
Manufacture ID
:58 (KYOWA)
Model Number
:99
Version Letter
:A
Version Number
:5
Serial Number
:4123456
Selector
:0

Template ID
:39
Physical Measurand
:mm
Minimum physical value
:0.000000
Maximum physical value
:5.000000
Transducer Electrical
Signal Type
:Bridge Sensor
Full-Scale Electrical
Value Precision
:2
Minimum electrical
output
:0.000000
Maximum electrical
output
:0.001000
Mapping Method
:Linear
Bridge Type
:Full
Bridge element
Impedance
:350.000000
Response Time
:0.472485
Excitation level,
normal
:2.000000
Excitation level,
nmin
:1.000000
Excitation level,
max
:6.000000
Calibration Date
:2005/04/14
Calibration Initials
:TED
Calibration Period
:365
Measurement location ID
:0
Selector
:3
Extended Selector
:1

```

MEMO

- TEDS information of the incorrectly read CH is not printed out.
- For details of the TEDS information, refer to TEDS sensor manufacturing company.

6. FILE OPERATION

This Chapter describes details of saving measuring conditions and measured data in internal memory or flash ATA memory card with the following extensions

Extension	Description of Files
prm	Measuring condition file. Input the file name with 1 to 8 characters.
ini	Data file of initial measurement. Input the file name with 1 to 7 characters.
rtn	Data file of realtime measurement. Input the file name with 1 to 7 characters.
itl	Data file of interval measurement. Input the file name with 1 to 7 characters.
trg	Data file of trigger measurement. Input the file name with 1 to 7 characters.
t_i	Data file of trigger interval measurement. Input the file name with 1 to 7 characters.
csv	CSV converted measured data file.

Measured data saved in the memory is converted into CSV format file and saved.
At this time, extension of the converted file is 'csv.'

NOTE

- Use the flash ATA memory card that is formatted in FAT format.
- When using the flash ATA memory card, format the flash ATA card with your PC with FAT format in advance
- Use our recommended flash ATA memory card.
- While accessing to the flash ATA memory card, the LED lights up.
At this time, do NOT extract the flash ATA memory card.

MEMO

- You can use our recommended CF card instead of flash ATA memory card.
When using the CF card, customers are required to separately prepare a PC card adaptor.
- When using the CF card, format the CF card with your PC with FAT format in advance.
- While accessing to the CF card, the LED lights up
At this time, do NOT extract the CF card.
- Use our recommended CF card.
(Recommended) SanDisk made product
SDCFB-1000-801 (Capacity: 1 GB)
You can also use the CF card with capacity less than 1 GB.
(Limited to the above series)
Dedicated adaptor: SDCF-03A

6-1 SAVING AND READING CONDITION FILE

6-1-1 Saving Condition File

Measuring conditions can be saved as a file. Set the file name within 1 to 8 characters and with extension ‘prm.’
Following is an example for saving the file into the internal memory with a name ‘test.’

1: CH Condition
2: TEDS Information
3: Auto-MEAS
4: Condition File

Press the **4** key on the main menu or press the **ENTER** key with the cursor on the [4: Condition File].

0: Specif Dr
1: Read
2: Save

Press the **0** key with the indication on the left [Condition File] menu or press the **ENTER** key with the cursor on the [0: Specif Dr].

Specif Dr
Memory
(1: Memory)
(0: PC Card)

Press the **1** key on the left indication, set the save destination drive to “Memory” and press the **ENTER** key. Then, the indication returns to [Condition File] menu.

0: Specif Dr
1: Read
2: Save

Press the **2** key on the [Condition File] menu or press the **ENTER** key with the cursor on the [2: Save].

File Name

(abcdefghij)
0123456789

Input characters with numeric keys (**0** to **9**). Pressing the cursor key (**^** or **v**) changes the characters corresponding to the numeric keys. (See the following table.)

Numeric key	0123456789
^	0123456789
	abcdefghij
	klmnopqrst
v	uvwxyz#%&-@
	_~()

File Name
test
(abcdefghijklmnopqrstuvwxyz)
0123456789

Suppose a “test” is entered as a file name. Move the cursor key  to indicate characters from ‘k’ to ‘t’ and press . Move the cursor with the  key to indicate characters from ‘a’ to ‘j’ and press . Next, move the cursor with  once again and press  and . Then, press the  key to save the measuring conditions and the indication returns to the [Condition File] menu.

6-1-2 Reading Condition File

Previously saved measuring condition files are read and set.

Procedures for reading previously set files from the internal memory are described in the following.

0: Specif Dr
1: Read
2: Save

Press the  key on the left indication [Condition File] menu or press the  key with the cursor on the [0: Specif Dr].

Specif Dr
Memory
(1: Memory)
(0: PC Card)

Press the  key on the left indication and set the desired drive to “Memory” and press the  key. Then, the indication returns to the [Condition File] menu.

0: Specif Dr
1: Read
2: Save

Press the  key on the [Condition File] menu or press the  key with the cursor on the [1: Read].

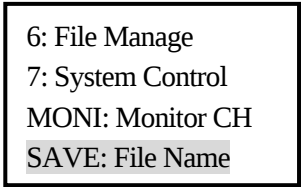
File Name
test.prm
test1.prm
test2.prm

A file name of the previously saved condition file appears. Move the cursor with the cursor key ( or ) to a cursor reading file name and press the  key. Then, the required file name is read and the indication returns to the [Condition File] menu.

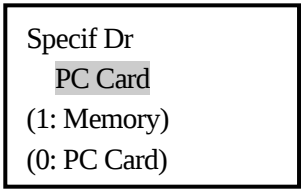
6-2 SAVING MEASURED DATA

6-2-1 Setting and Saving File Name

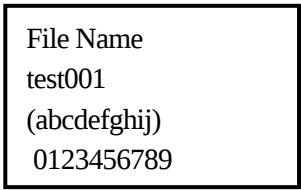
Set a drive and file name for saving measured data. The file name is set in 7 characters.



Press the **SAVE** key on the main menu or press the **ENTER** key with the cursor on the [Save: File Name].



Select the required drive for saving data. Press the **1** key to select the internal memory and, **0** key to select the PC card. The indication on the left shows the state that the PC card is selected. Then, press the **ENTER** key.



Input characters with numeric keys (**0** to **9**). Every time the cursor key (**▲** or **▼**) is pressed, characters corresponding to numeric keys vary. (See the following table.) Press the **ENTER** key to determine the file name and the indication returns to the main menu.

*: Alphanumeric Entry Table

Numeric key	0123456789
▲	0123456789
	abcdefghijklmnopqrstuvwxyz
▼	klmnopqrst
	uvwxyz#%~@
	_~()

MEMO

Drive for saving data is indicated with the following icons.

- : “Internal Memory” is set for saving data.
- : “PC Card” is set for saving data.

6-2-2 Saving Data

Measured data is saved into the file by adding new data at every measurement. When saving the measured data, the **SAVE** key LED on the front panel should be lighted up. The LED turns ON/OFF every time the **SAVE** key is pressed.

6-2-3 Data File Format

Data of the UCAM-60B is saved in KYOWA's data file format. This section describes the data file format used for saving the UCAM-60B acquired data.

Data that is filed by this data file format is saved in additional form.

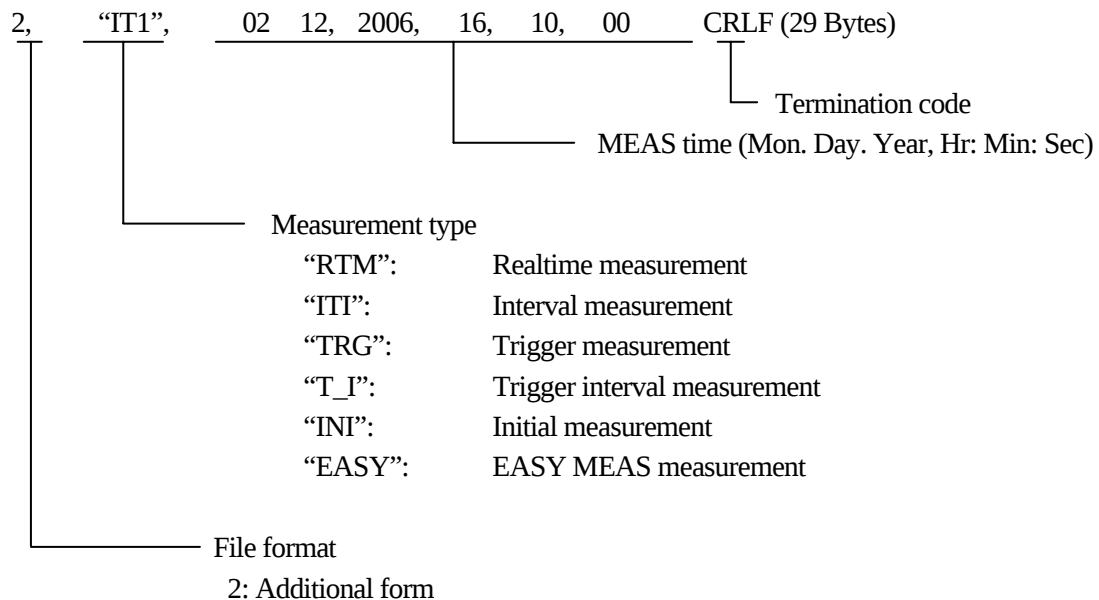
- Additional form: Additional form is a data file format in which data of multiple measurements are added and saved into one file (“Multiple measurement/file”).

- Inner description of the file

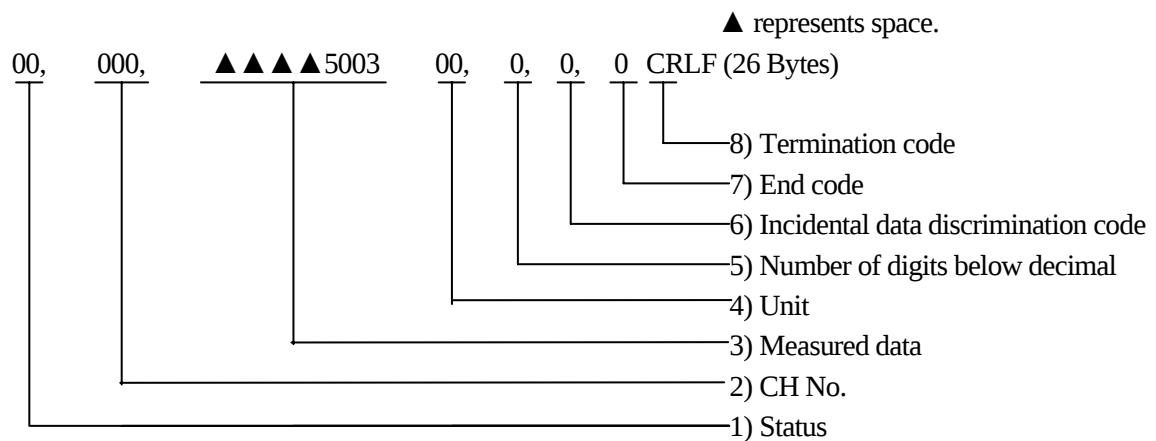
Data in the file is saved in ASCII code format as shown in the following.

2,"TT1",08,12,2003,16,10,00	→(1) Header
00,000, 5003,00,0,0,0	
00,001, 402,00,0,0,0	
00,002, 0,00,0,0,0	
00,003, -1,00,0,0,0	
00,004, 0,00,0,0,0	
00,005, -18.266,30,3,0,0	
00,006, 0,00,0,0,0	
00,007, -0.0007,31,4,0,0	
00,008, 1,00,0,0,0	
00,009, 0,00,0,0,1	
	→ (2) Measured data

(1) Header



(2) Measured data



1) Status:

Status No.	Details
00	Normal data
01	Exceeding measured data
02	Initial value is faulty
03	Exceeding indication and the number of printed out digits
04	Using unusable CH mode
05	Exceeding thermocouple measuring range
06	Common dummy does not exist. Measured data of dummy CH is faulty
07	Terminal temperature of thermocouple measurement is faulty
08	Skip CH
09	Disconnected
10	Scanner transmission error
11	A-D converter faulty
30	CH mode between the UCAM-60B and USB-70A does not match
31	Scanner not installed

2) CH No.: Measurement CH Nos. (from 000 to 999)

3) Measured data: Measured data

4) Unit No.

No.	Unit	No.	Unit	No.	Unit
00	$\mu\epsilon$	20	Cm/s^2	40	m/s
01	$\mu\text{m/m}$	21	m/s^2	41	m/min
02	mN	22	G	42	km/h
03	N	23	g	43	Hz
04	kN	24	kg	44	kHz
05	MN	25	t	45	MHz
06	$\text{N} \cdot \text{m}$	26	ms	46	rpm
07	$\text{kN} \cdot \text{m}$	27	s	47	Ω
08	$\text{N} \cdot \text{cm}$	28	min	48	$\text{k}\Omega$
09	Pa	29	h	49	$\text{M}\Omega$
10	hPa	30	mV	50	mW
11	kPa	31	V	51	W
12	MPa	32	mA	52	kW
13	N/mm^2	33	A	53	dB
14	N/m^2	34	K	54	%
15	mmHg	35	$^{\circ}\text{C}$	55	ppm
16	Kgf/cm^2	36	rad	56	pH
17	mm	37	$^{\circ}$	57	R
18	cm	38	rad/s	58	(Blank)
19	m	39	cm/s		

5) Number of digits below decimal point

6) Incidental data discrimination code

0: Data other than the following item '1.'

1: Incidental data (Temperature data of transducer with temperature measuring function)

7) End code

0: CH other than the last CH

1: Last CH at the end of measurement repeat times

2: Last CH on half way of the measurement repeat times.

3: CH when the measurement is stopped on half way of the measurement.

8) Termination code: End code

CR (0x0D) LF (0x0A)

6-3 FILE MANAGEMENT

The following operations are allowed for measuring condition file (condition file) and measured data file (data file) in the internal memory and PC card.

- | | |
|-------------------|---|
| 1: File List | Lists up file names in the selected drive. |
| 2: Convert File | Converts the selected data file into CSV format file. |
| 3: Reproduce File | Prints out the selected data file. |
| 4: Delete File | Deletes the selected file. |
| 5: Copy File | Copies file between internal memory and PC card. |
| 6: Change Name | Changes the file name. |
| 7: Format | Deletes all files in the selected drive. |

3: Auto-MEAS
4: Condition File
5: Check
6: File Manage

Press the **[6]** key on the main menu or press the **[ENTER]** key with the cursor on the [6: File Manage].

0: Specif Dr
1: File List
2: Convert File
3: Reproduce File

The [File Manage] menu appears as shown on the left. The file operations are conducted from this indication.

6-3-1 Selecting Drive

Select a desired drive for operation. File operation is conducted for the selected drive. Do not forget to select and set the drive before the file operation

0: Specif Dr
1: File List
2: Convert File
3: Reproduce File

Press the **[0]** key on the [File Manage] menu or press the **[ENTER]** key with the cursor on the [0: Specif Drive].

Specif Dr
Memory
(1: Memory)
(0: PC Card)

Select the desired drive. Press the **[0]** key to select the PC card and, **[1]** key to select the internal memory. Indication on the left shows the state that the internal memory is selected. Press the **[ENTER]** key to return to [File Manage] menu.

NOTE

A drive specified at this time is for operation in the [File Manage] menu and not for a drive that is iconized on the ready state window and specified for saving data.

6-3-2 List of Files

0: Specif Dr
1: File List
2: Convert File
3: Reproduce File

Press the **[1]** key on the [File Manage] menu or press the **[ENTER]** key with the cursor on the [1: File List].

File List
test001.prm
test001.rtm
test002.rtm

Files in the selected drive are listed up.
Press the **[ENTER]** or **[ESC]** key and the indication returns to the [File Manage] menu.

6-3-3 Converting File

0: Specif Dr
1: File List
2: Convert File
3: Reproduce File

Press the **[2]** key on the [File Manage] menu or press the **[ENTER]** key with the cursor on the [2: Convert File].

Convert File
test001.rtm
test002.rtm

Data files in the selected drive are displayed. Move the cursor to the converting file and press the **[ENTER]** key. Then a message appears to confirm the conversion. Press the **[ENTER]** key once again.

Convert File
test001.rtm
test0010.csv
test002.rtm

Data file in the selected drive and converted file are displayed.

MEMO

When a file is converted, it is not only converted into CSV format file but also subjected to the following operations.

- (1) The file is divided for every 100 CHs and numbered with identification Nos. (from 0 to 9).
- (2) Identification No. after the division is added to the file name before the conversion to create a new file name.
(Ex.1) When measured data of 30 CHs is named with 'test001.rtm,' the file name after the conversion shall be 'test0010.csv.'
(Ex.2) When measured data of 130 CHs is named with 'test002.rtm,' '2' file names are created after the conversion; 'test0020.csv' and 'test0021.csv.'

6-3-4 Reproducing File

0: Specif Dr
1: File List
2: Convert File
3: Reproduce File

Press the **[3]** on the [File Manage] menu or press the **[ENTER]** key with the cursor on the [3: Reproduce File].

Reproduce File
test001.rtm
test002.rtm

Data files on the selected drive are displayed. Move the cursor to the reproducing file and press the **[ENTER]** key. A message to confirm the reproducing file appears. Press the **[ENTER]** key once again to print out the measured data.

6-3-5 Deleting file

1: File List
2: Convert File
3: Reproduce File
4: Delete File

Press the **[4]** key on the [File Manage] menu or press the **[ENTER]** key with the cursor on the [4: Delete File].

Delete File
test001.prm
*test001.rtm
test002.rtm

Files on the selected drive are displayed. Move the cursor to the desired file and press the **[ENTER]** key to indicate [*] in front of the file name. Every time the **[ENTER]** key is pressed, the indication switches from 'Select' to 'Cancel.' In addition, multiple files can be selected.

Press the **[DEL]** key to display the confirm message. Press the **[ENTER]** key at this time to delete the file.

Delete File
test001.prm
test002.rtm
test003.rtm

6-3-6 Copying File

2: Convert File
3: Reproduce File
4: Delete File
5: Copy File

Press the **[5]** key on the file manage menu or press the **[ENTER]** key with the cursor on the [5: Copy File].

Copy File
test001.prm
*test001.rtm
test002.rtm

Files on the selected drives are displayed. Move the cursor to the desired file and press the **ENTER** key to indicate '*' in front of the file name. Every time the **ENTER** key is pressed, the indication switches from 'Select' to 'Cancel.' In addition, multiple files are selected.

Copy File
test001.prm
test001.rtm
test002.rtm

Press the **ENTER** key while pressing the **SHIFT** key to indicate a confirm message. Press the **ENTER** key once again to copy the desired file.

MEMO

The copy source and copy destination shall be as follows.

- When the selected drive (copy source) is "PC Card," the copy destination is "Memory."
- When the selected drive (copy source) is "Memory," the copy destination is "PC Card."
- No data is copied between the same drive.

6-3-7 Changing File Name

3: Reproduce File
4: Delete File
5: Copy File
6: Change Name

Press the **6** key on the file manage menu or press the **ENTER** key with the cursor on the [6: Change Name].

Change File Name
test001.prm
test001.rtm
test002.rtm

Files on the selected drive are displayed. Move the cursor to the desired file and press the **ENTER** key.

Specify File Name
test000
(abcdefghij)
0123456789

Input the file name after the change with numeric keys and press the **ENTER** key to determined the changed file name.

6-3-8 Format

4: Delete File
5: Copy File
6: Change Name
7: Format

Press the  key on the file manage menu or press the **ENTER** key with the cursor on the [7: Format].

Format

(YES:ENTER)
(NO:ESC)

A message appears to confirm the format. Press the **ENTER** key to delete all files in the selected drive and the indication returns to the file manage menu.

MEMO

- Do not turn OFF the UCAM-60B during formatting the PC card.
- Do not extract the PC card while formatting.

7. MONITOR AND REAL-TIME CH MEASUREMENT

7-1 SETTING MEASURING FUNCTION

Measuring function is classified into 4 types.

(1) Initial value measurement (Initial value)

When measurement is conducted by using strain gages and strain gage transducers, the output in no-load state (Initial Unbalance Value) is measured and saved as an initial value.

For measuring voltage or temperature, the initial value generally has no meaning. However, it can be used for measuring the above voltage or temperature by setting “Delta V” and “Delta T.”

For details, see “12-3 DELTA V” and “12-4 DELTA T.”

(2) MEAS value measurement (MEAS value)

A value obtained by subtracting the initial value from the output of the sensor is regarded as the measured value.

$$\text{Measured result (MEAS value)} = (\text{Measured value}) - (\text{Initial value})$$

When coefficient calculation function is enabled, the following calculation is enabled.

CAL coefficient:	Calculated result obtained from the preset calculation coefficient shall be the measured value.
Decimal point:	Measured value is indicated with the preset decimal point.
Unit:	Measured value is indicated with the preset unit.
Offset:	Calculated result obtained by the preset offset shall be the measured value.

When **[COEF]** key LED is lighted up, the coefficient calibration function is enabled.

Every time the **[COEF]** key is pressed for approximately every 3 seconds, the LED turns ON/OFF.

(3) EASY MEAS measurement

The base operation of the EASY MEAS measurement is as same as the item (2) MEAS measurement.

Press the ZERO key on the front panel for approximately 3 seconds. Then, instead of measuring the initial value, the output of strain gages or strain gage transducers at this time is measured as ZERO value.

Measurement thereafter shall be conducted by regarding the value subtracting the above Zero value as the measured value (Auto-Zero function).

$$\text{Measured result} = (\text{Measured value}) - (\text{Zero value})$$

When the coefficient calculation function is enabled, the following calculation is enabled.

$$\text{Measured result} = \text{CAL coefficient} \times (\text{Measured value} - \text{Zero value}) + \text{Offset}$$

NOTE

In the EASY MEAS measurement, ZERO value is not stored in the file.

If the ZERO has essential meaning as the initial unbalance value, use the initial or MEAS measurement as usual.

(4) Original measurement (Original value)

Outputs of sensors are indicated as they are. The original measurement is used when ZERO compensation is conducted on the sensor side or when it is required to confirm the sensor output in advance.

7-1-1 Setting Operation Other Than Initial Value

0: MEAS Value
 1: Original Value
 2 Initial Value
 3: EASY MEAS

When it is in the ready state, press the **[FUNC]** key to indicate measuring function menu. Move the numeric key or the cursor to the required measuring function and press the **[ENTER]** key. Then, the required measuring function is determined and the indication returns to the ready state. In addition, the LED corresponding to the measuring function lights up.

7-1-2 Setting Initial Value (Measurement)

0: MEAS Value
 1: Original Value
 2: Initial Value
 3: EASY MEAS

Press the **[2]** key on the measuring function menu or press the **[ENTER]** key with the cursor on the [2: Initial Value] to indicate menu items of the initial value.

Initial Value
 Start: START/STOP
 Stop: START/STOP
 Return: ESC

Press the **[START/ATOP]** key to start the initial measurement.

Pressing the **[START/STOP]** during the measurement stops the measurement.

When the measurement is completed, the measured data is stored. Then, the indication returns to the ready state, the measuring function turns to MEAS value measurement and the **[MEAS]** key LED lights up.

MEMO

When the initial value measurement is conducted with the **[SAVE]** key LED lit, the measured data is saved with a file name "Save file name. ini."

MEMO

When coefficient calculation function is not enabled, the indication shall be as follows.

CH Mode		Number of Digits Below Decimal Point	Unit
Strain measurement (High resolution)		1	με
Strain measurement (Other than high resolution)		0	με
Voltage (500 mV)	50 mV≥	3	mV
	>50 mV	2	
Voltage (50 V)	5 V≥	4	V
	>5 V	3	
Current (50 mA)		2	mA
Temperature (Thermocouple, Pt)		1	°C
Potentiometer sensor		2	%

MEMO

Relations between the CH mode and measured value in MEAS value measurement are described in the following table.

CH Mode	MEAS measurement (Relative change value obtained by subtracting the initial value from the original value)
Strain related mode (Including strain measurement of transducers with temperature measuring function)	Measurement available
Voltage	Measurement not available. Measured with the original value (raw measured value). (However, available using the "Delta V function.")
Current	Measurement available
Thermocouple Resistance thermometer sensor (Including resistance thermometer sensor with temperature measuring function)	Measurement not available. Measured with the original value (raw measured value). (However available using "Delta T function." (Note that the "Delta T function" does not function for the thermocouple resistance thermometer with temperature measuring function.)
Potentiometer sensor	Measurement available
Differential transformer transducer	Measurement available
Sliding resistance transducer	Measurement available

7-1-3 Auto-ZERO

Press the **[ZERO]** key for approximately 3 seconds in EASY MEAS measurement to measure the initial unbalance value (Zero value) of strain gages or strain gage transducers. Value subtracting the above initial unbalance value (Zero value) shall be regarded as the measured value on and after then.

MEMO

Relations between the CH mode and measured value in EASY MEAS value measurement are described in the following table.

CH Mode	EASY MEAS measurement (Relative change value obtained by subtracting the ZERO value from the original value)
Strain related mode (Including strain measurement of transducers with temperature measuring function)	Measurement available
Voltage	Measurement not available. Measured with the original value (raw measured value). (However, available using the "Delta V function.")
Current	Measurement available
Thermocouple Resistance thermometer sensor (Including resistance thermometer sensor with temperature measuring function)	Measurement not available. Measured with the original value (raw measured value). (However available using "Delta T function." (Note that the "Delta T function" does not function for the thermocouple resistance thermometer with temperature measuring function.)
Potentiometer sensor	Measurement available
Differential transformer transducer	Measurement available
Sliding resistance transducer	Measurement available

7-2 MONITORING

Monitor measurement is conducted for maximum 40 CHs.

7-2-1 Setting Monitor CH

Set CHs for monitor measurement.

5: Check
6: File Manage
7: System Control
MONI. Monitor CH

Press the **MONI.** key on the main menu or press the cursor key (**△**) or (**▽**) to locate the cursor on the [MONI. Monitor CH]. Then, press the **ENTER** key.

Monitor CH
CH(00) : 000
CH(01) : 001
CH(02) : 002

● Monitor CH No.

● CH No. to be monitored

Input the required CH No. with numeric keys and press the **ENTER** key. Input **0** to a CH that is not monitored.
Press the **ESC** key to return to the main menu.

7-2-2 Starting/Stopping Monitoring

CH.	DATA	UNIT
000	10	$\mu\epsilon$
001	15	$\mu\epsilon$
002	10	mV

When it is in ready state, press the **MONI.** key to start the monitor measurement. The current monitoring CH No., measured value and unit are indicated. Press the (**△**) or (**▽**) key to scroll the CH.

Press the **MONI.** key once again to end the monitor measurement and the indication returns to the ready state.

MEMO

Measured value '999999' means that the entered numeric is exceedingly large or the sensor is disconnected.

7-3 REAL-TIME MEASUREMENT

7-3-1 Starting/Stopping Realtime Measurement

