

Control Number: ZRH2MAE-01

INSTRUCTION MANUAL
For
High Resistivity Meter
Model Hiresta-UX

MITSUBISHI CHEMICAL ANALYTECH

EC DECLARATION OF CONFORMITY

We hereby declare that the following equipment complies with the essential requirements of:

Electromagnetic Compatibility Directive: 2004/108/EC
Low Voltage Directive: 2006/95/EC

Model Name : High Resistivity Meter Model Hiresta-UX

Standard to which Conformity is Declared:

EN61000-6-3:2007 : Generic standards-Emission standard for residential, commercial and light-industrial environments

EN61000-6-1:2007 : Generic standards-Immunity for residential, commercial and light-industrial environments

EN61010-1:2010 : Safety requirements for electrical equipment for measurement, control, and laboratory use

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Type of Equipment : Laboratory Equipment

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About This Manual

Hiresta-UX runs surface resistivity and volume resistivity measurements.
The remote measurement also can be run from a PC through a USB interface.
Read the following items at installation or measurement.

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SAFETY PRECAUTIONS

Read this instruction manual carefully before use.

Keep the manual at hand when operating the unit.

Security can not be assured if the unit is operated without following the instructions in this manual. Contact local distributor if any questions, errors, or omissions are found.

WARNING

Information under this sign explains critical operations which contain risk of death or serious casualties.

CAUTION

Information under this sign explains critical operations which contain risk of human casualties or damages to surrounding objects.

POINT

Information under this sign explains important and useful information for utilizing the unit.

Warnings and Cautions

WARNING

- Ground the grounding line or the earth terminal of a power cable stably. When they are not grounded, the contact with the chassis metal may cause an electrical shock which may lead to death.
- Always set or remove the option devices while the power switch is OFF. Up to 1000V of direct current is applied on the probe electrode. When the power switch is ON, the contact with the electrode may cause an electrical shock which may lead to death.

WARNING

- Hiresta-UX is not explosion-proof. Never install the unit in a combustible place.
- When it thunders, disconnect the power cable and the probe. Electric shocks by lightening may be caused.

CAUTION

- Install Hiresta-UX in a room where temperature is 5 to 40 degrees Celsius. Failure to do so can lead to the unit trouble and the accident.
- Do not place objects around the power switch of the unit rear. The power switch can not be turned OFF in emergency to cause accidents.
- Do not connect many plugs in one outlet. The outlet overheats to cause a fire.
- Install the unit in a place free from much water, humidity, dust, and oil smoke to prevent a fire, a trouble, and an electric shock.

WARNING

- Up to 1000V of direct current is applied on the probe electrode. When the power switch is ON, the contact with the electrode may cause an electrical shock which may lead to death.

WARNING

- Always remove the main power plug after stop, at parts change, or at repair and inspection. By touching live part, electrical shock may be caused.

CAUTION

- Pull the power plug while holding it. The disconnection or short circuit in a plug or a cable may be caused.
- Do not disassemble or remodel the unit to prevent accidents. Contact local distributor when disassembling the unit for inspection and repair.
- Do not touch the electrode when using the probe. The electrode may be deteriorated and correct measurement result can not be obtained.
- When the accident (trouble) occurs to this unit, immediately inform the supervisor of it, follow the regulations, and take emergency measures against it. Never restart this unit while the cause is unclear or the trouble is not solved.

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Section 1: Names and Functions of the Unit

1-1. Hiresta-UX Main Unit

The connectors for Hiresta-UX are described. Refer to “Section 4: Operation Method” for the display.

1-1-1. Rear Panel

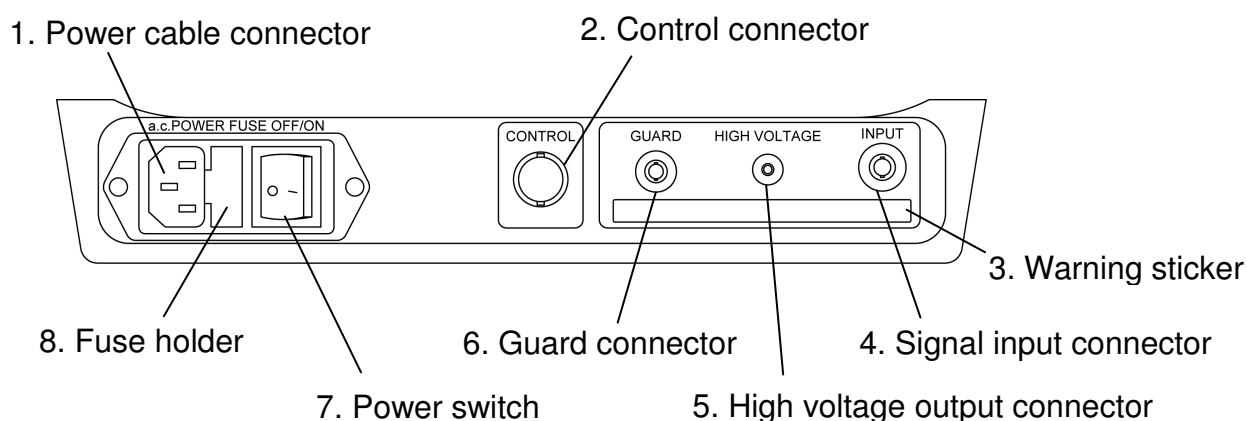


Fig.1-1. Rear Panel

Table 1-1. Rear Panel

No.	Names	Contents
1	Power cable connector	Connects the power cable to supply AC power (AC 85 – 264Va.c.). Always connect a grounding wire to prevent electrical shocks.
2	Control connector	Connect the connector for the control of the X-Type J Box or the foot switch.
3	Warning sticker	Warning indication for safety
4	Signal input connector	Connect the signal connector of a measuring probe.
5	High voltage output connector	Connect the high voltage connector of a measuring probe.
6	Guard connector	Connect the connector for the guard electrode of the X-Type J Box or Resitable UFL.
7	Power switch	The power is turned on and off. Press side to turn on power. Press ○ side to turn off power.
8	Fuse holder	Two fast-blow fuses are incorporated. Size: $\phi 5.2 \times 20\text{mm}$

1-1-2. Side Panel

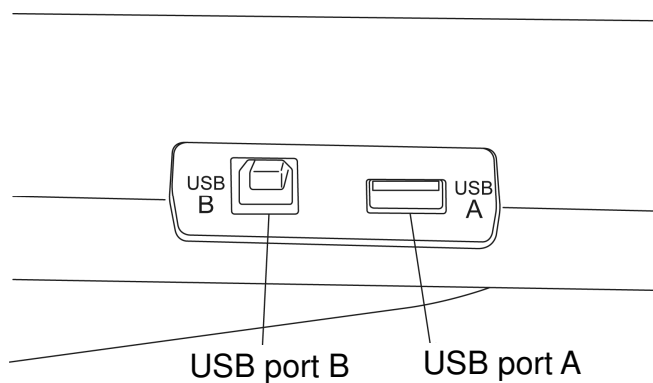


Fig.1-2. Side Panel

Table 1-2. Side Panel

No.	Names	Contents
1	USB port A	Connect a USB memory.
2	USB port B	Connect a USB cable.

