

DATA LOGGER

UCAM-60C

INSTRUCTION MANUAL

Thank you for purchasing KYOWA's product UCAM-60C 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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TYPE

The following types of UCAM-60C are available depending on the specifications of the power supply.

UCAM-60C-AC	For AC power supply	AC 100 ~ 240 V
UCAM-60C-DC	For DC power supply	DC 10 ~ 16 V

STANDARD ACCESSORIES

The following accessories are enclosed with the UCAM-60C. Check that there are no missing accessories after opening the package.

• Instruction Manual (CD-R)		1 set
• Simplified Instruction Manual		1 booklet
• AC power supply cable P-18	(for devices running on AC power)	1 unit
• 3P-2P conversion adaptor CM-52	(for devices running on AC power)	1 piece
• AC power supply fuse	(for devices running on AC power)	1 piece
• DC power supply cable P-76	(for devices running on DC power)	1 unit
• DC power fuse	(for devices running on DC power)	1 piece
• Thermal recording paper UCAM-60A-RP		1 roll
• Magnet screwdriver		1 unit
• Ground wire		1 unit
• Terms and Conditions of New Product Warranty		1 copy

OPTIONAL PRODUCTS

The following options are available for the UCAM-60C. Select the right options for your measurement.

• Dedicated built-in scanner, TEDS-compatible	USS-61B
• Dedicated built-in scanner with NDIS connectors, TEDS-compatible	USS-62B
• Dedicated built-in scanner with lightning arrester, TEDS-compatible	USS-63B
• Control software	UCS-60B
• Scanner interface for USB-70 series	USI-67A
• External input/output unit	UIO-60A
• AC adaptor for UCAM-60C-DC	H-12439

The following scanners can be used in other UCAM series as well.

Follow the instructions in the instruction manual enclosed with the scanner and the instruction manual (CD-R) enclosed with the main unit.

- Scanner USB-70 series

SAFETY PRECAUTIONS (Be sure to read this before use)

BEFORE USE

Be sure to comply with the following safety precautions during use.
Kyowa Electronic Instruments Co., Ltd. shall not be liable for any damage suffered as a result of using the product not in compliance with these safety instructions.

SAFETY SYMBOLS

- The following symbol markings are used in this device to ensure that it is used safely.

 GND	Indicates the grounding terminal. Ground all terminals showing this symbol in this device where possible. However, this shall exclude cases in which a 3-pin AC power supply cable is used for grounding.
--	---

- The following warning and caution symbols are used in these Safety Precautions and this device to ensure that it is used safely.

 WARNING	Possibility of death or serious injuries being inflicted on the user when handled wrongly.
 CAUTION	Risk of damage being suffered by the user or possibility of physical damage when handled wrongly.

 WARNING	
• Grounding To prevent electric shock, ground this device where possible before connecting the AC power supply cable. If grounding is not carried out, there is a risk of electric shock when a failure or current leakage occurs. Either use a 3-pin AC power supply cable to ground the unit, or connect the “GND” terminal to the earth. • Necessity of grounding terminal To prevent electric shock, do not disconnect the external ground wire of this device, and do not remove the wiring of the ground terminal. • Checking the grounding function To prevent electric shock, check that there is no fault in the grounding function before operating this device. If you think there is a fault in the protective grounding and grounding function of the fuse holder etc., do not operate this device. • Power supply To prevent fire, check that the voltage of the power supply that you are using matches the power supply voltage specifications of this • Power supply cable and power supply outlet To prevent electric shock and fire, use the enclosed power supply cable and 3P-2P conversion adapter, and where possible, use a power supply outlet equipped with a ground terminal. When using a 3-pole power supply cable, use a 3-pole power supply outlet equipped with a ground terminal. If a power supply extension cable without a ground wire is used, the protection function will be disabled. When connecting the power supply cable, connect the ground terminal to the earth first before doing so. When disconnecting the power supply cable, do so first before disconnecting the ground wire. Make sure this device is grounded first before taking any measurements. In the case of a device that only uses a DC power supply, be especially careful regarding the polarity of the DC power cable. A reverse connection can cause a failure or fire.	



WARNING

- **Fuse**

To prevent fire, use only fuses with the specified ratings (current, voltage, type) in this device.

Do not use fuses that are not specified, and do not short-circuit the fuse holder.

Pull out the power supply cable first before replacing the fuse.

- **External connections**

To prevent electric shock, ground this device properly first before connecting any external devices such as PCs and the measured object.

- **Flammable gas atmosphere**

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

To prevent failure and accidents due to wrong handling and installation, understand the operating environmental conditions and operating method indicated below first so that this device can be used correctly and safely to exploit its performance satisfactorily.

To prevent malfunction and accidents due to erroneous handling and installation, and to allow the UCAM-60C for a safe and well performance, understand the handling method and condition by reading the following instructions



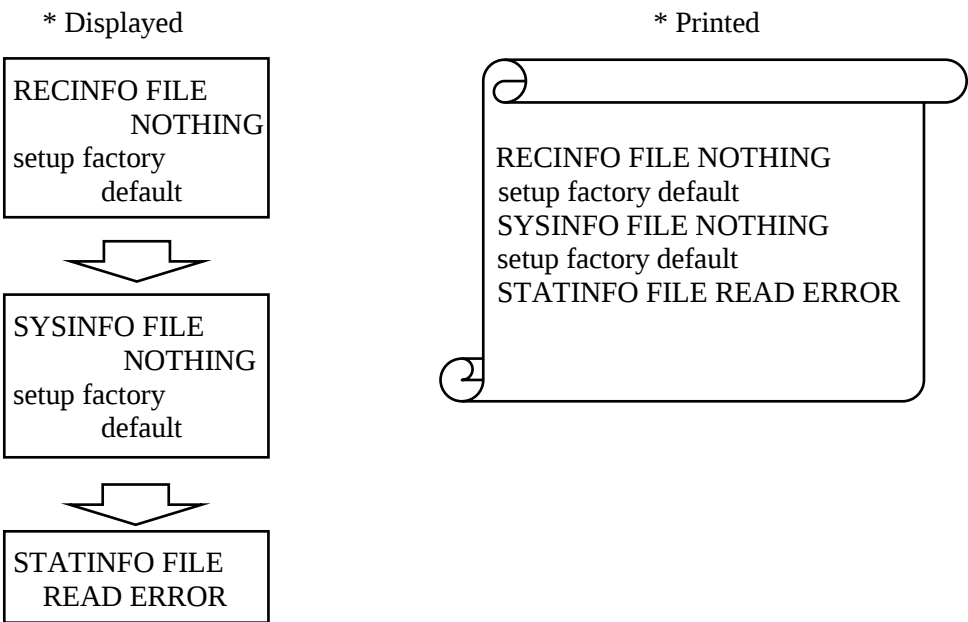
CAUTION

- 1) Do not turn off the power supply when reading/writing a data file and do not take out the USB memory.**
 - The data file may be damaged or lost.
 - This may result in a failure.
- 2) After turning off the power supply, wait for 5 sec or longer before turning on the power supply again.**
 - If the power supply is turned on within 5 sec or turned on/off repeatedly, the fuse may be broken or this device may malfunction by the rush current generated when the power supply is turned on.
- 3) Use this device within a temperature range of 0 - 50°C.**
 - When used outside the operating temperature range, this will result in a failure or a drop in the performance.
 - When you have no choice but to use this device in a cold place or location exposed to direct sunlight, use a blind or insulate the device.
- 4) Do not block the ventilation outlets.**
 - When there is no space for heat release, the temperature inside this device will rise, resulting in a failure or a drop in the performance.
- 5) Use this device in a relative humidity range of 20 - 85%.**
 - When used outside the operating humidity range or in an environment exposed to water droplets, this will result in a failure or a drop in the performance.
- 6) Do not use this device straightaway if the environment changes suddenly.**
 - Leave the device in the operating environment for a while to let it get used to the environment first before use.
 - When the ambient temperature changes suddenly due to movement etc., condensation may occur, resulting in a failure or a drop in the performance.
- 7) Do not use this device in a dusty environment.**
 - Use the device in an environment in which PCs can be used.
 - When the printer or USB port is left open, dust will get inside the device, resulting in a failure or a drop in the performance.
- 8) Do not use this device in an environment exposed to vibration and shock.**
 - Do not use the device in a location exposed to vibration and shock.
 - When exposed continuously to vibration or a large shock, this will result in a failure or a drop in the performance.
- 9) Do not use this device in a strong magnetic field.**
 - Use the device in an environment in which PCs can be used.
 - When used near devices that generate a strong magnetic field such as radios, microwave ovens, electric furnaces, this will result in a failure, malfunction, or a drop in the performance.
- 10) Do not use this device in a location where the power supply environment is bad.**
 - For AC power specifications, use a 100 V - 240 V, noise-less power supply which does not stop momentarily.
 - For DC power specifications, use a 10 V - 16 V, noise-less power supply which does not stop momentarily.
- 11) Do not pull the connection cable.**
 - Connect the cable with some spare allowance so that excessive forces do not act on the connection.
 - If the cable is pulled or subject to excessive forces, this will result in a failure or interrupt the measurement.
- 12) Warm up this device before use.**
 - After turning on the power supply, wait for about 30 - 60 minutes to warm up the device.

NOTES ON RESTORING FACTORY DEFAULTS

The following error message is displayed and printed when the UCAM-60C is turned on and started up after executing the procedure described in section 15-4 "HOW TO RESET TO FACTORY DEFAULT SETTING" of the UCAM-60C Operation Manual (IM-A1184E).

The following error message is displayed or printed when the power is turned ON and the unit is started.



This error message indicates the existence of the configuration file of the UCAM-60C.
This error message indicates the existence of the UCAM-60C setting file.
This error message is always displayed and printed when the UCAM-60C is returned to the factory settings, and does not indicate a problem with the UCAM-60C.
It does not indicate a problem with the UCAM-60C.

NOTATIONS USED IN THE INSTRUCTION MANUAL

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

- **Quotation phrases**

Operating panel keys are enclosed with rectangle frames.

Ex.) OK, ZERO keys, etc.

Menu items shown in display 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-60C.

MEMO

Describes reference information for handling the UCAM-60C.

1. PRODUCT OUTLINE

1-1 PRODUCT OUTLINE

The UCAM-60C 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 vacuum fluorescent display is adopted to help you to acquire the measured results in an understandable English. Measuring targets such as strain gages, strain gage transducers (TEDS compatible products are connectable), civil engineering transducers with temperature measuring function, potentiometer sensors, DC voltage, direct current (DC), thermocouples and platinum resistance thermometer are able to be connected with UCAM-60C.

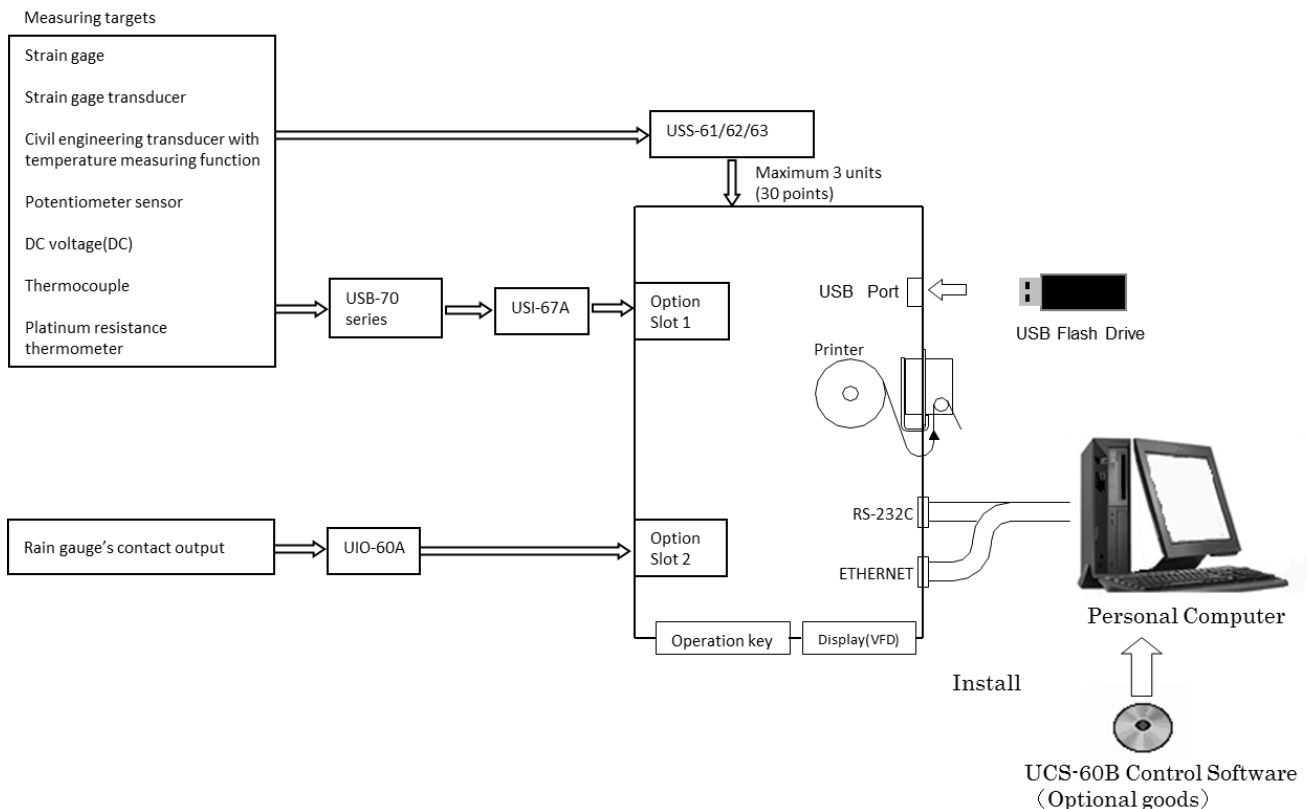
Since the UCAM-60C can be equipped with a maximum of 30CHs scanning units, the UCAM-60C may fulfill the demand of small-scale measurement solely by itself. For large-scale multipoint measurement, the UCAM-60C can measure up to 1000 CHs by connecting the external scanners such as USB-70 series scanners.

Measured data is able to be stored into built-in memory.

A standard type UCAM-60C is equipped with a printer so that the measured results are able to be printed out on-site immediately for confirmation after the measurement.

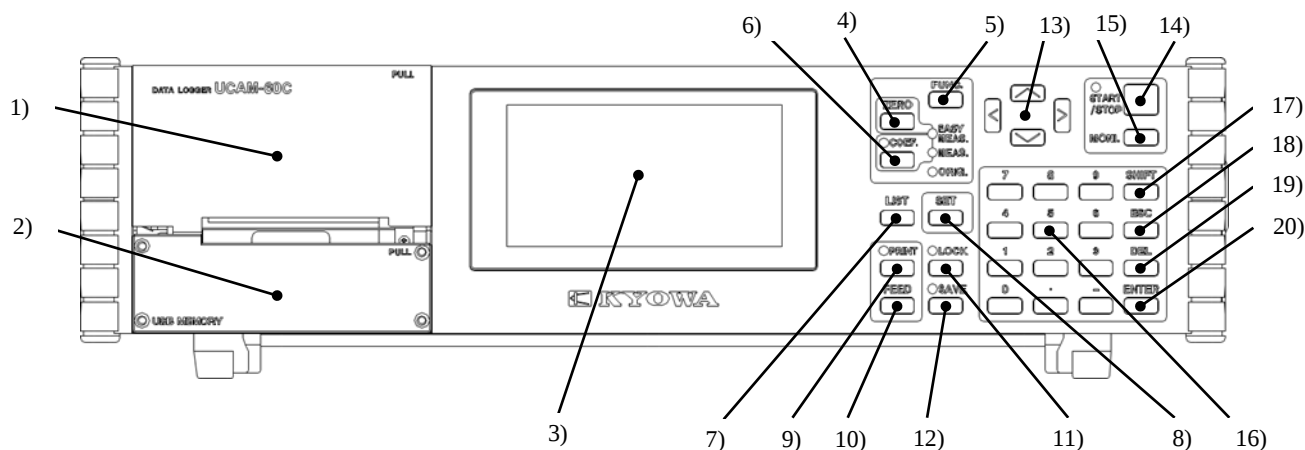
In addition, since LAN or RS-232C interface is prepared as standard equipment, the UCAM-60C can be controlled by the PC using a control software UCS-60B (optional goods) in which the measured data can be directly recorded into the PC for analyzation.

1-2 SYSTEM CONFIGURATION

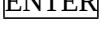


2. CONTROLS AND INDICATORS

2-1 FRONT PANEL



- 1) Printer
- 2) USB Port : Insertion Port for USB Flash Memory.
- 3) Display
- 4) **ZERO** key: When measuring function is set to “EASY MEAS,” press **ZERO** key for more than 3 seconds to measure the “ZERO” value.
- 5) **FUNC** key: Set measuring function.
- 6) **COEF** Key: Select whether or not coefficient calculation to be conducted.
Press the **COEF** key for approximately more than 3 seconds. LED lights up, indicating that it is in the state of coefficient calculation mode.
Press the **COEF** key for approximately more than 3 seconds again in the above state. The LED lights out, indicating that it is in the state without coefficient calculation mode.
- 7) **LIST** key: Print a list of various settings to the built-in printer.
- 8) **SET** key: Press for various settings. After pressing, the menu of setting items is displayed.
- 9) **PRINT** key: Selects whether to print measured data or not. **PRINT** LED lights up while printing.
- 10) **FEED** key: Press this key to feed the recording paper to the printer.
- 11) **LOCK** key: Press this key for approximately 3 seconds to enter key-locked state. The LED lights up, indicating that it is in key-locked state.
Press the **LOCK** key once again. The **LOCK** LED lights out and the key-locked is deactivated.
- 12) **SAVE** key: Selects whether to save measured data or not.
Press the **SAVE** key for approximately more than 3 seconds to save the measured data. The LED lights up, indicating that it is in the measured data saving state.
Press the **SAVE** key in the above state once again for approximately more than 3 seconds. Then, the **SAVE** LED lights out, indicating that it is in a state where measured data will not be saved.

- 13) Cursor keys (, , , ): Moves the cursor up, down, right, and left.
- In the standby mode, if pressing  key for approximately more than 3 seconds, the window will light out, indicating that it is in the key-locked state. In the state of light out of window, pressing the  key for more than approximately 3 seconds allows the window to be displayed again and the key-locked state is deactivated.
- 14)  key: Press this key for starting or stopping the real-time measurement.
- The LED lights up during the measurement.
- 15)  Key: Monitor measurement will keep being 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: Back to the previous display.
- 19)  key: Deletes one character or one line.
- 20)  key: Determines and executes the selected item.

Press the  key for approximately more than 3 seconds in ready state to have the interval measurement state.

Press the 0 k 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.

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

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.

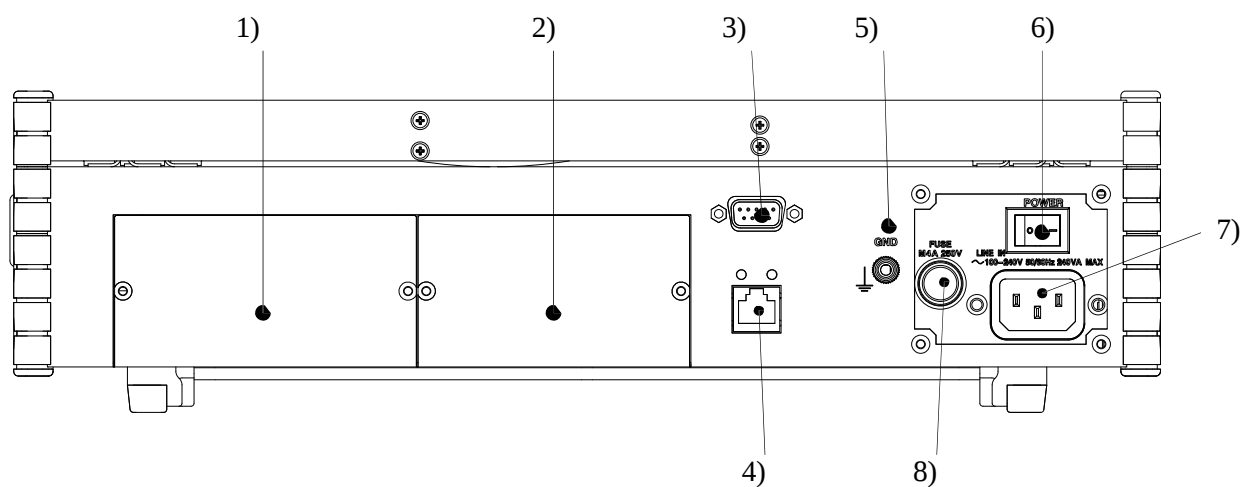
Press the  key for approximately more than 3 second in ready state to be in trigger interval measurement state.

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 interval measurement are erased.

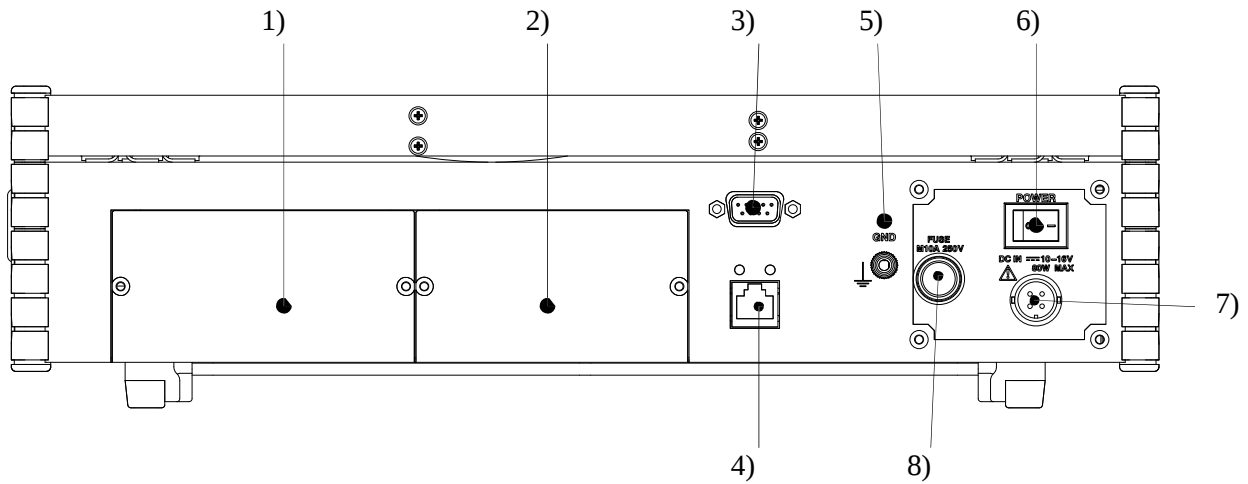
2-2 REAR PANEL

(1) AC power supply dedicated unit



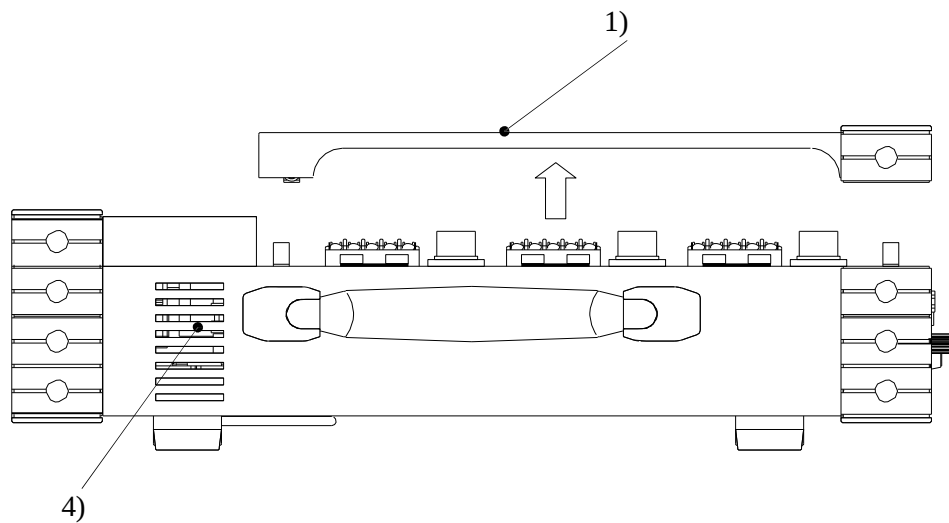
- 1) Option slot 1: Scanner interface USI-67A inserting slot.
- 2) Option slot 2: External input/output unit UIO-60A inserting slot.
- 3) "RS-232C" connector: RS-232C interface connector
- 4) "Ethernet" connector: Ethernet interface connector
- 5) "GND" terminal: UCAM-60C's ground terminal
- 6) "POWER" switch: Power switch
- 7) "LINE IN" connector: Power cable connecting inlet socket
- 8) "FUSE" holder: Power supply fuse
Use fuse 4A.