```
02/03 14:00:00
CH. 000 Measuring
001    15 µε
002    10 mV
```

Press the **START/STOP** key to start the realtime measurement. Then, the current measuring CH No., measured value, and unit are indicated. In addition, the **START/STOP** key LED lights up during the measurement.

After the measurement is conducted for the preset number of times, the measurement stops.

In addition, pressing the **START/STOP** key during the measurement stops the measurement.

MEMO

Measured value '9999' means that the entered numeric is exceedingly large or the sensor is disconnected.

7-3-2 Printing Measured Data

Press the **PRINT** key. The **PRINT** key LED lights up to printout the measured data.

Every time the **PRINT** key is pressed, the **PRINT** LED switches ON/OFF.

Printing example

```
** REALTIME MEASURE **
2006/02/07 10:00:00
ST CH  DATA  UNIT
00 000  1000 µ ε
00 001  -1000 µ ε
```



● Status

Printing contents of the measurement are ST (Status), CH, measured value, and unit.

Details of the status are described in the following table.

Status No.	Details
00	Normal data
01	Exceeding measured data
02	Initial value is faulty
03	Exceeding indication and the number of printed out digits
04	Using unusable CH mode
05	Exceeding thermocouple measuring range
06	Common dummy not exists. Measured data of dummy CH is faulty
07	Terminal temperature of thermocouple measurement is faulty
08	Skip CH
09	Disconnected
10	Scanner transmission error
11	A-D converter faulty
30	CH mode between the UCAM-60B and USB-70 series does not match
31	Scanner is not installed

7-3-3 Saving Measured Data

Measured data are filed and saved into an internal memory or PC card with an extension “rtm.”

To save the desired data, it is required to set a file name in advance and light up the **SAVE** key LED.

For data saving operation, see “6-2 SAVING MEASURED DATA.”

7-3-4 CONFIRMING MEASURED DATA

After the measurement is completed, press the **LIST** key to indicate and print out the lastly measured data.

2006/02/07
10:00:00
CH. DATA UNIT
000 10 μ ϵ

Press the **LIST** key to indicate the measured value.

Pressing the cursor key (**▲** or **▼**) scrolls the window up and down.

Here, press the **LIST** key once again to print out the measured value.

Press the **ESC** key and the indication returns to the ready state.

8. AUTO-MEASUREMENT

Measurement that is automatically conducted with preset measuring conditions for acquiring data is called the Auto-measurement and is classified into 3 types.

(1) Interval measurement

Measurement start time and time interval are set in advance. Measurement is automatically conducted according to these interval conditions.

(2) Trigger measurement

Data of any 1 CH is monitored and when previously set trigger conditions are satisfied, measurement is automatically conducted.

(3) Trigger interval measurement

Data of any 1 CH is monitored and when previously set trigger interval conditions are satisfied, measurement is automatically conducted. Thereafter, measurement is automatically conducted at preset time intervals.

8-1 INTERVAL MEASUREMENT

Interval condition has the following 2 items.

(1) Measurement start time

Set measurement start time with Year-Month-Day and Hour-Minute-Second.

If “-” is entered instead of setting the measurement start time, the interval measurement starts up right after it is executed.

(2) Interval table

An interval table consists of more than 1 steps which are called in Nos. Fifteen steps from 0 to 14 are available in the UCAM-60B.

Set measurement time interval and measuring times as well as status for every step.

- Set the number of measurement repeat times conducted at the step time interval.
Setting ‘000’ means measurement is conducted for infinite times. Measurement is repeated until the interval measurement is stopped Therefore, you cannot go to the next step.
- The number of status indicates the operation after terminating the steps. It has the following 3 types.
E: Indicates the end of the interval table. Entered with the key.
C: Indicates it is moved to the next step. Entered with the key.
Numeric from 00 to 14: Jumps to the desired step. (Input the next step No.)
- If all the statuses from steps 00 to 14 are set to “C,” after setting ‘14’ to the last step, interval measurement can be automatically terminated.
- Loop of the steps set.

Example

Step	Status
00	C
01	C
02	00

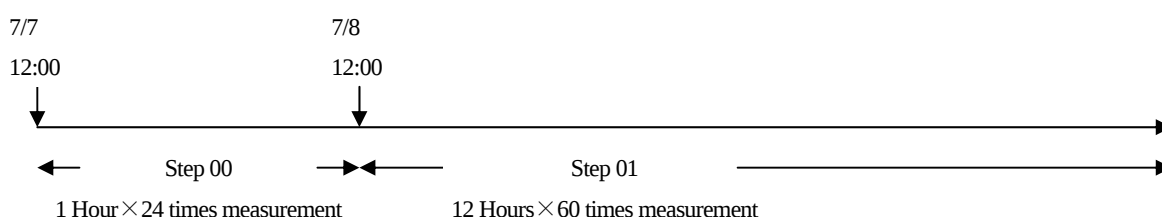
If “Step” and “Status” are set in the above manner, status of the steps are repeated until the interval measurement is stopped.

NOTE

- Measuring times set by selecting [1: Repeat Times] from [0: MAS Condition] main menu is reflected to the number of measuring times set in measurement for interval start measurement (From start CH to end CH).
- When [1: Repeat Times] selected from [0: MEAS Condition] is set to “00,” interval ON (interval measurement) is not available.
- Set the [1: Repeat Times] selected from [0: MEAS Condition] to other than “00.”

Procedure for setting interval table is described in the following.

An interval measurement is started at 2006/07/-7, 12:00:00 and conducted for 24 times at 1 hour intervals. After then, it is conducted for 60 times at 12 hours intervals



8-1-1 Setting Interval Conditions

0: MEAS Condition

1: CH Condition

2: TEDS Information

3: AUTO-MEAS

Press the **0** key on the main menu or press the **ENTER** key with the cursor on the [0: MEAS Condition].

0: MEAS CH

1: Repeat Times

2: Interval

3: Trigger

Press the **2** key on the left [MEAS condition] menu indication or press the **ENTER** key with the cursor on the [2: Interval].

MEAS Start Time

Yr Mon Day

2006/07/07

Input Year-Month-Day of the measurement start time with numeric keys and then, press the **ENTER** key.

MEAS Start Time

Hr : Min : Sec

12:00:00

Input Hour : Minute : Second of the measurement start time with numeric keys and then, press the **ENTER** key.

STEP Day H M S
00 00:01:00:00
Times ST
0024 C

Set step 00 conditions. Input time interval and measuring times with numeric keys. Input  key for the status. After entering the status, press the  key.

STEP Day H M S
01 00 12:00:00
Times ST
0060 E

Set step 01 conditions. Input time interval and measuring times with numeric keys. Input  key for the status. After entering the status, press the  key to determine the time interval and measuring times and step 02 window appears. Press the  keys until the indication returns to the main menu.

8-1-2 Other Key Operations

The following key operations are available when interval table is entered.

(1) Moving the Step

Steps are moved by cursor keys ( or .

In addition, contents of the desired step are displayed by moving the cursor to the desired step No., entering the desired step No. from numeric key, and then pressing the  key.

(2) Coping the Items

- Press the ENTER key while pressing the SHIFT key to copy the contents of the desired step.
- Contents of the desired step can be copied by pressing the  key

00 00 00:00:10
0000 C
Copy source:00
Copy destination:01~09

Input the step No. of the copy destination and press the  key to determine the entered step No. and to update the display.

- Step No of the copy source
- Step No. of the copy destination

(3) Correcting

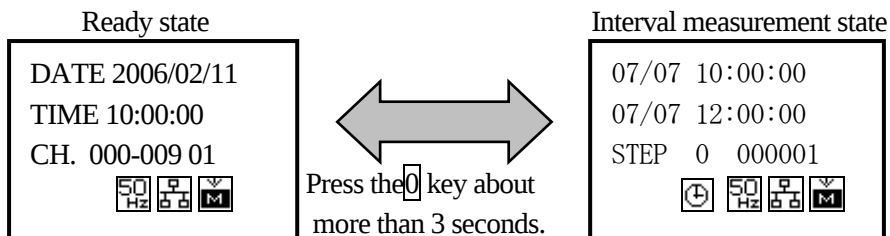
Move the cursor to the desired portion with  or  key and after correcting the contents, press the ENTER key.

(4) Return

Press the ESC key to return to the previous operating state. However, items during editing or entering are not defined.

8-1-3 Starting and Canceling Interval Measurement (1)

- Start: Press the **0** key for approximately more than 3 seconds in ready state to have the interval measurement state.



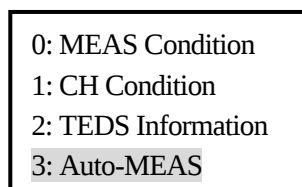
Then, the current time, start time of the next measurement, activating step No. and the measurement times, an icon (🕒) of the current interval measurement are displayed to start the interval measurement.

The **SAVE** key LED automatically lights up to be in the state ready for saving the measured data.

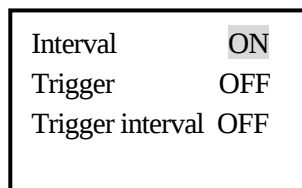
- Cancel: Press the **0** key for approximately more than 3 seconds when waiting for the measurement start to cancel the interval measurement state and the icon (🕒) of the current interval measurement is cancelled.

8-1-4 Starting and Cancelling Interval Measurement (2)

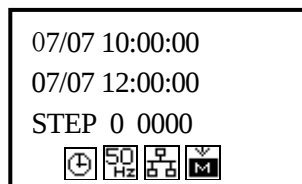
- Start



While pressing the **SHIFT** key in ready state, press the **START/STOP** key. Or, press the 3 key on the main menu or with the cursor on the [3: Auto-MEAS], press the **ENTER** key.



On the Auto-MEAS menu, move the cursor to the interval setting, press the cursor keys (**<** or **>**) key, select ON and then, press the **ENTER** key.



Current date, start time of the next measurement, step No. and the number of measuring times, and icon (🕒) of the interval measurement are displayed to start the interval measurement.

The **SAVE** key LED automatically lights up to be ready for saving the measured data.

- Cancel

07/07 10:00:00
07/07 12:00:00
STEP 0 0000







INTERVAL MEAREMENT WINDOW

0: MEAS Condition
1: CH Condition
2: TEDS Information
3: Auto-MEAS

When the UCAM-60B is waiting for measurement start, press **START/STOP** key while pressing the **SHIFT** key.

Or, press the 3 key on the main menu with the cursor on the [3: Auto-MEAS] and press the **ENTER** key.

Interval **OFF**
Trigger OFF
Trigger Interval OFF

Move the cursor to “Interval” on the [Auto-MEAS] menu. Press the cursor key (**<** or **>**), select “OFF” and then, press the **ENTER** key.

8-2 TRIGGER MEASUREMENT

Trigger conditions have the following 4 items.

(1) Trigger Mode

Select trigger measurement mode from the following 2 types.

- Relative value: Value changed from the value that started the previous measurement is regarded as the value for starting the next measurement.
- Absolute value: When the value exceeds the preset trigger value, the measurement starts.

(2) Trigger CH

To start the trigger measurement, data monitoring CH is specified.

(3) Reference Value

Set measured value to start the trigger measurement.

When the monitored measured value exceeds the reference value, the trigger measurement starts.

- When the trigger mode is set to relative value mode, items of the reference value is displayed for setting.
- When the trigger mode is set to absolute value mode, items of the reference value is not displayed.

(4) Trigger Table

A trigger table is composed of more than 1 steps that are called in numbers. The step is numbered up to 15 steps from 0 to 14.

Set trigger value, the number of measuring times, and status for every step.

- Set the number of measuring times with the determined steps.
Setting '0000' means trigger measurement is repeated infinitely. It is repeated until it is stopped. Therefore, you cannot go to the next step.
- The status shows the operation of the UCAM-60B after the step and select from the following 3 types.
E: End of the trigger table. Input with the key.
C: Indicate to move to the next step. Input with the key.
Numeric from 00 to 14: Jumps to the desired step. (Input the next step No.)
- Suppose all the steps from 00 to 14 steps are set to "C." After conducting the final step '14,' the trigger measurement automatically ends.
- Loop of the step is set.

Example

Step	Status
00	C
01	C
02	00

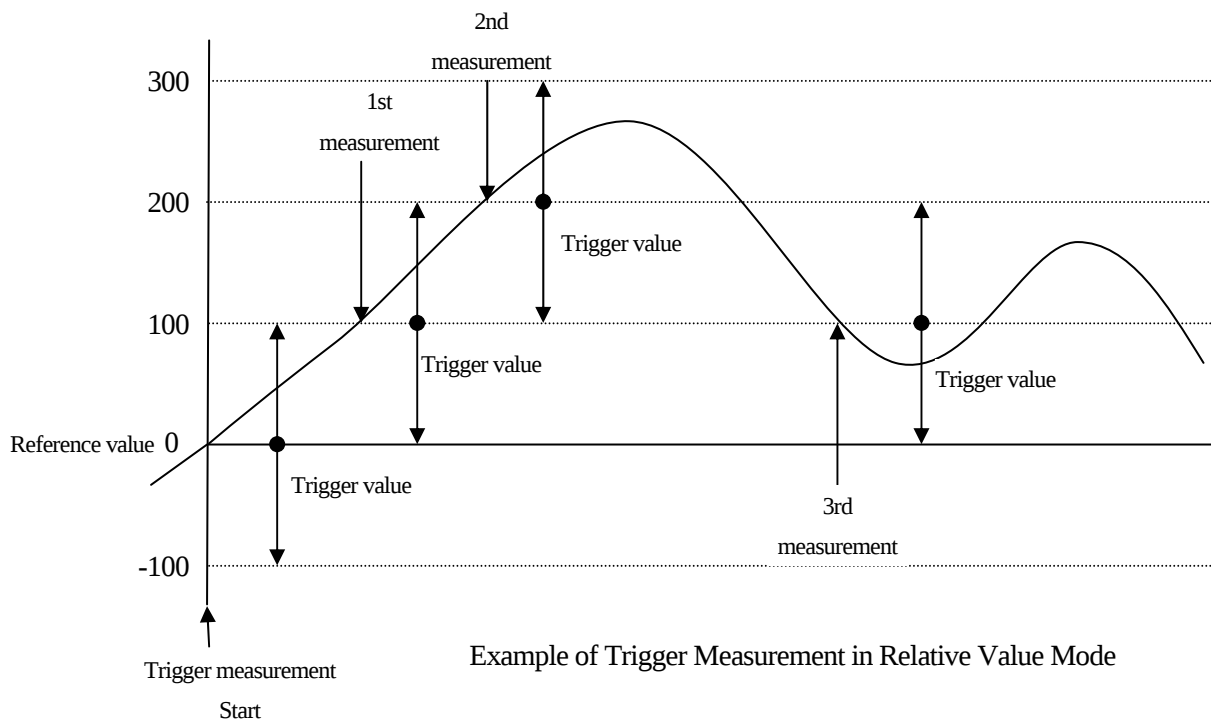
If the statuses of the steps are set as shown above, the following step loop is repeated until the trigger measurement is stopped.

Step 00 → 01 → 02 → 00 → 01 → 02 → ••••

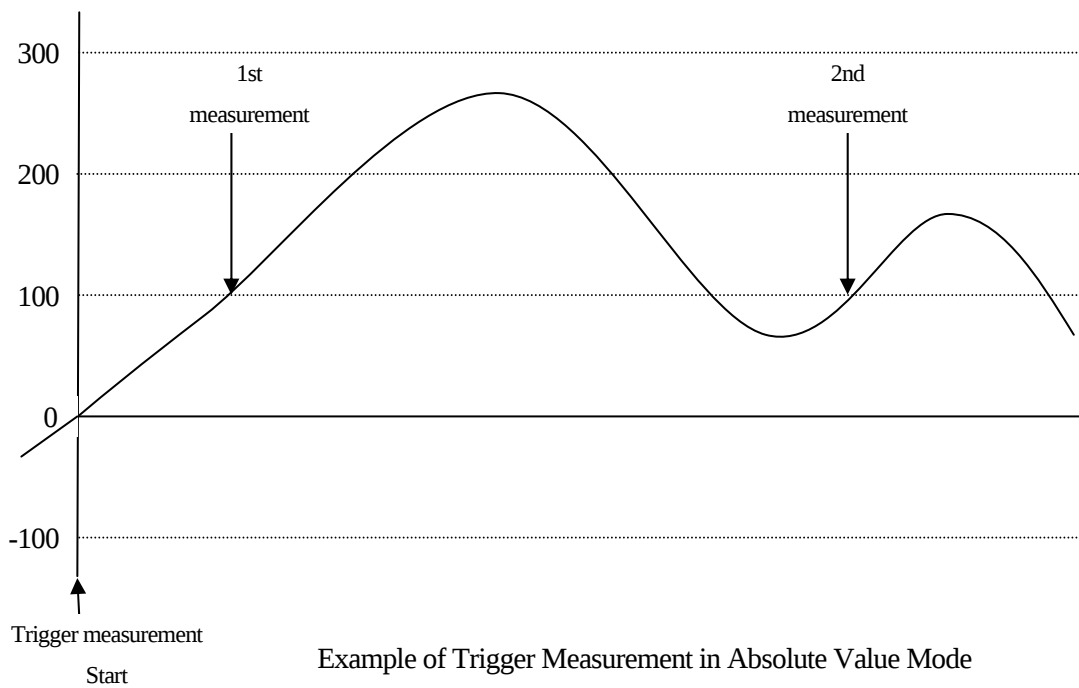
NOTE

- Select the number of times set by selecting [1: Repeat Times] from the [0: MEAS Condition] main menu. Then, the trigger measurement is repeatedly conducted for the determined times (From start CH to end CH).
- If the number of times is set to "00" by selecting [1: Repeat Times] from the [0: MEAS Condition] main menu, trigger "ON" (trigger measurement) is not available.

■ Example of Measurement in Relative Value Mode (Reference value: 0, Trigger value: 100)



■ Example of Measurement in Absolute Value Mode (Trigger value: 100)



8-2-1 Setting Trigger Mode

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **1** key on the system control menu or press the **ENTER** key with the cursor on the [1: Measurement].

0: Int Scanner
1: Scan Speed
2: Trigger Mode
3: Cold Junction

Press the **2** on the measurement menu or press the **ENTER** key with the cursor on the [2: Trigger Mode].

Trigger Mode
Relative Value
(1: Absolute)
(0: Relative)

Press the **0** key on the measurement menu to indicate the “Relative.” Press the **ENTER** key in the above state and the indication returns to the measurement menu.

8-2-2 Setting Trigger Conditions

0: MEAS Condition
1: CH Condition
2: TEDS Information
3: Auto-MEAS

Press the **0** key on the main menu or press the **ENTER** key with the cursor on the [0: MEAS Condition].

0: MEAS CH
1: Repeat Times
2: Interval
3: Trigger

Press the **3** key on the left [MEAS condition] menu or press the **ENTER** key with the cursor on the [3: Trigger].

MEAS Condition
Trigger CH:000
Ref Val: 0.000000

Input trigger CH and reference value and press the **ENTER** key.
• Reference value is not set in absolute value mode.

STEP Trigger
00 100.0000
Times ST
0005 E

Set step 00 conditions. Input trigger value and the number of desired trigger measuring times with numeric keys. In this example, input the **1** key for the status. After entering the status, press the **ENTER** key.
After setting conditions is completed, press the EDC key until the ready window is displayed.

8-2-3 Operations of Other Keys

The following key operations are available when entering the trigger table.

(1) Moving the Step

Select and move to the desired step with the cursor key **▲** or **▼** key.
In addition, move the cursor to the desired step No., input the desired step No. with the numeric key and press the **ENTER** key. Then, contents of the step are indicated.

(2) Copying Items

Press the **ENTER** key while pressing the **SHIFT** key with the cursor on the desired step No. And then, the contents of the step is copied.
Copying the step contents is also available by pressing the  key.

00 100.0000
0000 C
Copy source: 00
Copy destination: 01~09

Input the coy source step No. and press the **ENTER** key to determine the input item and to update the display.

● Step No. of the copy source

● Step No. of the copy destination

(3) Correct

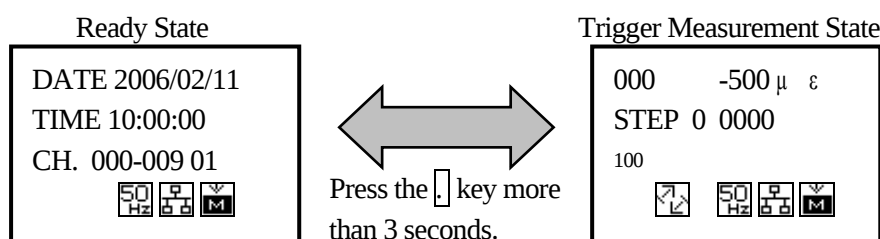
Move the cursor to the desired portion with  or  key. After correcting, press the  key.

(4) Return

Press the  key to return to the 1 step previous operating state. However, items during editing and entering are not determined.

8-2-4 Starting and Cancelling Trigger Measurement (1)

- Start: Press the  key for approximately more than 3 second in ready state to be in trigger measurement state.



Trigger CH and monitor data, step No., the number of measuring times, trigger value, and icon  of the active trigger measurement are displayed.

The  key LED automatically lights up to be ready for saving the measured data.

- Cancel: Press the  key for approximately 3 more than 3 seconds in trigger measurement. Then, the trigger measurement state is cancelled and the icon  of the active trigger measurement is erased.

8-2-5 Starting and Cancelling Trigger Measurement (2)

- Start:

0: MEAS Condition
1: CH Condition
2: TEDS Information
3: Auto-MEAS

When it is in ready state, press the  key while pressing the  key.

Or, press the  key of the main menu or press the  key with the cursor on the [3: Auto-MEAS] of the main menu.

Interval OFF
Trigger ON
Trigger Interval OFF

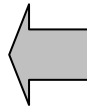
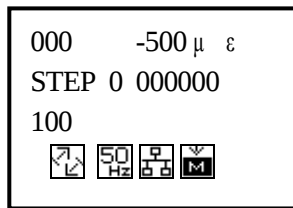
Move the cursor to the “Trigger” on the [Auto-MEAS] menu. Select “ON” with the cursor keys  or  and press the  key.

000 -500 μ ϵ
STEP 0 000000
100
   

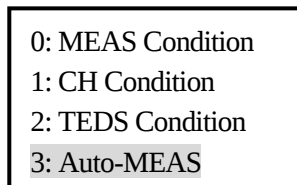
Trigger CH and the monitor data, step No., measuring times and trigger value, and an icon  of the active trigger measurement are displayed.

The  key LED automatically lights up to be ready for saving the measured data.

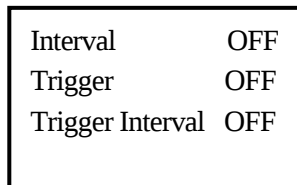
- Cancel:



TRIGGER MEASUREMENT WINDOW



Press the START/STOP key while pressing the **SHIFT** key.
Or, press the **3** key on the main menu or press the **ENTER** key with the cursor on the [3: Auto-MEAS].



Move the cursor to “Interval” on the [Auto-MEAS] menu, select “OFF” with the cursor keys (**<** or **>**) and press the **ENTER** key.

8-3 TRIGGER INTERVAL MEASUREMENT

Trigger interval conditions have the following 3 items.

(1) Trigger CH

To start the trigger interval measurement, data monitoring CH is specified.

(2) Reference Value

Set measured value to start the trigger measurement.

When the monitored measured value exceeds the reference value, the interval measurement starts.

(3) Interval Table

An interval table is composed of more than 1 steps that are called in numbers. The step is numbered up to 15 steps from 0 to 14.

Set time measurement intervals, the number of measuring times, and status for every step.

- Set the number of measuring times with the determined steps.
Setting '0000' means interval measurement is repeated infinitely. It is repeated until it is stopped. Therefore, you cannot go to the next step.
- The status shows the operation of the UCAM-65B after the step. Select from the following 3 types.
E: End of the trigger table. Input with the ☐ key.
C: Indicate to move to the next step. Input with the ☐ key.
Numeric from 00 to 14: Jumps to the desired step. (Input the next step No.)
- Suppose all the steps from 00 to 14 steps are set to "C." After conducting the final step '14,' the trigger interval measurement automatically ends.
- Loop of the step is set.

Example

Step	Status
00	C
01	C
02	00

If the statuses of the steps are set as shown above, the following step loop is repeated until the interval measurement is stopped.

Step 00 → 01 → 02 → 00 → 01 → 02 → ••••

NOTE

- Select the number of times set by selecting [1: Repeat Times] from the [0: MEAS Condition] main menu. Then, the interval measurement is repeatedly conducted for the determined times (From start CH to end CH).
- If the number of times is set to "00" by selecting [1: Repeat Times] from the [0: MEAS Condition] main menu, interval "ON" (trigger measurement) is not available.
Select [1: Repeat Times] from the [0: MEAS Condition] and set other than "00."

8-3-1 Setting Trigger Interval

```

0: MEAS Condition
1: CH Condition
2: TEDS Information
3: Auto-MEAS

```

Press the **0** key on the main menu or press the **ENTER** key with the cursor on the [0: MEAS Condition].

```

1: Repeat Times
2: Interval
3: Trigger
4: Trigger Interval

```

Press the **4** on the left menu (MEAS condition menu) or press the **ENTER** key with the cursor on the [4: Trigger Interval].

```

MEAS Condition
Trigger CH:000
Ref Vale: 0.000000

```

Input trigger CH and reference value and press the **ENTER** key.

```

STEP Day H M S
00 00 12:00:00
Times ST
0060 E

```

Set step 00 conditions. Input time interval and measuring times with numeric keys. Input the status and press the **ENTER** key to determine the entered items. Then, step 01 window appears. After entering the interval table, press the **ESC** key until the indication returns to the main menu.

8-3-2 Operations of Other Keys

The following key operations are available when entering the trigger table.

(1) Moving the Step

Select and move to the desired step with the cursor key **▲** or **▼** key.

In addition, move the cursor to the desired step No., input the desired step No. with the numeric key and press the **ENTER** key. Then, contents of the step are indicated.

(2) Copying Items

Press the **ENTER** key while pressing the **SHIFT** key with the cursor on the desired step No. And then, the contents of the step are copied.

Copying the step contents is also available by pressing the  key.