1-2. Probe

WARNING

High voltage (up to 1000V of direct current) is applied on the electrodes. Never touch them during measurement to prevent electric shocks which may lead to death.

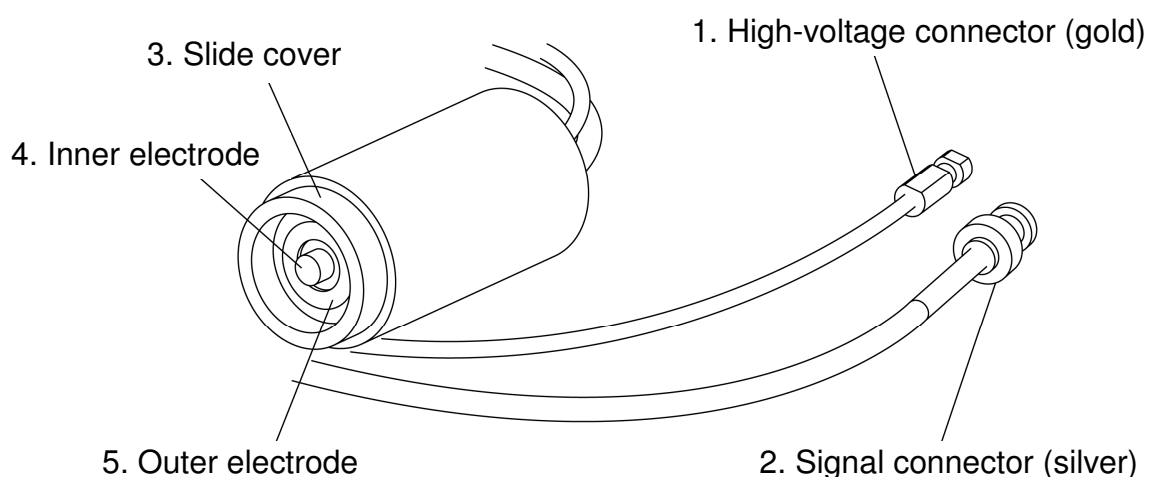


Fig.1-3. Probe

Table 1-3. Probe

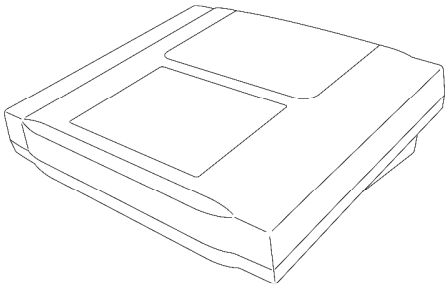
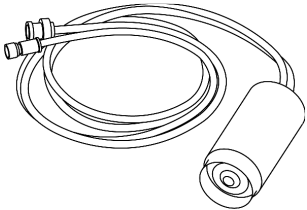
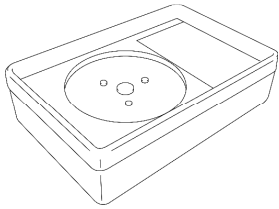
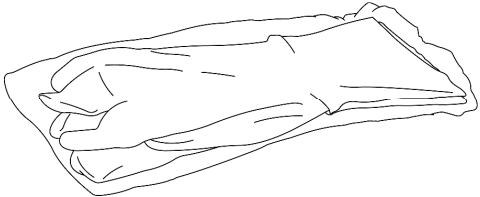
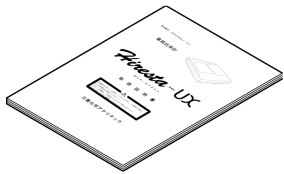
No.	Names	Contents
1	High voltage connector	Connect the connector to the high voltage output connector of the main unit rear panel.
2	Signal connector	Connect the connector to the signal input connector of the main unit rear panel.
3	Slide cover	For preventing the contact with the inner and outer electrodes of the probe. When the cover is pushed on measurement sample, it lifts up.
4	Inner electrode	Inner electrode for measurement Spring is included inside. When the electrode is pushed on measurement sample, it is inserted.
5	Outer electrode	Outer electrode for measurement

Section 2: Installation

2-1. Installation

2-1-1. Unpacking and Contents Check

This unit is packed in one cardboard box.
Check that the following items are included.

Hiresta-UX main unit: One Model number: MCP-HT800 Parts number: RMH014E	
URS probe: One Model number: MCP-HTP14 Parts number: RMH214	
URS probe checker: One Model number: MCP-TRURS Parts number: RMH327	
Protective gloves Model number: MCP-GV Parts number: RMJ803	
Instruction manual (this manual): One Parts number: ZRH2MAE	

2-1-2. Installation

WARNING

Hiresta-UX is not explosion-proof. Never install the unit in a combustible place. Failure to do so can lead to a fire and explosion.

CAUTION

- Install Hiresta-UX in a room where temperature is 5 to 40 degrees Celsius. Failure to do so can lead to the unit trouble and the accident.
- Do not place objects around the power switch of the unit rear. The power switch can not be turned OFF in emergency to cause accidents.
- Install the unit in a place free from much water, humidity, dust, and oil smoke to prevent a fire, a trouble, and an electric shock.

- (1) Install the unit at a place free from large temperature change, corrosive gas, dust, moisture, and direct sunlight.
- (2) Temperature should be 5 to 40 degrees Celsius and humidity should be 80% or less in the usage environment.
- (3) Install the unit at a place free from the effects of electric and magnetic fields.

2-1-3. Power Cable

WARNING

Ground the grounding line or the earth terminal of a power cable stably. When they are not grounded, the contact with the chassis metal may cause an electrical shock which may lead to death.

CAUTION

Do not connect many plugs in one outlet. The outlet overheats to cause a fire.

- (1) Connect the power cable apart from other units (a large motor and a dryer, etc.). Connect the power cable in a place where power fluctuation should be within $\pm 10\%$.
- (2) Use a grounded 3P power outlet or a 2P/3P converting plug to connect a grounding wire firmly.

2-2. Peripheral Device Connection

WARNING

- Always set or remove the option devices while the power switch is OFF. Up to 1000V of direct current is applied on the probe electrode. When the power switch is ON, the contact with the electrode may cause an electrical shock which may lead to death.
- Up to 1000V of direct current is applied on the probe electrode. When the power switch is ON, the contact with the electrode may cause an electrical shock which may lead to death.

CAUTION

- When it thunders, disconnect the power cable and the probe.
- Pull the power plug while holding it. The open or short circuit in a plug or a cable may be caused.
- Do not touch the electrode when using the probe. The electrode may be deteriorated and correct measurement result can not be obtained.

2-2-1. Probe Connection

Connect the probe as follows.