(2) DC power supply dedicated unit

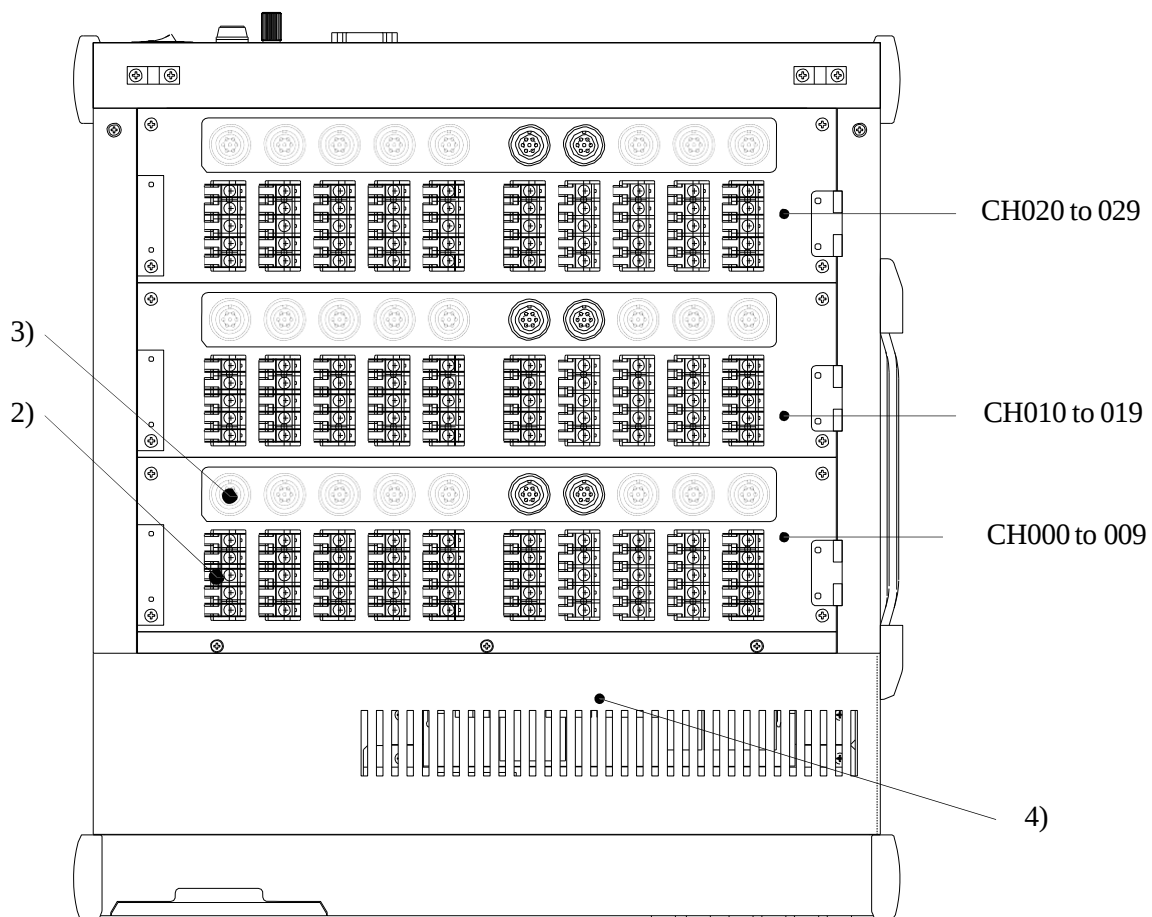


- 1) Option slot 1: Scanner interface USI-67A inserting slot.
- 2) Option slot 2: External input/output unit UIO-60A inserting slot.
- 3) “RS-232C” connector: RS-232C interface connector
- 4) “Ethernet” connector: Ethernet interface connector
- 5) “GND” terminal: UCAM-60C’s ground terminal
- 6) “POWER” switch: Power switch
- 7) “DC IN” connector: DC power cable connecting connector
- 8) “FUSE” holder: Power supply fuse
Use fuse 10A

2-3 TOP



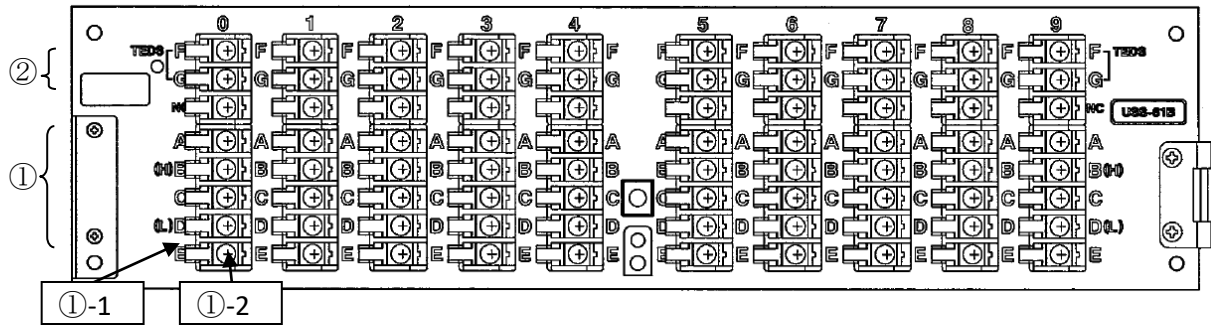
* To remove the top cover, hold the rear side of the cover of UCAM-60C and lift it up according to the direction of arrow.



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

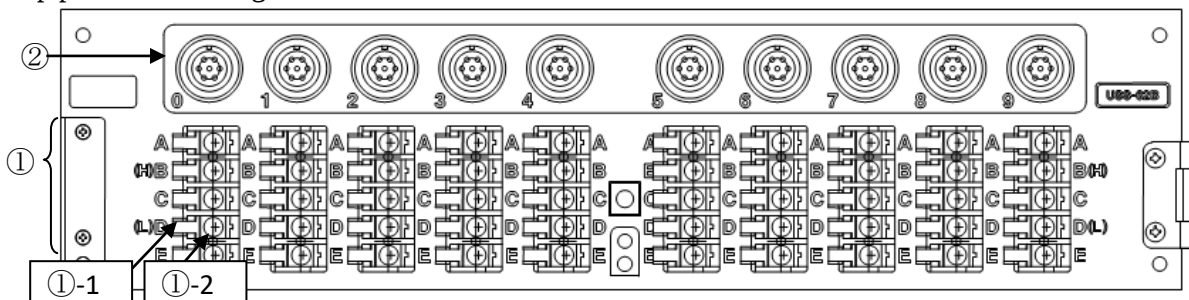
* The above figure is an example that installed with three USS-62Bs.

Top panel of scanning unit USS-61B,63B



- ① Input Terminal Input terminal block(soldering,screw-fixed terminal block) for voltage/thermocouple measurements
- ①- 1 Soldering lug A place to solder cable.
The surface tensions on the right and left edges prevent the solder from flowing to the screws
- ①- 2 Screw and a metal plate The tapped hole diameter is M3.
The screw have a metal plate for binding cables.
The recommended tightening torque for the screws is 0.49Nm
When using the solderless terminal, the outside dimensions should be 6.5m or less.
- ② TEDS terminal Input terminal for TEDS sensor.

Top panel of scanning unit USS-61B,63B



- ① Input Terminal Input terminal block(soldering,screw-fixed terminal block) for voltage/thermocouple measurements
- ①- 1 Soldering lug A place to solder cable.
The surface tensions on the right and left edges prevent the solder from flowing to the screws
- ①- 2 Screw and a metal plate The tapped hole diameter is M3.
The screw have a metal plate for binding cables.
The recommended tightening torque for the screws is 0.49Nm
When using the solderless terminal, the outside dimensions should be 6.5m or less
- ② Sensor connector For connecting the strain gage transducer

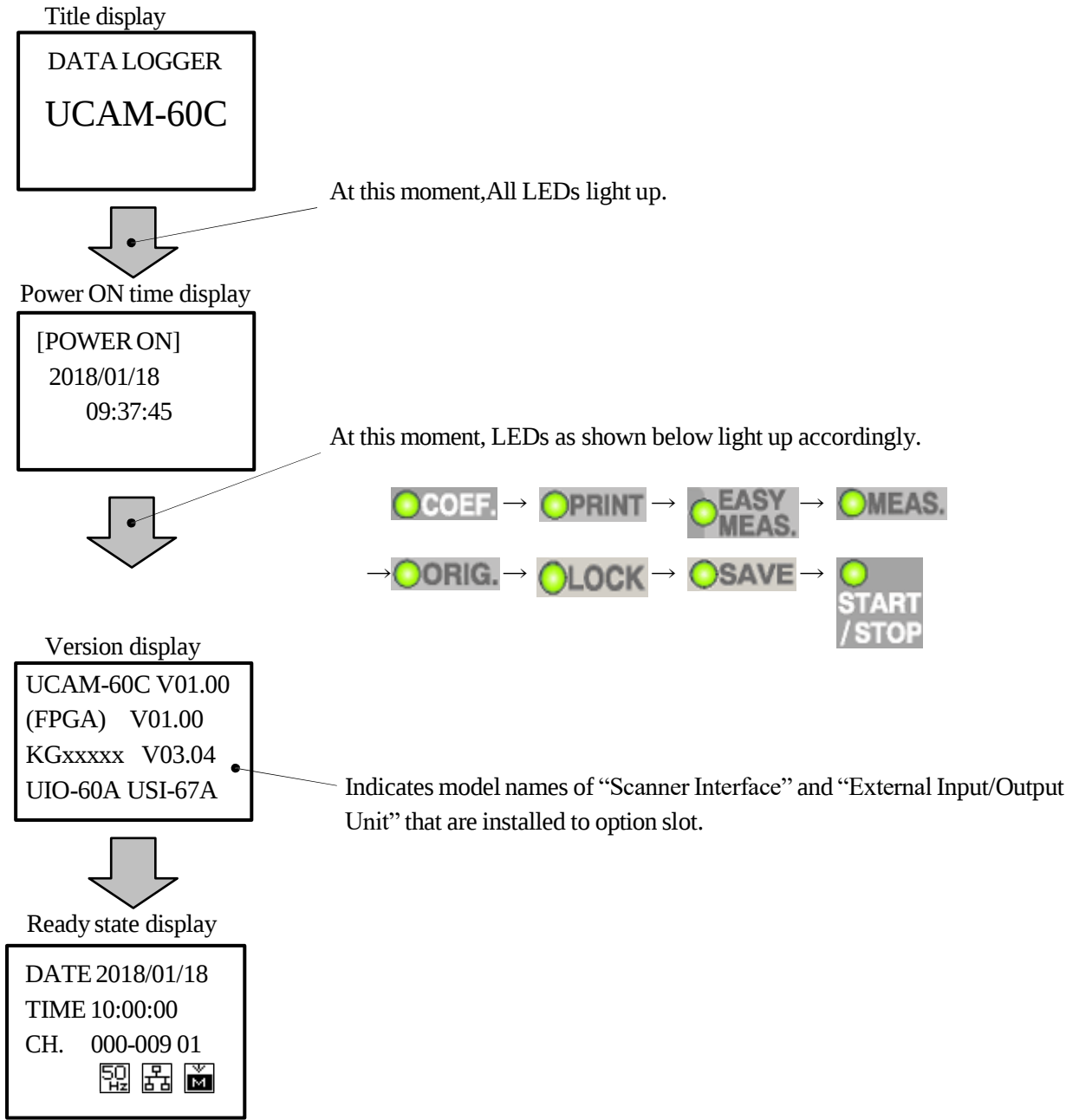
Note

Do not connect the FV-1A and FV-2A sold by KYOWA to the UCAM-60C.

2-4 DESCRIPTION OF DISPLAY WINDOW

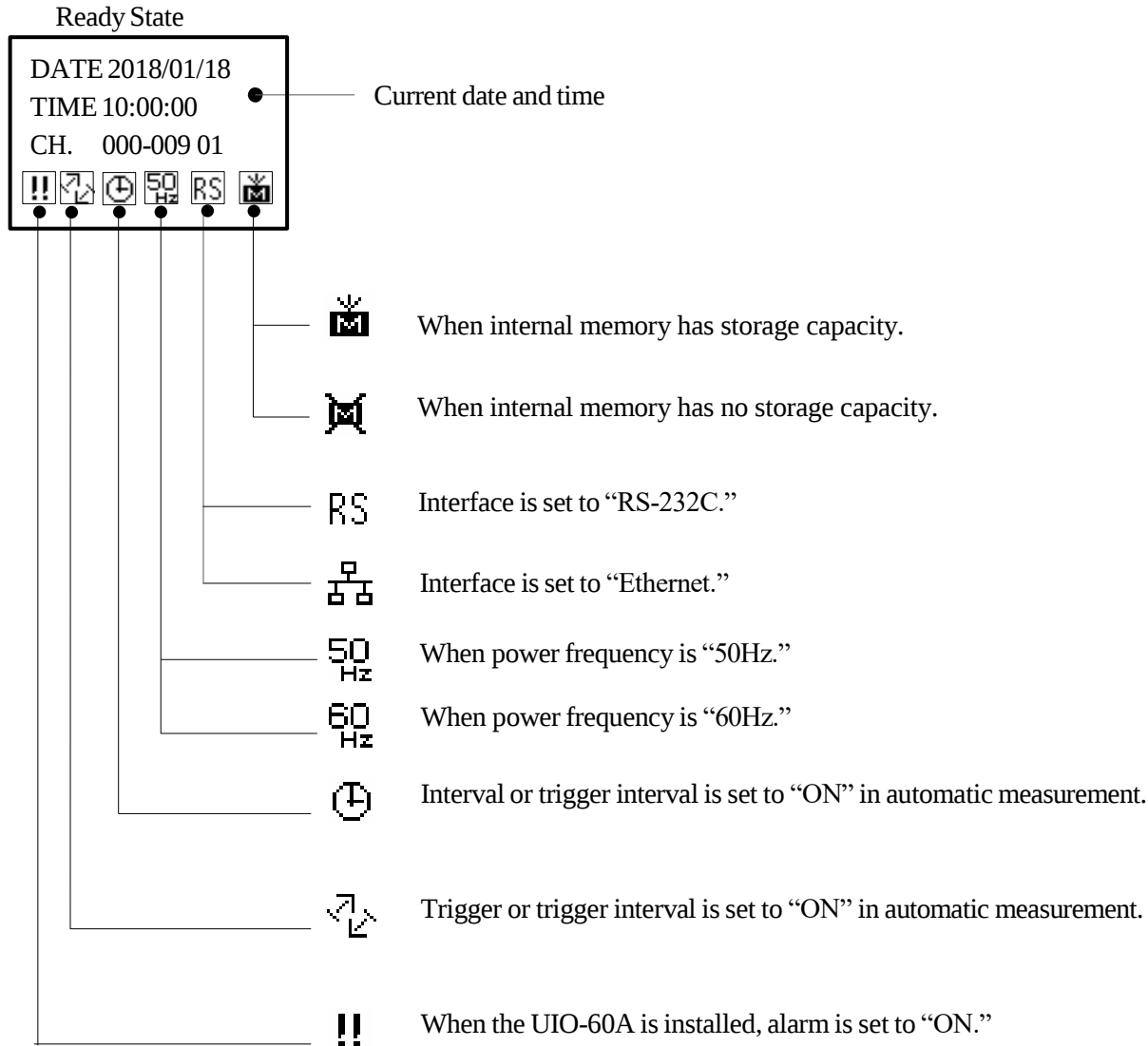
2-4-1 Display Window When the Power ON

Switch ON the power of UCAM-60C and the display window changes as shown in the following.



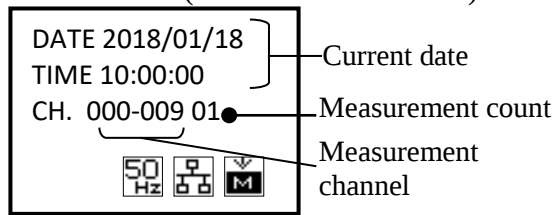
2-4-2 Ready State

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

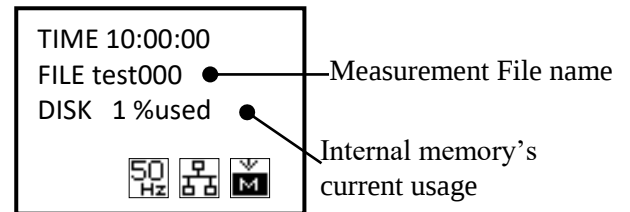


The main screen to be displayed in a ready state can be switched with the cursor keys , .
The following information appears in each main screen, indicating the current setting status of the UCAM-60C, respectively.

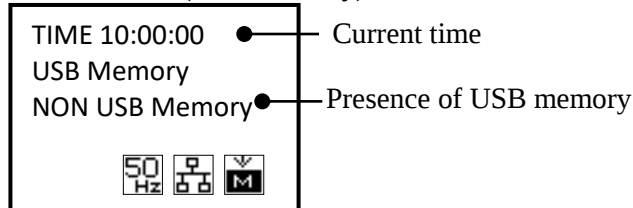
Main screen 1 (measurement condition)



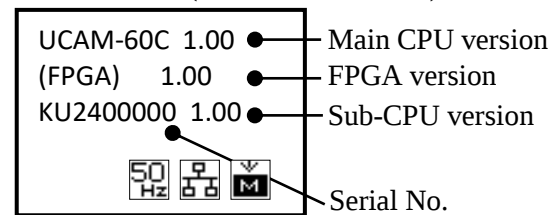
Main screen 2 (data storage)



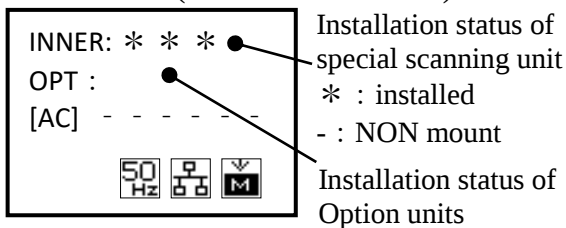
Main screen 3 (USB Memory)



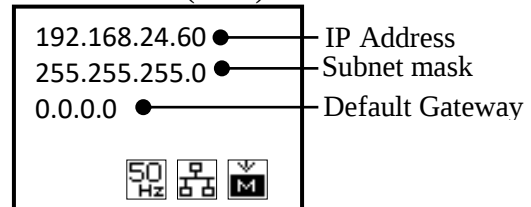
Main screen 4 (version information)



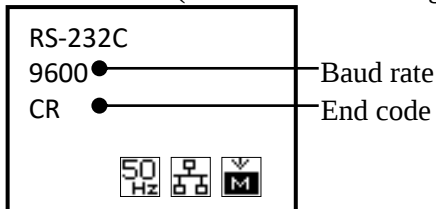
Main screen 5 (unit installation status)



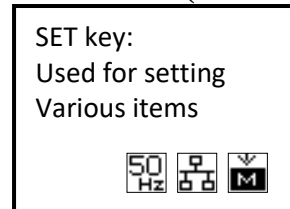
Main screen 6 (LAN)



Main screen 7 (RS connection setting)



Main screen 8 (about the SET key)



3. CONNECTING DEVICES & PREPARING FOR MEASUREMENT

3-1 SYSTEM INSTALLATION

3-1-1 Grounding

Always ground the GND terminal to prevent the UCAM-60C from being affected by noise as well as receiving electric shock due to leaks of the electric current. For wire rods, it is recommended to use green color vinyl coated wire having a section area of more than 0.75 mm^2 .

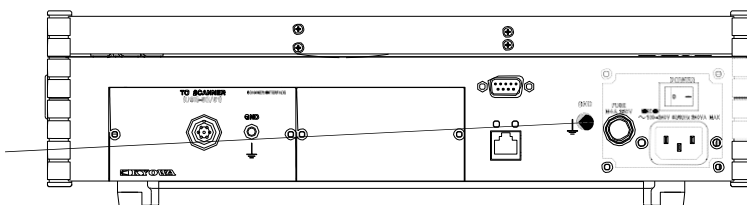
Grounding standard differs according to the operating environment. Refer the following grounding examples and consider the appropriate grounding method to reduce adverse effect of noise, enabling a stable measurement.

Basically, grounding is one-point grounding. If the grounding point is more than 1 point, note that a loop might be formed which may result in UCAM-60C to be affected by noise easily.

In addition, grounding should be independently made from the power system.