```

00 00 00:00:10
0000 C
Copy source: 00
Copy destination: 01~09

```

Input the copy source step No. and press the **ENTER** key to determine the input item and to update the display.

● Step No. of the copy source

● Step No. of the copy destination

(3) Correct

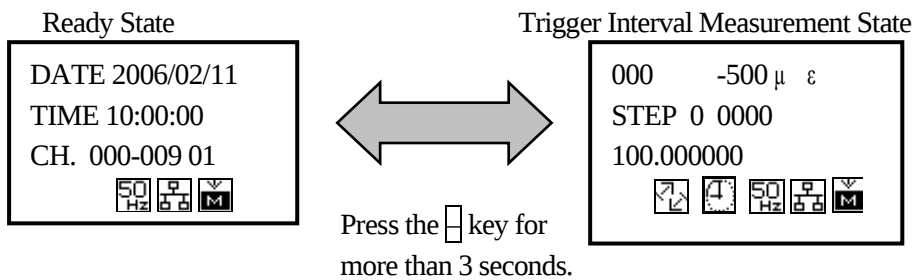
Move the cursor to the desired portion with  or  key. After correcting, press the  key.

(4) Return

Press the  key to return to the 1 step previous operating state. However, items during editing and entering are not determined.

8-3-3 Starting and Cancelling Trigger Interval Measurement (1)

- Start: Press the  key for approximately more than 3 second in ready state to be in trigger measurement state.



Trigger CH and monitor data, step No., the number of measuring times, trigger value, and icons   are displayed.

The  key LED automatically lights up to be ready for saving the measured data.

- Cancel: Press the  key for approximately 3 more than 3 seconds in trigger interval measurement. Then, the trigger interval measurement state is cancelled and the icons   of the active trigger measurement are erased.

8-3-4 Starting and Cancelling Trigger Interval Measurement (2)

- Start:

0: MEAS Condition
1: CH Condition
2: TES Information
3: Auto-MEAS

When it is in ready state, press the  key while pressing the SHIFT key.

Or, press the  key or press the  key with the cursor located on the [3: Auto-MEAS] menu.

Interval OFF
Trigger OFF
Trigger Interval ON

On the [Auto-MEAS] menu, move the cursor to “Trigger Interval” and select “ON” with the cursor keys  or  and press the  key.

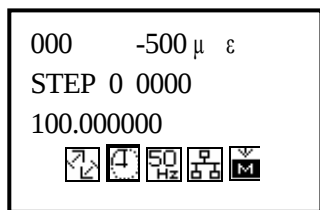
000 -500 μ ϵ
STEP 0 0000
100.000000

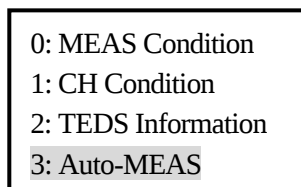
Trigger CH and the monitor data, step No., the number of measuring times, trigger value and icons   of the active trigger interval measurement are displayed.

The  key LED automatically lights up to be ready for saving the measured data.

- Cancel:

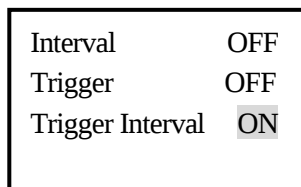


TRIGGER INTERVAL MEASUREMENT WINDOW



When it is in ready state, press the **START/STOP** key while pressing the SHIFT key.

Press the **3** key or press the ENTER key with the cursor located on the [3:Auto-MEAS] menu.



On the [Auto-MEAS] menu, move the cursor to “Trigger Interval” and select “ON” with the cursor key (**<** or **>**) and then, press the ENTER key.

9. CHECK FUNCTION

The UCAM-60B is provided with the following check functions.

(1) BV2V

Measures bridge excitation voltage (2V) supplied to strain gages and strain gage transducers at the terminal board to which these sensors are connected, outputs the measured results on the display or printer, and checks any abnormality on the bridge power supply.

(This function can be used for internal scanners and USB-70 series scanners.)

(2) BV5V

Measures the bridge excitation voltage (5V) supplied to strain gages and strain gage transducers at a terminal board where sensors are actually connected, outputs the measured results on the display or printer, and checks any abnormality on the bridge power supply.

(This function can be used for internal scanners.)

(3) In/Out Resistance

Measures input/output resistance of strain gages and strain gage transducers, outputs the measured results on the display or printer, and checks any abnormality on sensors and the measuring circuit.

(This function is not available for scanning units USS-21A and USS-22A.)

(4) Mode Detection

Detects bridge configuration for strain measurement to judge the proper channel mode to be set and outputs the results on the display or printer.

This function is newly added and not available for the conventional models.

(This function is not available for scanning units USS-21A and USS-22A.)

(5) Terminal Temperature

Outputs the temperature of the input terminal board which is the reference junction for temperature measurement from 0°C with thermocouple. The reference temperature is measured by the built-in thermometer of scanning unit. This function is useful for checking any abnormality on the temperature measuring circuit.

(6) Disconnection

Checks any possible disconnection of the sensor's input cable in strain measurement and output the checked results (OK/NG) on the display or printer.

(7) Burnout

Checks any possible disconnection of the thermocouple which may be deteriorated due to oxidation through high-temperature measurement and outputs the result (OK/NG) on the display or printer.

(8) Insulation

Measures insulation resistance of transducer and outputs the result. This function is provided since strain gage transducers such as civil engineering transducers which are used in the field for a long period of time, may have the insulation resistance lowered due to water intrusion, etc., thereby making measurement unstable.

(9) Display

Display check function checks the indicator. Displays the fixed pattern and checks faulty state such dot omission, etc.

(10) Printer

Printer check function prints out the fixed pattern and checks faulty state such as blur and pale.

MEMO

There are 2 methods for printing out checked results in items from (1) to (8).

- 1) Checked results are printed out while checking with the **PRINT** LED lighted up.
- 2) After checking is completed, the checked results are printed out by pressing the **LIST** key.

	Built-in Scanning Unit			External Scanner		External Scanner		
	For general purpose	For general purpose	For general purpose	For general purpose	For civil-engineering	For general purpose	For temperature	For civil-engineering
Check Function	USS-61A USS-62A USS-61B USS-62B (*1)	USS-21A USS-22A	USS-63A USS-23A USS-63B (*1)	USB-70 -10 -20	USB-70 -30	USB-51A USB-20A USB-50A	USB-51AT	USB-20D USB-50D
BV 2 V	○	○	○	○	○	×	×	×
BV 5 V	○	○	○	×	×	×	×	×
Input/Output Resistance	○	×	○	×	×	×	×	×
Detect Mode	○	×	○	×	×	×	×	×
Terminal Temp	○	○	○	○	○	○	○	○
Disconnection (*2)	○	○	○	○	○	○	×	○
Burnout (*3)	○	○	○	○	○	×	×	×
Insulation (*2)	○	○	○	○	○	○	×	○

*1: Scanning units USS-61A/62A/63A and USS-61B/62B/63B are compatible with all the check functions.

*2: Enable only for CH mode set to strain measurement.

*3: Enable only for CH mode set to thermocouple measurement.

MEMO

The above check functions are not applicable to USB-65A (For LVDT transducer).

Select the desired check menu to carry out the check function.

2: TEDS Information
3: Auto-MEAS
4: Condition File
5: Check

Press the **5** key on the main menu or press the **ENTER** key with the cursor on the [5: Check] menu.

0: BV2V
1: BV5V
2: In/Out Resistance
3: Detect Mode

Select the desired check item on the left [Check] menu.

9-1 BV 2V

0: BV2V
1: BV5V
2: In/Out Resistance
3: Detect Mode

Press the **0** key on the check menu or press the **ENTER** key with the cursor located on the [0: BV2V].

BV2V Check
Start : **START/STOP**
Stop : **START/STOP**
Return : **ESC**

The selected check item and executing key are indicated.
Pressing the **START/STOP** key starts or stops the checking.

BV2V Check
CH. DATA UNIT
00 2.001 V
01 2.000 V

After BV2V check is executed, the checked results are displayed on the window.

Press the **LIST** key to print the checked results.

Press the **▲** or **▼** key to move the CH.

Press the **ESC** key to return the indication to the previous display.

9-2 BV 5V

0: BV2V
1: BV5V
2: In/Out Resistance
3: Detect Mode

Press the **[1]** key on the check menu or press the **[ENTER]** key with the cursor on the [1: BV5V].

BV 5V Check
Start : **START/STOP**
Stop : **START/STOP**
Return : **ESC**

The selected check item and executing key are indicated.
Pressing the **START/STOP** key starts or stops the checking.

BV5V Check
CH. DATA UNIT
00 4.999 V
01 5.001 V

After BV5V check is executed, the checked results are displayed on the window.

Press the **[LIST]** key to print out the checked results.

Press the **[^]** or **[v]** key to move the CH.

Press the **[ESC]** to return the indication to the previous display.

9-3 INPUT/OUTPUT RESISTANCE

0: BV2V
1: BV5V
2: In/Out Resistance
3: Detect Mode

Press the **[2]** key on the check menu or press the **[ENTER]** key with the cursor on the [2: In/Out Resistance].

In/Out Resist Check
Start : **START/STOP**
Stop : **START/STOP**
Return : **ESC**

The selected check item and executing key are indicated.
Pressing the **START/STOP** key starts or stops the checking.

Input Resistance Check
CH. DATA UNIT
00 119.6 Ω
01 350.5 Ω

After input/output resistance check is executed, the checked results are displayed on the window.

Press the **[LIST]** key to print the checked results.

Press the **[^]** or **[v]** key to move the CH.

Press the **[<]** or **[>]** key to switch input and output resistance window.

Press the **[ESC]** to return the indication to the previous display.

9-4 MODE DETECTION

0: BV2V
1: BV5VC
2: In/Out Resistance
3: Detect Mode

Press the **3** key on the check menu or press the **ENTER** key with the cursor on the [3: Detect Mode].

Mode Check
Start : **START/STOP**
Stop : START/STOP
Return : ESC

The selected check item and executing key are indicated.
Pressing the **START/STOP** key starts or stops the checking.

Mode Check
CH. Mode
000 01 1G120
001 12 4G

After mode check is executed, the checked results are displayed on the window.

Press the **LIST** key to print out the checked results.

Press the **▲** or **▼** key to move the CH.

MEMO

Measuring modes detected by “Detect Mode” function are indicated in the following 6 types.

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

9-5 TERMINAL TEMPERATURE

1: BV5V
2: In/Out Resistance
3: Detect Mode
4: Terminal Temp

Press the **4** key on the check menu or press the **ENTER** key with the cursor on the [4: Terminal Temp].

Terminal Temp Check
Start: **START/STOP**
Stop: START/STOP
Return: ESC

The selected check item and executing key are indicated.
Pressing the **START/STOP** key starts or stops the checking.

Terminal Temp Check
CH. DATA UNIT
00 26.5 °C
01 26.6 °C

After terminal temperature check is executed, the checked results are displayed on the window.

Press the **LIST** key to print out the checked results.

Press the **▲** or **▼** key to move the unit

Press the **ESC** to return the indication to the previous display.

9-6 DISCONNECTION

2: In/Out Resistance
3: Detect Mode
4: Terminal Temp
5: Disconnection

Press the **5** key on the check menu or press the **ENTER** key with the cursor on the [5: Disconnection].

Disconnection Check
Start : **START/STOP**
Stop : **START/STOP**
Return : ESC

The selected check item and executing keys are indicated.
Pressing the **START/STOP** key starts or stops the checking.

Disconnection Check
CH. Results
00 OK
01 OK

After disconnection check is completed, the checked results are displayed on the window.

Press the **LIST** key to print out the checked results.

Press the **▲** or **▼** key to move the CH.

Press the **ESC** to return the indication to the previous display.

9-7 BURNOUT

3: Detect Mode
4: Terminal Temp
5: Disconnection
6: Burnout

Press the **6** key on the check menu or press the **ENTER** key with the cursor on the [6: Burnout].

Burnout Check
Start : **START/STOP**
Stop : **START/STOP**
Return : ESC

The selected check item and executing keys are indicated.
Pressing the **START/STOP** key starts or stops the checking.

Burnout Check
CH. Results
022 --
023 OK

After burnout check is executed, the checked results are displayed on the window.

Press the **LIST** key to print out the checked results.

Press the **▲** or **▼** key to move the CH.

Press the **ESC** to return the indication to the previous display.

9-8 INSULATION

4: Terminal Temp
5: Disconnection
6: Burnout
7: Insulation

Press the **7** key on the check menu or press the **ENTER** key with the cursor on the [7: Insulation].

Insulation Check
Start : **START/STOP**
Stop : START/STOP
Return : ESC

The selected check item and executing key are indicated.
Pressing the **START/STOP** key starts or stops the checking.

Insulation Check
CH. DATA UNIT
000 HIGH MΩ
001 HIGH MΩ

After insulation check is executed, the checked results are displayed on the window.

Press the **LIST** key to print out the checked results.

Press the **▲** or **▼** key to select the CH.

Press the **ESC** key to return the indication to one step previous window.

MEMO

Insulation resistance is displayed with measured value from 1 to 100 MΩ.

- 1 MΩ or less: Displayed as “LOW” MΩ
- Exceeding 100 MΩ: Displayed as “HIGH” MΩ

9-9 DISPLAY

5 Disconnection
6: Burnout
7: Insulation
8: Display

Press the **8** key on the check menu or press the **ENTER** key with the cursor on the [8: Display].

Display Check
Start : **ENTER**

Return : ESC

The selected check item and executing key are indicated.
Press the **ENTER** key.



When display check function is executed, all the LEDs on the panel turn ON. Visually check whether OFF LED exists.
Press the **ESC** key to return to the indication to the previous display.

9-10 PRINTER

6: Burnout
7: Insulation
8: Display
9: Printer

Press the **9** key on the check menu or press the **ENTER** key with the cursor on the [9: Printer].

Printer Check
Start : ENTER

Return : ESC

The selected check item and executing key are indicated.
Press the **ENTER** key.

Printer Check
Sheet Yes
Head Status OK
Return: ESC

When print check function is executed, test printing is carried out.
In addition, presence or absence of printer sheet and printer head state are indicated on the window.
Pressing the **ESC** key returns the indication to the previous display.

```
*****
* UCAM60B PRINTER TEST *
2006/Feb/07 10:00:00

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
  abcdefghijklm
    nopqrstuvwxyz
0123456789.+ -

***** END OF TEST *****
```

Example of Test Printing

10. SETTING INTERFACE

This Chapter is related to RS-232C interface and Ethernet interface.

Select and set the desired interface. (Note that using 2 interfaces at the same time is not allowed.)

10-1 SELECTING INTERFACE

Select the desired interface.

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **2** key on the left [System control] menu or press the **ENTER** key with the cursor on the [2: Interface].

0: Interface
1: Data type
2: RS-232C
3: ETHERNET

Press the **0** key on the left [Interface] menu or press the **ENTER** key with the cursor on the [0: Interface].

Interface
RS-232C
(1: RS-232C)
(0: ETHERNET)

Press the **0** key on the left display to indicate the “Ethernet” and, **1** key to indicate “RS-232C.”

Press the **ENTER** key to determine the entered selected and the indication returns to the interface menu.

RS : Interface is set to “RS-232C”

 : Interface is set to “Ethernet.”

10-2 DATA OUTPUT TYPE

(1) Header

0:Interface
1: Data Type
2: RS-232C
3: ETHERNET

Press the **[1]** key on the left [Interface] menu or press the **[ENTER]** key with the cursor on the [1: Data Type].

0: Header
1: Data

Press the **[0]** key or press the **[ENTER]** key with the cursor on the [0: Header].

Output Header
Output
(1: Output)
(0: Not output)

Press the **[1]** key to indicate “Output” and, **[0]** key to indicate “Not output.” Press the **[ENTER]** key to determine the selected item and the indication returns to the previous display.

(2) Data

0: Interface
1: Data Type
2: RS-232C
3: ETHERNET

Press the **[1]** key on the [Interface] menu or press the **[ENTER]** key with the cursor on the [1: Data Type].

0: Header
1: Data

Press the **[1]** key or press the **[ENTER]** key with the cursor located on the [1: Data Type].

Data Output Type
All Items
(1: All Items)
(0: CH & Data)

Press the **[0]** key to indicated “CH & Data” and, **[1]** key to indicate “All Items” on the left [Data Output Type] menu. Press the **[ENTER]** key to determine the selected item and the indication returns to the previous display.

10-3 SETTING RS-232C

This section is related to setting of RS-232C interface.

0: Interface
1: Data type
2: RS-232C
3: ETHERNET

Press the **2** key on the [Interface] menu or press the **ENTER** key with the cursor on the [2: RS-232C].

0: Baud Rate
1: Terminat Code
2: Timeout Time

The left RS-232C setting menu appears.

(1) Baud rate

Select and set the desired baud rate from 2400, 96000, 19200, and 38400.

0: Baud Rate
1: Terminat Code
2: Timeout Time

Press the **0** key on the [RS-232C] setting menu or press the **ENTER** key with the cursor on the [0: Baud Rate].

Baud Rate
9600
(0: 9600,1: 19200)
(2: 38400, 3: 2400)

Press the **0** key on the left display menu to indicate the selected baud rate.

Press the **ENTER** key to determine the selected item and the indication returns to the previous display.

(2) Termination code

Select and set the desired termination code from CR and CRLF.

0: Baud rate
1: Terminat Code
2: Timeout Time

Press the **[1]** key on the [RS-232C] setting menu or press the **[ENTER]** key with the cursor on the [1: Terminat Code].

Terminat Code
CR
(1: CRLF)
(0: CR)

Press the **[0]** key to indicate “CR” and, **[1]** key to indicate “CRLF” on the left [Termination Code] display. Press the **[ENTER]** key to determined the selected item and the indication returns to the previous display.

(3) Timeout time

Select and set the timeout time from 5 seconds and 50 seconds.

0: Baud Rate
1: Terminat Code
2: Timeout time

Press the **[2]** key on the left [RS-232C] setting menu or press the **[ENTER]** key with the cursor on the [2: Timeout Time].

Timeout Time
5 sec
(1: 50 Sec)
(0: 5 Sec)

Press the **[0]** key to indicate “5 Sec” and, **[1]** key to indicate “50 Sec” on the left [Timeout Time] display. Press the **[ENTER]** key to determine the selected item and the indication returns to the previous display.

10-4 SETTING ETHERNET

This section details settings of Ethernet interface (10BASE-T/100BASE-TX).

0: Interface
1: Data Type
2: RS-232C
3: ETHERNET

Press the **[3]** key on the interface menu or press the **[ENTER]** key with the cursor on the [3: ETHERNET].

0: IP Address
1: Subnet Mask
2: Default Gateway
3: UCAM Name

The left Ethernet setting menu appears.

(1) IP address

0: IP Address
1: Subnet Mask
2: Default Gateway
3: UCAM Name

Press the **0** key on the [ETHERNET] menu or press the **ENTER** key with the cursor on the [0: IP Address].

IP Address
192.168. 0. 60

Input the "IP Address" with numeric keys.
Pressing the **ENTER** key determines the entered item and the indication returns to the [ETHERNET] setting menu.
(Default is set to '192.168.0.60.')

(2) Subnet mask

0: IP Address
1: Subnet Mask
2: Default Gateway
3: UCAM Name

Press the **1** key on the [ETHERNET] menu or press the **ENTER** key with the cursor on the [1: Subnet Mask].

Subnet Mask
255.255.255. 0

Input subnet mask with numeric keys.
Press the **ENTER** key to determine the entered item and the indication returns to the [ETHERNET] setting menu.
(Default is set to '255.255.255.0.')

(3) Default Gateway

0: IP Address
1: Subnet Mask
2: Default Gateway
3: UCAM Name

Press the **2** key on the [ETHERNET] setting menu or press the **ENTER** key with the cursor on the [2: Default Gateway].

Default Gateway
0. 0. 0. 0

Input default gateway with numeric keys.
Press the **ENTER** key determine the entered item and the indication returns to the [ETHERNET] setting menu.
(Default is set to '0.0.0.0.')

(4) UCAM Name

0: IP Address
1: Subnet Mask
2: Default Gateway
3: UCAM Name

Press the **3** key on the [ETHERNET] setting menu or press the **ENTER** key with the cursor on the [3: UCAM Name].

UCAM Name
UCAM60B
(ABCDEFGHIJ)
0123456789

Input the UCAM name with numeric keys (within 16 characters).
Press the **ENTER** key to determine the entered name and the indication returns to the [ETHERNET] setting menu.
(Default is set to 'UCAM60B.')

(5) Work Group Name

1: Subnet Mask
2: Default Gateway
3: UCAM Name
4: Work Grp Name

Press the **4** key on the left [ETHERNET] setting menu or press the **ENTER** key with the cursor on the [4: Work Grp Name].

Work Grp Name
WORKGROUP
(ABCDEFGHIJ)
0123456789

Input a work group name with numeric keys (within 16 characters).
Press the **ENTER** key to determine the entered name and the indication returns to the [ETHERNET] setting menu.
(Default is set to 'ORKGROUP.')

11. OTHER SETTINGS

11-1 SETTING TIME

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control]

0: Environment
1: Measurement
2: Interface
3: Printer

Press the 0 key on the left [System Control] menu or press the **ENTER** key with the on the [0: Environment].

0: Time
1: Buzzer
2: Japanese/Eng
3: Monitor

Press the **0** key on the left Environment] setting menu or press the **ENTER** key with the cursor on the [0: Time].

Yr Mon Day
2006/07/07
H M S
10:00:00

Input the desired time with numeric keys. Press the **ENTER** key to set the determined time and the indication returns to the [Environment] setting menu.

11-2 SETTING BUZZER

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

0: Time
1: Buzzer
2: Japanese/Eng
3: Monitor

Press the **1** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [1: Buzzer].

Buzzer
ON
(1:ON)
(0:OFF)

Press the **1** key to indicate “ON” and **0** key to indicate “OFF.” Press the **ENTER** key to determine the selected item and the indication returns to the [Environment] setting menu.

11-3 SETTING LANGUAGE

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor located on the [6: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

0: Time
1: Buzzer
2: Japanese/Eng
3: Monitor Disp

Press the **2** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [2: Japanese/Eng].

Japanese/Eng
Japanese
(1:English)
(0:Japanese)

Press the **0** key to select “Japanese” and, **1** key to select “English.” Press the **ENTER** key to determine the selected language and the indication returns to the [Environment] setting menu.

11-4 SETTING MONITOR DISPLAY

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

0: Time
1: Buzzer
2: Japanese/Eng
3: Monitor Disp

Press the **3** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [3: Monitor Disp].

Title Line
ON
(1: ON)
(0: OFF)

Press the **0** key to indicate “OFF” and, **1** key to indicate “ON.”
Press the **ENTER** key to determine the selected item and the indication returns to the [Environment] setting menu.

[Title Line set to “ON”]

CH.	DATA	UNIT
000	10	$\mu\epsilon$
001	15	$\mu\epsilon$
002	10.129	mV

[Title Line set to “OFF”]

000	10	$\mu\epsilon$
001	15	$\mu\epsilon$
002	10.128	mV
003	1.4845	V

11-5 SETTING MONITOR FONT

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

1: Buzzer
2: Japanese/Eng
3: Monitor Disp
4: Monitor Font

Press the **4** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [4: Monitor Font].

Font Size
Standard
(1: Large)
(0: Standard)

Press the **0** key to indicate “Standard” and, **1** key to indicate “Large.”
Press the **ENTER** key to determine the selected item and the indication returns to the [Environment] setting menu.

[Font size set to “Standard”]

000 -2 $\mu\epsilon$
001 10 $\mu\epsilon$
002 15 $\mu\epsilon$
003 10.129 mV

[Font size set to “Large”]

000
- 2 $\mu\epsilon$
001
10 $\mu\epsilon$

11-6 SAVE CHECK WINDOW

- When saving the measured data is set to “OFF” (with the **SAVE** key LED turned OFF), whether or not to display alarm is set when starting the real-time CH measurement.
- When saving the measured data is set to “ON” (with the **SAVE** key LED turned ON), no alarm is displayed.

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

2: Japanese/Eng
3: Monitor Disp
4: Monitor Font
5: Save Check

Press the **5** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [5: Save Check].

Save Check Window
ON
(1: ON)
(0: OFF)

Press the **0** key to indicate “OFF” and, **1** key to indicate “ON.” Press the **ENTER** key to determine the selected item and the indication returns to the [Environment] setting menu.

[Save Check Window]

SAVE OFF state
Do you want measure?
Start: START/STOP
Return: ESC

- Press the **SAVE** key at this time to have save enable state (**SAVE** key LED lights up).
- Press the **START/STOP** key once again to start the measurement. (However, no measured data is saved.)
- Press the **ESC** key to return to the ready state.

11-7 BACKUP FILE

When a folder for saving the measured data is set to “PC card,” set whether or not to create a backup file of the measured data.

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

3: Save Check
4: Monitor Disp
5: Monitor Font
6: Backup File

Press the **6** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [6: Backup File].

Backup File
Not create
(1: create)
(0: Not create)

Press the **0** key to indicate “Not create” and, **1** key to indicate “create”
Press the **ENTER** key to determine the selected item and the indication returns to the [Environment] setting menu.

- Set the [Backup File] to “Yes” and files with the following extensions are created.

“RT\$”: Real-time CH measurement
“IT\$”: Interval measurement
“TR\$”: Trigger measurement
“T_\$”: Trigger interval measurement
“IN\$”: Initial measurement
“ES\$”: EASY MEAS measurement

11-8 SETTING MAINTENANCE

- Setting Maintenance Function is a maintenance function.

NOTE

- Basically, it is used in “Maintenance 1.”

11-9 SETTING PRINTER

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **3** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [3: Printer].

0: Feed Line
1: Header
2: Title
3: Received Data

[Printer] menu window is displayed.

11-9-1 Setting Feed Line

Set whether or not feed line is inserted when printing out data.

If no feed line is inserted, print by moving every line to the front.

0: Feed Line
1: Header
2: Title
3: Received Data

Press the **0** key on the [Printer] setting menu or press the **ENTER** key with the cursor on the [0: Feed Line].

Feed Line
Use
(1: Use)
(0: Not use)

Press the **0** key to indicate “Not use” and, **1** key to indicate “Use.”
Press the **ENTER** key to determine the selected item and the indication returns to the [Printer] setting menu.

[Printing with Feed Line “Not used”]