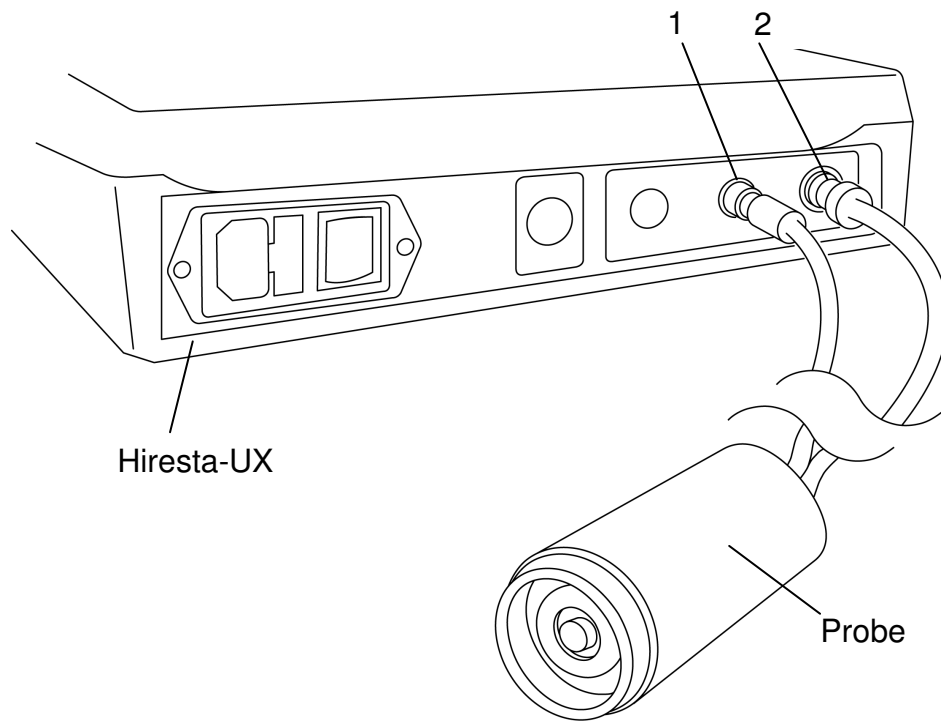


Fig. 2-1. Probe Connection

- (1) Insert 1. the high voltage connector (gold) of the probe into the high voltage output connector of Hiresta-UX main unit and turn it clockwise and firmly.
- (2) Insert 2. the signal connector (silver) of the probe into the signal input connector of the main unit and turn it clockwise and firmly.

2-2-2. Connection of Resitable UFL (Option)

Connect Resitable UFL as follows.

Connect the probe by referring to “2-2-1. Probe Connection”.

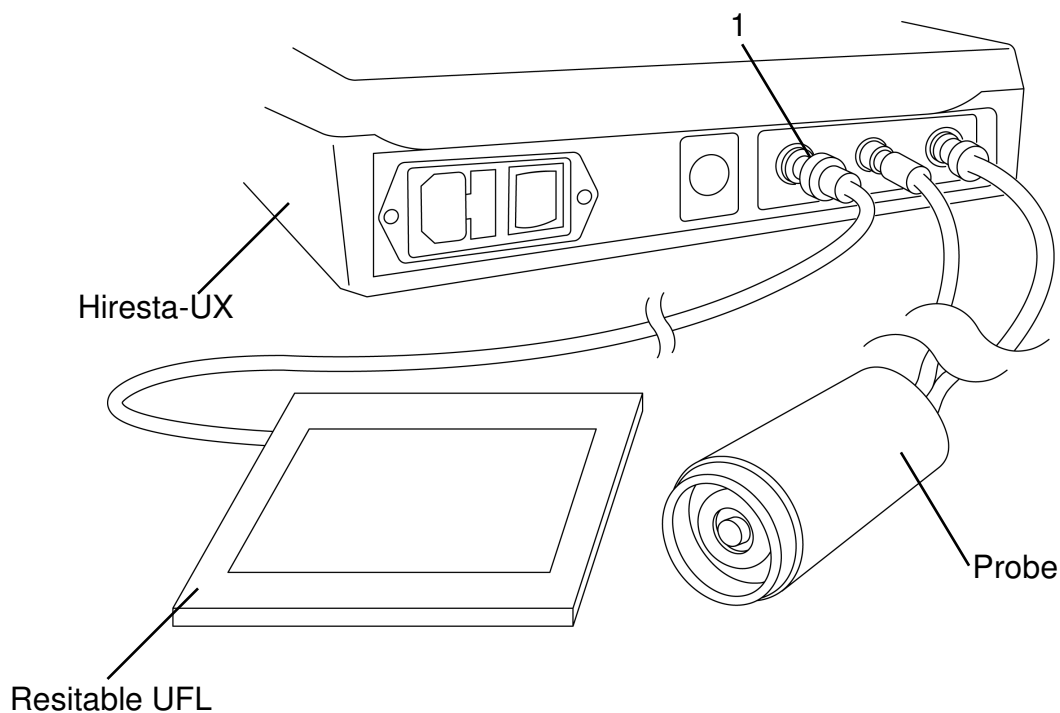


Fig. 2-2. Connection of Resitable UFL

- (1) Insert 1. the guard connector of Resitable UFL into the guard connector of Hiresta-UX main unit and turn it clockwise and firmly.

2-2-3. Connection of J-Box X-Type (Option)

Connect J-Box X-Type as follows.

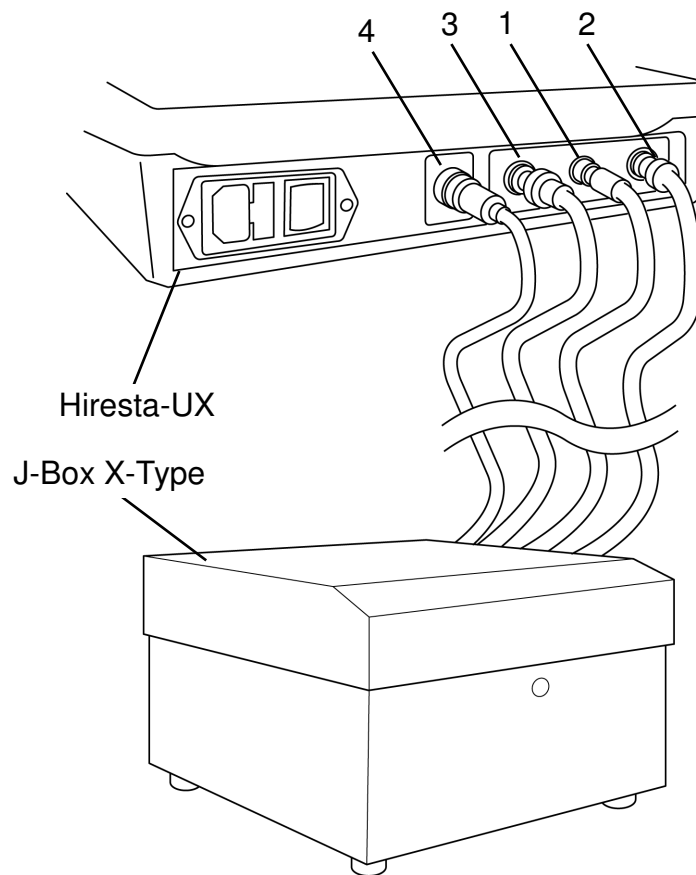


Fig. 2-3. Connection of J-Box X-Type

- (1) Insert 1. the high voltage connector (gold) of J-Box X-Type into the high voltage output connector of Hiresta-UX main unit and turn it clockwise and firmly.
- (2) Insert 2. the signal connector (silver) of J-Box X-Type into the signal input connector of the main unit and turn it clockwise and firmly.
- (3) Insert 3. the guard connector of J-Box X-Type into the signal input connector of the main unit and turn it clockwise and firmly.
- (4) Insert 4. the control connector of J-Box X-Type into the guard connector of the main unit and turn it clockwise and firmly.