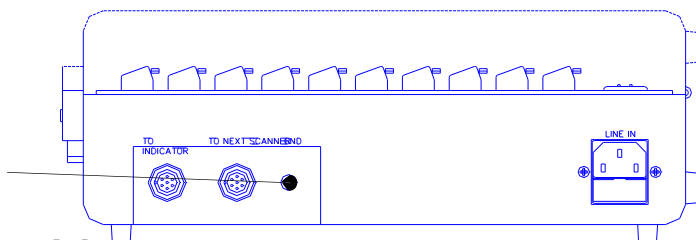
- UCAM-60C's rear side

“GND” terminal



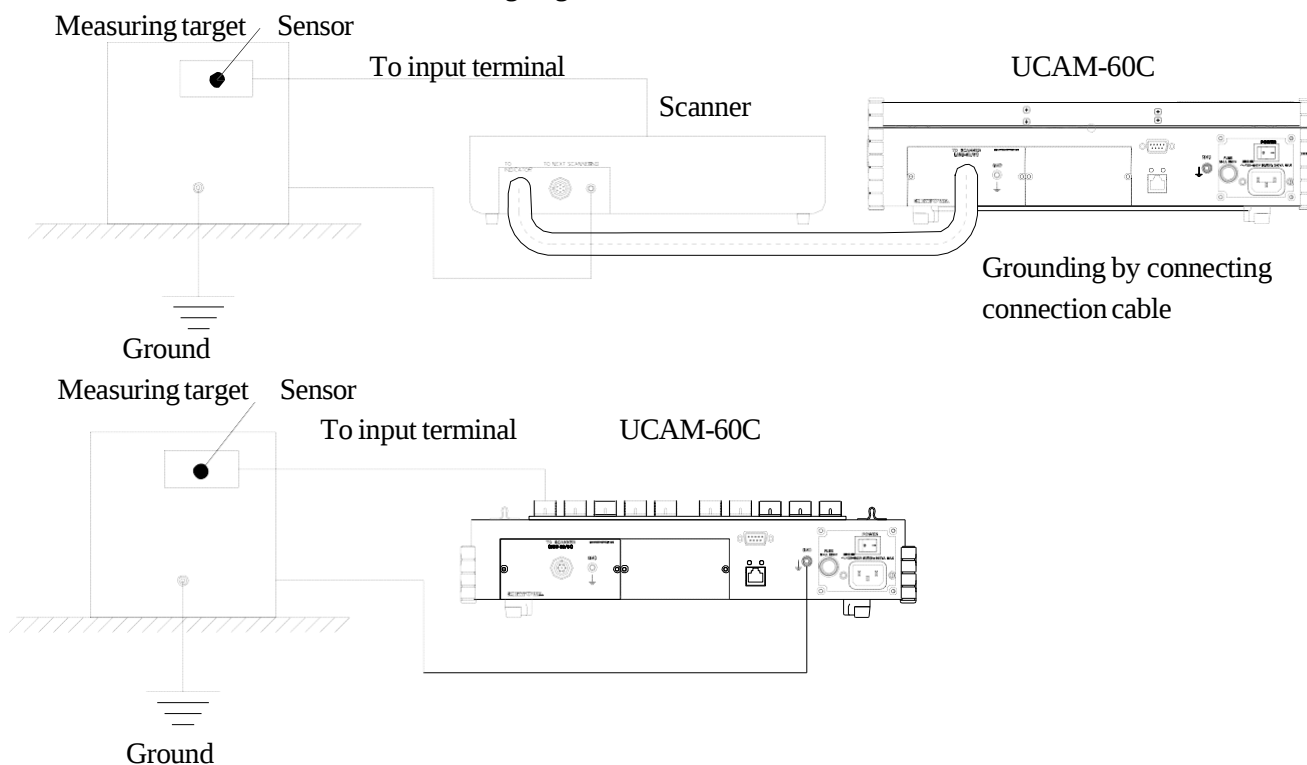
- Rear side of scanner

“GND” terminal



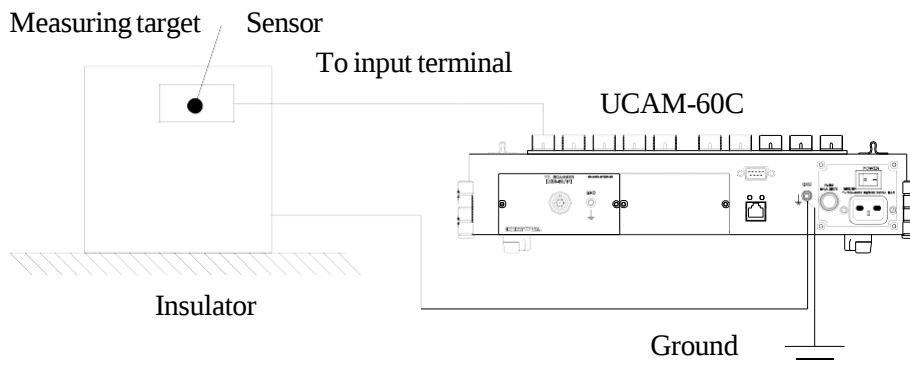
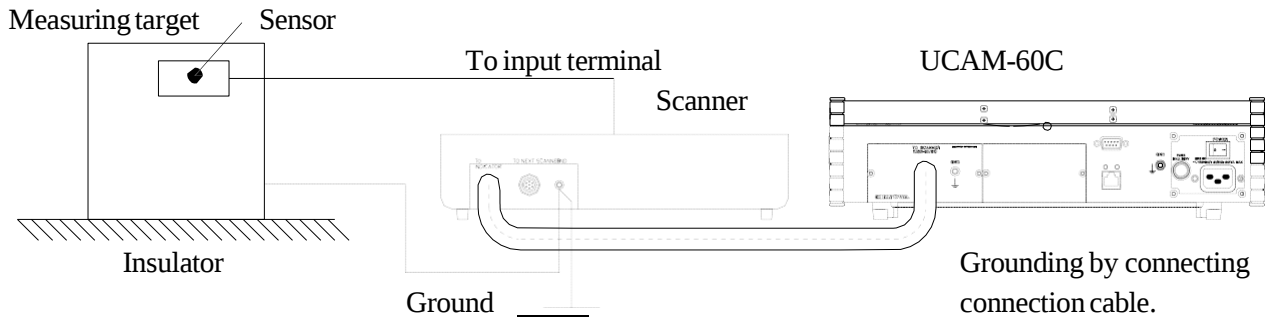
3-1-1-1 When Measuring Target is Grounded

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



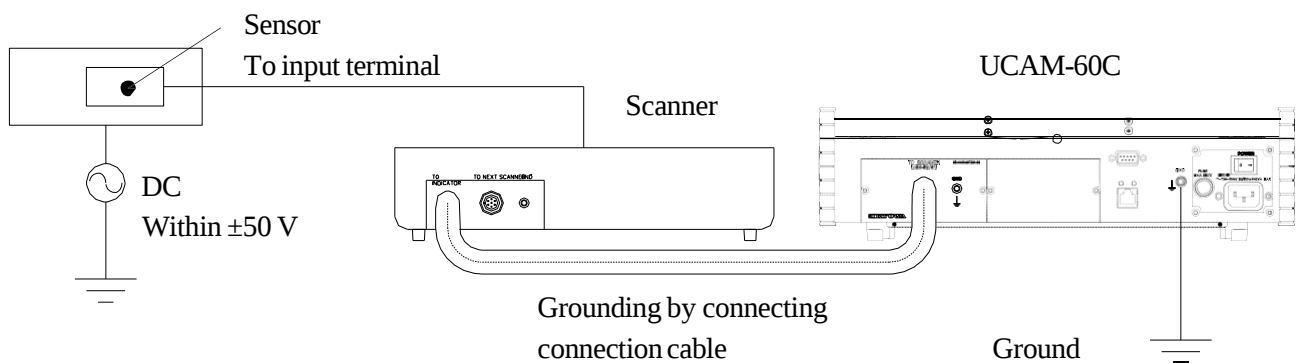
3-1-1-2 When Measuring Target is Insulated from the Ground

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



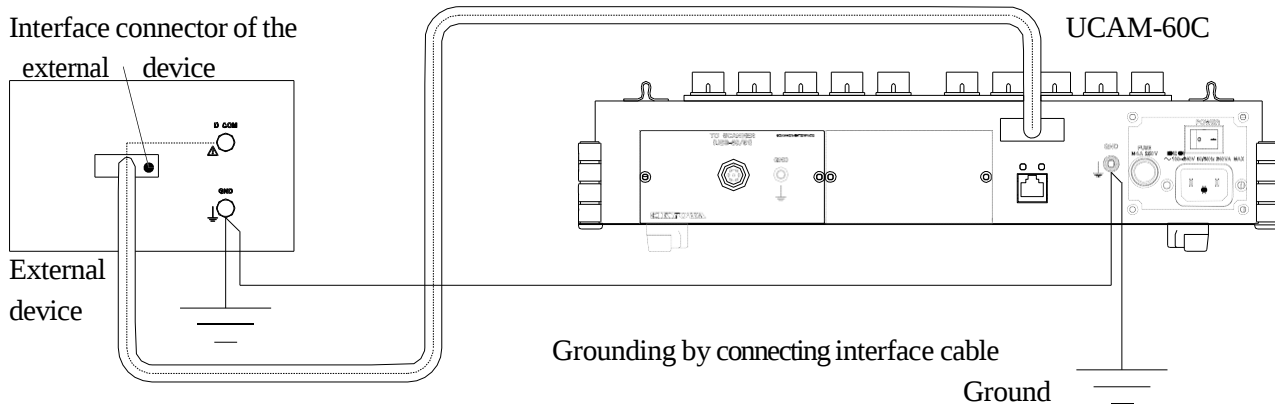
3-1-1-3 When Measuring Target has Potential to the Ground

- (1) Ground either the scanner’s “GND” terminal of USB-70 series, etc., or the “GND” terminal of UCAM-60C.



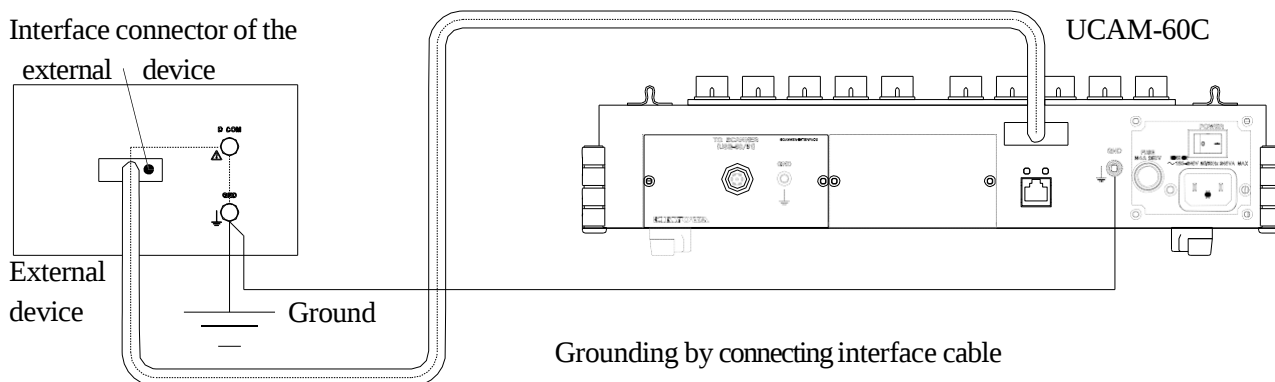
3-1-1-4 When Connecting to an External Device Which Has No Connection between Digital Common and GND Terminal

- (1) Connect UCAM-60C's "GND" terminal to "GND" terminal of the external device.
- (2) Ground either the UCAM-60C's "GND" terminal or "GND" terminal of the external device.



3-1-1-5 When Connecting to an External Device Which Has Connection between Digital Common (or Chassis) and GND Terminal

- (1) Connect the "GND" terminal of the UCAM-60C to the GND terminal of the external device.
- (2) Ground the GND terminal of the external device.



3-1-2 Grounding for Lightning Surge Protection

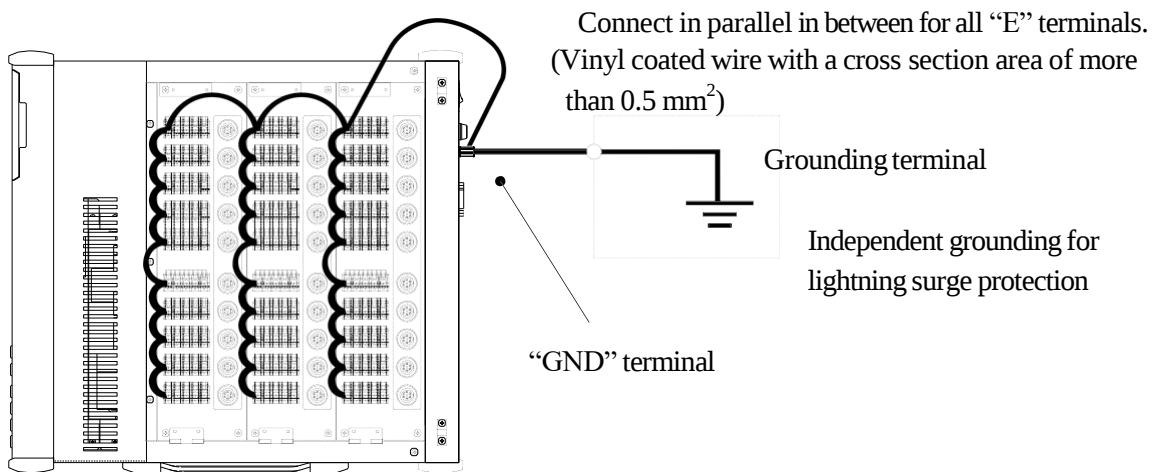
To protect the UCAM-60C or scanners from lightning surge, connect “E” terminals of each of the input terminals to the “GND” terminal.

For lightning surge protection, conduct grounding independently.

The effect of the lightning surge protection depends on how well of the connection of grounding and wiring.

Connect the “GND” terminal to lightning surge protecting ground with a area of at least 1.25 mm² green color vinyl coated wire in a minimum length of connection.

3-1-2-1 Grounding for Protection of Data Logger and Scanners from Lightning Surge

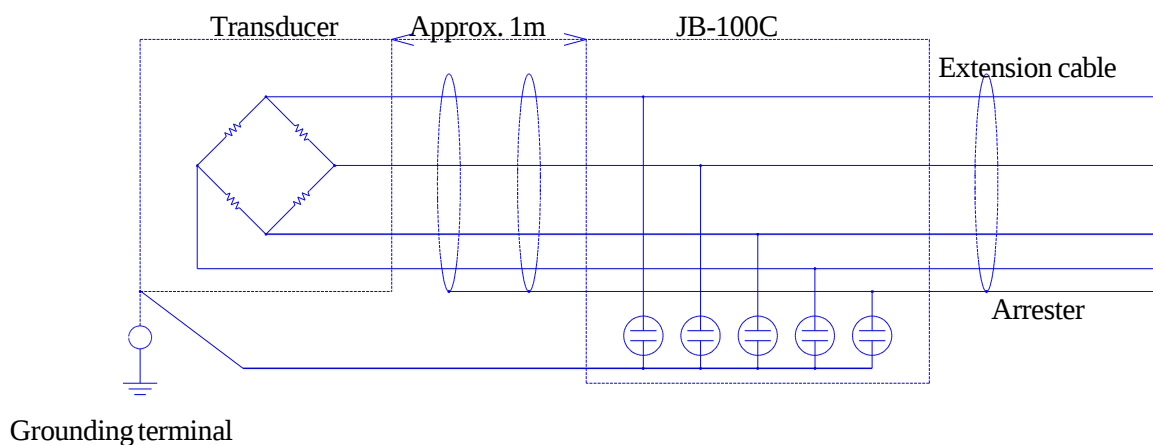


3-1-2-2 Grounding for Protection of Sensors from Lightning Surge

(1) When using KYOWA’s strain gage transducer

Connect KYOWA Lightning Arrester Kit JB-100C in a close distance with each transducer (about 1m) and ground independently for lightning surge protection.

(For details, refer to JB-100C instruction manual.)



Independent grounding
for lightning surge protection

(2) When using other sensors

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

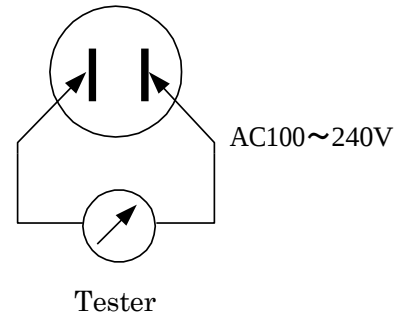
3-1-3 Connecting Power Cable

Under AC power supply specs of the UCAM-60C, 100 to 240 VAC is required.

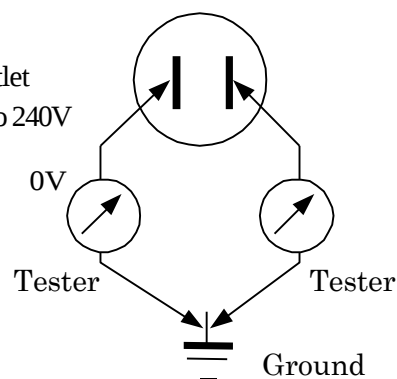
(For AC power supply dedicated unit)

Before connecting the power cable, confirm the following steps.

- (1) Measure voltage between 2-prong power outlet with a tester and ensure that it is provided with power voltage from 100 to 240 V.



- (2) Measure voltage between each receptacle of the 2-prong power outlet and the ground with tester and confirm that 0V for one, while 100 to 240V for the other.



- (3) If the UCAM-60C is operated in environment where interfering devices such as induction motor, welding machine, etc. are used, power supply may be deteriorated 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-60C with unstable frequency or square-wave output of power supply or it may cause malfunction in the operation.

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-60C.
- AC output of some low-cost UPSs may not be sine wave but rectangular wave.
Upon selecting the UPS, check the UPS's specifications.
Producing of rectangular wave indicates bad operation of the UCAM-60C and measurement may become unstable.

3-1-4 Connecting DC Power Supply

Under DC power supply specs of the UCAM-60C, 10 to 16 VDC is required. (For DC power supply dedicated unit)

Before connecting the power cable, confirm the following.

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

If the UCAM-60C is used with DC power voltage other than stated above, it may cause low performance and malfunction of UCAM-60C.

- (2) Ground the “GND” terminal of UCAM-60C at the rear panel.

- (3) Ensure a correct connection between DC power cable (P-76) and DC power connector with a correct polarity in correspond to each other.

A reverse connection can cause a failure or fire.

Connect the connector side of the included DC power cable to the back of this device.

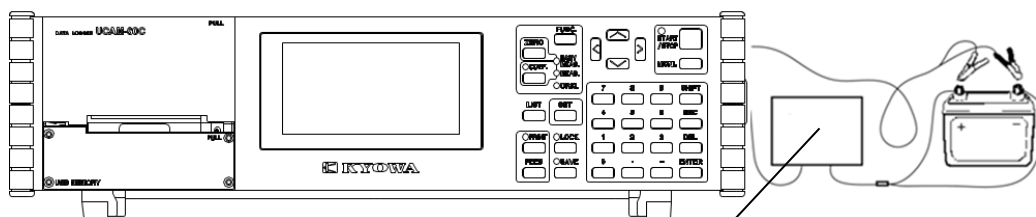
Connect the cable end to the following voltage:

Cable end: red, white → DC10V to 30V

Cable end: black, green → DC0V

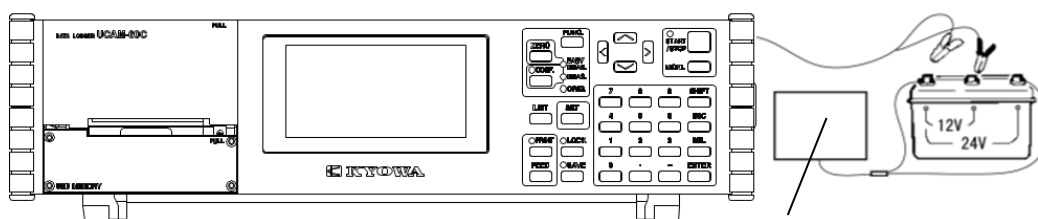
MEMO

- The minus ‘-’ side of the UCAM-60C’s DC power connector is connected to the ground while plus ‘+’ side of the UCAM-60C’s DC power connector is connected to the transducers which had been grounded. Do not connect or contact the chassis of UCAM-60C with plus ‘+’ sides or it will cause low performance of the UCAM-60C and malfunction.



Measuring instrument with ‘+’ side connected to the ground

- Do not supply the voltage by connecting the minus ‘-’ side of the UCAM-60C DC power connector (=GND) to the middle point of connection of battery, etc.

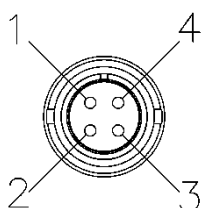


Other measuring instruments, etc.

MEMO

The power connector model and pin assignment are shown below.

Pin No	Assign
1	+SIDE
2	
3	-SIDE
4	



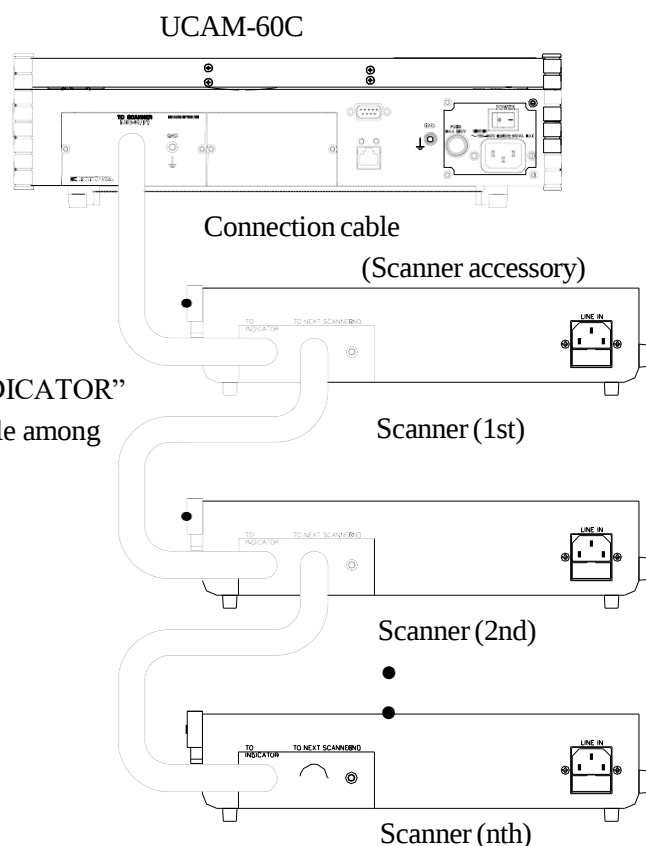
Part No. : RM12BRD-4PH(receptacle)
 manufacturer : Hirose electronic
 Compatible plug : RM12BPE-4S
 (Hirose electronic)

3-2 CONNECTING EXTERNAL DEVICES

3-2-1 Connecting USB-70 Series Scanners

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

- (1) Install the scanner interface USI-67A to optional slot 1 at the rear panel.
- (2) Connect “TO SCANNER” (USB-70) of the USI-67A and “TO INDICATOR” connector of the USB-70 series scanner with the connection cable among the scanner’s accessories.
- (3) For connecting 2nd scanner, connect “TO NEXT SCANNER” connector of the 1st scanner to “TO INDICATOR” connector of the 2nd scanner with the connection cable among the scanner’s accessories.
- (4) For connection after the 2nd scanner, connect in the same manner as indicated in step (3).



MEMO

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

- When 1 unit of USB-70 series scanner is used and the cable is extended to 240 m or more.
- When 2 units of USB-70 series scanners are used and the total extension of the cable exceeds 120 m or more.
- When 3 units of USB-70 series scanners are used and the total extension of the cable exceeds 60 m or more.
- When more than 4 units of 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-60C and the maximum extension length of the connection cable are as follows.

- Connection cable can be extended up to 1 km with maximum connection of 20 units of scanners.
- When using internal scanners, a maximum of 20 units of internal scanners can be connected.

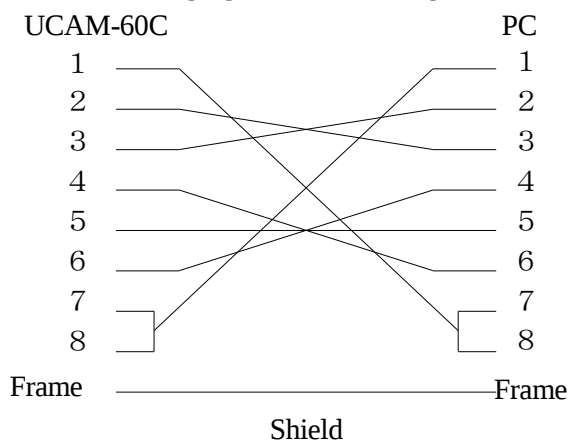
NOTE

Before installing the scanner interface to option slot 1, turn OFF the UCAM-60C.

3-2-2 Connecting RS-232C Interface

RS-232C interface connector is provided at the rear panel of the UCAM-60C.

Refer to the following figure for connecting the UCAM-60C to the PC.