```

** REALTIME (ORIG) **
2004/07/07 10:00:00
ST CH DATA UNIT
00 000 -5146 µε
00 001 -5016 µε
** REALTIME (ORIG) **
2004/07/07 10:00:00
ST CH DATA UNIT
00 000 -5147 µε
00 001 -5017 µε

```

[Printing with Feed Line “Used”]

```

** REALTIME (ORIG) **
2004/07/07 10:00:00
ST CH DATA UNIT
00 000 -5145 µε
00 001 -5015 µε

** REALTIME (ORIG) **
2004/07/07 10:00:00
ST CH DATA UNIT
00 000 -5146 µε
00 001 -5016 µε

```

11-9-2 Printing Header

Before printing out the measured data, set required items for printing out header portion.

```

0: Feed Line
1: Header
2: Title
3: Received Data

```

Press the **[1]** key on the [Printer] setting menu or press the **[ENTER]** key with the cursor on the [1: Header].

```

Header
Print
(1: Print)
(0: Not print)

```

Press the **[0]** key to indicate “Not print” and, **[1]** key to indicate “Print.” Press the **[ENTER]** key to determine the selected item and the indication returns to the [Printer] setting menu.

[Printing with Header set to “Not print”]

```

2004/07/07 10:00:00
ST CH DATA UNIT
00 000 1000 µε
00 001 -1000 µε

```

[Printing with Header set to “Print”]