2-2-4. USB Connection

Use a USB memory to connect a PC or input or output measurement data. Connect the USB memory as follows.

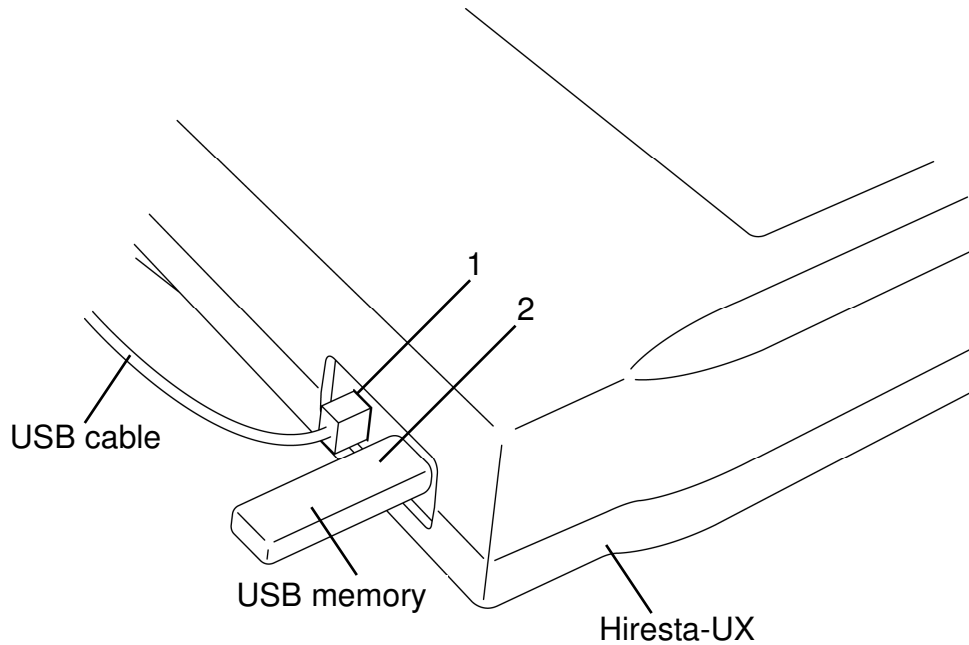


Fig. 2-4. USB Connection

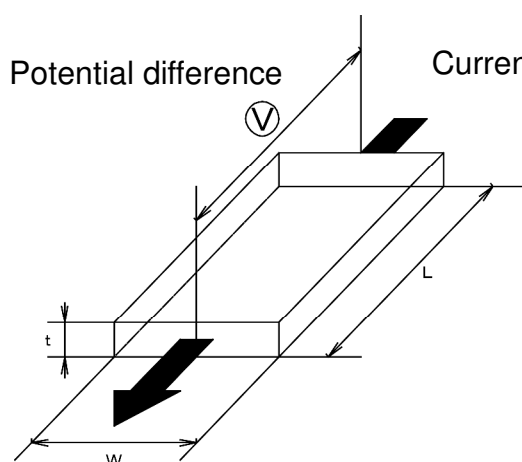
- (1) Connect a USB cable (A-B type) to 1. the "USB B" connector of Hiresta-UX side and the USB connector of a PC. (USB 3.0 cables are unavailable.)
- (2) Set a USB memory to 2. the "USB A" connector of Hiresta-UX side.

Section 3: Measurement Principle

3-1. Outline

(Electric) resistance is generally used as a measure for the conductivity (the ease of electric passage) of a substance (material). The value of the resistance expressed per unit volume ($1\text{cm} \times 1\text{cm} \times 1\text{cm}$) is volume resistivity (unit: $\Omega \cdot \text{cm}$).

This value is an absolute value specific to a substance and determined by measuring the potential difference (V) between electrodes separated by the distance L when constant current I (A) is applied to the cross section of $W \times t$.



$$\text{Cross section} = W \times t$$

$$\text{Resistance } R = \frac{V}{I}$$

$$\text{Volume resistivity } \rho_v = \frac{V}{I} \times \frac{W}{L} \times t$$

Fig. 3-1. Volume Resistivity (ρ_v , $\Omega \cdot \text{cm}$)

When measuring high-resistivity material, small current can not be applied stably. Therefore, the constant-voltage process of applying constant voltage and measuring leak current is used. The material condition of the surface is different from the one of the inside. It's necessary for material control that indicating condition by each index. The surface resistivity is results of surface condition and the volume resistivity is one of inside condition. They're defined on JIS K 6911-2006 or ASTM standard.

3-2. Surface Resistivity

As a measure for the conductivity of a material surface and the surroundings, the surface resistivity (Unit: Ω/\square (ohm per square)) is used.

As Fig. 3.2 “Measurement Method of the Surface and Volume Resistivities”, an electrode (a probe) is pressed on a sample surface and the surface current is detected. In “JIS K 6911-2006”, the current passing in the sample thickness direction is applied to the ground and only current passed to the surface is measured by placing the electrode (guard electrode) under sample.

The measurement by JIS method with “J-Box X-Type” can be run by Hiresta-UX.

When the sample of JIS standard size can not be prepared, use “MCC-A method” with the ring electrode probe and “Resistable UFL”. Place sample on the metal surface of Resistable UFL and press the probe on the sample. At this time, the metal surface of Resistable UFL functions as the guard electrode.

However, when the sample is thin as paper and film, etc., much of current may flow into the metal surface of Resistable UFL than between ring electrodes to interrupt measurement. As the sample thickness is thinner or the applied voltage is higher, measurement tends to be interrupted. In this case, measurement can be run stably in the Teflon[®] side of Resistable UFL.

In addition, membrane samples formed on an insulated substrate (glass, ceramics, plastics, etc.) also can be measured by MCC-B method of pressing the probe on sample.

Depending on sample material, form, and purpose, the methods can be selected. (Refer to “Fig. 3-3. JIS and MCC Methods”.)

The surface resistivity (ρ_s) can be obtained by Formula 3-1.