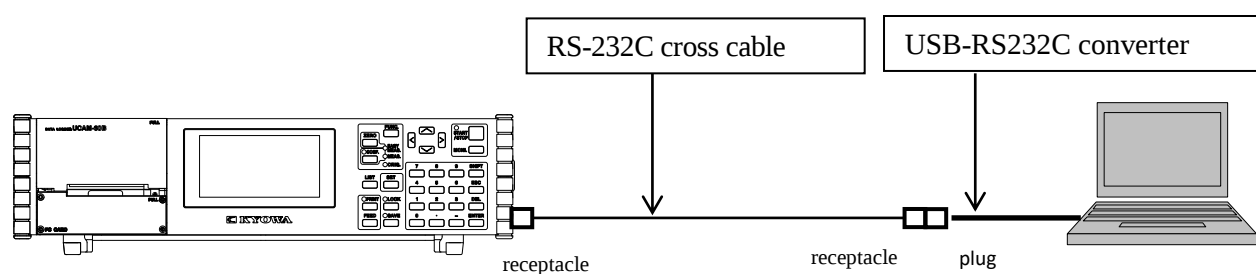


MEMO

Applicable cable

SANWA SUPPLY CORP. made RS-232C cable (cross cable), KRS-403XF3K2 (3m), etc.

If your computer does not have an RS-232C (serial) communication port, a USB-RS-232C converter can be used to make a connection.



NOTE

USB-RS232C converter

Example of products : USB-RSAQ6R made by I-O data

(Instrument side : D-sub 9pin plug PC side : USB typeB)

* It is necessary to install a separate USB driver.

For details on compatible operating systems, USB driver installation, and RS communications protocol settings, see the USB-RS232C-converter manufacturer's website.

It is necessary to unify the RS communications protocol (the baud rate, termination code, etc.) for the UCAM itself, USB-RS232C converter, and UCS-60B (control software).

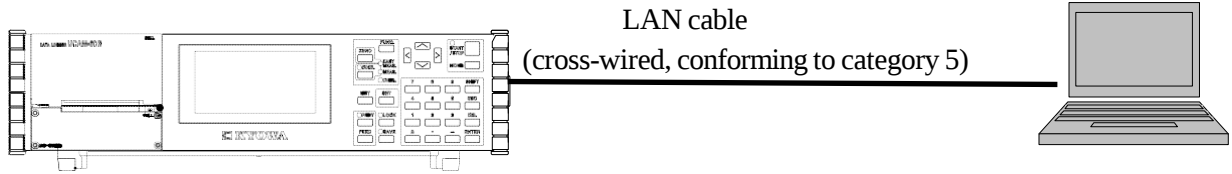
For detail of RS communications protocol settings, Refer to UCAM-60C/65C_Control Commands Instruction Manual and UCS-60B Instruction Manual

The USB-RS232C-converter communication port can be set from the computer's Device Manager under Control Panel.

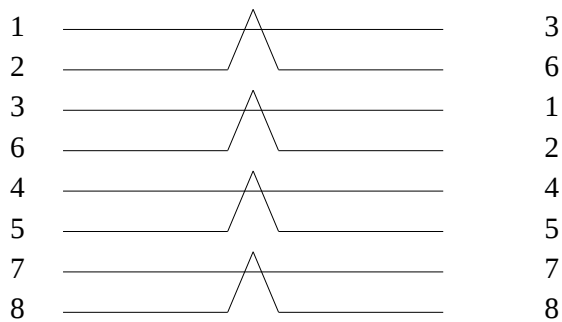
3-2-3 Connecting Ethernet

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

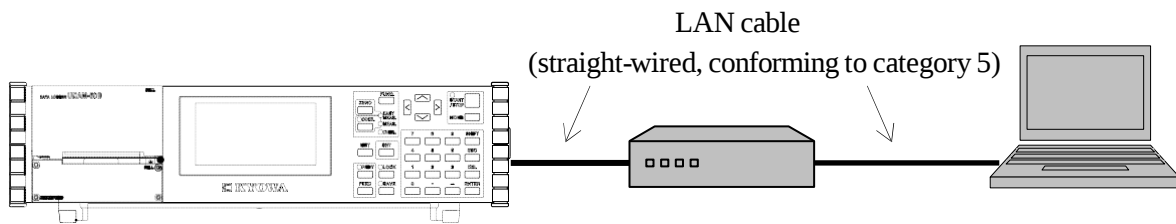
(1) When directly connecting the UCAM-60C to the PC



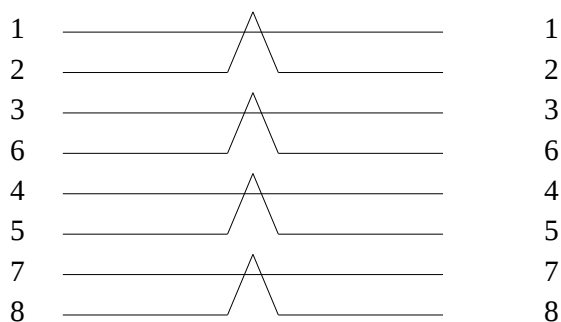
- Use a cross-wired LAN cable of category 5 or higher.
- Schematic drawing of cross wire connection is described in the following.



(2) When connecting to network via hub



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



NOTE

Since cross-wired LAN cable is excluded in the product warranty of OS manufacturer, do not use it.

NOTE

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

3-3 SETTING THE IP ADDRESS

Connection is not possible when the IP addresses of UCAM-60C and your PC are not set.
This section describes how to set the IP address of the UCAM-60C together with the IP address of your PC.

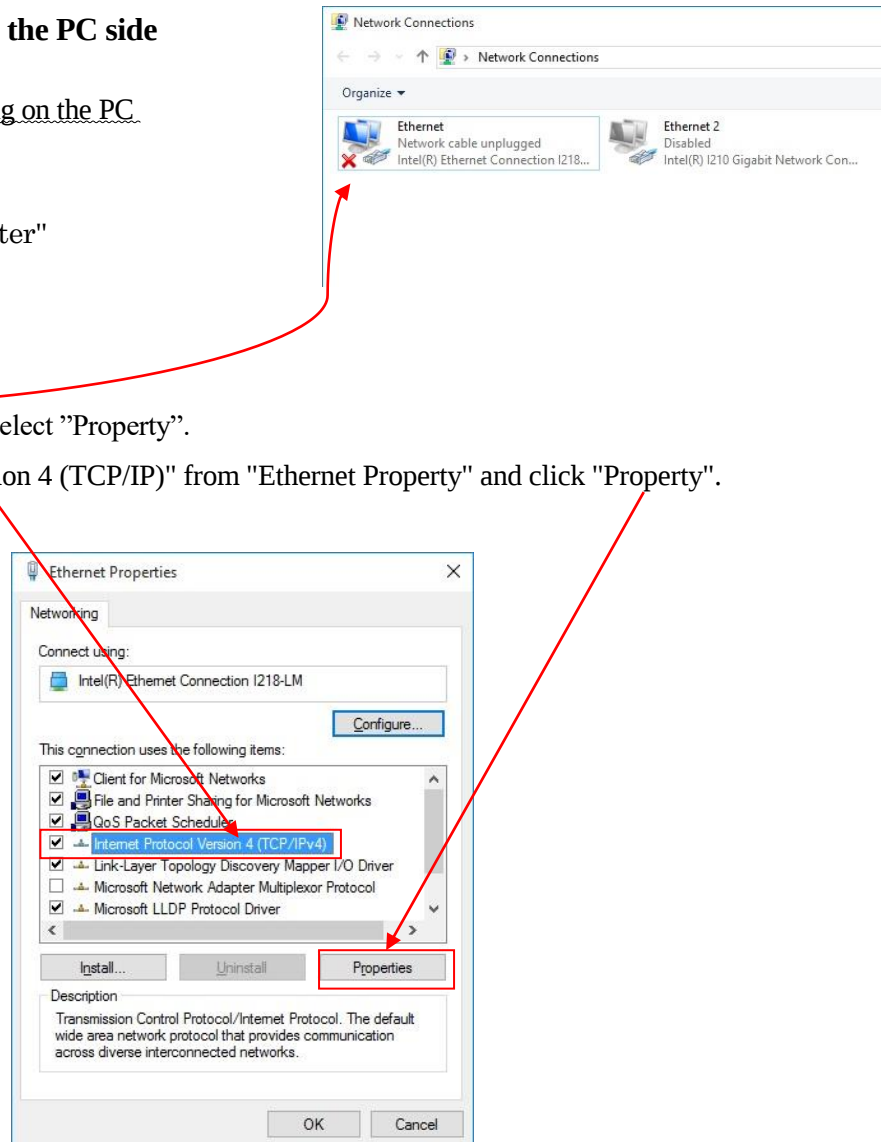
3-3-1 Setting confirmation on the PC side

First, confirm the IP address setting on the PC.

- (1) Select "Control Panel".
→ "Network and Sharing Center"
→ "Change adapter setting"
→ "Network Connection".
Network connections opens.

- (2) "Ethernet" right click and Select "Property".

- (3) Select "Internet Protocol Version 4 (TCP/IP)" from "Ethernet Property" and click "Property".



- 4) Confirm the IP address of the "Internet Protocol Version 4 (TCP/IP)" property.
(Example)

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 192 . 168 . 20 . 13

Subnet mask: 255 . 255 . 255 . 0

Default gateway: 192 . 168 . 20 . 250

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: 192 . 168 . 1 . 249

Alternate DNS server: 202 . 239 . 206 . 26

☐ Validate settings upon exit

Advanced...

OK Cancel

In the above-mentioned (example), the IP address is 192. 168. 20. 13.

3-3-2 UCAM setting

- 1) Set the IP address on the UCAM side to 192. 168. 20.***.

Set the same number until 192. 168. 20. Enter any number that is different from your PC for the "***" of the 4th group.

In addition, even when other PCs and devices are connected in the same LAN environment, enter a different number so that the number *** is not duplicated.

- 2) Set the IP address of the UCAM-60C.
See "10-4 Ethernet Setting" for details.

When connecting the UCAM-60C to PC with LAN or Ethernet cable, check the connection as stated below.

(1) Confirmation of hardware connection (Confirmation by checking the status of LED of LAN connector of UCAM-60C)

There are 2 LEDs at the LAN connector of the UCAM-60C, indicating whether the current connection of hardware is correct or not. Turn ON the UCAM-60C and launch the UCS-60B of PC. If LAN connection is correct, one of the LEDs lights up while the other flickers (irregularly). If not, check the LAN cable connection .

(2) Confirmation of software connection

Check by Ping command

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

1) Start the command prompt

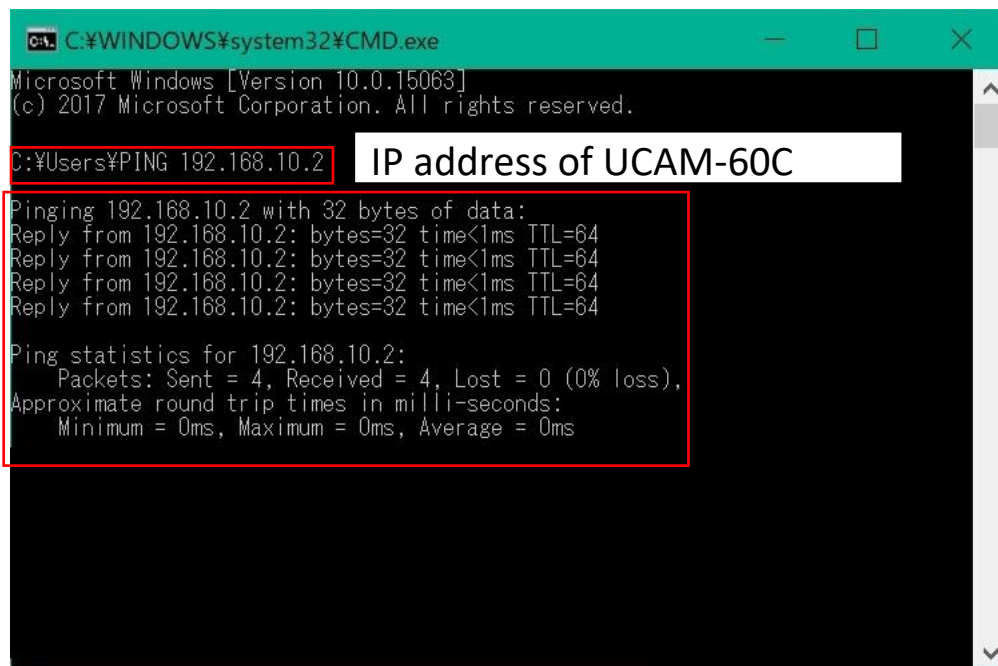
Select “Start” - “All Programs” - “Accessories” - and “Command Prompt.”

2) Input Ping command.

Input “ping” followed by the IP address of UCAM-60C as shown below and press the Enter key.

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

If result as shown in the following (0% loss) is displayed, the communication is same as expected and it can be concluded that the network connection is correctly set.



The screenshot shows a Windows Command Prompt window titled "C:\WINDOWS\system32\CMD.exe". The window displays the following text:

```
Microsoft Windows [Version 10.0.15063]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\PING 192.168.10.2
Pinging 192.168.10.2 with 32 bytes of data:
Reply from 192.168.10.2: bytes=32 time<1ms TTL=64
Reply from 192.168.10.2: bytes=32 time<1ms TTL=64
Reply from 192.168.10.2: bytes=32 time<1ms TTL=64
Reply from 192.168.10.2: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

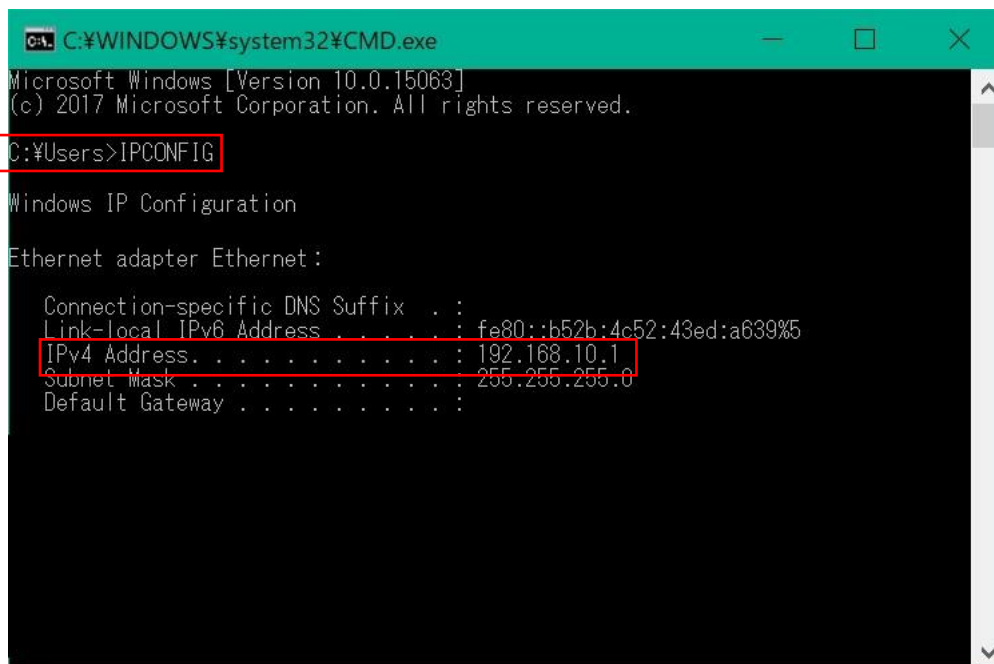
A red box highlights the command prompt area, and a white box with the text "IP address of UCAM-60C" points to the IP address 192.168.10.2 in the command.

- (3) If correct connection of hardware and software had been confirmed but controlling of UCAM-60C in practical application cannot be conducted,
- 1) Check setting condition of the current application.
 - 2) Check with the security software's Firewall removed.
 - 3) Ethernet communication is not available if the communications port (9001) is set to a state where it is always closed.

(Supplementary note)

About how to check the PC's IP address

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



```
C:\WINDOWS\system32\CMD.exe
Microsoft Windows [Version 10.0.15063]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users>IPCONFIG