```

** REALTIME (ORIG) **
2004/07/07 10:00:00
ST CH DATA UNIT
00 000 1000 µε
00 001 -1000 µε

```

11-9-3 Printing Title

Before printing out the measured data, set required items for title portion.

0: Feed Line
1: Header
2: Title
3: Received Data

Press the **[2]** key on the [Printer] setting menu or press the **[ENTER]** key with the cursor on the [1: Header].

Header
Print
(1: Print)
(0: Not print)

Press the **[0]** key to indicate “Not print and, **[1]** key to indicate “Print.” Press the **[ENTER]** key to determine the selected item and the indication returns to the [Printer] setting menu.

[Printing with Title set to “Not print”]

** REALTIME (ORIG) **
2004/07/07 10:00:00
00 000 1000 $\mu\epsilon$
00 001 -1000 $\mu\epsilon$

[Printing with Title set to “Print”]

** REALTIME (ORIG) **
2004/07/07 10:00:00
ST CH DATA UNIT
00 000 1000 $\mu\epsilon$
00 001 -1000 $\mu\epsilon$

11-9-4 Printing Received Data

Set required items on character string received from the PC.

0: Feed Line
1: Header
2: Title
3: Received Data

Press the **[3]** key on the [Printer] setting menu or press the **[ENTER]** key with the cursor on the [3: Received Data].

Received Data
Print
(1: Print)
(0: Not print)

Press the **[0]** key to indicate “Not print” and, **[1]** key to indicate “Print.” Press the **[ENTER]** key to determine the selected item and the indication returns to the [Printer] setting menu.

11-10 SETTING OFFSET

Set offset value to shift the measured value.

0: MEAS Condition
1: CH Condition
2: TEDS Information
3: Auto-MEAS

Press the **[1]** on the main menu or move the cursor to the [1: CH Condition] with the cursor key (**[↑]** or **[↓]**) and then, press the **[ENTER]** key.

2: CAL Coef
3: Decimal Point
4: Unit
5: Offset

Press the **[5]** key on the [CH Condition] setting menu or press the **[ENTER]** key with the cursor on the [5: Offset].

CH. Offset
000 0.00000
001 0.00000
002 0.00000

Press the offset with the numeric keys. Press the **[ENTER]** key to determine the entered offset.

Numeric value is entered in physical value.

Press the **[DEL]** key to blank out the selected CH data.

Press the **[ESC]** key to return the indication to the [CH Condition] setting menu.

MEMO

Offset value is enabled (when the measured value is indicated in physical value) when measuring function is “MEAS Value,” “EASY MEAS,” or “ORIG. and when the **[COEF]** key LED on the front panel is turned ON.

The **[COEFF]** key LED turns ON/OFF every time it is pressed for approximately more than 3 seconds..

MEMO

The offset setting operation is capable of the following key operations as same as the CH mode setting operation.

- Move the cursor to the [CH] with the cursor key **[←]**. Input the desired CH No. and indicated the setting.
- Press the **[ENTER]** key while pressing the **[SHIFT]** key to copy the offset value.
- Copying operation is also available by pressing the  key.

11-11 Setting Initial Value

This section describes setting of initial value.

Generally, when it is in no-load state before the measurement, the actually measured value is used as the initial value. However, if no-load state is not available or if the initial value is erased with a certain reason, it can be entered by numeric keys.

NOTE

The initial value is an essential data to be regarded as a reference of the measured data.
Take special care when changing the initial value.

4: Unit
5: Offset
6: Ref Resist
7: Initial Value

Press the  key on the [CH Condition] setting menu or press the  key with the cursor on the [7: Initial Value].

CH Initial Value	
000	0.00000
001	0.00000
002	0.00000

Input the desired initial value with numeric keys. Press the  key to determine the entered initial value.

Press the  key to blank out the selected CH data.

Press the  key to return the indication to the [CH Condition] setting menu.

MEMO

The initial value setting operation is capable of the following key operations as same as the CH mode setting operation.

- Move the cursor to the [CH] with the cursor key . Input the desired CH No. and indicated the setting.
- Press the  key while pressing the  key to copy the determined initial value.
- Copying operation is also available by pressing the  key.

11-12 SETTING CH NAME

Set a CH name within 11 characters for every measuring CH.

6: Ref Resist
7: Initial Value
8: Scan Speed
9: CH Name

Press the **9** key on the [CH Condition] setting menu or press the **ENTER** key with the cursor on the [9: CH Name].

CH Name
000 0123456789_
(0123456789)
0123456789

Change the character table with the cursor key (**▲** or **▼**), input the

CH name with corresponding numeric key and then, press the **ENTER** key to determine the entered CH name. CH name can be changed by moving the cursor to the [CH] with the cursor key (**▲** or **▼**).

Press the **ESC** key to return the indication to the [CH Condition] setting menu.

MEMO

The CH name setting operation is capable of the following key operations as same as the CH mode setting operation.

- Move the cursor to the [CH] with the cursor key **◀**. Input the desired CH No. and indicated the setting.
- Press the **ENTER** key while pressing the **SHIFT** key to copy the determined CH name value.
- Copying operation is also available by pressing the  key.

12. OTHER FUNCTIONS

12-1 STROKE CHANGE

Stroke change function is a function used for measuring displacement when it exceeds the capacity of a displacement sensor.

Every time when the displacement reaches the capacity of the displacement sensor, the stroke change function is activated to measure the output of the displacement sensor before and after it is moved. That is, measured value before the move is added to the output after the move enabling continuous measurement.

NOTE

Stroke change function is capable of continuous measurement by changing initial values of measuring CHs to be adapted to the output of the displacement sensor.

However, if the initial value is already excessively large and exceeding the range caused by stroke change function, it should be noted that correct measurement may not be obtained.

MEMO

Before executing the stroke change function, do not forget to confirm the following points.

- (1) Measuring function is in MEAS value mode.
- (2) It is not during the measurement.

0: MEAS Condition

1: CH Condition

2: TEDS Information

3: Auto-MEAS

Press the **0** key on the main menu or press the **ENTER** key with the cursor on the [0: MEAS Condition].

2: Interval

3: Trigger

4: Trig Interval

5: Stroke Change

Press the **5** key on the left [MEAS Condition] setting menu or press the **ENTER** key with the cursor on the [5: Stroke Change]

Object CH

CH: 000

Specify the object CH. Input the CH No. for stroke change with numeric keys and then, press the **ENTER** key.

MEAS Before Move
CH: 000
(Execute: ENTER)
(Stop: ESC)

Conduct measurement before moving the sensor. Press the **ENTER** key to start the measurement.

MEAS After Move
CH: 000
(Execute: ENTER)
(Stop: ESC)

Conduct measurement after moving the sensor. Press the **ENTER** key to start the measurement.

Stroke Change
CH: 000
(Execute: ENTER)
(Stop: ESC)

Stroke change function is reflected to the measured value. Press the **ENTER** key to conduct stroke change operation.

12-2 MEASUREMENT TIMING

Measurement timing is only displayed to AC power supply dedicated unit.

Generally, it is set to [Synchronous] and measurement is conducted by synchronizing with the power supply.

When DC power supply dedicated unit is used, it is set to [Asynchronous].

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **1** key on the left [System Control] menu or press the **ENTER** key with the cursor located on the [1: Measurement].

2: Trigger Mode
3: Cold Junction
4: Power Frequency
5: MEAS Timing

Press the **5** key on the left measurement related menu or press the **ENTER** key with the cursor on the [5: MEAS Timing].

MEAS Timing
Synchronous
(1: Asynchronous)
(0: Synchronous)

Press the **0** key to indicate “Synchronous” and, **1** key to indicate “Asynchronous.” Press the **ENTER** key to determine the selected item and the indication returns to the [Measurement] menu.

12-3 DELTA V

When it is in MEAS value or in EASY MEAS measurement mode, “Delta V” function determines the value obtained by subtracting the initial value of CH preset for voltage measurement or Zero value from the original value as the measured value.

Measured results = Measured value (Original value) – Initial value or Zero value

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **1** key on the left system control menu or press the **ENTER** key with the cursor on the [1: Measurement].

3: Cold Junction Data
4: Power Frequency
5: MEAS Timing
6: Delta V

Press the **6** key on the left [Measurement] menu or press the **ENTER** key with the cursor on the [6: Delta V].

Delta V
Not use
(1: Use)
(0: Not use)

Press the **0** key to indicate “Not use” and **1** key to indicate “Use.”
Press the **ENTER** key to determine the selected item and the indication returns to the [Measurement] menu.
For how to measure the initial value, see “7-1-2 Setting Initial Value (Measurement).”
For how to measure the Zero value, see “7-1-3 Auto Zero.”

12-4 DELTA T

When it is in MEAS value or in EASY MEAS measurement mode, “Delta T” function determines the value that is obtained by subtracting the initial value of CH preset for temperature measurement using thermocouple or Zero value from the original value as the measured value.

Measured results = Measured value (Original value) – Initial value or Zero value

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **1** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [1: Measurement].

4: Power Frequency
5: MEAS Timing
6: Delta V
7: Delta T

Press the **7** key on the left [Measurement] menu or press the **ENTER** key with the cursor on the [7: Delta T].

Delta V
Not use
(1: Use)
(0: Not use)

Press the **0** key to indicate “Not use” and, **1** key to indicate “Use.”
Press the **ENTER** key to determine the selected item and the indication returns to the [Measurement] menu.
For how to measured the initial value, see “7-1-2 Setting Initial Value (Measurement).”
For how to measure the Zero value, see “7-1-3 Auto Zero.”

12-5 SETTING PRINTING ITEMS

Press the **LIST** key with preset menu items displayed to print out the selected contents.

Printing items are described in the following table.

Printing Items		Key Operation					Printing Contents						
MEAS Condition	MEAS CH	SET	→	0	→	0	→	LIST	Start CH and End CH				
	Repeat Times	SET	→	0	→	1	→	LIST	Repeat times				
	Interval	SET	→	0	→	2	→	LIST	Contents of interval measurement				
	Trigger	SET	→	0	→	3	→	LIST	Contents of trigger measurement				
	Trigger Interval	SET	→	0	→	4	→	LIST	Contents of trigger interval measurement				
CH Condition	Manual CH Mode	SET	→	1	→	0	→	LIST	CH mode				
	CAL Coefficient	SET	→	1	→	2	→	LIST	CAL Coefficient				
	Decimal Point	SET	→	1	→	3	→	LIST	Decimal point position				
	Unit	SET	→	1	→	4	→	LIST	Unit				
	Offset	SET	→	1	→	5	→	LIST	Offset				
	Ref Resist	SET	→	1	→	6	→	LIST	Reference resistance value				
	Initial Value	SET	→	1	→	7	→	LIST	Initial value				
	Scan Speed	SET	→	1	→	8	→	LIST	Scanning speed				
	CH Name	SET	→	1	→	9	→	LIST	CH name				
TEDS Information	Set CH	SET	→	2	→	0	→	LIST	Setting contents of CHs				
	Auto-MEAS	SET	→	2	→	1	→	LIST	Setting contents of items				
File Manage	File List	SET	→	6	→	1	→	LIST	File list				
System Control	Environment	SET	→	7	→	0	→	1	→	LIST	Setting contents of items in Environment		
	Measurement	SET	→	7	→	1	→	0	→	LIST	Setting contents of items in Measurement		
	Interface												
	• RS-232C	SET	→	7	→	2	→	2	→	0	→	LIST	Setting contents of items of RS-232C
	• ETHERMET	SET	→	7	→	2	→	3	→	0	→	LIST	Setting contents of items of Ethernet
	Printer	SET	→	7	→	3	→	0	→	LIST	Setting contents of items of Printer		

12-6 POWER CONTROL

Note that this item is not displayed on AC power supply dedicated unit.

To save consumption of external battery, the DC power supply dedicated unit is provided with power ON/OFF function in interval measurement.

The power control function is enabled when measurement is conducted at more than 1 hour intervals and when the [Power Control] is set to "Use." When the "Use" is selected, power is turned ON 5 minutes before the measurement and automatically turned OFF after the measurement.

4: Condition File
5: Check
6: File Manage
7: System Control

Press the **7** key on the main menu or press the **ENTER** key with the cursor on the [7: System Control].

0: Environment
1: Measurement
2: Interface
3: Printer

Press the **0** key on the left [System Control] menu or press the **ENTER** key with the cursor on the [0: Environment].

5: Monitor Font
6: Backup File
7: Maintenance
8: Power Control

Press the **7** key on the left [Environment] menu or press the **ENTER** key with the cursor on the [8: Power Control].

Power Control
Use
(1: Use)
(0: Not use)

Press the **0** key to indicate "Not use and, **1** key to indicate "Use."
Press the **ENTER** key to determine the selected item and the indication returns to the [Environment] menu.

MEMO

In the interval measurement using the power control, the following items are printed out when measured.

- The time when the power is turned ON for the next time.
- The time when the power is turned OFF.

13. TECHNICAL INFORMATION REQUIRED FOR MEASMENT

13-1 COMPENSATING NONLINEARITY IN STRAIN GAGE

An ideal bridge output in strain measurement can be obtained by the following equation.

$$\text{Output voltage } e = \frac{1}{4} K_s \cdot \varepsilon \cdot E$$

where, K_s : Gage factor
 ε : Strain value
 E : Bridge applied voltage

Assume that only one side of the wheatstone bridge is regarded as the strain gage and when only the said side changes, nonlinearity generates between the strain value and output voltage.

Nonlinearity generates in relation between strain value and output voltage. The output voltage at that time is obtained by the following equation resulting to cause error as shown in the following table.

$$\text{Output voltage } e = \frac{\varepsilon}{1+\varepsilon}$$

True Strain Value	Error
1,000 $\mu\text{m/m}$	-0.1%
10,000 $\mu\text{m/m}$	-1.0%
100,000 $\mu\text{m/m}$	-9.1%

The UCAM-60B automatically conducts compensation calculation for the output voltage to obtain the true strain value.

$$\text{Output voltage } \varepsilon = \frac{e}{1-e}$$

The above nonlinearity also generates when opposite side active measuring method is adopted.

MEMO

1. When measuring the internal scanner of the UCAM-60A/60B, nonlinearity compensation is not required for 1-gage method.
2. When measuring the internal scanner, nonlinearity compensation is required for 2-gage method (Active-dummy method) and 4-gage method (Opposite side active method) and compensating process is internally conducted in the UCAM-60B.
3. When measuring the external scanner, nonlinearity compensation is required for 1-gage method, 2-gage method (active-dummy method), and 4-gage method (Opposite side active method) and compensating process is internally conducted in the UCAM-60B.

A list of compensation equations is described in the next page.

Compensation equation regarding MEAS CH mode in strain measurement is described in the following table.

Measuring Method	MEAS CH Mode	Compensation Equation	Internal Scanner	External Scanner
1-gage method (3-wire system connection) (2-wire system connection)	1G 120 1G 240 1G 350	$\varepsilon = \frac{e}{1-e}$	Not compensated (Note 1)	Compensated
1-gage method (True-dummy method)	1G 120/D 1G 120/A 1G 350/D 1G 350/A	$\varepsilon = \frac{e}{1-e}$	Not compensated (Note 1)	Compensated
2-gage method (Active-dummy method)	2G/A-D 2G/COM-D	$\varepsilon = \frac{e}{1-e}$	Compensated	Compensated
2-gage method (Active-active method)	2G/A-A	$\varepsilon = e$	Not compensated	Not compensated
4-gage method (Opposite side active method)	4G/A-A	$\varepsilon = \frac{2e}{2-e}$	Compensated	Compensated
4-gage method (Full-bridge method)	4G 4G_HR 4G/I (120) 4G/I (350) 4g/I_HR 4G/T	$\varepsilon = e$	Not compensated	Not compensated

(Note 1) Provided only for the UCAM-60A/60B

13-2 HOW TO USE DUMMY GAGE METHOD

A true-dummy method is adopted in KYOWA's Data Logger UCAM series that is designed to exclude in effective manner by the Software, an apparent strain resulted from linear expansion coefficient of measuring target (test piece) caused by change in ambient temperature.