$\rho_s (\Omega/\square) = R \times RCF (S)$ (Formula 3-1)

R: Resistance value (Ω)

RCF(S): Surface Resistivity Correction Factor

3-3. Volume Resistivity

Volume resistivity (Unit: $\Omega \cdot \text{cm}$) is determined by placing an electrode on the opposing surfaces of a sample and measuring electric current flowing inside the sample. The outer electrode of the ring electrode probe works as the guard electrode and the current passed through the exterior of the detection electrode (the inner electrode) flows to the ground. Measurement can be run by the following two methods (MCC-A Method where Resistable UFL is used and JIS Method where X-Type J-Box is used.) The surface resistivity (ρ_v) can be obtained by the formula 3-2.

$$\rho_v (\Omega/\text{cm}) = R \times \text{RCF} (\text{V}) \times 1/t \text{ (Formula 3-2)}$$

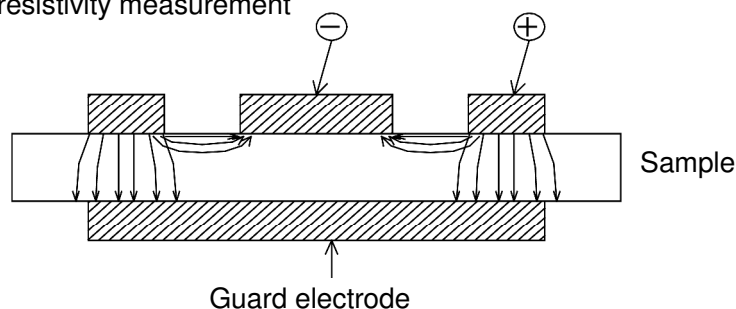
R: Resistance value (Ω)

RCF (V): Volume Resistivity Calculation Factor

t: Sample thickness (cm)

Hiresta-UX can display the calculation result by formulas 3-1 and 3-2 by selecting the surface and volume directions and a probe type.

Surface resistivity measurement



Volume resistivity measurement

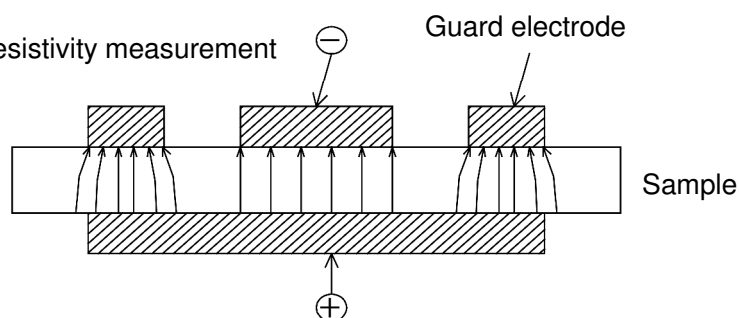
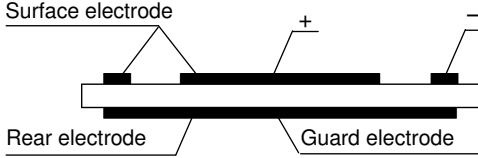
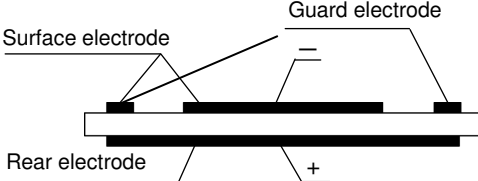


Fig. 3.2 Measurement Method of Surface and Volume Resistivities

Items	JIS method (JIS K 6911)
Surface Resistivity	
Volume Resistivity	

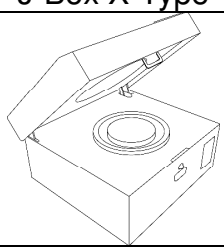
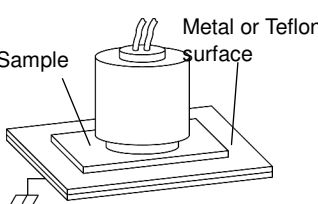
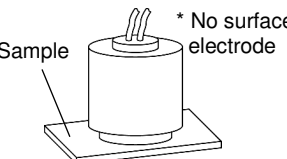
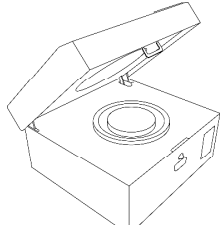
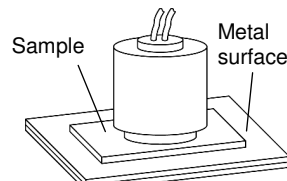
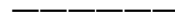
Items	MCC method		
	J-Box X-Type	MCC-A	MCC-B
Surface Resistivity			
Volume Resistivity			

Fig. 3-3. JIS and MCC Methods

3-4. Correction Factor (RCF (S), RCF (V))

The correction factors (RCF (S) and RCF (V) of the ring electrode probe are determined by the electrode diameters as shown in the formulas 3-3 and 3-4. Correction factors of probes is registered previously in Hiresta-UX (refer to Table 3-1 Correction Factors). Therefore the value can be called up automatically by selecting a probe type.

$$RCF (S) = \frac{2\pi}{\ln(d_2/d_1)} \quad \text{..... (Formula 3-3)}$$

$$RCF (V) = \frac{\pi d_1^2}{4} \quad \text{..... (Formula 3-4)}$$

Table 3-1. Correction Factors

Probe types	d2 (cm)	d1 (cm)	RCF (S)	RCF (V)
UR-SS	0.6	0.3	9.065	0.071
URS	1.1	0.59	10.09	0.273
UR	3.0	1.6	10.00	2.011
UR-100	5.32	5.0	100	19.63
ASTM/JIS	7.0	5.0	18.85	19.63
UA			1.050	

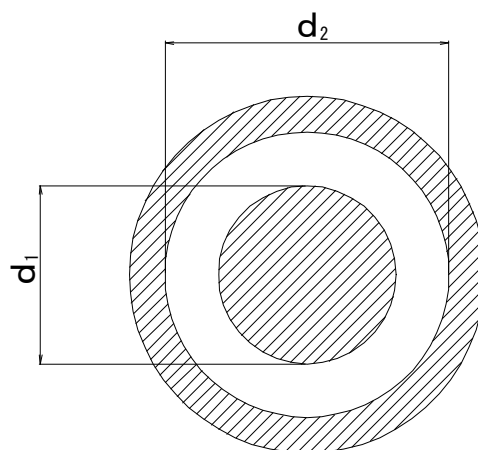


Fig. 3-4. Probe Electrode Form

Section 4: Operation Method

This chapter describes the operations in each window.

POINT

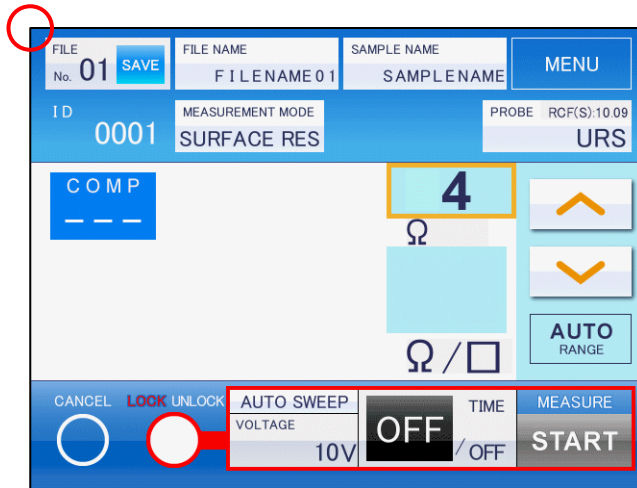


Fig. 4-1. Captured Screen Shot

Connect an USB memory and touch the upper left of the window three times continuously to save a captured screen shot into the USB memory. A number is assigned automatically to the file name as “H_UX000000.bmp” and the file is saved.

4-1. Measurement Window

Run operation in the touch panel. In the measurement window, sample resistance and resistivity can be measured. Refer to “4-2. Measurement Parameters” for each item description.