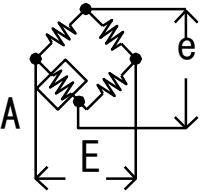
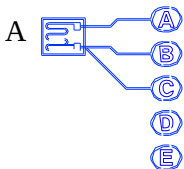
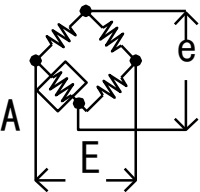
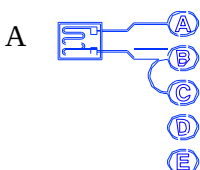
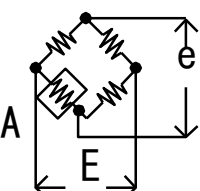
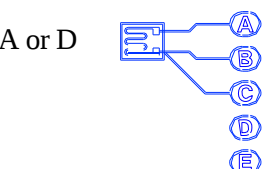
Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::b52b:4c52:43ed:a639%5
    IPv4 Address. . . . . : 192.168.10.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :
```

3-4 CONNECTING SENSORS

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

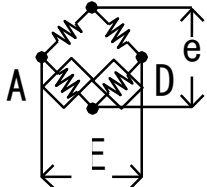
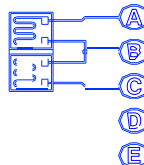
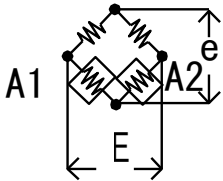
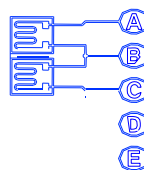
Measuring Method	Bridge Circuit	Connecting Method	CH Mode
	 : Strain gage  : Built-in fixed resistor A : Active gage D : Dummy gage E : Bridge exciter e : Bridge output	A : Active gage D : Dummy gage	
1-gage method (3-wire system connection) Gage resistance 120 Ω 240 Ω 350 Ω			1G 120 (BV 2 V) 1G 240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

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

■ (*1) 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 based on gage lead wire used, error of the initial value, etc.
- When measurement is conducted in environment with excessive noise, use KYOWA’s low-noise lead wire (L-13/14/15/16).
- With USS-61B/62B/63B’s accessory, short bar, when using 1-gage method (2-wire system connection), short-circuit between B – C.

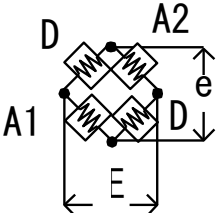
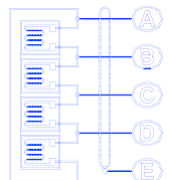
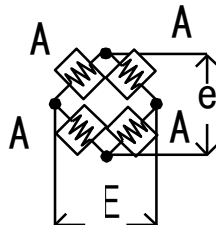
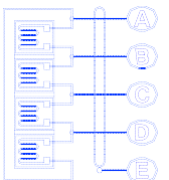
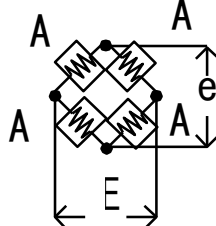
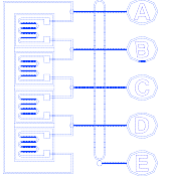
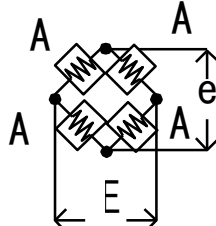
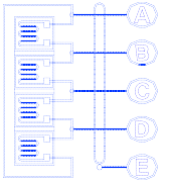
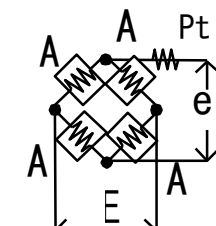
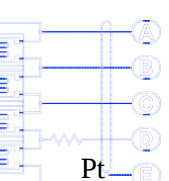
Measuring Method	Bridge Circuit	Connection Method	CH Mode
	 : Strain gage  : Built-in fixed resistor A : Active gage D : Dummy gage E : Bridge Exciter e : Bridge output	A : Active gage D : Dummy gage	
2-gage method (Active-dummy method) Gage resistance 60 Ω to 1 K Ω		A D 	2G/A-D (BV 2 V) 2G/A-D_5 V (*1)
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.

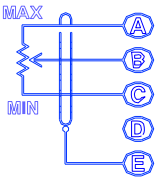
NOTE

- If using strain gage with gage resistance of below 120-ohm under BV 5V (CH mode target 1G120_5V, 1G120D_5V, 1G120A_5V, 2G/A-D_5V, 2G/A-A_5V, 4G_HR), for the strain measurement and using of short gage length of strain gage or strain gage on plastic, woods, etc. and other bad heat-dissipation materials, the self-generating of heat of strain gage might not be negligible. Before measuring, ensure that there is no trouble in measurement.

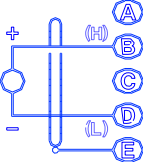
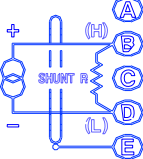
Measuring Method	Bridge Circuit	Connecting Method	CH Mode
	 : Strain gage  : Built-in fixed resistor A : Active gage D : Dummy gage E : Bridge exciter e : Bridge output	A : Active gage D : Dummy gage	
4-gage method (Opposite side active method) Gage resistance 60 Ω to 1 K Ω ^(*2)		A1 D A2 D  Shield	4G/A-A
4-gage method Full-bridge method Strain gage transducer Bridge resistance 60 Ω to 1 K Ω High resolution 120 Ω to 1000 Ω		A A A A  Shield	4G 4G_HR
4-gage method (Constant current excitation) Full-bridge method Strain gage transducer Bridge resistance 120 Ω		A A A A  Shield	4G/I (120)
4-gage method (Constant current excitation) Full-bridge method Strain gage transducer Bridge resistance 350 Ω		A A A A  Shield	4G/I (350) 4G/I_HR
4-gage method Full-bridge method Civil engineering transducer with temperature measuring function Bridge resistance 350 Ω		A A A A  Shield	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 $R = 250\ \Omega$ High accuracy resistor	 Shield	I/50 mV

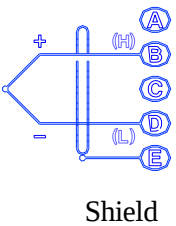
MEMO

Recommendation of high accuracy resistor for measuring electric current

- When it is used within range from 0 to $\pm 30\text{ mA}$: Y0875250R000T9L (VISHAY Foil Resistor made) (Tolerance:0.01%)
- When it is used within range from 0 to $\pm 50\text{ mA}$: Y0785500R000T9L (VISHAY Foil Resistor made) (Tolerance:0.01%)

*When it is used within range from 0 to $\pm 50\text{ mA}$, Two Y0785500R000T9L have to connect parallel

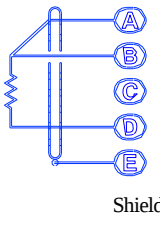
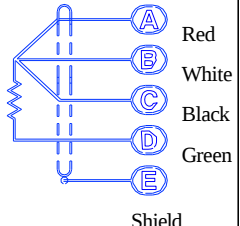
3-4-4 Connecting Thermocouple

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

MEMO

- When measuring, enclose the terminal part with terminal cover so that the terminal part can be adapted to be equivalent with room temperature.
Do not expose terminal part to wind of air-conditioner or direct sunlight.
If thermal gradient is generated, measurement error may occur.
- Set the scanner on a flat surface. If it is set against the wall, thermal gradient may be generated and measurement error may occur.
- Use a twisted pair shielded type cable for thermocouple measurement.
If a parallel or non-shielded type cable is used, measurement may be affected by external noise and error may occur.
- Do not connect the thermocouple to a measuring target which has larger electric potential than the ground directly. It may cause malfunction and error in 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-60C's built-in printer is equipped with function of auto-loading of recording sheet.

Replace the recording sheet according to the following procedures.

- 1) Push down the fitting metal.
- 2) Set the recording sheet in.
- 3) Slot in the recording sheet into the printer as shown in figure (b). Then, the printer can automatically load the recording sheet

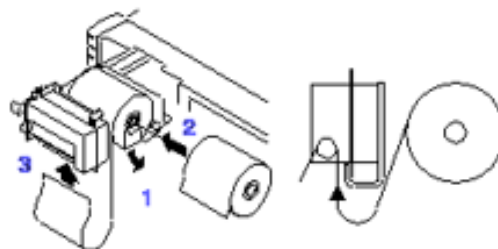


Figure (a)

Figure (b)

- 4) The paper sensor detects the paper, and the paper is automatically pulled in.
- 5) After a certain length of the paper is pulled in and "TEST PRINT" is printed, printing becomes possible.

MEMO

- The auto-load function does not work when the UCAM-60C is turned off.
- Be sure to do this with the power ON.
- The model of the recording sheet is UCAM-60A-RP (with 10 rolls per box, spec: heat sensitivity type, wide: 58 mm, length: 25mm per roll)

3-6 ABOUT INTERNAL BACKUP BATTERY

When power of the UCAM-60C is off, internal backup battery is used for maintaining the contents for the clock function

NOTE

- The internal backup battery has an expiration date of approximately 7 years.
- For battery replacement, the battery must be picked up and replaced.

4. HOW TO OPERATE UCAM-60C

4-1 OPERATIONAL FLOW

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

(1) Installation of the UCAM-60C and connection of scanners

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

For details, refer to “3. CONNECTING DEVICES & PREPARING FOR MEASUREMENT.”

(2) Connection of sensors

Connect sensors.

For wiring, refer to “3-4 CONNECTING SENSORS.”

(3) Setting of required measuring conditions

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

For details, refer to “5. BASIC SETTING FOR MEASUREMENT.”

(4) Setting of method for recording measured results

Measured results are displayed in the window. In addition, they can be printed out from the built-in printer and saved in the internal memory.

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

(5) Saving of measuring conditions

Preset measuring conditions are saved into the internal memory or USB Flash Drive.

For details, refer to “6. FILE OPERATION.”

(6) Measurement

Conduct measurement.

For how to start the measurement, refer to “7. MONITOR & REAL-TIME CH 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.

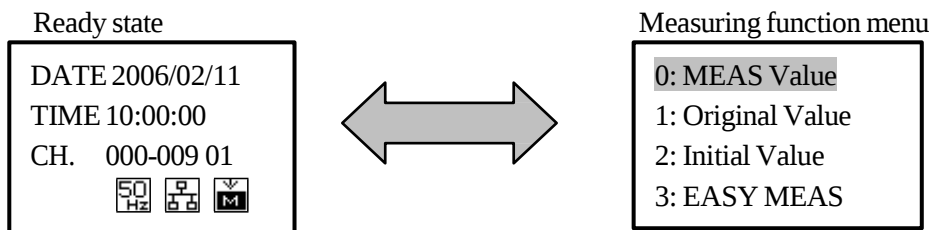
Setting Items		Details	Operation Key	Reference
Main items	Sub items			
System setting	Internal scanner	Set whether or not internal scanner is used.	SET→7→1→0	5-1-1 Setting Internal Scanner
	Scanning speed	Collectively set scanning speed of measurement from starting CH to ending CH of measurement. *1	SET→7→1→1	5-1-2 Setting Scanning Speed
	Cold junction compensation	When measuring thermocouple, setting 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. The power frequency is detected automatically. - 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 setting	Measuring CH	Set starting and ending CHs of the measurement.	SET→0→0	5-2-1 Setting MEAS CH
	Repeat times	Set the number of repeat times for measurement by operating the measurement for the first time.	SET→0→1	5-2-2 Setting Repeat Times
CH condition setting	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 after decimal point	Set a decimal point position for indicating physical quantity converted value.	SET→1→3	5-3-5 Setting Digits After Decimal Point
	Unit	Set unit for indicating physical quantity converted value.	SET→1→4	5-3-6 Setting Unit
	Offset	Set offset value for converting the measured value into physical quantity.	SET→1→5	5-3-7 Setting Offset
	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	5-3-8 Setting Reference Resistance Value

* 1: Able to be set afterwards.

4-3 HOW TO SET

4-3-1 Indicating Menu Items

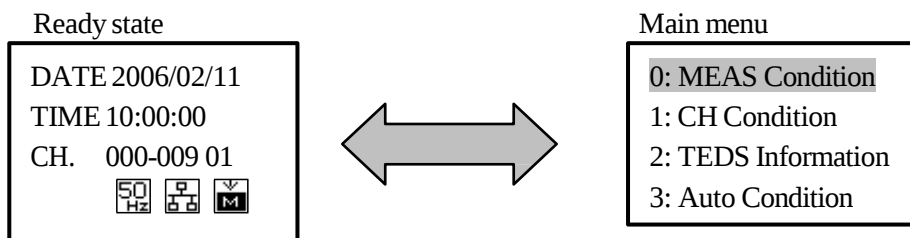
When the UCAM-60C is in ready state, press the  key. Menu items on measuring function will be displayed. Set the required measuring function and the indication returns to the ready state.



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

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.

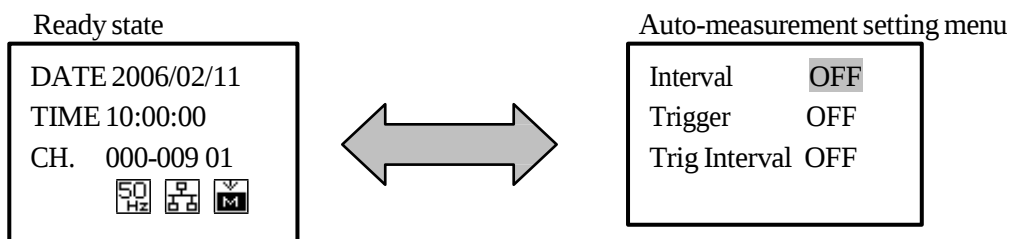
Press the  key and the setting items will be stored and indication returns to the ready state.



Press the  key while pressing the  key under the ready state. Items related to auto-measurement are displayed.

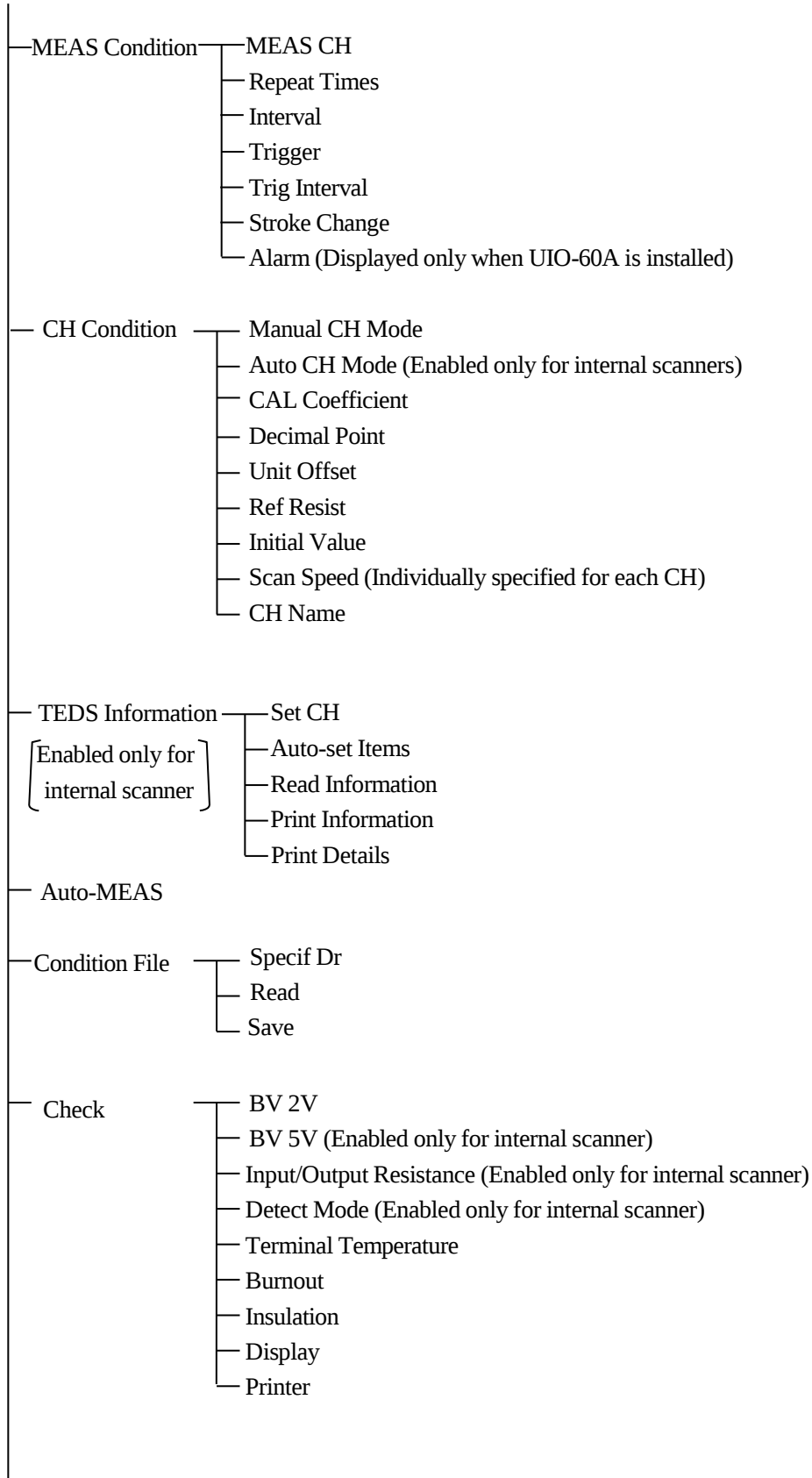
Set the auto-measurement to ON and press the  key to start the auto-measurement.

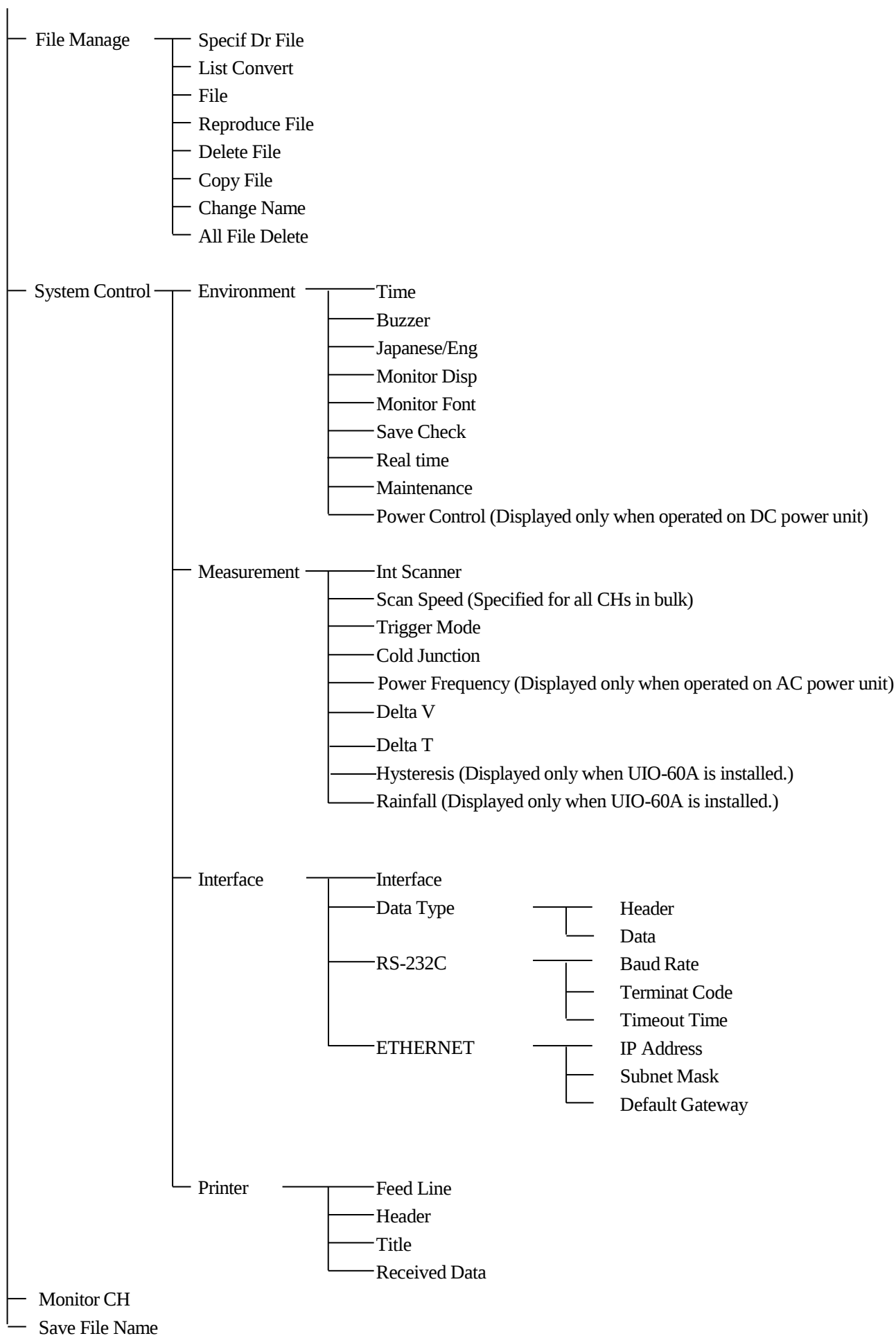
Press the  key to return to the ready state.



4-4 MENU LIST

By pressing the  key, the following tree structure indicates the setting items. 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] of [7: System Control] of the main menu.

Procedures are described consecutively.

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 in the screen as shown at 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)

Press the  key to change the display to indicate the “Use.” Press  key in 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 a 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.)

5-1-2 Setting Scanning Speed

The UCAM-60C 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.

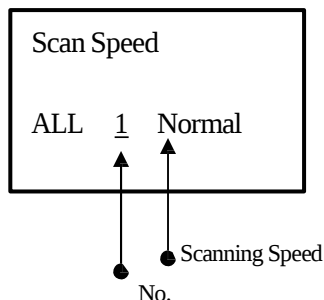
The following 8 types of scanning speed can be selected in the UCAM-60C.

0: High speed	Enabled only for internal scanners with 20 ms/CH. Preset CH mode has the priority. For details, refer to message in MEMO.
1: Normal	Standard scanning speed. Scanning speed varies with preset CH modes and measuring scanners. For details, refer to 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 for 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 in the [Measurement] menu or press the **[ENTER]** key with the cursor on the [1: Scan Speed]. And then, a number to set the scanning speed and the scanning speed will be displayed.



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

Or, press the cursor key (**[<]** or **[>]**) while pressing the **[SHIFT]** key to sequentially change the scanning speed display. Therefore, select the “Normal” by pressing **[ENTER]** key.
After that, pressing 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, refer to “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-60C will always conduct preliminary measurement except when it is monitoring data.

While the UCAM-60C is conducting the preliminary measurement, scanning unit’s LED flickers.

In addition, since results of preliminary measurement are used for the actual measurement, take special care when 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

“High Speed” scanning speed is enabled only for UCAM-60C’s 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)

5-1-3 Setting Cold Junction Compensation

For cold junction compensation that measures the temperature by thermocouple instrument, select one method from the following selections.

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

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

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

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

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

Press the **3** key in 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 to select [Internal] and the indication will return to the [Measurement] menu.

5-1-4 Setting Power Frequency

Power frequency required for operating the UCAM-60C is described as follows.

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. Set the power frequency if the “MEAS Timing” is set to “Asynchronous.”
- For DC power supply device
 1. Set the power frequency.

NOTE

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

Operation method is as follows when the power frequency is set to 50 Hz.

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

Press the **4** key in 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 select [50 Hz] and the indication will return 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 in 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-60C 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 in 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 relevant position and re-input the changed data.

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

5-2-2 Setting Repeat Times

With one times operation of starting measurement, set the number of times of measurement between the “First CH” and “Last CH.”

If N times (1 to 99) are set, CHs preset between the “First CH” and “Last CH” will be measured for N times. In addition, if ‘00’ times is set, the measurement will be conducted continuously until it is stopped manually.

Operation for setting one measuring times 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 in 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 relevant position with the cursor key (**[←]** or **[→]**) and input the changed numeric once again.

Pressing the **[ENTER]** key determines the set 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 indication the above items are described in the following.

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

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

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

Menu items in 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. (This mode is called CH mode here)

(1) Basic method for setting CH mode

CH mode setting operations are described in the following.

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

Press the **0** key in 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.

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

● Mode
● Mode No.

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**). (refer to the
list of CH modes relating to the mode Nos. and CH modes.)

Press the **ENTER** key to determine the mode input into the [CH]
and the cursor moves to the next [CH].
Pressing the **ESC** key returns the indication to the [CH Condition]
setting menu.
Methods for inputting the mode No. can be conducted by
methods other than stated as above. Refer to the next pages.

(2) Selecting and setting an arbitrary CH

It is possible to 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 setting of specified CH is displayed

(3) Increase or decrease the mode No. and select it.

By increasing or decreasing the mode No., display of CH mode can be changed.

```
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. to decrease the mode No.