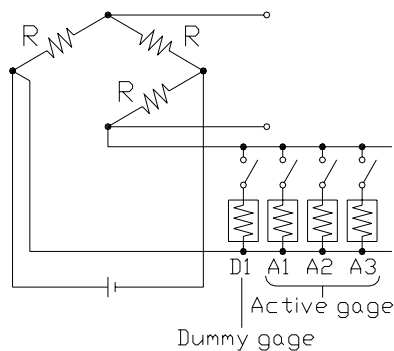
When compensating temperature of multiple active gages with one dummy gage, if temperature between both gages are identical, correct temperature compensation is available. Therefore, if the dummy gage is used for strain measurement of materials with poor thermal conductivity such as plastic, composite materials, concrete, etc., a true gage can be realized and it is largely effective for improving measurement accuracy.

Normally, if the SELCOM gage is used, dummy gage is not necessary but when the SELCOM gage applicable for the linear expansion coefficient of measuring target (test piece) is not available, the true dummy gage method is a very effective method.

(1) True-Dummy Method

One dummy gage is arranged in a group having the same temperature condition and measured with the same condition as the active gage. The respective data is recorded in the memory and then, subjected to subtraction process by the software for temperature compensation.

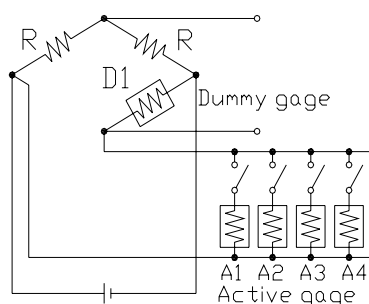
Thus the temperature compensation of multiple active gages is available without affected by self-heating and all the more capable of correctly measuring strain with one dummy gage.



(2) Common Dummy Method

In this common dummy method, active gages are changed in series and bridge excitation voltage is applied only when it is in measurement. On the other hand, bridge excitation voltage is applied to dummy gage every time the active gage is measured.

Therefore, since difference in self-heating influence may generate between the active and dummy gages, it is difficult to conduct a complete temperature compensation with this common dummy method.



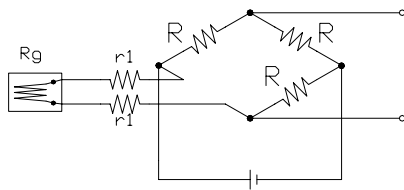
13-3 HOW TO COMPENSATE TEMPERATURE INFLUENCE ON LEAD WIRE

(3-WIRE SYSTEM CONNECTION)

When a lead wire is extended from the gage to a bridge circuit using a SELCOM gage as shown in the following, resistance change of the lead wire caused by temperature is viewed as an apparent strain.

With this state, it is not available to fully exert effective features of the SELCOM gage in strain measurement.

An apparent strain caused by temperature effect on the lead wire can be obtained by the following equation.



$$\varepsilon = \frac{\Delta R}{R} \cdot \frac{1}{Ks} = \frac{r1 \cdot 2l \cdot \alpha \cdot \Delta t}{Rg + r1 \cdot 2l} \cdot \frac{1}{Ks}$$

Rg: Gage resistance value (Ω)

α : Resistance temperature coefficient of lead wire ($^{\circ}\text{C}$)

Δt : Temperature change ($^{\circ}\text{C}$)

l: Lead wire length (m)

rl: Resistance value of 1-m long lead wire (Ω/m)

Ks: Gage factor = 2.00

For example, when one way of parallel vinyl coated wire having cross-section 0.3 mm^2 in 10 meter (Resistance value: $0.062 \text{ } \Omega/\text{m}$, Resistance temperature coefficient: $3.93 \times 10^{-3}/^{\circ}\text{C}$) is 10 m, an apparent strain per degree temperature change shall be obtained by the following expression.

$$\varepsilon = \frac{0.062 \times 2 \times 10 \times 3.93 \times 10^{-3} \times 1}{120 + 0.062 \times 2 \times 10} \times \frac{1}{2} \div 20 \text{ } \mu\text{m} / \text{m}/^{\circ}\text{C}$$

In the same manner, the apparent strains for 20 meter and 50 meter lead wires are obtained as follows resulting to have large difference. .

20 m: $40 \text{ } \mu\text{m}/\text{m}/^{\circ}\text{C}$

50 m: $100 \text{ } \mu\text{m}/\text{m}/^{\circ}\text{C}$

In addition, when a parallel vinyl coated wire having cross-section 0.08 mm^2 in diameter (Resistance value: $0.239 \text{ } \Omega/\text{m}$, Resistance temperature coefficient: $3.93 \times 10^{-3}/^{\circ}\text{C}$) is used and calculated in the same manner, the apparent strain shall be obtained by the following expression.

10 m: $145 \text{ } \mu\text{m}/\text{m}/^{\circ}\text{C}$

20 m: $290 \text{ } \mu\text{m}/\text{m}/^{\circ}\text{C}$

50 m: $725 \text{ } \mu\text{m}/\text{m}/^{\circ}\text{C}$

As a result, an apparent strain generates that is larger than the parallel vinyl coated wire with cross section 0.3 mm^2 . Thus, the smaller the cross section of the lead wire and longer the length of the lead wire, the larger it becomes the temperature influence.

As a method for removing the temperature effect on the lead wire, 3-wire system connection is currently widely adopted in strain meter measuring instrument.

Principle of the 3-wire system connection is described in the following.

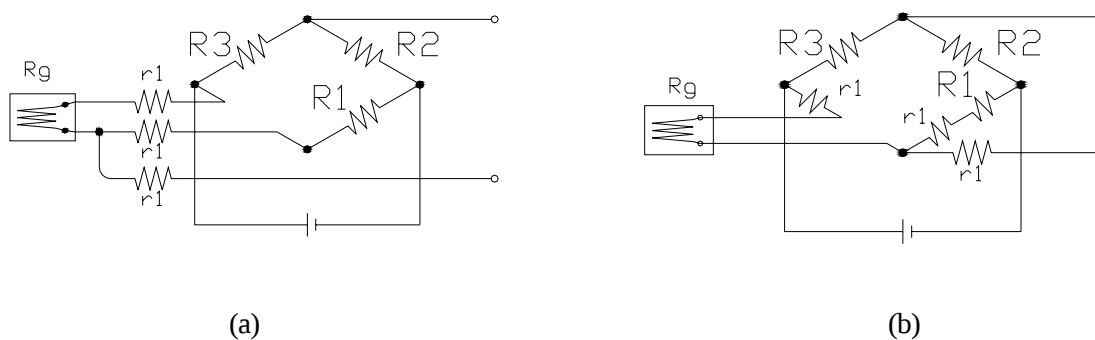
In the following figures, R_g represents a strain gage, R_1 , R_2 , and R_3 represent internal fixed resistance, and r_l represents lead wire resistance. Figure (b) is a simplified figure of a basic circuit of figure (a).

In the above figures, the 3-wire system connection is configured by using 3 lead wires for strain gage lead wire to have one lead wire resistor provided to the adjacent side.

With this connection method, temperature effect on lead wire is cancelled and ignored.

As essential precautions when using the 3-wire system connection method, in order to have the same temperature effect on the lead wire, the 3 lead wires should be of same type, should have the same length, cross section, and coating color.

To satisfy the above requirements, a 3-wire parallel vinyl coated wire is applicable.



13-4 COMPENSATING GAGE FACTOR

The UCAM-60B is designed to conduct measurement with gage factor 2.00. When the gage factor of the current gage is not 2.00, it is required to compensate the strain gage. Compensation can be conducted by the following expression.

$$\text{True strain gage} = \text{Measured strain gage} \times \frac{2.00}{\text{Gage factor of the current strain gage}}$$

The above calculation can be carried out by using the coefficient calculation function.

13-5 COMPENSATION FOR LONG LEAD WIRE AND CABLE

If the length of the lead wire is extended in 1-gage method and 2-gage method connections, bridge circuit of the strain gage may be structured with unnecessary lead wire resistance in series and gage factor of the apparent strain lowers.

$$\text{True strain gage} = \text{Measured strain gage} \times \frac{\text{Gage resistance} + \text{Lead wire resistance}}{\text{Gage resistance}}$$

The above resistance of the lead wire is resistance of the whole lead wire (Round-trip resistance).

However, for the 3-wire system connection method, substitute one-way resistance.

If the length of the cable is extended 4-gage connection method (Full-bridge method, transducers), bridge circuit may be structured with unnecessary cable resistance in series and sensitivity is deteriorated due to decrease in excitation voltage.

$$\text{True strain gage} = \text{Measured strain gage} \times \frac{\text{Bridge resistance} + \text{Cable resistance}}{\text{Gage resistance}}$$

The above cable resistance is resistance of the whole cable (Round-trip resistance).

The above expression can be obtained by coefficient calculation function.

Example of round-trip resistance per meter for lead wire and cable is described in the following table.

The resistance may slightly vary with the wire rod actually used. If you can check the resistance of the actually used wire rod, use the correct value.

Cross-section (mm ²)	Number of wires/ Wire diameter	Round-trip resistance per 10 meter (Ω)	Remarks
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 cable

14. APPENDIX

14-1 SETTING SCANNER

(1) When Using One USB-70/65A

CH.070~079	:	USB-70/65A	:	CH switch	[07]
CH.060~069	:	↓	:	↓	[06]
CH.050~059	:	↓	:	↓	[05]
CH.040~049	:	↓	:	↓	[04]
CH.030~039	:	↓	:	↓	[04]
CH.020~029	:	USS-6*B	:	Assign CHs even if with no USS	
CH.010~019	:	USS-6*B	:	Assign CHs even if with no USS	
CH.000~009	:	USS-6*B	:	Assign CHs even if with no USS	

(2) When Using One USB-50/51 (CH Nos. 050 to 099 with Box No. set to '1.')

CH.090~099	:	USB-50/51A	:	Box No.	[1]
CH.080~089	:	↓	:	↓	
CH.070~079	:	↓	:	↓	
CH.060~069	:	↓	:	↓	
CH.050~059	:	↓	:	↓	
CH.040~049	:	Cannot use			
CH.030~039	:	Cannot use			
CH.020~029	:	USS-6*B	:	Assign CHs even if with no USS	
CH.010~019	:	USS-6*B	:	Assign CHs even if with no USS	
CH.000~009	:	USS-6*B	:	Assign CHs even if with no USS	

14-1-1 When Internal Scanner is set to “Not Use”

(1) When Using One USB-70/65A

CH.040~049	:	USB-70/65A	:	CH switch	[04]
CH.030~039	:	↓	:	↓	[03]
CH.020~029	:	↓	:	↓	[02]
CH.010~019	:	↓	:	↓	[01]
CH.000~009	:	↓	:	↓	[00]

(1) When Using One USB-50/51 (CH Nos. 000 to 049 with Box No. set to '0.')

CH.040~049	:	USB-50/51	:	Box No.	[0]
CH.030~039	:	↓	:	↓	
CH.020~029	:	↓	:	↓	
CH.010~019	:	↓	:	↓	
CH.000~009	:	↓	:	↓	

- USS-2 *A: Internal scanning unit USS-21A, 22A, 23A
- USS-6 *A: Internal scanning unit USS-61A, 62A, 63A
- USS-6 *B: Internal scanning unit USS-61B, 62B, 63B

Maximum 3 units of any of the above scanning units are installed. (CHs 000 to 029)

14-2 AMOUNT OF DATA IN INTERNAL MEMORY

Amount of data of 1 measurement can be obtained by the following simplified format.

(Simplified format)

$$\text{One measurement (Byte)/[CHs]} = \text{29 (Byte)} + \text{[CHs]} \times \text{26 (Byte)}$$

26 (Byte) per CH is used.

The number of CHs

Header information: 29 (Byte) per measurement is used.

Amount of data (Byte) per measurement of the active CH

(Example) How many measuring times is available for 30-CH measurement?

Amount of data used for one 30-CH measurement is obtained by the above simplified format.

$$29 \text{ (Byte)} + 30 \text{ (Number of CHs)} \times 26 \text{ (Byte)} = 809 \text{ (Byte)}$$

Internal memory is 7 MB. It is converted into Byte by the following expression.

$$7 \text{ MB} = 1.024 \text{ k(Byte)} \times 7 = 7,168 \text{ k(Byte)} = 7,340,032 \text{ (Byte)}$$

$$(1 \text{ k(Byte)} = 1,024 \text{ (Byte)})$$

Then, the number of storing times in 7 MB is obtained by the following expression.

$$7,340,032 \text{ (Byte)} \div 809 \text{ (Byte)} = 9,072 \text{ times}$$

One interval measurement/Hour (24 times/Day)

$$9,072 \text{ times} / 24 \text{ times} = 378 \text{ days}$$

*: For one measurement/hour of interval measurement with 30-CH, data can be recorded for 378 days only by internal memory.

MEMO

- (1) The above example is applicable only when 1 file is stored in the internal memory.
When multiple files are stored, extra sector on the memory may be used to reduce the measuring times.
- (2) When the internal memory becomes full while saving data, data is written into memory card (flash ATA card, etc.) in the PC card slot.
- (3) When measuring mode “4GT” is used, the amount of data is doubled as 2 data of strain + temperature per CH.

- The number of data saving times available in internal memory

The number of measuring CHs and the number of data saving times are described in the following table.

The number of measuring CHs includes from the first to last CHs.

Number of MEAS CHs	Number of Bytes Used for One Measurement	Number of Storing Times Available In Internal Memory (7 MByte (7,340,032 Byte))
1	55	133455
4	133	55188
5	159	46163
10	289	25398
20	549	13369
30	809	9072
40	1069	6866
50	1329	5522
60	1589	4619
70	1849	3969
80	2109	3480
90	2369	3098
100	2629	2791
150	3929	1868
200	5229	1403
250	6529	1124
300	7829	937
350	9129	804
400	10429	703
450	11729	625
500	13029	563
550	14329	512
600	15629	469
650	16929	433
700	18229	402
750	19529	375
800	20829	352
850	22129	331
900	23429	313
950	24729	296
1000	26029	281

14-3 CONSUMPTION CURRENT OF DC POWER SUPPLY DEVICE

- Consumption current

Built-in Printer	Scanner	UCAM-60B (DC Power Supply Dedicated Unit)
Not use	Internal 30 CHs only or more than four USB-70s (UPS-70 is required)	Approx. 20 W When 12 V: Approx. 1.7 A
	Internal 30 CHs + USB-70 (1 unit)	Approx. 24 W When 12 V: Approx. 2.0 A
	Internal 30 CHs + USB-70 (3 units)	Approx. 31 W When 12 V: Approx. 2.6 A
Use	Internal 30 CHs only	Approx. 45 W When 12 V: Approx. 3.8 A
	Internal 30 CHs + USB-70 (3 units)	Approx. 60 W When 12 V: Approx. 5.0 A

MEMO

- (1) Take care that consumption current may largely vary according to whether “Use” or “Not use” the built-in printer.
- (2) Power supply in use may be applied with 10 A of rush current when starting up the UAM-60B. It is preferable to use the power supply device with enough current.
- (3) When more than four USB-70s are used, it is required to load power supply to the USB. See instruction in the catalog.

- Power Control Function of UCAM-60B-DC

- (1) For DC power supply dedicated unit, a power control function (that automatically turns ON/OFF at interval measurement) is enabled. (See “12-6 Power Control.”)

Set the Power Control to “Use” to have the power control function enabled at more than 1 hour intervals.

- (2) When the UCAM-60B is not under measurement, the power control function turns OFF and turns ON 5 minutes before the measurement and turn OFF after the measurement.

However, even if it is not under measurement, approximately maximum 10 mA current is consumed.

(Since minimum power is used for time control, power ON/OFF operation, etc., take care that it is different from completely power OFF state with the power switch turned OFF.)

- (3) Operation of the interval measurement during power control shall be as follows.

Power ON time of the next measurement “ALARM SET**”: **” and power OFF time “POWER OFF: **” are printed on the printer and it becomes power OFF state (Not measuring).

Cancelling this printing operation .is not available.

Turns ON five minutes before the measurement to start the next interval measurement.

After completing the preset measuring times of the interval measurement, “INTERVAL END” is printed out and it becomes power OFF state.

- (1) After finishing the interval measurement, the UCAM-60B becomes in not measuring state.

Turn OFF and turn ON the power switch. Then, the UCAM-60B starts up as usual.

- (2) To normally return from not measuring state, turn OFF and ON the power switch. Then, the UCAM-60B starts up as usual.

When the interval measurement is left ON as it is, after finishing the next interval measurement, the UCAM-60B becomes turn OFF (Not measuring state) state once again.

- Reference Material for Selecting Battery

The following is a reference example.

In practice, since battery capacity varies with capacity change and electric current in battery self-discharge and ambient temperature, it is essential up to how much extent we should consider the battery characteristic data and safety factor.

Example (1) Battery capacity calculation when using battery in interval measurement

Measuring Period: 1 month

Interval Condition: Once/30 minutes (Power control is disabled. Always set to power ON state)

Battery: 12 V 72 Ah specification

UCAM-60B-DC (Built-in printer not used, only internal 30 CHs)

$$1.7 \text{ (A)} \times 24 \text{ (Hour)} \times 31 \text{ (Day)} = 1265 \text{ (Ah)}$$

$$1265 \text{ (Ah)} \div 72 \text{ (Ah/Battery)} = 17.6$$

Calculate by setting battery capacity safety factor to 70%. Then, the battery capacity is obtained by the following expression.

$$17.6 \times 6 (1 \div 0.7) = \text{Approx. } 25$$

- Use 25 batteries in parallel connection.

Example (2) Battery capacity calculation when using battery in interval measurement

Measuring Period: 1 month

Interval Condition: Once/1 Hour (Power control is enabled. Power ON times is hour/15 minutes)

Battery: 12 V 72 Ah specification

UCAM-60B-DC (Built-in printer not used, only internal 30 CHs)

$$1.7 \text{ (A)} \times 24 \text{ (Hour)} \times 31 \text{ (Day)} \times 15 \text{ (Minute)} / 60 \text{ (Minute)} = 316 \text{ (Ah)} \quad * \text{ Power ON}$$

$$0.01 \text{ (A)} \times 24 \text{ (Hour)} \times 31 \text{ (Day)} \times 45 \text{ (Minute)} / 60 \text{ (Minute)} = 5.6 \text{ (Ah)} \quad * \text{ Not measuring state}$$

$$\text{Sum: Approx. } 322 \text{ (Ah)}$$

$$322 \text{ (Ah)} \div 72 \text{ (Ah/Battery)} = 4.47$$

Calculate by setting battery capacity safety factor to 70%. Then, the battery capacity is obtained by the following expression.

$$4.47 \times 6 (1 \div 0.7) = \text{Approx. } 6.4$$

- Use 7 batteries in parallel connection.

14-4 HOW TO RESET TO FACTORY DEFAULT SETTING

NOTE

Currently, only items set in [MEAS Condition], [CH Condition], [Auto-MEAS] and [System Control] menus can be reset to factory default setting.

(1) Turn ON the UCAM-60B.

(2) With the **MEAS** LED lighted up, continuously press the **DEL** key.

(3) The left window appears.