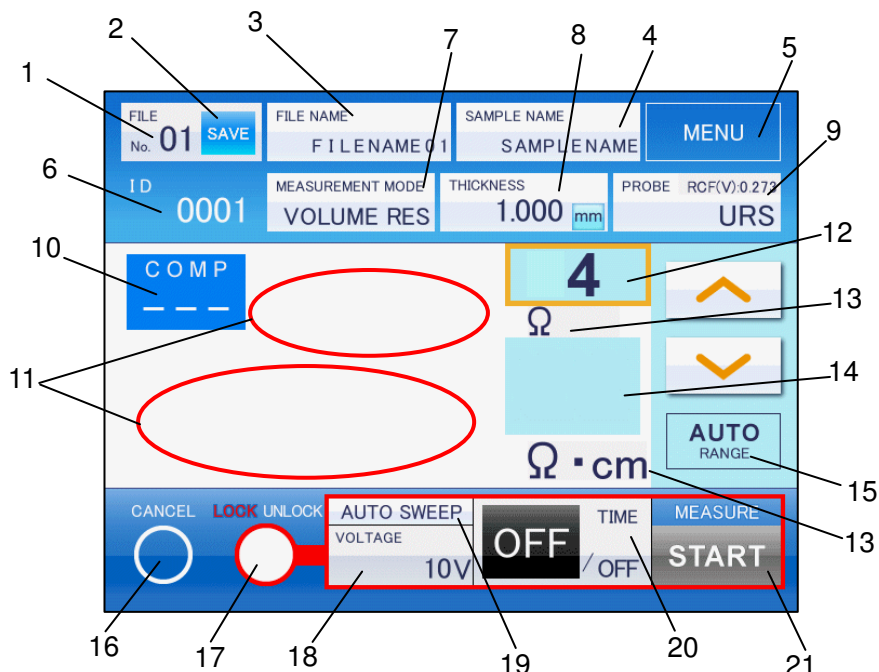


Fig. 4-2. Measurement

Table 4-1. Contents of Measurement Window

No.	Window indications	Contents
1	FILE	Select the file set at a measurement parameter.
2	SAVE	Save measurement parameters which are used.
3	FILE NAME	A name can be input into measurement parameters which are used.
4	SAMPLE NAME	A name can be input into the sample name which is used.
5	MENU	The menu window is displayed.
6	ID	The ID number displayed in measurement result is displayed. The number increases by one whenever measurement data is fixed. (Up to 2000 IDs)
7	MEASUREMENT MODE	Select a measurement mode.
8	THICKNESS	Input sample thickness. Use the thickness to measure volume resistivity. Refer to “Section 3: Measurement Principle”. The thickness is displayed when “MEASUREMENT MODE” is “VOLUME RES”.
9	PROBE	Select a probe from six types. When selecting “EXT”, RCF values can be inputted. The resistivity correction factor of a selected probe is displayed in the upper right.

No.	Window indications	Contents
10	COMP	After judging whether the setting matches the comparator, "OK", "NG", or "— — —" is displayed.
11	Measurement data 1	The mantissa of measurement data is displayed.
12	Range display	When the range switch is automatic, a value changes during measurement and measurement is run in the best range. When the range switch is manual, the preset range is displayed.
13	Units	The unit of measurement data is displayed.
14	Measurement data 2	The exponent part of measurement data is displayed.
15	Range switching	"AUTO" or "MANUAL" in "RANGE" is switched. For manual switching, set the range with ΔV .
16	Measurement stop button	Measurement is stopped forcibly.
17	START LOCK button	Safety to prevent [START] button in "Measure" from being readily set to ON. By setting the start lock button to ON, measurement is ready.
18	VOLTAGE	Select applied voltage. When selecting "EXT", voltage (29 types) can be inputted. During measurement, the displayed voltage is applied.
19	AUTOMATIC SWEEP	The automatic sweep is set to ON.
20	TIME	Select one measurement time.
21	START/ HOLD	Button for starting or ending measurement Release the start lock button of the safety to hold down the button.

4-2. Measurement Parameters

Previously save measurement parameters. Saved parameters can be called up from “File” of the measurement window.

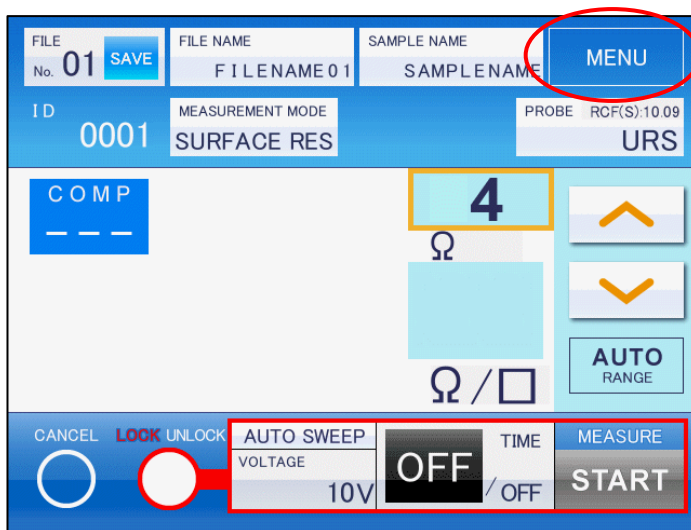


Fig. 4-3. Measurement

- (1) Touch “MENU” in the measurement window.
The menu window is displayed.

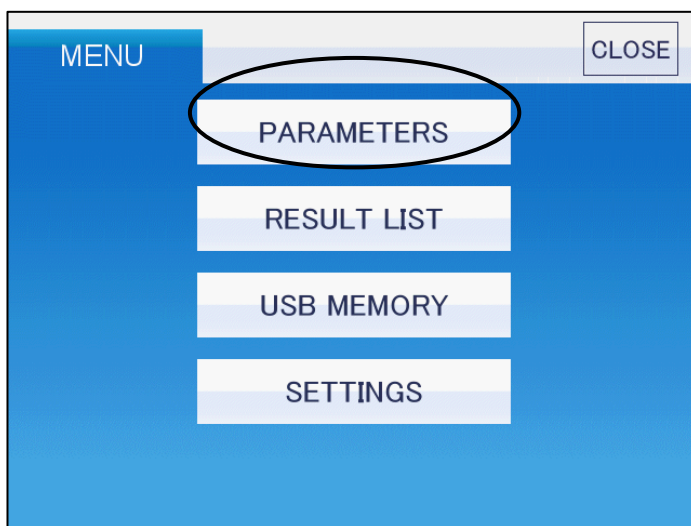


Fig. 4-4. MENU

(2) Touch “Parameters”. The file selection window is displayed.