(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
```

While pressing the  key or  key with the cursor set on the mode No., 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 CH No. of copy destination is determined and display is updated.

- 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 Transducer with temperature measuring function
17(4G/T)	Voltage (500 mV)
18(V/500mV)	Voltage (50 V)
19(V/50V)	Current (50 mA)
20(I/50mA)	Thermocouple (K)
21(TC/K)	Thermocouple (T)
22(TC/T)	Thermocouple (E)
23(TC/E)	Thermocouple (J)
24(TC/J)	Thermocouple (R)
25(TC/R)	Platinum resistance thermometer sensor 100 Ω (New JIS)
26(Pt100)	Platinum resistance thermometer sensor 100 Ω (Old JIS)
27(JPt100)	Potentiometer sensor
28(POT.)	1-gage (120 Ω , BV 5V)
29(1G120_5V)	1-gage (240 Ω , BV 5V)
30(1G240_5V)	1-gage (350 Ω , BV 5V)
31(1G350_5V)	1-gage(120 Ω , Dummy, BV 5V)
32(1G120/D_5V)	1-gage (120 Ω , Active, BV 5V)
33(1G120/A_5V)	1-gage (350 Ω , Dummy, BV 2 V)
34(1G350/D_5V)	1-gage (350 Ω , Active, BV 5V)
35(1G350/A_5V)	2-gage (Active-dummy, BV 5V)
36(2G/A-D_5V)	2-gage (Active-active, BV 5V)
37(2G/A-A_5V)	Linear variable differential transformer transducer
38(LVDT)	*: Not available for internal scanner.
	LVDt transducer with resistance thermometer sensor
39(LVDT/T)	*: Not available for internal scanner.
	Sliding resistance transducer (A section only)
40(POT./A)	*: Not available for internal scanner.
	Sliding resistance transducer (Measures A and B sections)
41(POT./AB)	*: Not available for internal scanner.
	Using scanner USB-70A in “SCANNER” mode.
42(USB-70A-S)	*: Not available for internal scanner.
	Usually Not use (Using scanner USB-50/51 series)
43(USB-50/51)	*: Not available for internal scanner.

■ Settable CH Mode on Scanning Unit and External Scanner

- CH mode No. "00" can be set regardless of external 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 be used

- 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 be used
38, 39, 40, 41	Generally, not being 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.

NOTE

For CH mode No. after "29", UCAM-60C is different to UCAM-60A.

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

02/11 13:24:10
 CH. 000 ←
 Checking

Current checking CH No. is displayed

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 that can be set automatically

- 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 stated above Displayed as '99----.'

As it is not able for auto-setting of this CH, set the CH mode manually.

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 in the same way for every CH as described in this section. In either ways, the set items can be confirmed only in the window described in this section.

About 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 in 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
1 1 Normal
2 1 Normal
3 1 Normal

Preset items of measuring CH are displayed.

Numbers corresponding to the scanning speed can be input with numeric keys (**[0]** to **[7]**). Pressing the **[ENTER]** key determines the scanning speed input into the [CH] and the cursor will move 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, refer to “MEMO 2.”
1: Normal	Normal scanning speed. The scanning speed varies with CH mode and scanners. For details, refer to “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 can be operated as same as the CH mode setting operation by the following operation keys.

- Press the cursor key  and move the cursor to the [CH]. Input the desired channel No and press the  key. The set value of the selected CH will be displayed.
- 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 setting of 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/I_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

“High speed” scanning speed is effective only for UCAM-60C’s built-in internal scanners.

Do not set the “High speed” to external scanners.

If the scanning speed is set to “Normal,” scanners will 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)

5-3-4 Setting Calibration Coefficient

Coefficient used for converting a measured value into physical quantity 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) Inputting 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 $\boxed{2}$ key in the [CH Condition] setting menu or press the cursor key ($\boxed{\wedge}$ or $\boxed{\vee}$) to have the cursor on the [2: CAL Coef] and then, press the $\boxed{\text{ENTER}}$ 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 ($\boxed{0}$ to $\boxed{9}$). However, it is not necessary to input a decimal point or a letter $\boxed{E}$. In addition, input a “+” sign with the $\boxed{0}$ key and, “-” sign with the $\boxed{}$ key.

Press the $\boxed{\text{ENTER}}$ key to determine the calibration coefficient that had been input into the [CH]. Then, the cursor will move to the next [CH].

Press the $\boxed{\text{ESC}}$ key and the indication will return to the [CH Condition] menu.

(2) Inputting 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 $\boxed{2}$ key in the [CH Condition] setting menu or press the cursor key ($\boxed{\wedge}$ or $\boxed{\vee}$) to have the cursor on the [2: CAL Coef] and then, press the $\boxed{\text{ENTER}}$ 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 $\boxed{\text{DEL}}$ key to delete the display at the input place of the calibration coefficient.

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

Press the $\boxed{\text{ESC}}$ key. The indication will return 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 quantity) when 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 and OFF when the **COEF** key is pressed for approx. more than 3 secs.

MEMO

The calibration coefficient setting operation can be operated as same as the CH mode setting operation by the following operation keys

- Press the cursor key  and move the cursor to [CH]. Input and display the relevant 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 setting of calibration coefficient.

5-3-5 Setting Digits After Decimal Point

When measured value is displayed in physical quantity, a decimal point position can be set by referring to the

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

Setting of numeric value with 3 digits after 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 in the [CH Condition] setting menu or press the cursor key (**↑** or **↓**) to have 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 location of decimal point entered at the [CH] and the cursor will move to the succeeding [CH].
Press the **ESC** and the indication will return to the [CH Condition] setting menu.

MEMO

The setting operation of decimal point's position can be operated as same as the CH mode setting operation by the following operation keys.

- 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 to copy the the setting of desired decimal point position.

5-3-6 Setting Unit

Units of measured values in physical quantity are described as follows.

Required unit is entered with the unit No. (Refer to “List of Unit Nos.” below)

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

Press the **4** key in the [CH Condition] setting menu or press the cursor key (**▲** or **▼**) to have 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 will move to the succeeding [CH].
Press the **ESC** key and the indication will return 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 setting operation of unit can be operated as same as the CH mode setting operation by the following operation keys.

- 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 desired unit.

5-3-7 Setting Offset

Offset of measured values in physical quantity are described as follows.

2: CAL Coef
3: Decimal Point
4: Unit
5: Offset

Press the  key in the [CH Condition] setting menu or press the cursor key ( or ) to have the cursor on the [5: Offset] and then, press the  key.

CH. Offset
000 0.000
001 0.000
002 0.000

Preset contents of the measuring channel are displayed.
Input the desired Offset value with numeric keys ( to ).
Pressing the  key determines the Offset value entered in the [CH] and the cursor will move to the succeeding [CH].
Press the  key and the indication will return to the [CH Condition] setting menu.

MEMO

The setting operation of Offset can be operated as same as the CH mode setting operation by the following operation keys.

- 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 desired Offset value.

5-3-8 Setting Reference Resistance Value

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

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

Press the  key in the [CH Condition] setting menu or press the cursor key ( or ) to have 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. (If other than resistance thermometer sensor and transducer with temperature measuring function, they are indicated as “---”.)

Input resistance value with numeric keys ( to ).

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

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

NOTE

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

NOTE

The reference resistance value setting operation of unit can be operated as same as the CH mode setting operation by the following operation keys.

- 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 desired reference resistance value.

5-4 SETTING REQUIRED CONDITIONS BY TEDS INFORMATION

The UCAM-60C 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 is not available.
- Reading TEDS sensor information of external scanners is not available.
- Only TEDS sensor information of sensors connected to internal scanner can be read.

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

Dedicated Scanning Unit	Readability	Template ID	Sensor Type
USS-61B	Readable	33	Strain gage sensor
USS-62B	Readable	33	Strain gage sensor
USS-63B	Readable	33	Strain gage sensor
USS-21A/61A	Unreadable	-----	-----
USS-22A/62A	Unreadable	-----	-----
USS-23A/63A	Unreadable	-----	-----

5-4-2 TEDS Information

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

Refer the following for selecting the TEDS information.

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

Press the **2** key in the main menu or press the cursor key (**▲** or **▼**)
to have 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 for every CH whether to read the connected TEDS sensor information or not.

0: Set CH

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

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

CH	Setting
000 1	ON
1 1	ON
2 0	OFF

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

- 1: ON Read TEDS sensor information
- 0: OFF Not read TEDS sensor information

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

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

MEMO

The CH setting operation of unit can be operated as same as the CH mode setting operation by the following operation keys.

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

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”: Reflect the item
- “OFF”: Not reflect the item

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

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

CH Mode	ON
CAL Coef	ON
Decimal Point	ON
Unit	ON

5-4-2-3 Reading TEDS Information

After reading TEDS sensor information, the set CH conditions will be read as well.

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

Press the **2** key in the [TED Information] menu or press the cursor key (**^**)
or **V**) to have 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. in which TEDS information is being read is displayed.

Read TEDS Information
CH. Results
1 OK
2 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 read CH is printed out.

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

Press the **3** key in the [TED Information] menu or press the cursor key (**↑**)
or **↓**) to have 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 sensor information of the incorrectly read CH cannot be printed out.
- For details of the TEDS sensor information, refer to TEDS sensor manufacturing company.

5-4-2-5 Printing Detailed TEDS Information

TEDS sensor 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 in the [TEDS Information] menu or press the cursor key (**↑** or **↓**) to have 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 sensor information of the incorrectly read CH cannot be printed out.
- For details of the TEDS sensor information, refer to TEDS sensor manufacturing company.

6. FILE OPERATION

This Chapter describes details of saving measuring conditions and measured data in internal memory with the following extensions.

In addition, This Chapter describes details of Copying measuring conditions and measured data in USB Flash Drive.

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 real time 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 with 'csv' extension.

NOTE

- Use the USB Flash Drive that had been formatted in FAT32 format.
- Before using the USB Flash Drive, format the USB Flash Drive with your PC in FAT format.
- Note that USB Flash Drive in NTFS,exFAT,etc format will not be recognized.
- While accessing into the USB Flash Drive, the LED lights up. At this moment, do NOT extract the USB Flash Drive.
- Use our recommended USB Flash Drive.
(Recommended) Green house made USB Flash Drive
GH-UF1-XSB2G (Capacity: 2 GB)

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: USB Memory)

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
(abcdefghij)
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: USB Memory)

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].

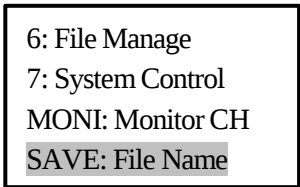
File Name
test.prm
test1.prm
test2.prm

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 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].



Input characters with numeric keys (0 to 9). Every time the cursor key (**^** or **v**) 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
v	klmnopqrst
	uvwxyz#%&-@
	~()

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

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

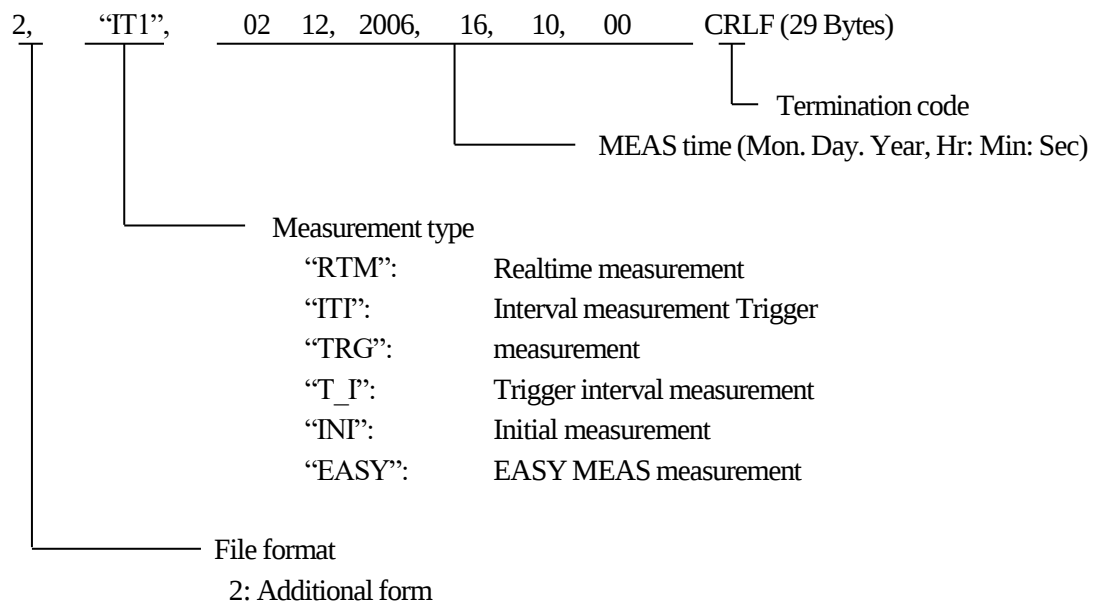
- **Additional form:** Additional form is a data file format in which data of multiple measurements are added and saved into one file (“Multiple measurement/file”).

- Inner description of the file

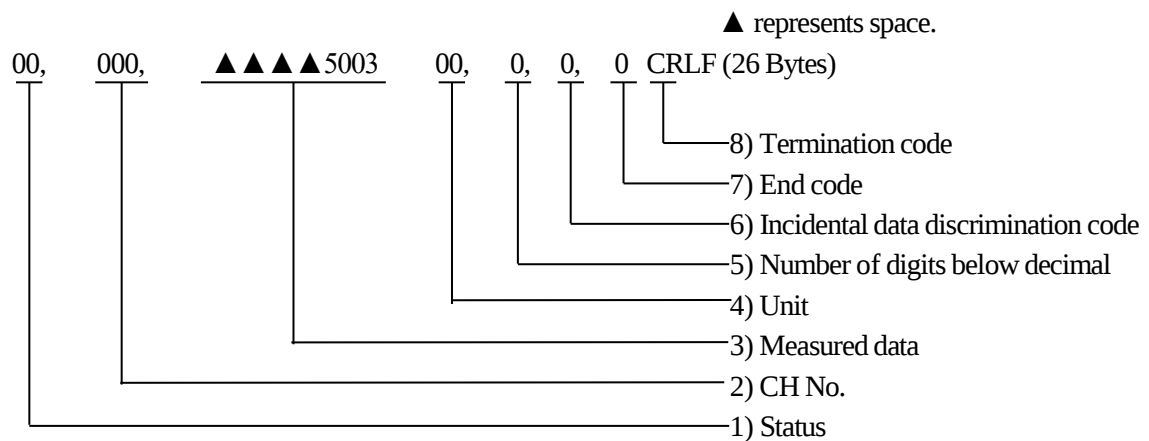
Data in the file is saved in ASCII code format as shown in the following.

2,"IT1",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-60C 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 USB Memory.
6: Change Name	Changes the file name.
7: All File Del	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: USB Memory)

Select the desired drive. Press the **[0]** key to select the USB Memory **[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.

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.

Delete File
test001.prm
test002.rtm
test003.rtm

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

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

MEMO

All data in the built-in memory can be reproduced automatically by inserting a USB memory containing the "_ucam_backup_sddata" folder.

See "12-1 Automatic Data Retrieval by Inserting a USB Memory" for details.

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
(abcdefghijklmnopqrstuvwxyz)
0123456789

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

6-3-8 All File Delete

4: Delete File
5: Copy File
6: Change Name
7: All File Del

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

All File Delete

(YES:ENTER)
(NO:ESC)

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

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.

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

(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.

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

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

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	%

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.

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
1	10	$\mu\epsilon$
2	15	$\mu\epsilon$
3	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

01/18 14:00:00	
CH. 000 Measuring	
1	15 $\mu\epsilon$
2	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. **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 **			
2018/01/18 10:00:00			
ST	CH	DATA	UNIT
00 000		1000	$\mu \epsilon$
00 001		-1000	$\mu \epsilon$



● 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-60C 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 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.

2018/01/18
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-60C.

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

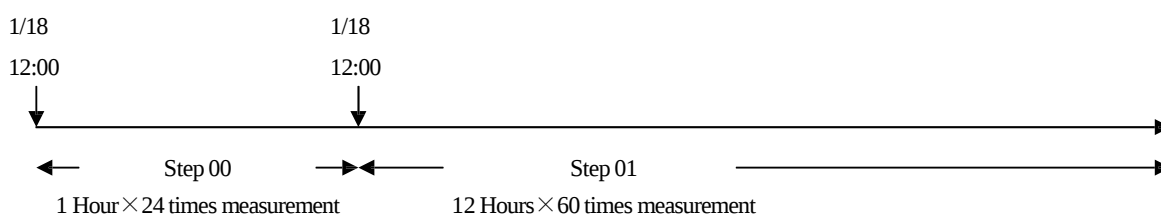
If “Step” and “Status” are set in the above manner, status of the steps are repeated until the interval measurement is stopped.

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 2018/01/18, 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

2018/01/18

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

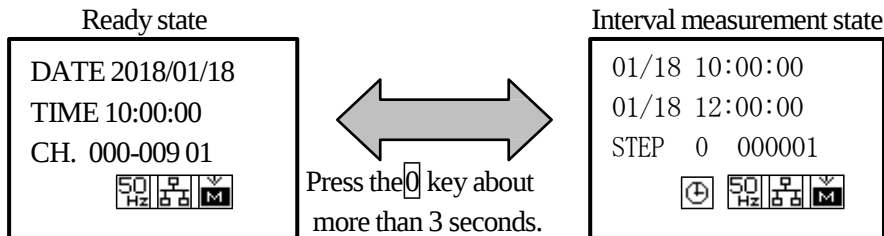
Move the cursor to the desired portion with  or  key and after correcting the contents, press the ENTER key.

(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  key for approximately more than 3 seconds in ready state to have the interval measurement state.



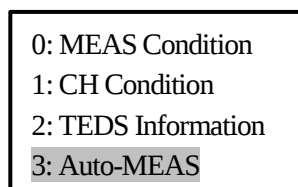
Then, the current time, start time of the next measurement, activating step No. and the measurement times, an icon  of the current interval measurement are displayed to start the interval measurement.

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

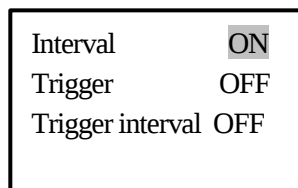
- Cancel: Press the  key for approximately more than 3 seconds when waiting for the measurement start to cancel the interval measurement state and the icon () of the current interval measurement is cancelled.

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

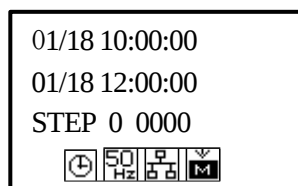
- Start



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.



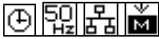
On the Auto-MEAS menu, move the cursor to the interval setting, press the cursor keys ( or ) key, select ON and then, press the **ENTER** key.



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

01/18 10:00:00
 01/18 12:00:00
 STEP 0 0000




INTERVAL MEAREMENT WINDOW

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

When the UCAM-60C 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-60C 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

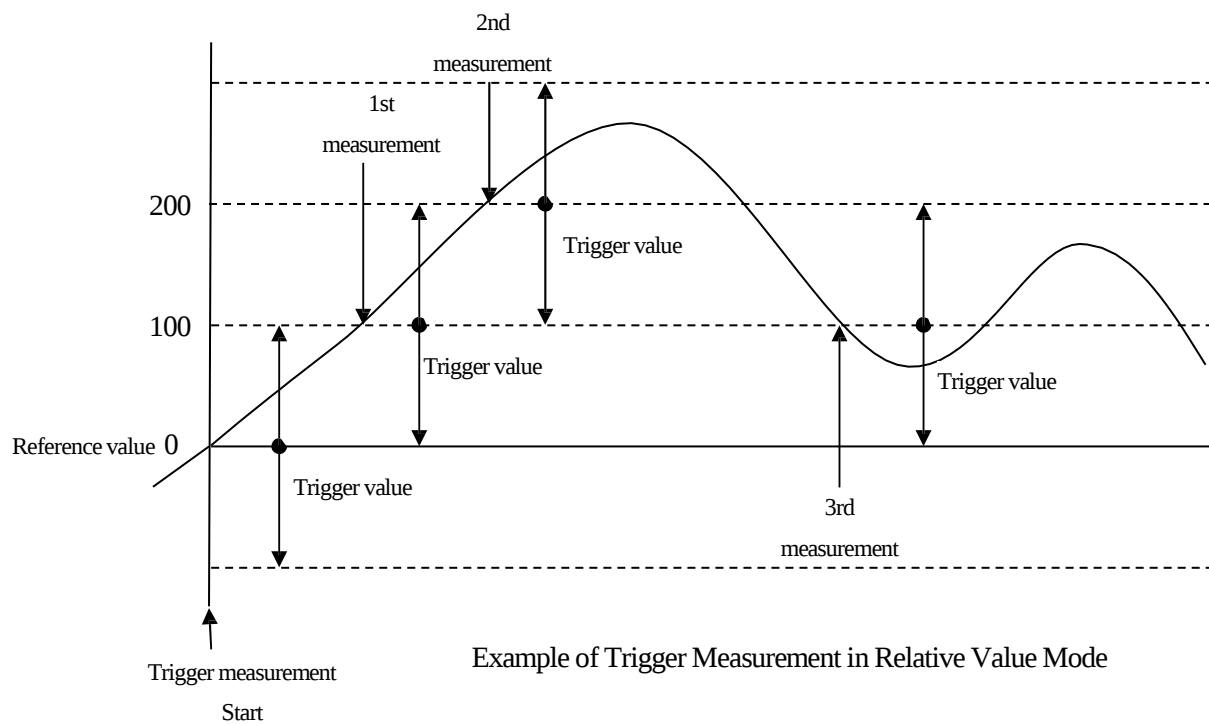
If the statuses of the steps are set as shown above, the following step loop is repeated until the trigger measurement is stopped.

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

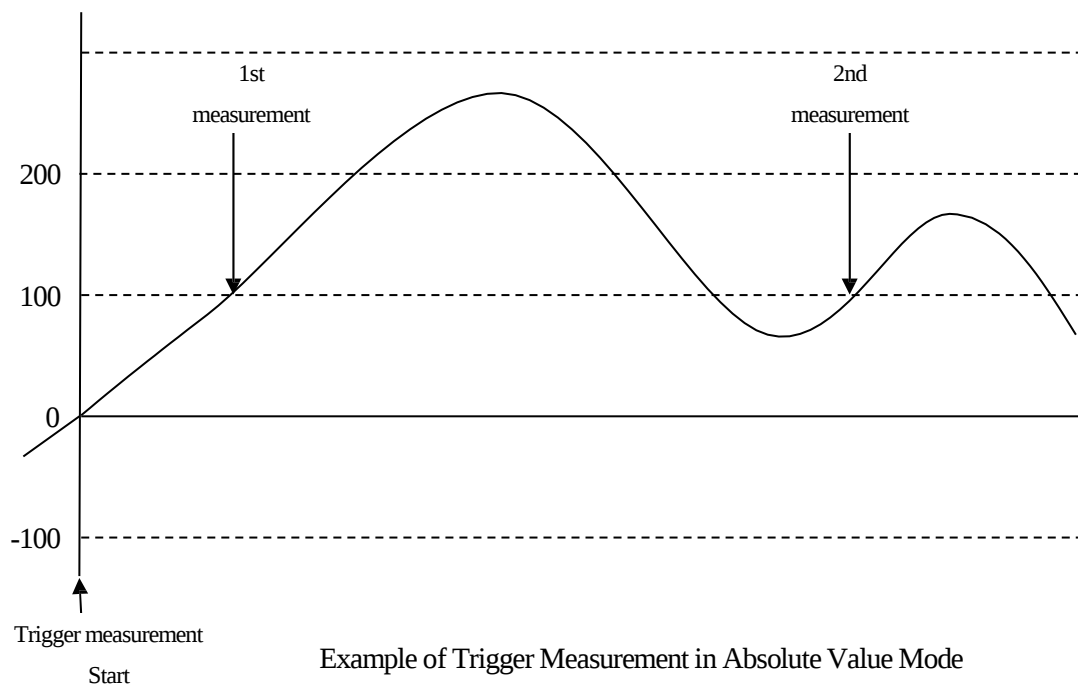
NOTE

- 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 C 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 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

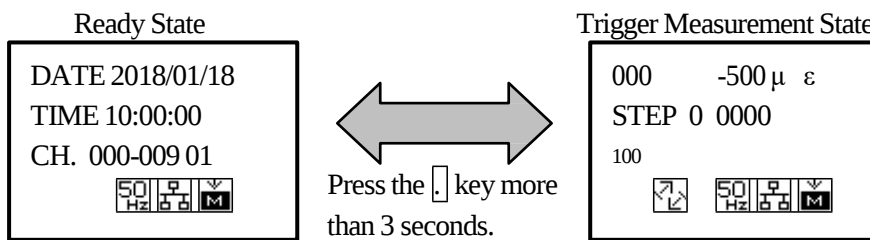
Move the cursor to the desired portion with  or  key. After correcting, press the  key.

(4) Return

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

8-2-4 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

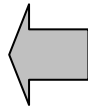
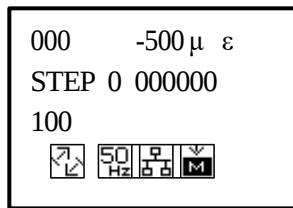
Move the cursor to the “Trigger” on the [Auto-MEAS] menu. Select “ON” with the cursor keys ( or ) and press the  key.

000 -500 μ ε
STEP 0 000000
100
   

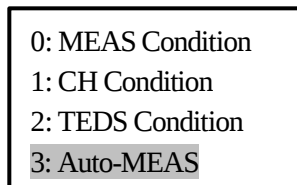
Trigger CH and the monitor data, step No., measuring times and trigger value, and an icon  of the active trigger measurement are displayed.

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

- Cancel:

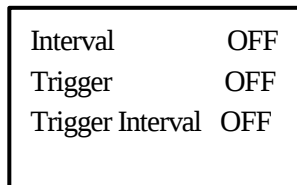


TRIGGER MEASUREMENT WINDOW



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-60C 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

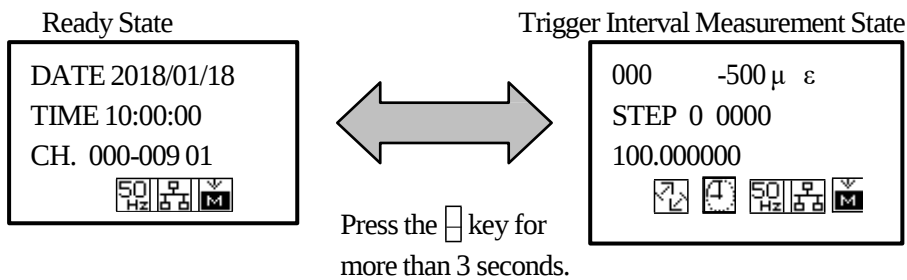
Move the cursor to the desired portion with  or  key. After correcting, press the  key.

(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

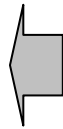
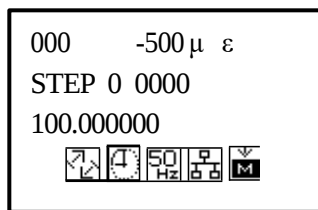
On the [Auto-MEAS] menu, move the cursor to “Trigger Interval” and select “ON” with the cursor keys ( or ) and press the  key.

000 -500 μ ε
STEP 0 0000
100.000000
    

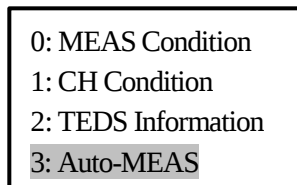
Trigger CH and the monitor data, step No., the number of measuring times, trigger value and icons ( ) of the active trigger interval measurement are displayed.

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

- Cancel:

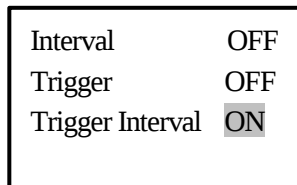


TRIGGER INTERVAL MEASUREMENT WINDOW



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-60C 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

Simply 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

(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	
	For general purpose	For civil-engineering	For general purpose	For Civil engineering
Check Function	USS-61A USS-62A USS-61B USS-62B	USS-63A USS-63B	USB-70 -10 -20	USB-70 -30
BV2V	○	○	○	○
BV5V	○	○	×	×
Input/Output Resistance	○	○	×	×
Detect Mode	○	○	×	×
Terminal Temp	○	○	○	○
Disconnection	○	○	○	○
Burnout	○	○	○	○
Insulation	○	○	○	○

*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.

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.

NOTE

Regarding the input and output resistance, the resistance value between terminal block A and C is measured as the input resistance, and that between B and D is measured as the output resistance. In the case of 1 gauge, because B to D is open, the value is 999999.

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 $^{\circ}\text{C}$
01 26.6 $^{\circ}\text{C}$

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 : **S**TART/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
1 OK
2 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 : **S**TART/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  key on the check menu or press the  key with the cursor on the [7: Insulation].

Insulation Check
Start : 
Stop : 
Return : 

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

Insulation Check
CH. DATA UNIT
1 HIGH MΩ
2 HIGH MΩ

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

Press the  key to print out the checked results.

Press the  or  key to select the CH.

Press the  to return the indication to one step previous window.

MEMO

Insulation check function is measured by applied 15V between E-B terminal.
Therefore, when use this function, Both of measurement target and UCAM must connect to earth, as shown below.

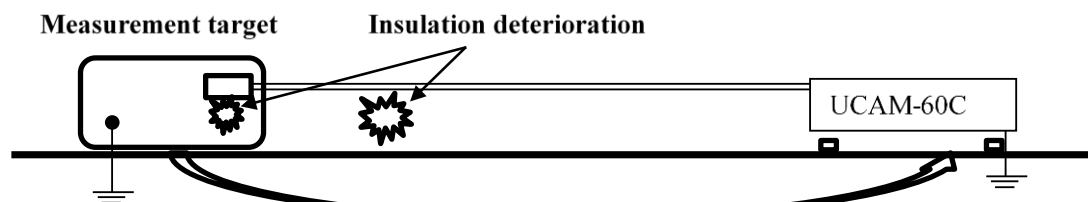
Regarding the gauge insulation resistance, use the separately provided ohmmeter (Megger)

*Incidentally, ohmmeter applies a high voltage to measurement target.

If measurement is performed while connected, high voltage is applied to the UCAM input, which can cause it to break.

Accordingly, disconnect from the UCAM terminal block before performing measurement.

For details on how to measure the accurate insulation resistance of the sensor, please contact each manufacturer



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

Even when Insulation resistance between Cable and Earth is declining, as shown above,
Displayed as "LOW" 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.