```
LOAD  SETUP
FACTOR YDEFAULT
[SET] : LOAD
[ESC] : CANCEL
```

Then, release the **DEL** key.

(4) Next, press the **SET** key.

(5) The window changes to the left display

```
SETUP  FINISH
REBOOT UCAM
```

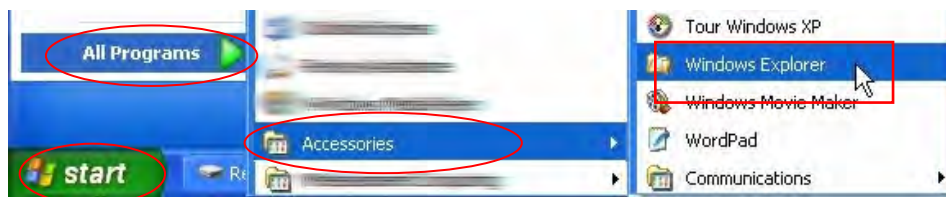
(6) Turn OFF and turn ON once again. Then, the UCAM-60B activates with the factory default setting.

14-5 HOW TO VIEW INTERNAL MEMORY/PC CARD FROM PC

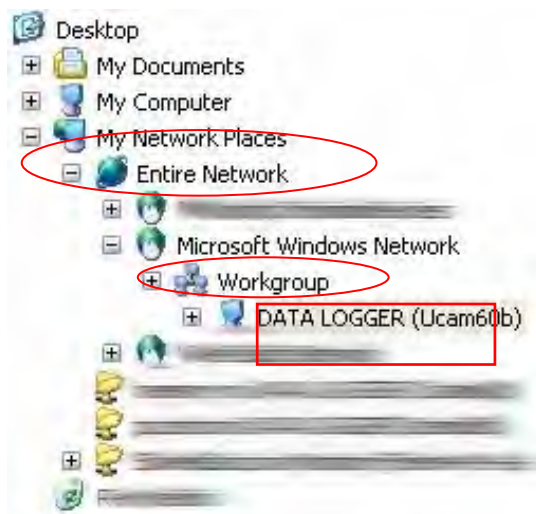
With the Ethernet interface connected, accessing to UCAM-60B internal memory and PC card is enabled.

(Description shall be made with “WindowsXP” [Explorer].)

- (1) Click [Start] on Windows and click menus in due order [All Programs], [Accessories] and then, [Windows Explorer].



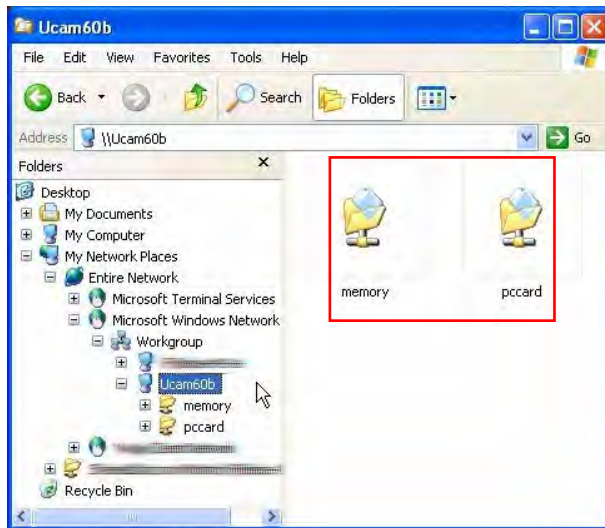
- (2) On the [Windows Explorer] menu, select “Workgroup.”



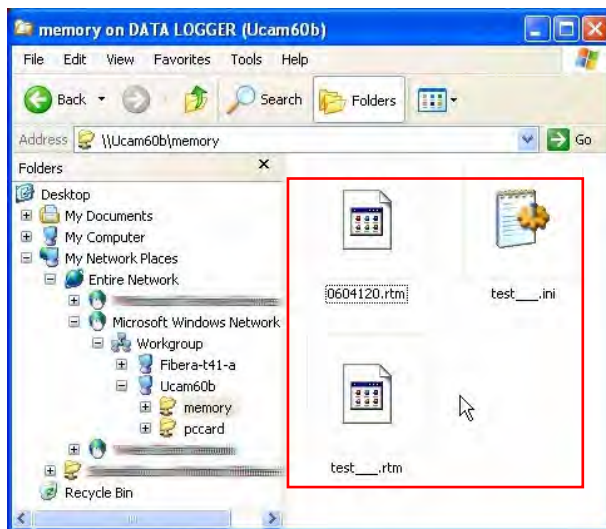
In the “Workgroup” menus, “Ucam60b” is displayed.
If it is not displayed, check the Ethernet setting.

- (3) Select the “Ucam60b” to display the “memory” and “pccard.”

The “memory” is an internal memory of the UCAM-60B and “pccard” is a PC card installed on the UCAM-60B.



- (4) Select “memory” and select a file type “MEAS data file (*.INI, *.RTM, *.IT*, TRG, *.T_I)” and a data file recorded on the UCAM is displayed.”



NOTE

- (1) If the optional UCS-60A (Optional) is used, specify the above folder to access to the internal memory and PC card.
- (2) Files in the internal memory and PC card can be copied to PC side.
Also, files in the internal memory and PC card can be deleted and transferred.
On the other hand, copying and transferring files in the PC card to internal memory are not allowed.
- (3) The above description is mentioned for WindowsXP. Take care that the operation may vary with operating environment or other OSs

15. SPECIFICATIONS

- Applicable Sensors
 - Strain gage, Strain gage transducer (Can connect to TEDS compatible product)
 - Civil engineering transducer with temperature measuring function
 - DC voltage, DC current
 - Thermometer (Thermocouple, Platinum resistance thermometer sensor)
 - Potentiometer sensor
 - LVDT Linear variable differential transformer transducer (When scanner USB-65A is used)
 - Sliding resistance transducer (When scanner USB-65A is used)
- Connecting available scanners
 - The following KYOWA'S scanners can be connected by using scanner interface (Optional)
 - USB-70 series scanners (Use USI-67A scanner interface)
 - USB-65A scanner (Use USI-67A scanner interface)
 - USB-51A/51AT scanner (Use USI-65A scanner interface)
 - USB-20A/50A scanner (Use USI-65A scanner interface)
 - USB-20D/50D scanner (Use USI-65A scanner interface)

Applicable Sensors and Connected Scanners

Connected Scanners Applicable Sensors			For general strain measurement					For civil engineering measurement			
			Internal Scanner Note 1)	USB -70 -10 /20	USB -51A	USB -51AT	USB -20A USB-50A	Internal Scanner Note 2)	USB -70 -30	USB -65A	USB -20D USB -50D
Strain gage Strain gage transducer	1-gage method	120Ω	○	○	○	-	○	○	○	-	-
		240Ω	○	○	-	-	-	○	○	-	-
		350Ω	○	○	-		○	○	○	-	-
	1-gage method (True dummy)	120Ω	○	○	○	-	○	○	○	-	-
		350Ω	○	○	-	-	○	○	○	-	-
	2-gage method 60 to 1000Ω	Active-dummy	○	○	○	-	○	○	○	-	-
		Active-active	○	○	○	-	○	○	○	-	-
		Common-dummy	-	○	-	-	-	-	○	-	-
	4-gage method 60 to 1000Ω Note 3	Opposite side Active method	○	○	○	-	○	○	○	-	-
		Full bridge method	○	○	○	-	○	○	○	-	○
Civil Engineering transducer	4-gage method 120 Ω	Constant current excitation	○	-	-	-	-	○	-	-	-
	4-gage method 350Ω	Constant current excitation	○	○	-	-	-	○	○	-	○
		Transducer with temperature measuring function	○	-	-	-	-	○	○	-	○
	Linear variable differential transformer transducer		-	-	-	-	-	-	-	○	-
	Sliding resistance transformer		-	-	-	-	-	-	-	○	-
Voltage	DC Voltage		○	○	○	○	○	○	○	-	○
Current	DC Current		○	○	-	-	-	○	○	-	-

Connected Scanners Applicable Sensors			For general strain measurement					For civil engineering measurement			
			Internal Scanner Note 1)	USB -70 -10 /20	USB -51A	USB -51AT	USB -20A USB -50A	Internal Scanner Note2)	USB -70 -30	USB -65A	USB -20D USB -50D
Temperature	Thermocouple	K(CA)	○	○	-	○	○	○	○	-	-
		T(CC)	○	○	-	○	○	○	○	-	-
		E(CRC)	○	○	-	○	○	○	○	-	-
		J(IC)	○	○	-	○	○	○	○	-	-
		R	○	○	-	○	○	○	○	-	-
	Platinum resistance thermometer sensor	Pt100 Ω (New JIS)	○	-	-	-	-	○	○	-	-
		JPt100 Ω (Old JIS)	○	-	-	-	-	○	○	-	-
Potentiometer sensor			○	○	-	-	-	○	○	-	-
Built-in lightning surge protector			-	-	-	-	-	○	○	○	-
Scanner interface (USI-***) ^{Note 4)}			Not required	67A	65A		Not required	67A		65A	

Note 1) When scanning unit USS-61B or USS-62B is installed

Note 2) When scanning unit USS-63B is installed

Note 3) When it is in high resolution mode: 120 to 1000 Ω

Note 4) Only 1 type of scanner interface can be installed.

- Number of measuring CHs

■ Input terminal

■ Scanning speed

When internal scanner is installed: Maximum 30

When external scanner is connected: Maximum 1000

When internal + external scanners are used: Maximum 1000

Terminal board installed by either soldering or screw clamping

NDIS connector (When scanning unit USS-62B is used)

50 ms/CH (Standard mode)

280 ms/CH (High resolution mode) *Setting available to every CH

20 ms/CH (High speed mode, optional)* Only internal scanner: Collective setting

Power Frequency Scanner	50 H Zone	60 Hz Zone
Internal scanner (Standard mode)	50 ms/CH	50 ms/CH
Internal scanner (High resolution mode)	0.28 Sec/CH	0.28 Sec/CH
Internal scanner (High speed mode)	20 ms/CH	20 ms/CH
USB-70A series scanner (Standard mode only)	60 ms/CH	58.4 ms/CH
USB-50/51 series scanner (Standard mode only)	80 ms/CH	66.7 ms/CH

*: The above numeric values denote standard scanning speed (maximum speed) for each condition.

The following settings are available except for the above setting.

0.28 sec/CH
0.5 sec/CH
1 sec/CH
2 sec/CH
5 sec/CH
10 sec/CH

Scanning Speed Applicable Sensors	Standard Mode (50 ms/CH)	High Resolution Mode (0.28 Sec/CH)	High Speed Mode (20 ms/CH)
Strain (gage transducer)	○	○	○
Voltage, Current	○	×	○
Civil engineering transducer	○	×	×
Thermometer (TC, Pt)	○	×	×
Potentiometer sensor	○	×	○

- High resolution and high speed modes are set only for internal scanner.
- High resolution mode is set only for 4-gage method
- High speed mode is set only for 4-gage method of strain measurement and for voltage, current, potentiometer sensors.

- Switching element Semiconductor relay (Internal scanner)
- Operation mode Realtime measurement
Monitor measurement
Automatic measurement
- Measuring function Initial value measurement (Saves the measured value as initial value)
Original value measurement (No initial value is subtracted)
MEAS value measurement (Measured value = Original value – initial value)
EASY MEAS measurement (Auto-ZERO function is enabled)
(Measured value = Original value – Zero value)
*All CHs: Collective setting

- Coefficient calculating function Multiplication function of calibration coefficient, Calibration using TEDS information sensor, converting measured value into physical value, scaling are available.

- Unit 59 units

No.	Unit	No.	Unit	No.	Unit
00	$\mu\epsilon$	20	Cm/s^2	40	m/s
01	$\mu\text{m/m}$	21	m/s^2	41	m/min
02	mN	22	G	42	km/h
03	N	23	g	43	Hz
04	kN	24	kg	44	kHz
05	MN	25	t	45	MHz
06	$\text{N} \cdot \text{m}$	26	ms	46	rpm
07	$\text{kN} \cdot \text{m}$	27	s	47	Ω
08	$\text{N} \cdot \text{cm}$	28	min	48	$\text{k}\Omega$
09	Pa	29	h	49	$\text{M}\Omega$
10	hPa	30	mV	50	mW
11	kPa	31	V	51	W
12	MPa	32	mA	52	kW
13	N/mm^2	33	A	53	db
14	N/m^2	34	K	54	%
15	mmHg	35	$^{\circ}\text{C}$	55	ppm
16	Kgf/cm^2	36	rad	56	pH
17	mm	37	$^{\circ}$	57	R
18	cm	38	rad/s	58	(Blank)
19	m	39	cm/s		

- Auto-MEAS function
 - Trigger measurement
 - Trigger measurement is started by relative value (Constant variation) or absolute value.

Interval measurement

Automatically measured at the preset time intervals

Trigger interval measurement

Combination of the above trigger and interval measurements

- Storage function

Internal memory

Capacity: Approx. 7 Mbyte

Flash ATA memory card (PC card)

Capacity: (Varies with card types)

Card (Optional)

■ Strain measurement (Standard mode)

Bridge excitation voltage	Constant voltage bridge excitation:	Approx. 2 VDC
	Constant voltage bridge excitation:	Approx. 5VDC
	Constant current bridge excitation:	Approx. 5.7 mA (With bridge resistance 350 Ω) Approx. 16.7 mA (With bridge resistance 120 Ω)
Scanning speed	50 ms/CH	
Gage factor	2.00 fixed	
	(Compensation is available with 2.00/Ks by coefficient calculation function.)	
Initial value storage range	As same as the measuring range	

Measuring Range, Resolution, Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 50000 \mu\text{m/m}$	1 $\mu\text{m/m}$	$\pm (0.05\% + 1 \text{ of indicated value}) \mu\text{m/m}$
0 to $\pm 500000 \mu\text{m/m}$	10 $\mu\text{m/m}$	$\pm (0.05\% + 10 \text{ of indicated value}) \mu\text{m/m}$

■ Strain measurement (High resolution mode)

Bridge excitation	Constant voltage bridge excitation:	Approx. 5 VDC
	Constant current bridge excitation:	Approx. 16.7 mA
	(With bridge resistance 350 Ω)	
Scanning speed	0.28 ms/CH	
Gage factor	2.00 fixed	
	(Compensation available with 2.00/Ks by coefficient calculation function)	
Initial value storing range	As same as the measuring range	

Measuring range, Resolution, Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 20000 \mu\text{m/m}$	0.1 $\mu\text{m/m}$	$\pm (0.05\% + 0.3 \text{ of indicated value}) \mu\text{m/m}$
0 to $\pm 200000 \mu\text{m/m}$	1 $\mu\text{m/m}$	$\pm (0.05\% + 3) \text{ of indicated value}) \mu\text{m/m}$

*: 4-gage method only (Bridge resistance: 120 to 1000 Ω)

*: For constant current bridge excitation: Only with bridge resistance 350 Ω

Measuring range 0 to $\pm 15000 \mu\text{m/m}$
 0 to $\pm 150000 \mu\text{m/m}$

*: Can set only for interval scanners.

■ Strain measurement (High speed mode)

Bridge excitation Constant voltage bridge excitation: Approx. 2 VDC
 Constant current bridge excitation: Approx. 5.7 mA
 (With bridge resistance 350 Ω)
 Approx. 16.7 mA
 (With bridge resistance 120 Ω)

Scanning speed 20 ms/CH
 Gage factor 2.00 fixed
 (Compensation available with 2.00/Ks by coefficient calculation)

Measuring range, Resolution, Accuracy

Measuring Range	Resolution	Accuracy
0 to ± 50000 μm/m	1 μm/m	±(0.08% + 3 of indicated value) μm/m
0 to ±500000 μm/m	10 μm/m	±(0.08% +30 of indicated value) μm/m

*: 4-gage method only

*: Can set only for internal scanners.

■ Voltage measurement (Standard mode)

Scanning speed 50 ms/CH
 Initial value storage range As same as the measuring range

Measuring range, Resolution, Accuracy

CH Mode	Measuring Range	Resolution	Accuracy	Input Resistance
V/500 mV	0 to ±50.000 mV	1 μV	±(0.05% + 3 of indicated value)	10 MΩ or more
	0 to ±500.00 mV	10 μV		
V/50 V	0 to ±5.0000 V	100 μV	±(0.05% + 2 of indicated value)	1 MΩ or more
	0 to ±50.000 V	1 mV		

■ Voltage measurement (High speed mode)

Scanning speed 20 ms/CH
 Initial value storage range As same as the measuring range

Measuring range, Resolution, Accuracy

CH Mode	Measuring Range	Resolution	Accuracy	Input Resistance
V/500 mV	0 to ±50.000 mV	1 μV	±(0.08%+6 of indicated value)	10 MΩ or more
	0 to ±500.00 mV	10 μV		
V/50 V	0 to ±5.0000 V	100 μV		1 MΩ or more
	0 to ±50.000 V	1 mV		

*: Can be set only for internal scanners.

■ Current measurement (Standard mode)

Scanning speed 50 ms/CH
Initial value storage range As same as the measuring range

Measuring range, Resolution, Accuracy

CH Mode	Measuring range	Resolution	Accuracy
I/50 mA	0 to ± 50.00 mA	10 μ A	$\pm(0.05\% + 0.01 \text{ of indicated value})$

(Note) However, external shunt resistance 250 Ω (High accuracy) is required.

Not including accuracy of the external shunt resistance.

■ Current measurement (High Speed mode)

Scanning speed 20 ms/CH
Initial value storage range As same as the measuring range

Measuring range, Resolution, Accuracy

CH Mode	Measuring Range	Resolution	Accuracy
I/50 mA	0 to ± 50.00 mA	10 μ A	$\pm(0.08\% + 0.01 \text{ of indicated value})$

*: Can set only for external scanners.

(Note) However, external shunt resistance 250 Ω (High accuracy) is required.

Not including accuracy of the external shunt resistance.

■ Thermocouple temperature measurement (Standard mode)

Scanning speed 50 ms/CH

Measuring range, Resolution, Accuracy

Types	Measuring range	Resolution	Accuracy	Internal Cold Junction Compensator Accuracy
K	-200.0 to 1230.0°C	0.1°C	$\pm 0.7^\circ\text{C}$	$\pm 0.5^\circ\text{C}$ Input terminal temperature at balancing time Ambient temperature range: 0 to 50°C
T	-200.0 to 400.0°C		$\pm 0.7^\circ\text{C}$	
E	-200.0 to 660.0°C		$\pm 0.5^\circ\text{C}$	