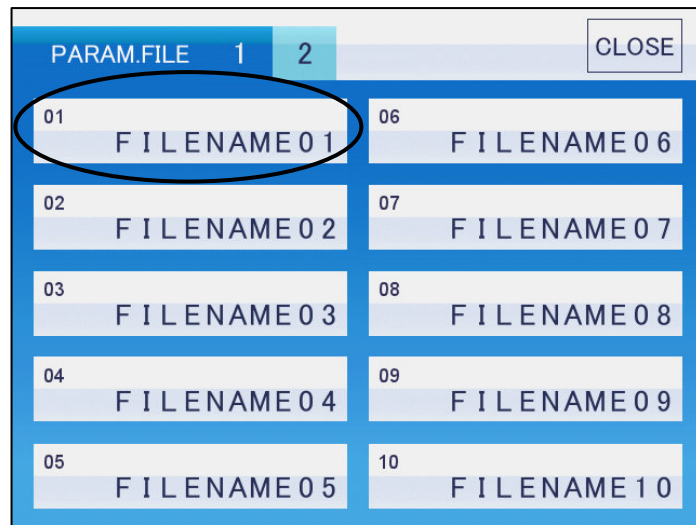


Fig. 4-5. File Selection

(3) Touch a file which is not set.

The parameter setting window is displayed. Up to 20 files can be saved.

For 11 to 20 parameters, touch the tab to switch to the window.

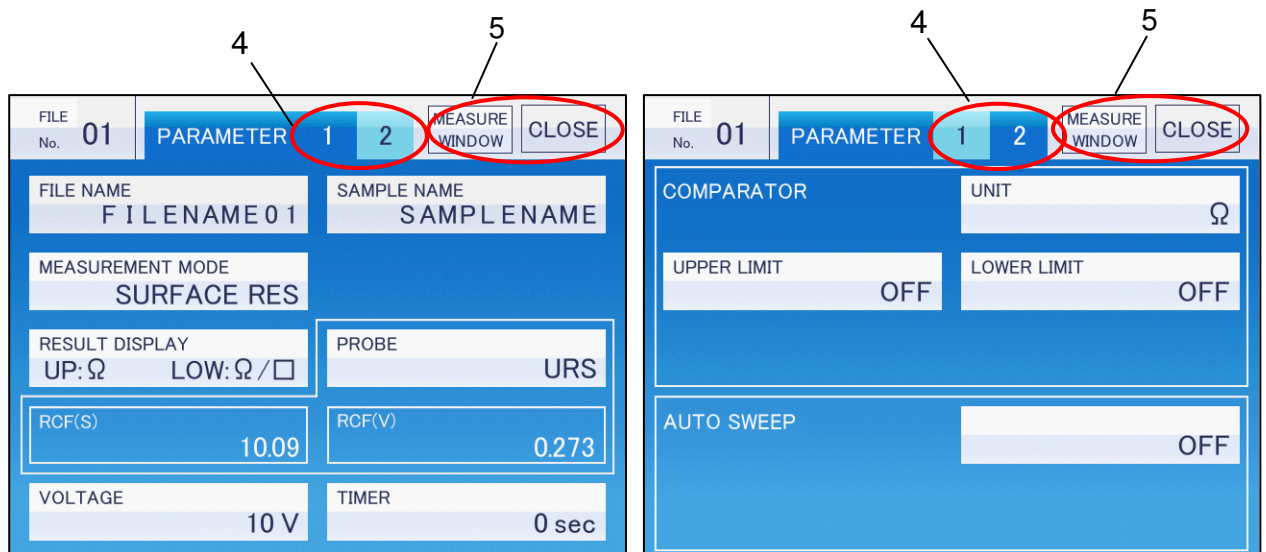


Fig. 4-6. Parameter Setting

(4) Change the setting items with the tab. Touch the items to set each item.

(5) Touch “MEASURE WINDOW” to return to the measurement window with preset parameters.

Touch “CLOSE” to return to the file selection window.

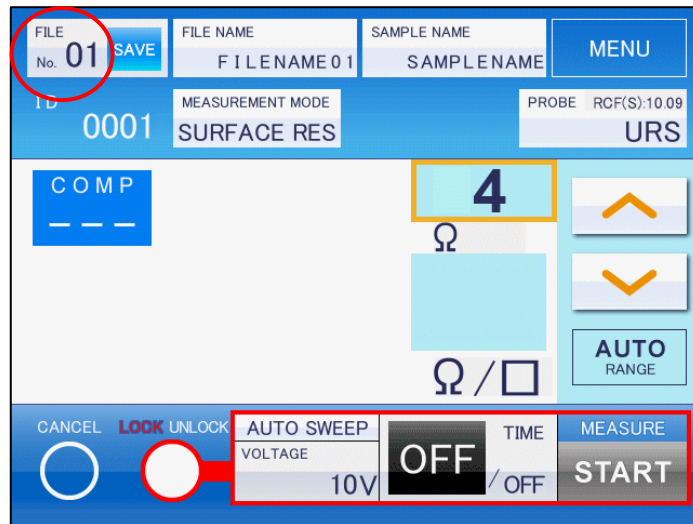


Fig. 4-7. Calling up Measurement Parameters

- (6) To call up the saved measurement parameters in the measurement window, touch "FILE". The file selection window is displayed.
- (7) Touch a saved file. The window returns to the measurement one.

4-2-1. FILE NAME

The screenshot shows the main measurement window of the MCP-HT800. At the top, there are tabs for 'FILE No.' (01), 'PARAMETER' (1, 2), 'MEASURE WINDOW', and 'CLOSE'. The 'FILE NAME' field is highlighted with a red circle and contains the text 'F I L E N A M E 0 1'. Other fields include 'SAMPLE NAME' (S A M P L E N A M E), 'MEASUREMENT MODE' (S U R F A C E R E S), 'RESULT DISPLAY' (UP: Ω LOW: Ω / \square), 'PROBE' (U R S), 'RCF(S)' (10.09), 'RCF(V)' (0.273), 'VOLTAGE' (10 V), and 'TIMER' (0 sec).

Fig. 4-8. File Name

Register a file name. Touch “FILE NAME” to display the keyboard for input.

The screenshot shows an on-screen keyboard with a light blue background. The text 'F I L E N A M E 0 1' is displayed in the input field at the top. The keyboard has buttons for digits 0-9, letters A-Z, and special keys: CLR, BS, ←, and →. At the bottom, there are 'O K' and 'C A N C E L' buttons.

Fig. 4-9. Keyboard

After inputting the file name, touch “OK”.

4-2-2. SAMPLE NAME

The screenshot shows the MCP-HT800 measurement interface. At the top, there are buttons for 'FILE No. 01', 'PARAMETER 1 2', 'MEASURE WINDOW', and 'CLOSE'. Below these, the 'FILE NAME' is set to 'FILENAME 01'. The 'SAMPLE NAME' field, which currently contains 'SAMPLENAME', is circled in red. The 'MEASUREMENT MODE' is 'SURFACE RES'. The 'RESULT DISPLAY' shows 'UP: Ω ' and 'LOW: Ω / \square '. The 'PROBE' is 'URS'. The 'RCF(S)' is '10.09' and 'RCF(V)' is '0.273'. The 'VOLTAGE' is '10 V' and the 'TIMER' is '0 sec'.

Fig. 4-10. Sample Name

Register a sample name. Touch “SAMPLE NAME” to display the keyboard for input.