```
*****
* UCAM60C PRINTER TEST *
2018/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: RE-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

The left Ethernet setting menu appears.

(1) IP address

0: IP Address
1: Subnet Mask
2: Default Gateway

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

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

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.')

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
1	10	$\mu\epsilon$
2	15	$\mu\epsilon$
002	10.129	mV

[Title Line set to “OFF”]

1	10	$\mu\epsilon$
2	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”]

1 -2 $\mu\epsilon$
2 10 $\mu\epsilon$
3 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 REAL TIME

When measuring real time mode, set whether or not to display 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: Real time

Press the **6** key on the left [Environment] setting menu or press the **ENTER** key with the cursor on the [6: Real time]

Real time
Not-display
(1: indicate)
(0: Not-display)

Press the **0** key to indicate “indicate” and **1** key to indicate “Not-display”.

The **ENTER** key to determine the selected item and the indication returns to the [Enviroment] setting menu.

11-8 SETTING MAINTENANCE

- Setting Maintenance Function is a maintenance function.

NOTE

- Basically, it is used in “Maintenance 1.”

MEMO

Maintenance setting 1 and maintenance setting 2 differ in the following ways.

Maintenance setting 1: ACOM (analog common) and GND are shared inside the main body

Maintenance setting 2: ACOM and GND are not shared inside the main body

Default setting when shipped from the factory is maintenance setting 1.

This is basically used in maintenance setting 1 but if it is subjected to noise and other effects due to the measurement site environment, the phenomenon may be improved by setting it to maintenance setting 2.

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) **

2017/07/07 10:00:00

ST CH DATA UNIT

00 000 -5146 μE

00 001 -5016 μE

** REALTIME (ORIG) **

2017/07/07 10:00:00

ST CH DATA UNIT

00 000 -5147 μE

00 001 -5017 μE

[Printing with Feed Line “Used”]

** REALTIME (ORIG) **

2017/07/07 10:00:00

ST CH DATA UNIT

00 000 -5145 μE

00 001 -5015 μE

** REALTIME (ORIG) **

2017/07/07 10:00:00

ST CH DATA UNIT

00 000 -5146 μE

00 001 -5016 μE

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”]

2017/07/07 10:00:00
 ST CH DATA UNIT
 00 000 1000 $\mu\epsilon$
 00 001 -1000 $\mu\epsilon$

[Printing with Header set to “Print”]

**** REALTIME (ORIG) ****
 2017/07/07 10:00:00
 ST CH DATA UNIT
 00 000 1000 $\mu\epsilon$
 00 001 -1000 $\mu\epsilon$

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 **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) ****
 2017/07/07 10:00:00
 00 000 1000 $\mu\epsilon$
 00 001 -1000 $\mu\epsilon$

[Printing with Title set to “Print”]

**** REALTIME (ORIG) ****
 2017/07/07 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 **[7]** key on the [CH Condition] setting menu or press the **[ENTER]** 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 **ENTER** key to determine the entered initial 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

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 **ENTER** key while pressing the **SHIFT** 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 01234567890

(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.

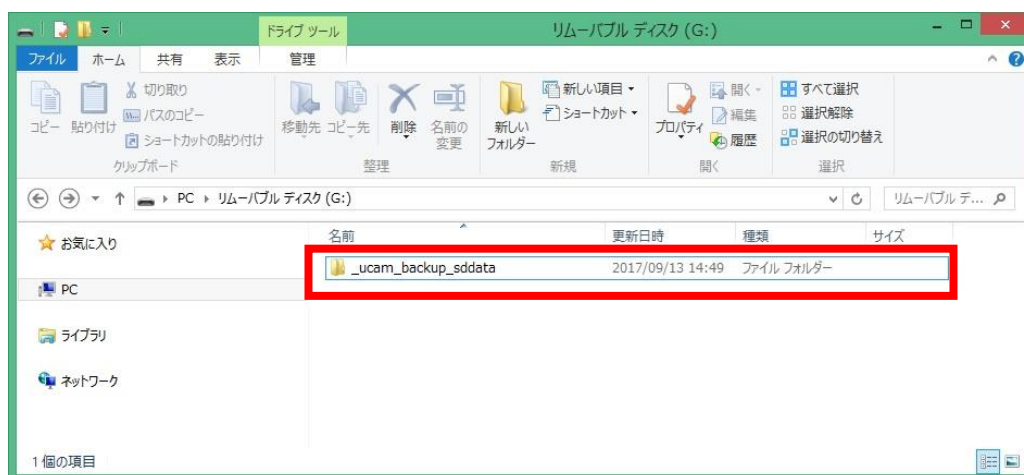
12. OTHER FUNCTIONS

12-1 AUTOMATIC COLLECTION OF MEASUREMENT DATA WHEN USB MEMORY IS INSERTED

In the UCAM-60C, it is possible to collect the data in the built-in memory automatically by inserting a USB memory containing the specified folder.

(1) Preparations in a Windows PC

Create the folder “_ucam_backup_sddata” in the USB memory.



(2) Insert the USB memory into UCAM-60C

Insert the USB memory prepared earlier into the USB port of the UCAM-60C.

Press the ENTER key when a short beep sounds 4 times.

When a long beep sounds, copying will start.

The LED on the left of the USB port is lit when copying. Do not pull out USB memory when the LED is lit.

At the end of the copying, another long beep sounds and the LED goes off.

Caution

- Use a USB memory with a capacity of 32GB or less.
- Use a USB memory formatted in the FAT32 format.
- Recommended USB memory
(Recommended products)
GH-UFI-XSB2G (capacity 2GB) made by Green house

In addition, a free space of 2GB or more is required to properly collect all the data.

Caution

- During data collection, measurement data will be lost if the time to measure the interval and trigger interval is up.

To avoid missing data, either collect the data so that the measurement timings do not overlap or collect the data via a network.

*The time taken to transfer data to a USB memory is about 3 min for a 1GB file.

*See the instruction manual for details on how to collect data via a network.

12-2 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.

12-3 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.

12-4 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.”

12-5 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.”

12-6 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

12-7 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.

12-8 UPDATE

"Main CPU", "Sub CPU" and "FPGA" exist as update targets in UCAM-60C.

An explanation for the update of each target is given here.

MEMO

Never turn the UCAM-60C off until the update is completed.

If the power is turned off, a off-side repair is needed.

Things to prepare : USB memory(capacity:32GB or less, file format:FAT32), PC,
update file (Download the latest version of the file from our company's website.)

12-8-1 Updating the main CPU

(1) Create a folder named "_ucam60c_update" in the USB memory.

(2) Save the 2 files below in the "_ucam60c_update" folder of the USB memory.

- FIRMWARE update file (kernel) : linux60Cv****.bin.gz
- FIRMWARE update file (user land) : romfs60Cv****.img.gz

[**** contains the version.]

(3) When UCAM - 60C is started up, when ready state is displayed, insert the prepared USB memory.

(4) The buzzer sounds and the **MEAS** LED blinks for about 4 seconds, so press the **7** key at that time.

(5) The update will be executed.

- • • The update time is about 3 minutes.

Please never turn off the power during this time.

(6) When the update is completed, the buzzer sounds again and the following screen is displayed.

...success

Please unplug
the USBmemory

(7) When unplugging the USB memory, UCAM - 60C will restart automatically.

If the buzzer sounds off during the operation in (4), unplug the USB memory, insert the USB memory again and operate from (4).

12-8-2 Update of FPGA

- (1) Unzip update file "_ucam_fpga_update" to the USB memory root.
- (2) check the file below in the "_ucam_fpga_update" folder of the USB memory.

- FIRMWARE update file (kernel) : UMBF60Cv****.rpd
[**** contains the version.]

The update file of FPGA is common to UCAM - 60C and UCAM - 65C.

- (3) When UCAM - 60C is started up, when ready state is displayed, insert the prepared USB memory.
- (4) The buzzer sounds and the **MEAS** LED blinks for about 4 seconds, so press the **8** key at that time.
- (5) The update will be executed.
 - • • The update time is about 2 minutes.

Please never turn off the power during this time.

- (6) When the update is completed, the buzzer sounds again and the following screen is displayed.

update success.
remove USBmemory
power off -> on
UCAM-60C

- (7) Please unplug the USB memory and turn the power off and then on again.

If the buzzer sounds off during the operation in (4), unplug the USB memory, insert the USB memory again and operate from (4).

12-8-3 Updating the Sub CPU

- (1) Create a folder named "_ucam_subcpu_update" in the USB memory.
- (2) Save the 2 files below in the "_ucam_subcpu_update" folder of the USB memory.

- FIRMWARE update file : Sh7044fw.bin , u60_sub.bin

The update file of FPGA is common to UCAM - 60C and UCAM - 65C.

- (3) When UCAM - 60C is started up, when ready state is displayed, insert the prepared USB memory.
- (4) The buzzer sounds and the **MEAS** LED blinks for about 4 seconds, so press the **9** key at that time.
- (5) The update will be executed.
 - • • The update time is about 2 minutes 30 seconds..

Please never turn off the power during this time.

- (6) When the update is completed, the buzzer sounds again and the following screen is displayed.

update success.
remove USBmemory
power off -> on
UCAM-60C

- (7) Please unplug the USB memory and turn the power off and then on again.

If the buzzer sounds off during the operation in (4), unplug the USB memory, insert the USB memory again and operate from (4).

13. TROUBLE SHOOTING

In the event that the product does not operate as expected or in a stable manner, you should trace the factor(s) that may be causing such a condition before concluding that the system has failed. Items to be checked and countermeasure against various phenomena are described in the following table. If troubles are not solved despite countermeasures, contact Kyowa or our representatives.

Repairs may be rejected if the product is damaged as a result of not following the instructions given in this instruction manual, or if the product is disassembled or modified by the customer.

Phenomenon	Checked Items and Countermeasures
Power to the main body does not turn on when using AC power. POWER LED does not light up.	• Make sure the AC power outlet has the specified voltage. ⇒Confirm with a tester etc. • Make sure the power cable is connected correctly. • Make sure the fuse blows out. A spare fuse is enclosed as an accessory. If the fuse blows out, replace it after eliminating the cause.
Power to the main body does not turn on when using DC power. POWER LED does not light up.	• Make sure the DC power supply has the specified voltage. Confirm with a tester etc. • Make sure the power cable is connected correctly. • Make sure the fuse blows out. A spare fuse is enclosed as an accessory. If the fuse blows out, replace it after eliminating the cause.
Operation stops and accepts no instruction at all.	• Make sure the operation failed due to noise. ⇒Turn off the power and turn on again. Take appropriate countermeasures for removing the noise from the environment, power source, etc. if the phenomenon caused by the noise recur.
The measured value varies.	• Make sure the measuring target (Specimen) and "GND" terminal of the product are grounded correctly. ⇒Ground them correctly. • Make sure the noise resulted in abnormalities in the operation of the product. ⇒Take appropriate countermeasures for removing the noise from the environment, power source, etc. • Make sure the input lead wire and cable are connected correctly to the input terminal. ⇒When the connections to the input terminal (soldering or screw stop) are unstable, the measured value fluctuates. Check the connection and securely connect it.

Strain measurement value is incorrect.	• See "9-1 BV2V" and "9-2 BV5V" to conduct the same bridge excitation voltage check as the measurement mode to see whether the prescribed bridge excitation voltage is being output. ⇒If the bridge excitation voltage is incorrect, it means that the bridge excitation circuit is faulty. Contact Kyowa or our representatives. • See "9-3 Input & Output Resistances" to conduct an input & output resistance check to see if it is equal to the resistance of the connected sensor and gauge. ⇒If the input & output resistance differs from the resistance of the connected sensor and gauge, the sensor and gauge may be faulty. Contact Kyowa or our representatives. • The measured value is 999999 and the LED of the scanning unit does not light up. ⇒Has the measuring CH been set wrongly? Has the dedicated scanning unit been set to "Do not use"? If the LED of the scanning unit does not light up, it means that measurement has not been carried out for the channel of the unit. If the dedicated scanning unit has been set to "Do not use", channel 0 will be assigned to the external scanner. • Do the settings of the measurement function conform to the measurement purpose? ○Original measurement: Sets whether to perform the coefficient calculation (calibration coefficient calculation) or not. The original value of the sum of the initial value of the sensor (initial value unbalance) and the sensor load is measured. The data may also be known as "raw data". ○MEAS value measurement: Sets whether to perform the coefficient calculation (calibration coefficient calculation) or not. During coefficient calculation, the COEF LED is lit up. By measuring the initial value before loading the sensor, the initial value is deducted. Only the sensor load can be measured. The initial value is saved in a file when the SAVE LED is lit up. ○EASY MEAS measurement: Sets whether to perform the coefficient calculation (calibration coefficient calculation) or not. During coefficient calculation, the COEF LED is lit up. This function is useful when measuring the sensor load → zero value in succession. However, the initial value will not be saved. • Is a sensor which supports remote sensing used? ⇒The sensor input terminals F and G are for TEDS use. When the F and G lines for remote sensing are connected to this, the measured value becomes abnormal. Measurements can be taken normally by cutting lines F and G.
---	--

Voltage measurement value is incorrect.	• Is the Delta V function enabled and the initial value is an abnormal value? ⇒Voltage and temperature are basically original values (raw data) that do not calculate the calibration coefficient or subtract the initial value. However, by enabling the deltaV or deltaT function, it becomes possible to measure with the measure value where coefficient calculation was performed. • Is a FV-1A and FV-2A sold by KYOWA used? Can not use the FV-1A and FV-2A to the UCAM-60.
The measured value of thermocouple is incorrect.	• See "9-5 Terminal Temperature" to conduct a terminal temperature check to see whether the result is almost the same as the surrounding temperature. (Since the UCAM main body generates heat by itself, the temperature displayed is higher than the ambient temperature by several °C.) ⇒If the result is incorrect, it means that the terminal temperature measurement element is faulty. Contact Kyowa or our representatives. • See INSTRUCTION MANUAL's "9-7 Burnout" to conduct a burnout check. ⇒If the result is NG, it means that the thermocouple is disconnected.
The measured value of a sensor used for a long time in the field is unstable e.g. strain gauge civil engineering transducer, etc.	• See "9-8 Insulation" to conduct an insulation check. ⇒If the result is NG, or if the measured insulation resistance is lower than the value prescribed for the sensor, it means that the insulation of the sensor has dropped and the measured value has become unstable due to the penetration of moisture. Replacement of the sensor is recommended but if it cannot be helped, the measured value may appear to stabilize by slowing the scanning speed.

14. TECHNICAL INFORMATION REQUIRED FOR MEASMENT

14-1 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 Bridge
 E : 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-60C 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-60C, 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-60C.
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-60C.

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

14-2 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.

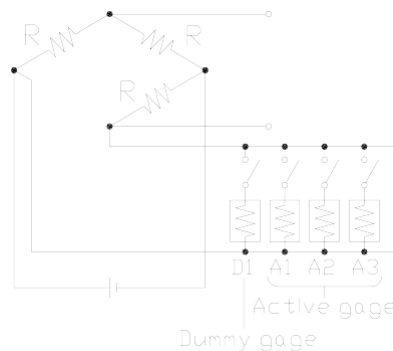
When compensating temperature of multiple active gages with one dummy gage, if temperature between both gages are identical, correct temperature compensation is available. Therefore, if the dummy gage is used for strain measurement of materials with poor thermal conductivity such as plastic, composite 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.

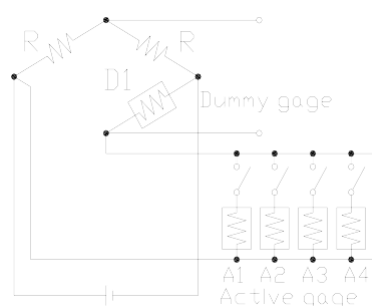
Thus the temperature compensation of multiple active gages is available without affected by self-heating and all the more capable of correctly measuring strain with one dummy gage.



(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.



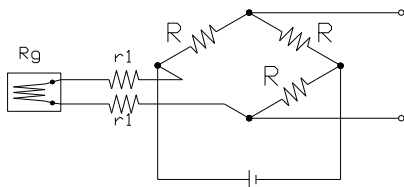
14-3 HOW TO COMPENSATE TEMPERATURE INFLUENCE ON LEAD WIRE

(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 ($1/^\circ\text{C}$)

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.

$$\varepsilon = \frac{0.062 \times 2 \times 10 \times 3.93 \times 10^{-3} \times 1}{120 \times 0.062 \times 2 \times 10} \times \frac{1}{2} \cong 20 \mu\text{m}/\text{m}/^\circ\text{C}$$

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: $40 \mu\text{m}/\text{m}/^\circ\text{C}$

50 m: $100 \mu\text{m}/\text{m}/^\circ\text{C}$

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: $145 \mu\text{m}/\text{m}/^\circ\text{C}$

20 m: $290 \mu\text{m}/\text{m}/^\circ\text{C}$

50 m: $725 \mu\text{m}/\text{m}/^\circ\text{C}$

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.

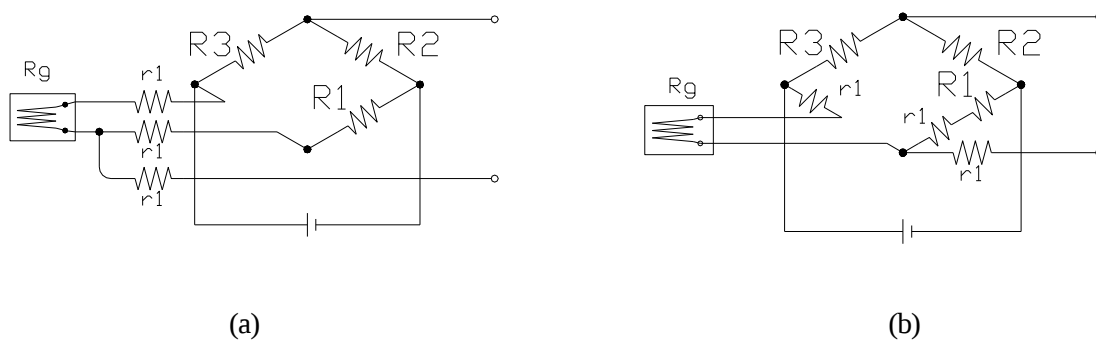
In the following figures, R_g represents a strain gage, R_1 , R_2 , and R_3 represent internal fixed resistance, and r_l represents lead wire resistance. Figure (b) is a simplified figure of a basic circuit of figure (a).

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.



14-4 COMPENSATING GAGE FACTOR

The UCAM-60C 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.

14-5 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

15. APPENDIX

15-1 SETTING SCANNER

15-1-1 When Internal Scanner is set to “Use”

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	

15-1-2 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]

- 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)

15-2 AMOUNT OF DATA IN INTERNAL MEMORY

Amount of data of 1 measurement can be obtained by the following simplified format.

(Simplified format)

$$\text{One measurement (Byte)/[CHs]} = \text{29 (Byte)} + \text{[CHs]} + \text{26 (Byte)}$$

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

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.

15-3 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-60C. 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-60C 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-60C becomes in not measuring state.

Turn OFF and turn ON the power switch. Then, the UCAM-60C starts up as usual.

- (2) To normally return from not measuring state, turn OFF and ON the power switch. Then, the UCAM-60C starts up as usual.

When the interval measurement is left ON as it is, after finishing the next interval measurement, the UCAM-60C 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)

$$1.7 \text{ (A)} \times 24 \text{ (Hour)} \times 31 \text{ (Day)} \times 15 \text{ (Minute)} / 60 \text{ (Minute)} = 316 \text{ (Ah)}$$

* Power ON

$$0.01 \text{ (A)} \times 24 \text{ (Hour)} \times 31 \text{ (Day)} \times 45 \text{ (Minute)} / 60 \text{ (Minute)} = 5.6 \text{ (Ah)}$$

* 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.

15-4 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-60C.

(2) With the **MEAS** LED lighted up, continuously press the **DEL** key.

(3) The left window appears.

LOAD SETUP
FACTORYDEFAULT
[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-60C activates with the factory default setting.

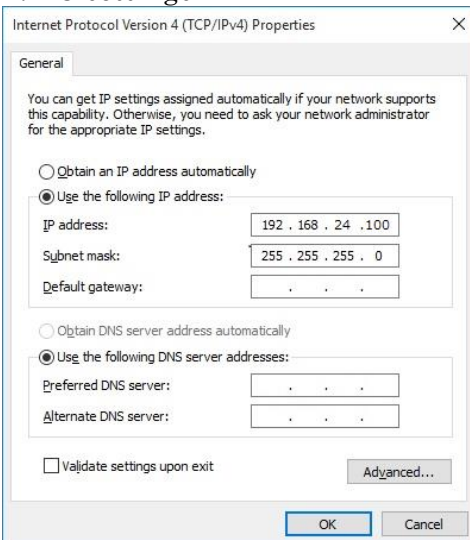
15-5 HOW TO VIEW THE CONTENTS IN THE BUILT-IN MEMORY FROM YOUR PC

- The built-in memory of the UCAM-60C can be accessed by using PC connected to the Ethernet.
- This section describes how to access with the IP address.
- The network conditions of the UCAM-60C and PC shall be configured as shown below.

Network conditions of the UCAM-60C		Network conditions of the PC	
IP address	192.168.24.60	IP address	192.168.24.100
Subnet mask	255.255.255.0	Subnet mask	255.255.255.0
Default gateway	0.0.0.0	Default gateway	Not set (remains blank)

- The description is given with a Windows 10 my computer.

1. PC settings



2. Confirm the hardware connections

(confirm that the LED of the product and Ethernet connector is lit)

There are 2 LEDs in the Ethernet connector of the product to indicate whether the hardware connection is normal.

Connect the LAN cable to the Ethernet connector of the product and turn on the power supply.

If the connection is correct, one of the LEDs will light up while the other LED will flash (irregular).

If the lighting up is incorrect, confirm the LAN cable, hub, etc.

3. Confirm the software connections

How to confirm using a Ping command

Send a ping command to the connected equipment using the PC command prompt, and confirm the connection to see whether a response is returned or not.