J	-200.0 to 870.0°C		$\pm 0.6^\circ\text{C}$	
R	0 to 1760.0°C		$\pm 2.2^\circ\text{C}$	

*: Note that the above accuracy does not include the accuracy of the internal cold junction

The cold junction compensator can be switched to internal or external side.

Thermocouple resistance: 1 k Ω or less

- Temperature measurement by civil engineering transducer with temperature measuring function (Standard mode)
Scanning speed 50 ms/CH

Measuring Range, Resolution, Accuracy

Measuring Range	Resolution	Accuracy
-50.0 to 200.0°C	0.1°C	±0.5°C

*: Target physical value and temperature can be measured by 1 CH.

*: Measuring range of strain measuring range is conforming to the above mentioned strain measurement.

- Temperature measurement by platinum resistance thermometer sensor (Standard mode)

Scanning speed 50 ms/CH

Measuring Range, Resolution, Accuracy

Types	Measuring Range	Resolution	Accuracy
Pt100	-200.0 to 660.0°C	0.1°C	±0.3°C
JPt100	-200.0 to 510.0°C		

*: 3-wire system connection

- Potentiometer sensor measurement (Standard mode)

Scanning speed 50 ms/CH

Initial value storage range as same as the measuring range

Sensor power supply Approx. 2 VDC

Potentiometer resistance 1 kΩ to 10 kΩ

Measuring Range, Resolution, Accuracy

CH Mode	Measuring Range	Resolution	Accuracy
POT.	0 to ±50.00°C	0.01%	±0.1% FS

- Potentiometer sensor measurement (High speed mode)

Scanning speed 20 ms/CH

Initial value storage range As same as the measuring range

Sensor power supply Approx. 2 VDC

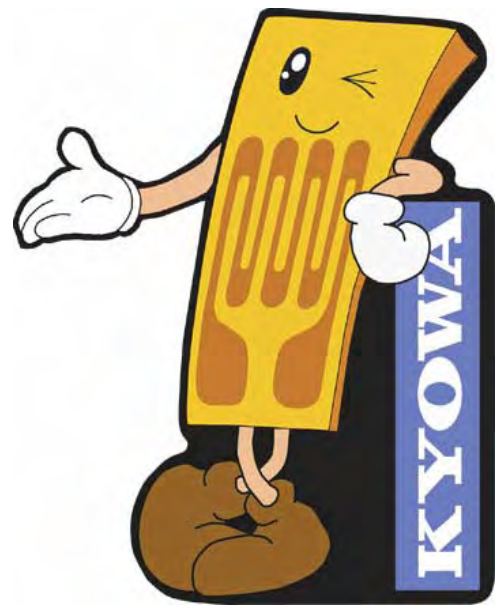
Potentiometer resistance 1 kΩ to 10 kΩ

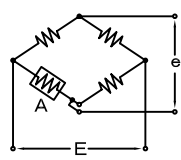
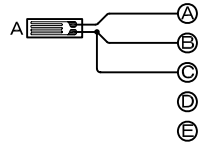
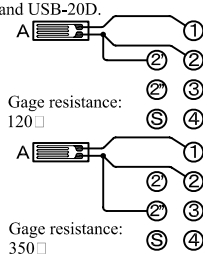
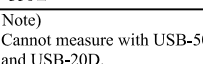
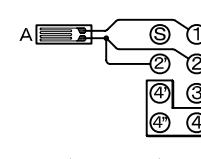
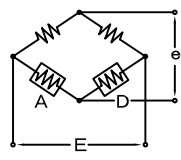
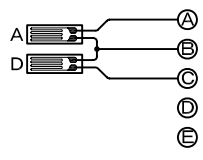
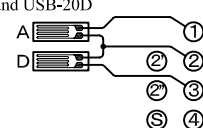
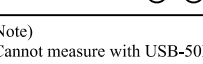
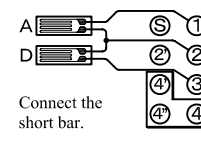
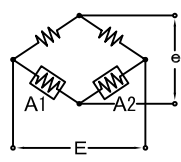
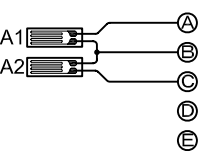
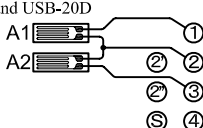
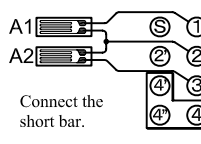
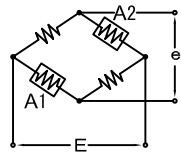
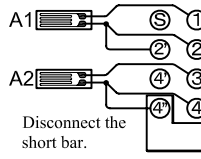
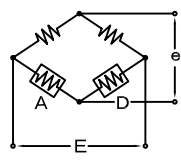
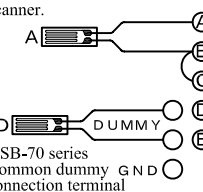
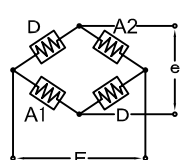
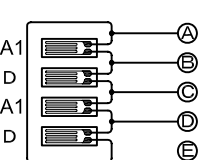
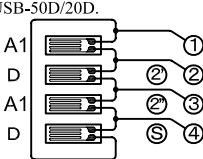
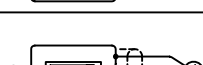
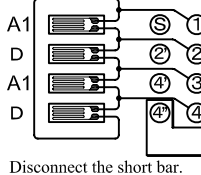
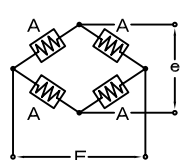
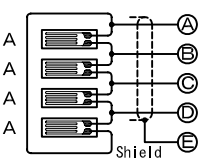
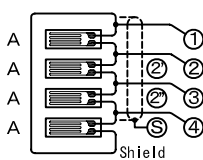
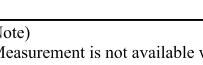
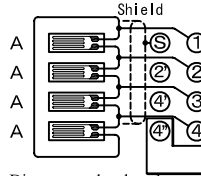
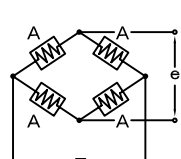
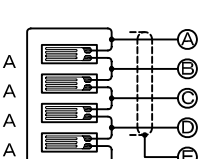
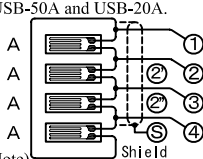
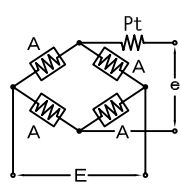
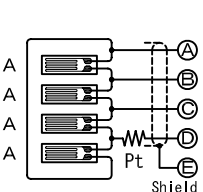
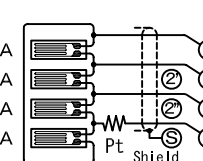
Measuring Range, Resolution, Accuracy

CH Mode	Measuring Range	Resolution	Accuracy
POT.	0 to 50.00°C	0.01%	±0.1% FS

*: Can be set only for external scanners.

■ Clock	Real-time clock built-in (battery backup)
■ Display	Fluorescent display tube (VFD) display 128 × 64 dots
■ Printer	Thermal printer Paper width: 58 mm (24 digits) Printing speed: 60 mm/sec
■ PC card Slot	Conforming to PCMCIA Ver 4.2 Can use commercially available flash ATA memory card (PC card)
■ Interface	RS-232C Ethernet (10BASE-T/100BASE-TX)
■ Self-diagnosis function	Check various points such as display, printer, bridge excitation, input disconnected, input/output resistance, insulation resistance, mode detection, etc.
■ TEDS compatible (Note 6)	Interface Compatible with IEEE1451. 4 Mixed mode Transducer Interface Class 2 Applicable sensor Sensor having information according to IEEE template No. 33 Cable length: 30 m or less (Note 6) When activating scanning units USS-61B/62B/63B
■ Operating temperature and humidity range	Temperature: 0 to +50 °C Humidity: 20 to 85% RH (Non-condensing)
■ Storage temperature range	-20 to +60 °C
■ Power supply	85 to 264 VAC, 50/60 Hz (For AC power dedicated unit) 10 to 16 VDC (For DC power dedicated unit)
■ Consumption current	100 VAC: 0.5 A or less 12 VDC: 4 A or less
■ External dimensions	360(W) × 88(H) × 400(D) mm (Protruded portion not included)
■ Weight	Approx. 8 kg



Measuring Method	Bridge circuit  : Gage  : Built-in fixed resistor A : Active gage D : Dummy gage E : Bridge excitation e : Bridge output Pt : Platinum resistance thermometer	Scanner, Internal Scanner USB-70 series		Scanner USB-20/50/51 series					
		Connection Method	Measuring CH Mode	Connection Method		Measuring CH Mode			
		A : Active gage D : Dummy gage	1) Setting mode on the Data Logger side USB-70A: Set the Scanner MODE SET switch to "REMOTE." 2) Setting mode on the Scanner side Only USB-70A is available Set the Scanner MODE SET switch to "SCANNER" and, Data Logger mode to "USB-70A_S."	USB-50A UAB-20A USB-50D USB-20D	USB-51A	USB-50A USB-20A USB-51A	USB-50D USB-20D	USB-51AT	
1-gage method Gage resistance: 120 Ω 240 Ω 350 Ω Note) 3-wire system with less error generating factors is recommended. Note) Conducts bridge nonlinearity compensation. (Note 1)	3-wire system connection method 		1) 120 □ → "1G 120" 240 □ → "1G 240" 350 □ → "1G 350" 2) 120 □ → "1" 240 □ → "2" 350 □ → "3"	Note) Cannot measure with USB-50D and USB-20D.  Gage resistance: 120 □  Gage resistance: 350 □	 Gage resistance: Only 120 □ Connect the short bar.	"3"	Note) USB-50A and USB-20A Gage resistance: Only 120 □ and 350 □ Note) USB-51A Gage resistance: Only 120 □	Note) Setting is not available.	Note) Setting is not available.
1-gage method (True-dummy method) (Note 1) Gage resistance: 120 Ω 350 Ω Note) Conducts bridge nonlinearity compensation. (Note 1)	3-wire system connection method Same as the above 1-gage method. 2-wire system connection method. Same as the above 1-gage method.	Same as the above 1-gage method. Same as the above 1-gage method.	1) When gage resistance is 120 □: Dummy → "1G 120/D" Active → "1G 120/A" When gage resistance is 350 □: Dummy → "1G 350/D" Active → "1G 350/A" 2) Cannot set on the Scanner side	Same as the above 1-gage method. Same as the above 1-gage method.	Same as the above 1-gage method. Same as the above 1-gage method.	Dummy → "1" Active → "2" Note) USB-51A Gage resistance: Only 120 □	Note) Setting is not available.	Note) Setting is not available.	
2-gage method (Active-dummy method) Gage resistance: 60 to 1000 □ Note) Conducts bridge nonlinearity compensation. (Note 1)			1) "2G/A-D" 2) Cannot set on the Scanner side.	Note) Cannot measure with USB-50D and USB-20D  	 Connect the short bar.	"4"	Note) Setting is not available.	Note) Setting is not available.	
2-gage method (Active-active method) Gage resistance: 60 to 1000 □			1) "2G/A-A" 2) Cannot set on the Scanner side.	Note) Cannot measure with USB-50D and USB-20D  	 Connect the short bar.	"5"	Note) Setting is not available.	Note) Setting is not available.	
2-gage method (Opposite side active method) Gage resistance: 120 □ Note) Conducts bridge nonlinearity compensation. (Note 1)		Note) Setting is not available.	1) Setting is not available. 2) Setting is not available.	Note) Measurement is not available.	 Disconnect the short bar.	"6"	Note) Setting is not available.	Note) Setting is not available.	
2-gage method (Common-dummy method) Gage resistance: 60 to 1000 □ Note) Conducts bridge nonlinearity compensation. (Note 1)		Note) Cannot measure with built-in scanner.  USB-70 series Common dummy connection terminal	1) "2G/COM-D" 2) "4"	Note) Measurement is not available.	Note) Measurement is not available.	Note) Setting is not available.	Note) Setting is not available.	Note) Setting is not available.	
4-gage method (Opposite side active method) Gage resistance: 60 to 1000 □ Constant voltage excitation Note) Conducts bridge nonlinearity compensation. (Note 1)			1) "4G/A-A" 2) "5"	Note) Measurement is not available with USB-50D/20D.  	 Disconnect the short bar.	"6"	Note) Setting is not available.	Note) Setting is not available.	
4-gage method (Full-bridge method) (Strain gage transducer) Gage resistance: 60 to 1000 □ Constant voltage excitation			1) "4G" "4G_HR" 2) "6"	 	 Disconnect the short bar.	"7"	"7"	Note) Setting is not available.	
4-gage method (Strain gage transducer) (Strain gage civil engineering transducer) Gage resistance: 120 □ 350 □ Constant current excitation			1) "4G/I(120)" "4G/I(350)" "4G/I_HR" 2) "7" Note) USB-70 series Bridge resistance: Only 350 □	Note) Measurement is not available with USB-50A and USB-20A.  Note) Bridge resistance: Only 350 □	Note) Measurement is not available.	Note) Setting is not available.	"6"	Note) Setting is not available.	
4-gage method (Civil engineering transducers with temperature measuring function) Bridge resistance: 350 □ Constant current excitation Note) Both strain and temperature can be measured with 1 measuring point.			1) "4G/T" 2) Cannot set on the Scanner side. Note) Built-in Scanner: Measurement is not available if scanning unit USS-21A/22A is used. Note) USB-70 series: Measurement is not available for scanners with -10 or -20 suffixed to the Model Name.	Note) Measurement is not available with USB-50A and USB-20A. 	Note) Measurement is not available.	Note) Setting is not available.	"5"	Note) Setting is not available.	

(Note 1) For details, see "Chapter 13 TECHNICAL INFORMATION REQUIRED FOR MEASUREMENT."

Measuring Target	Scanner, Internal Scanner USB-70 series		Scanner USB-20/50/51 series				
	Connection Method	Measuring CH Mode	Connection Method		Measuring CH Mode		
	$\frac{+}{-}$: DC Voltage power supply $\emptyset$: DC Current power supply TC : Thermocouple Pt : Platinum resistance hermometer	1) Setting mode on the Data Logger side USB-70A: Set the Scanner MODE SET switch to "REMOTE." 2) Setting mode on the Scanner side Only USB-70A is available Set the Scanner MODE SET switch to "SCANNER" and, Data Logger mode to "USB-70A_S."	USB-50A USB-20A USB-50D USB-20D	USB-51A USB-51AT	USB-50A USB-20A USB-51A	USB-50D USB-20D	USB-51AT
Potentiometer sensor Potentiometer resistance: 1 k $\square$ to 10 k $\square$		1) "POT" 2) Setting is ot available on the Scanner side.	Note) Measurement is not available.	Note) Measurement is not available.	Note) Setting is not available.	Note) Setting is not available.	Note) Setting is not available.
DC Voltage power supply Measuring range $\square$ 500 mV $\square$ 50 V		1) "V/500 mV" "V/50 V" 2) 500 mV $\rightarrow$ "8" 50 V $\rightarrow$ "9"	For strain unit 	For USB-51A Disconnect the short bar.	500 mV $\rightarrow$ "8" 50 V $\rightarrow$ "9"	500 mV $\rightarrow$ "8" 50 V $\rightarrow$ "9"	500 mV $\rightarrow$ "8" 50 V $\rightarrow$ "9"
			For temperature sensing unit 	For USB-51AT 			
DC Current power supply Note) Connect shunt resistor (250 $\square$ high accuracy resistor) for measurement.	Note) R: Shunt resistor	1) "1/50 mA" 2) Setting is not available on the Scanner side.	Note) Measurement is not available.	Note) Measurement is not available.	Note) Setting is not available.	Note) Setting is not available.	Note) Setting is not available.
Thermocouple Types K (CA) T (CC) E (CRC) J (IC) R		1) K $\rightarrow$ "TC/K" T $\rightarrow$ "TC/T" E $\rightarrow$ "TC/E" J $\rightarrow$ "TC/J" R $\rightarrow$ "TC/R" 2) Setting is not available on the Scanner side.	Note) Measurement is not available with USB-50D and USB-20D. Note) For USB-50A and USB-20A, measurement is available only when temperature sensing unit is installed.	Note) Measurement is not available with USB-51A.	K $\rightarrow$ "1" T $\rightarrow$ "2" E $\rightarrow$ "4" J $\rightarrow$ "5" R $\rightarrow$ "3"	Note) Setting is not available.	K $\rightarrow$ "1" T $\rightarrow$ "2" E $\rightarrow$ "4" J $\rightarrow$ "5" R $\rightarrow$ "3"
					Note) Setting is not available with USB-51A.		
Platinum resistance thermometer New JIS (JIS1604-1989) Old JIS	3-wie system connection method 	1) New JIS $\rightarrow$ "Pt100" Old JIS $\rightarrow$ "JPt100" 2) Setting is not available on the Scanner side. Note) For a small size thermometer, the mode is set to "Pt100." Note) For a built-in scanner, measurement is not available if scanning unit USS-21A/22A is used. Note) Measurement is not available for scanners with -10 or -20 suffixed to the Model Name.	Note) Measurement is not available.	Note) Measurement is not available.	Note) Setting is not available.	Note) Setting is not available.	Note) Setting is not available.
	2-wire system connection method 						
	Small size thermometer (BTS-100AT) 						
Skip		1) "SKIP" 2) "0"			"0"	"0"	"0"