3-1. Start the command prompt

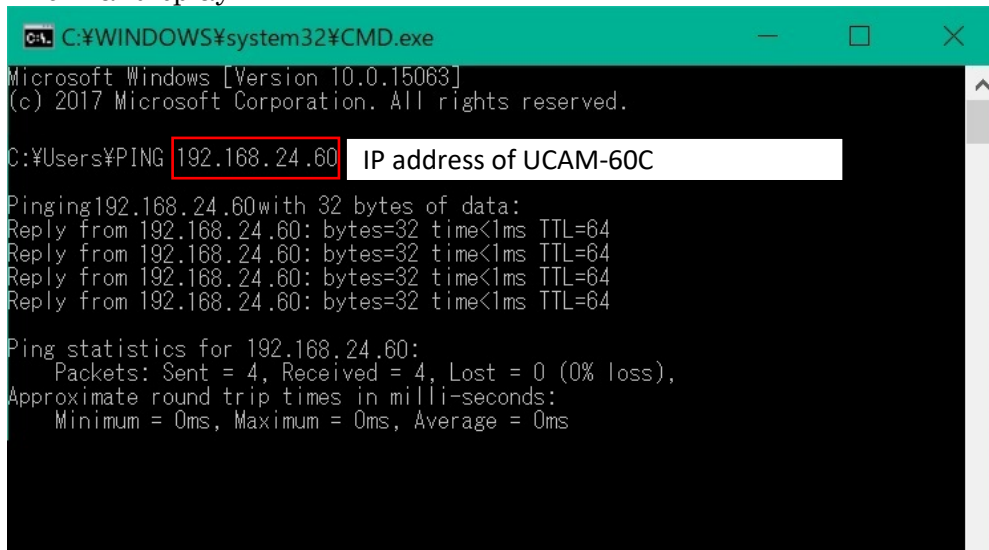
Enter "cmd" in "Search Web and Windows" at the bottom left of the desktop to execute the displayed "command prompt".

3-2. Enter a Ping command

Enter the IP address of the Ping connected equipment and press the ENTER key.

Communication will be carried out 4 times before the results are displayed.

*Normal display



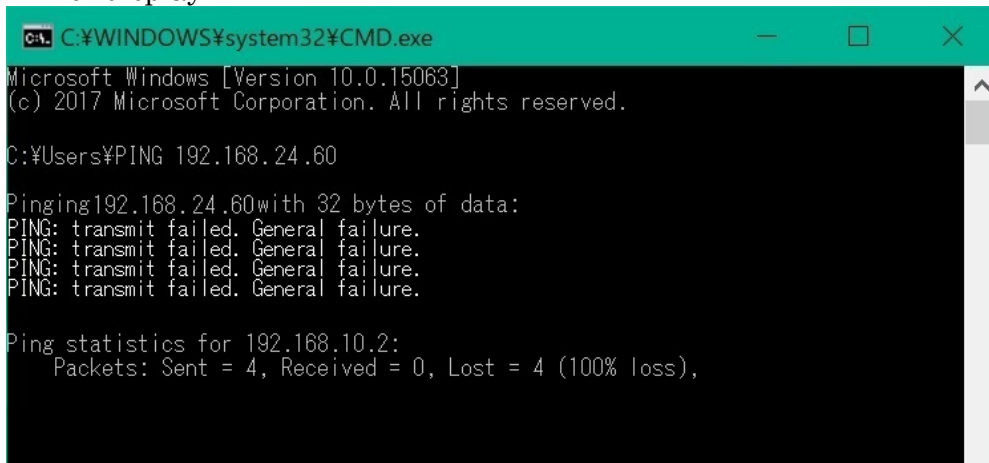
```
C:\WINDOWS\system32\CMD.exe
Microsoft Windows [Version 10.0.15063]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\PING 192.168.24.60 IP address of UCAM-60C

Pinging 192.168.24.60 with 32 bytes of data:
Reply from 192.168.24.60: bytes=32 time<1ms TTL=64
Reply from 192.168.24.60: bytes=32 time<1ms TTL=64
Reply from 192.168.24.60: bytes=32 time<1ms TTL=64
Reply from 192.168.24.60: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.24.60:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

*Error display



```
C:\WINDOWS\system32\CMD.exe
Microsoft Windows [Version 10.0.15063]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\PING 192.168.24.60

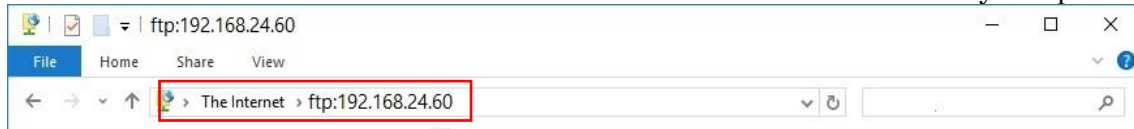
Pinging 192.168.24.60 with 32 bytes of data:
PING: transmit failed. General failure.
PING: transmit failed. General failure.
PING: transmit failed. General failure.
PING: transmit failed. General failure.

Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

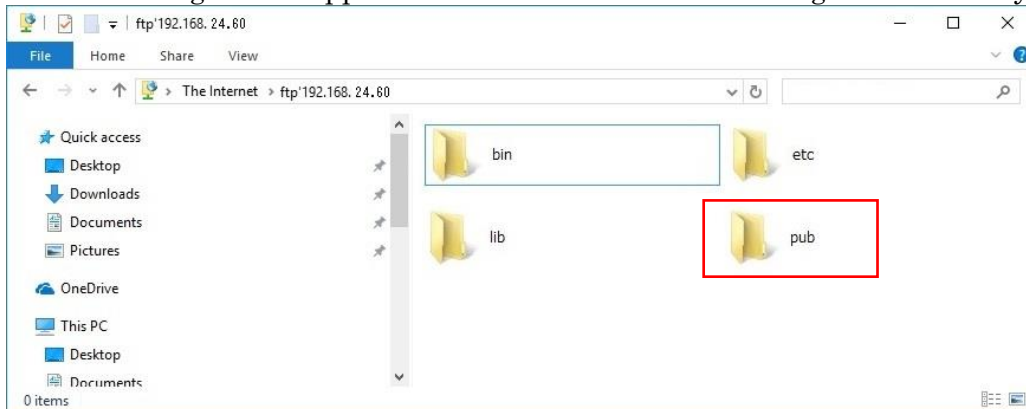
4. Start my computer

Press the "windows" key and "E" key at the same time to start up Explorer.

Enter the IP address of the UCAM-60C in the address field of my computer.



*The following screen appears when the UCAM-60C is recognized normally.

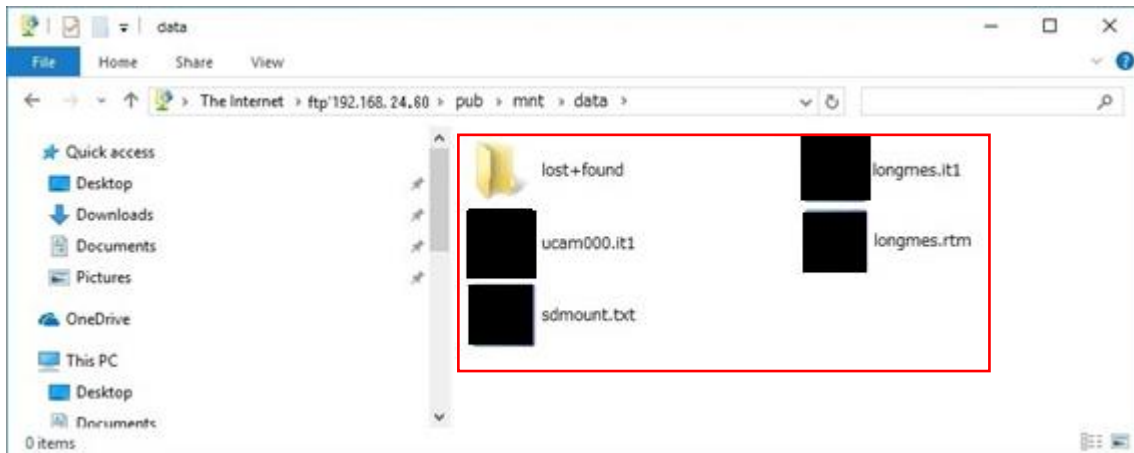


Data of the built-in memory of the UCAM-60C exists in the "pub" folder.

NOTE

Do not operate any folders other than the "pub" folder.
Otherwise, it may cause malfunction.

Move "pub" folder⇒"mnt" folder⇒"data" folder to display the MEMORY contents of the UCAM-60C.



Note

- 1) Even when the separately sold "UCS-60B" is in use, you can access the built-in memory if you specify the above-mentioned folder.
- 2) Files can be copied to the PC from the built-in memory and so on. Files can also be deleted or moved in the built-in memory. In addition, files cannot be copied or moved to the built-in memory from your PC.
- 3) The description above is for Windows 10. Operations may differ depending on the environmental settings and OS.

16. SPECIFICATIONS

- (1) Model UCAM-60C
- (2) Type Data Logger
- (3) Description Static Strain measuring Instrument

Type	Power supply	Control software UCS-60B	Features
UCAM-60C-AC	AC	Optional	Operate key,display,printer
UCAM-60C-DC	DC	Optional	
UCAM-65C-AC	AC	Standard	Fully controlled from the pc Operate key,display,printer none
UCAM-65C-AC-0	AC	Optional	
UCAM-65C-DC	DC	standard	
UCAM-65C-DC-0	DC	Optional	

(4) Measuring Targets and Connectable Scanners

- Measuring Targets Strain gages, strain gage transducers, civil engineering transducers with a thermal sensor, DC voltage-output or DC current-output instruments, potentiometer sensors, thermal sensors(Thermocouples and platinum resistance thermometer bulbs)
- Connectable Scanners USS-61B,62B,63B(Dedicated Scanners,mounted on top of the UCAM-60C)
The main unit can connect to the following scanners via the optional scanner interface
USB-70B series (via USI-67A)

• Measuring Targets and Connectable Scanners

Scanners			Dedicated Scanners	External Scanners	
				General purpose	Civil engineering
Measuring Targets				USB-70B-10/20	USB-70B-30
Strain gages and Strain-gage transducers *3	Quarter bridge system	120 Ω	●	●	●
		240 Ω	●	●	●
		350 Ω	●	●	●
	Quarter bridge (true-dummy system)	120 Ω	●	●	●
		350 Ω	●	●	●
	Half bridge 60 to 1000 Ω	Active dummy system	●	●	●
		Active Active system	●	●	●
		Common Dummy system		●	●
	Full bridge 60 to 1000 Ω (*2)	Opposite-leg active system	●	●	●
		Full bridge system	●	●	●

Measuring Targets			Scanners	Dedicated Scanners	External Scanners	
					General purpose	Civil engineering
					USB-70B-10/20	USB-70B-30
Civil engineering transducers	Full bridge 120 Ω	Constant-current excitation	●			
	Full bridge 350 Ω	Constant-current excitation	●	●	●	
		Transducers with a thermal sensor	●		●	
Voltage	DC voltage-output instruments		●	●	●	
Current	DC current-output instruments		●	●	●	
temperature	thermocouples	K(CA)	●	●	●	
		T(CC)	●	●	●	
		E(CRC)	●	●	●	
		J(IC)	●	●	●	
		R	●	●	●	
	Platinum Resistance Thermometer bulbs	Pt100(new JIS)	●		●	
		JPt100(old JIS)	●		●	
Potentiometer sensors			●	●	●	
Built-in lighting arresters			●(*1)		●	

*1. With USS-63B mounted.

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

*3. Can not use remote sensing sensor directly.

- (5) Channels Max 30 with dedicated scanners
 Max 1000 with external scanners connected
 Max 1000 with dedicated scanners and external scanners connected
- (6) Input Terminals Can connect to lead wires through either soldering or screwing.
 (screw:M3 with metal plate)
 NDIS connectors(USS-62B)
- (7) Switching Terminal Semiconductor relays

(8) Scanning speed

50 ms/channel(Standard mode)

0.28 s/channel(High-resolution mode)

Note: individually switchable for desired channels.

20 ms/channel(High-speed mode)

Note: Only collective switching for all channels of dedicated scanners.

Scanners \ Line Frequencies	50 Hz Zone	60 Hz Zone
Dedicated scanner(standard mode)	50 ms/channel	
Dedicated scanner(High-resolution mode)	0.28 s/channel	
Dedicated scanner(High-speed mode)	20 ms/channel	
USB-70 series(standard mode only)	60 ms/channel	58.4 ms/channel

Note1: Scanning speeds stated above are standard maximum speeds in respective modes. Besides these, the following speeds are set for each individual channel:0.28 s, 0.5 s, 1s, 2 s, 5 s, and 10 s

Note2: Repeat measurement interval time = (Number of Measuring channels * scanning speed)
+ data processing time (2~20s)
data processing time is indeterminate,changed by
measurement setting and environment.

Scanning speed \ Measuring Targets	Standard Mode (50 ms/CH)	High-resolution Mode (0.28 s/CH)	High-speed Mode (20 ms/CH)
Strain(Gage & transducer)	●	●	●
Voltage/current-output sensor	●	×	●
Civil engineering transducer	●	×	×
Temperature sensor (TC, Pt)	●	×	×
Potentiometer sensor	●	×	●

Notes: 1.High-resolution mode and high-speed mode are selectable for dedicated scanners only.
2.High-resolution mode is available only with Full bridge system.
3.High-speed mode is available Full bridge system, Voltage, Current, and Potentiometer sensor.

(9) Operating Modes	Real-time, monitor, and automatic
(10) Measurement Functions	• Initial Initial values are measured and stored in internal memory. • Original Raw values are measured without subtraction of initial values. • Measure Initial values are subtracted from original values. • Easy Measure Auto zero balancing function is activated. Note: The selected function is applied to all channels.
(11) Coefficient Calculation Function	Multiplication by calibration coefficient, calibration by TEDS, conversion of measured values to physical quantities, scaling and correction.
(12) Unit	59 units
(13) Automatic Measurement Function	• Trigger Measurement A relative value (certain changing quantity) or an absolute value triggers measurement. • Interval Measurement Measurement is automatically performed at preset time intervals. • Trigger Interval Measurement Combination of trigger measurement and interval measurement.
(14) Storage	Internal memory, approx. 1.8 GB

(15) Strain Measurement(Standard Mode)

- constant voltage excitation Approx. 2 or 5 VDC
- constant current excitation Approx. 5.7 mA(Bridge resistance 350 Ω)
Approx. 16.7 mA(Bridge resistance 120 Ω)
- Scanning speed 50 ms/channel
- gage factor 2.00 fixed
(Coefficient calculation function enables correction with 2.00/Ks)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 50k \mu\text{m/m}$	1 $\mu\text{m/m}$	$\pm(0.05\% \text{ of reading} + 1) \mu\text{m/m}$
$\pm 50k$ to $\pm 500k \mu\text{m/m}$	10 $\mu\text{m/m}$	$\pm(0.05\% \text{ of reading} + 10) \mu\text{m/m}$

Note: Resolution and accuracy be automatically change by Autorange function

(16) Strain Measurement(High-Resolution Mode)

- constant voltage excitation Approx. 5 VDC
- constant current excitation Approx. 16.7 mA(Bridge resistance 350 Ω)
- Scanning speed 280 ms/channel
- gage factor 2.00 fixed
(Coefficient calculation function enables correction with 2.00/Ks)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 20k \mu\text{m/m}$	0.1 $\mu\text{m/m}$	$\pm(0.05\% \text{ of reading} + 0.3) \mu\text{m/m}$
$\pm 20k$ to $\pm 200k \mu\text{m/m}$	1 $\mu\text{m/m}$	$\pm(0.05\% \text{ of reading} + 3) \mu\text{m/m}$

- Notes: 1.Available only with full bridges system
2.Bridge resistance should be 120 to 1000 Ω for bridge excitation with constant voltage.
3.Bridge resistance should be 350 Ω for bridge excitation with constant current.
Measuring range 0 to 15k $\mu\text{m/m}$
 0 to 150k $\mu\text{m/m}$
4.Available only with dedicated scanners.
5.Resolution and accuracy be automatically change by Autorange function

(17) Strain Measurement(High-speed Mode)

- constant voltage excitation Approx. 2 VDC
- constant current excitation Approx. 5.7mA(Bridge resistance 350 Ω)
Approx. 16.7mA(Bridge resistance 120 Ω)
- Scanning speed 20 ms/channel
- gage factor 2.00 fixed
(Coefficient calculation function enables correction with 2.00/Ks)
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Measuring Range	Resolution	Accuracy
0 to $\pm 50k \mu\text{m/m}$	1 $\mu\text{m/m}$	$\pm(0.08\% \text{ of reading} + 1) \mu\text{m/m}$
$\pm 50k$ to $\pm 500k \mu\text{m/m}$	10 $\mu\text{m/m}$	$\pm(0.08\% \text{ of reading} + 10) \mu\text{m/m}$

Notes: 1.Available only with full bridges system(120 to 1000 Ω)
2.Available only with dedicated scanners.
3.Resolution and accuracy be automatically change by Autorange function

(18) Voltage Measurement(Standard Mode)

- Scanning speed 50 ms/channel
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Range Mode	Measuring Range	Resolution	Accuracy	Input Resistance
V/500mV	0 to $\pm 50.000 \text{ mV}$	1 μV	$\pm(0.05\% \text{ of reading} + 0.003) \text{ mV}$	10 $\text{M}\Omega$ or more
	± 50.00 to $\pm 500.00 \text{ mV}$	10 μV	$\pm(0.05\% \text{ of reading} + 0.03) \text{ mV}$	
V/50V	0 to $\pm 5.0000 \text{ V}$	100 μV	$\pm(0.05\% \text{ of reading} + 0.0002) \text{ V}$	1 $\text{M}\Omega$ or more
	± 5.000 to $\pm 50.000 \text{ V}$	1 mV	$\pm(0.05\% \text{ of reading} + 0.002) \text{ V}$	

Note: Resolution and accuracy be automatically change by Autorange function

(19) Voltage Measurement(High-speed Mode)

- Scanning speed 20 ms/channel
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Range Mode	Measuring Range	Resolution	Accuracy	Input Resistance
V/500mV	0 to ± 50.000 mV	1 μ V	$\pm(0.08\% \text{ of reading} + 0.006) \text{ mV}$	10 M Ω or more
	± 50.00 to ± 500.00 mV	10 μ V	$\pm(0.08\% \text{ of reading} + 0.06) \text{ mV}$	
V/50V	0 to ± 5.0000 V	100 μ V	$\pm(0.08\% \text{ of reading} + 0.0006) \text{ V}$	1 M Ω or more
	± 5.000 to ± 50.000 V	1 mV	$\pm(0.08\% \text{ of reading} + 0.006) \text{ V}$	

Note: 1.Resolution and accuracy be automatically change by Autorange function.
2.Available only with dedicated scanners.

(20) Current Measurement(Standard Mode)

- Scanning speed 50 ms/channel
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring Range	Resolution	Accuracy
I/50 mA	0 to ± 50.00 mA	10 μ A	$\pm(0.05\% \text{ of reading} + 0.01) \text{ mA}$

Notes: 1. External shunt resistor (High-accuracy 250 Ω) is required.
2. Stated accuracy does not include the external shunt resistor.

(21) Current Measurement(High-speed Mode)

- Scanning speed 20 ms/channel
- Initial value memory range Same as measuring range
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring Range	Resolution	Accuracy
I/50 mA	0 to ± 50.00 mA	10 μ A	$\pm(0.08\% \text{ of reading} + 0.01) \text{ mA}$

Notes: 1. Available only with dedicated scanners.
2. External shunt resistor (High-accuracy 250 Ω) is required.
3. Stated accuracy does not include the external shunt resistor.

(22) Temperature Measurement with Thermocouple (Standard Mode)

- Scanning speed 50 ms/channel
- Measuring range, Resolution and Accuracy

Type	Measuring range	Resolution	Accuracy	Internal Reference Junction Compensator Accuracy
K	-200.0 to 1230.0 °C	0.1 °C	±0.7	±0.5 °C (With input terminal temperature balanced in an ambient) (Temp. range of 0 to 50 °C)
T	-200.0 to 400.0 °C		±0.7 °C	
E	-200.0 to 660.0 °C		±0.5 °C	
J	-200.0 to 870.0 °C		±0.6 °C	
R	0 to 1760.0 °C		±2.2 °C	

- Notes: 1. Accuracies do not include the internal reference junction compensator accuracy.
2. The reference junction compensator is switchable between internal and external.
3. Thermocouple resistance should be 1 k Ω or less.

(23) Temperature Measurement with Civil Engineering Transducers with a thermal sensor (Standard Mode)

- Scanning speed 50 ms/channel
- Measuring range, Resolution and Accuracy

Measuring range	Resolution	Accuracy
-50.0 to 200.0 °C	0.1 °C	±0.5 °C

- Notes: 1. Target physical quantity and temperature are measured in a single channel.
2. Strain measuring range are the same as in strain measurement in standard mode.

(24) Temperature Measurement with Platinum Resistance Thermometer Bulb (Standard Mode)

- Scanning speed 50 ms/channel
- Measuring range, Resolution and Accuracy

Type	Measuring range	Resolution	Accuracy
Pt100	-200.0 to 660.0 °C	0.1 °C	±0.3 °C
JPt100	-200.0 to 510.0 °C		

- Notes: Connection is 3-wire system

(25) Measurement with Potentiometer sensor(Standard Mode)

- Scanning speed 50 ms/channel
- Initial value memory range same as measuring range
- sensor power supply approx. 2VDC
- Potentiometer resistance 1 k Ω to 10 k Ω
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring range	Resolution	Accuracy
POT	0 to ± 50.00 %	0.01 %	± 0.1 %FS

(26) Measurement with Potentiometer sensor(High-speed Mode)

- Scanning speed 20 ms/channel
- Initial value memory range same as measuring range
- sensor power supply approx. 2 VDC
- Potentiometer resistance 1 k Ω to 10 k Ω
- Measuring range, Resolution and Accuracy

Channel Mode	Measuring range	Resolution	Accuracy
POT	0 to ± 50.00 %	0.01 %	± 0.1 %FS

Note: Available only with dedicated scanners.

(27) Internal timer Real time clock is Built-in (Battery backup)

(28) Display Fluorescent display tube,
128 $\times$ 64 dots

(29) Printer Printing Thermal
Paper width 58 mm (24 characters/line)
Printing speed 60 mm/s

(30) Interface RS-232C
LAN (10BASE-T/100BASE-TX)
USB2.0 (collect measurement data by USB Flash Drive)
Notes: 1 Measurement data cannot be saved directly to USB memory.
Notes: 2 USB Flash Drives Capacity:32GB or less
FileFormat:FAT32
Notes: 3 Recommend USB Flash Drives: GH-UFI-XSC2G
(Manufacturer: Greenhouse)

(31) File conversion	Binary Measurement data can be converted to CSV.
(32) Self –diagnosis Function resistance,	Checks display, printer, bridge excitation, leadwire-off, input/output insulation resistance, mode, etc.
(33) TEDS	• Interface IEEE1451.4 Mixed mode Transducer Interface Class2 • applicable sensor Should have information written in accordance with IEEE template No.33 Cable length should be 30m or less (with dedicated scanner USS-61B/62B/63B)
(34) Operating Temperature and Humidity	0 to 50 °C, 20 to 85 %RH (Non-condensation)
(35) Storage Temperature	-20 to 60 °C
(36) Setting Maintenance Function	ACOM at measurement circuit is switchable between floating and GND connect.
(37) Power supply	AC 100 to 240 V (AC-operated version) DC 10 to 16 V (DC-operated version) Note: DC operated version has power control function
(38) Current consumption	0.5 A or less: 100 VAC (With 3 dedicated scanners mounted) 4.0 A or less: 12 VDC (With 3 dedicated scanners mounted)
(39) Dimensions	360(W)×88(H)×400(D) mm (Excluding protrusions)
(40) Weight	Approx. 6.3 kg (Excluding scanner) Approx. 9.6 kg (With 3 dedicated scanners USS-62B mounted)



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