The screenshot shows an on-screen keyboard for entering the sample name. The keyboard has a light blue background and a grid of buttons. The top row contains numbers 1 through 0. The second row contains letters A through I, followed by a 'CLR' button. The third row contains letters J through R, followed by a 'BS' button. The fourth row contains letters S through Z, followed by left and right arrow buttons. At the bottom, there are 'OK' and 'CANCEL' buttons. The 'SAMPLE NAME' field at the top of the keyboard is empty and has a red cursor at the end.

Fig. 4-11. Keyboard

After inputting the file name, touch “OK”.

4-2-3. MEASUREMENT MODE

Fig. 4-12. Measurement Mode

Select “MEASUREMENT MODE” from “SURFACE RES”, “VOLUME RES”, or “PROBE CHECK”.

Fig. 4-13. Measurement Mode

- **SURFACE RES**
Measure the surface resistivity of samples.
- **VOLUME RES**
Measure the volume resistivity of samples. → Select the item to display “Thickness” setting.
- **PROBE CHECK**
Use this item when inspecting the unit by the probe checker.

4-2-4. THICKNESS

Select "VOLUME RES" in "4-2-3. MEASUREMENT MODE" to display "THICKNESS".

The screenshot shows a measurement mode screen with the following fields and values:

FILE No. 01	PARAMETER 1 2	MEASURE WINDOW	CLOSE
FILE NAME FILENAME 01	SAMPLE NAME SAMPLENAME		
MEASUREMENT MODE VOLUME RES	THICKNESS 1.000 mm		
RESULT DISPLAY UP: Ω LOW: $\Omega \cdot \text{cm}$	PROBE URS		
RCF(S) 10.09	RCF(V) 0.273		
VOLTAGE 10 V	TIMER 0 sec		

Fig. 4-14. Thickness

Input the thickness.

Touch the unit of the lower right to change " μm " or "mm".

The default is "1.000mm".

Touch "THICKNESS" to display the numerical keypad for input.

The screenshot shows a numerical keypad with the following layout:

0			
7	8	9	
4	5	6	CLR
1	2	3	BS
0	.	←	→
OK		CANCEL	

Fig. 4-15. Numerical Keypad

After inputting a value, touch "OK".

POINT

Sample thickness is required to calculate volume resistivity.

It is not used to measure a resistance value and surface resistivity

4-2-5. RESULT DISPLAY

Fig. 4-16. Result Display

Set the measurement values in the upper and lower columns of the measurement window. Select the display method from the following methods.

Fig. 4-17. Result Display

- Upper column: Ω , lower column: Ω/\square
A resistance value is displayed in the upper column. Resistivity is displayed in the lower column.
- Upper column: Ω/\square , lower column: Ω
Resistivity is displayed in the upper column. A resistance value is displayed in the lower column.
- Upper column: -, lower column: Ω
A resistance value is displayed only in the lower column.
- Upper column: -, lower column: Ω/\square
Resistivity is displayed only in the lower column.

4-2-6. PROBE

Fig. 4-18. Probe

Select a probe from “URS”, “UR”, “UR100”, “JIS/ASTM”, “URSS”, “UA”, or “EXT”.

Fig. 4-19. Probe

The relation between the probes and resistivity correction factors is as follows.

Table 4-2. Probes and Resistivity Correction Factors

Probe Types	Surface Resistivity Correction Factor	Volume Resistivity Calculation Factor
URS	10.09	0.273
UR	10.00	2.011
UR100	100	19.63
JIS/ASTM	18.85	19.63
URSS	9.065	0.071
UA	1.050	
EXT	Manual Setting	Manual Setting

When selecting [EXT], set Resistivity Correction factor, “RCF (S)” and “RCF (V)” from 0.001 to 9999.

FILE No. 01	PARAMETER 1 2	MEASURE WINDOW	CLOSE
FILE NAME FILENAME 01		SAMPLE NAME SAMPLENAME	
MEASUREMENT MODE SURFACE RES			
RESULT DISPLAY UP: Ω LOW: Ω / \square		PROBE EXT	
RCF(S) 10.00		RCF(V) 10.00	
VOLTAGE 10 V		TIMER 0 sec	

Fig. 4-20. Correction Factor

The default is “10.00”.

Touch “RCF (S)” or “RCF (V)” to display the numerical keypad for input.

0			
7	8	9	
4	5	6	CLR
1	2	3	BS
0	.	←	→
OK		CANCEL	

Fig. 4-21. Numerical Keypad

After inputting a value, touch “OK”.

4-2-7. VOLTAGE

FILE No. 01	PARAMETER 1 2	MEASURE WINDOW	CLOSE
FILE NAME FILENAME 01		SAMPLE NAME SAMPLE NAME	
MEASUREMENT MODE SURFACE RES			
RESULT DISPLAY UP: Ω LOW: Ω / \square		PROBE URS	
RCF(S) 10.09		RCF(V) 0.273	
VOLTAGE 10 V		TIMER 0 sec	

Fig. 4-22. Applied Voltage

Select applied voltage from “10V”, “50V”, “100V”, “250V”, “500V”, “1000V”, or “EXT”.

10V	50V
100V	250V
500V	1000V
EXT	CLOSE

Fig. 4-23. Applied Voltage

Touch “EXT” to display the numerical keypad for input.

0				
7	8	9		
4	5	6	CLR	
1	2	3	BS	
0	.	←	→	
OK		CANCEL		

Fig. 4-24. Numerical Keypad

After inputting applied voltage, touch “OK”.

Available applied voltages are as follows.

1 volt: 1 to 10V, 10 volts: 20 to 90V, 100 volts: 100 to 1000V, 250V

4-2-8. TIMER

When the timer time is set, fix the data when timer time passes after measurement start and end measurement. When the timer is OFF, touch “HOLD” without using the timer to fix the data and end measurement.

The screenshot shows the main menu of the device. At the top, there are buttons for 'FILE No. 01', 'PARAMETER 1', '2', 'MEASURE WINDOW', and 'CLOSE'. Below these are fields for 'FILE NAME' (FILENAME 01) and 'SAMPLE NAME' (SAMPLENAME). The 'MEASUREMENT MODE' is set to 'SURFACE RES'. The 'RESULT DISPLAY' shows 'UP: Ω' and 'LOW: Ω / □'. The 'PROBE' is set to 'URS'. The 'RCF(S)' is 10.09 and 'RCF(V)' is 0.273. The 'VOLTAGE' is 10 V. The 'TIMER' field is circled in red and shows '0 sec'.

Fig. 4-25. Timer

Select “TIMER” from “OFF”, “10 sec.”, “30 sec.”, “1 min.”, “5 min.”, “10 min.”, or “EXT”.

The screenshot shows a menu with eight buttons arranged in a 4x2 grid. The buttons are: 'OFF', '10sec', '30sec', '1min', '5min', '10min', 'EXT', and 'CLOSE'.

Fig. 4-26. Timer

Touch “EXT” to display the numerical keypad for input.

The screenshot shows a numerical keypad with a display at the top showing '0'. The keypad has buttons for digits 0-9, a decimal point, left and right arrows, a 'CLR' button, a 'BS' button, and 'OK' and 'CANCEL' buttons at the bottom.

Fig. 4-27. Numerical Keypad

After inputting the time, touch “OK”. 1 to 999 seconds can be set.

4-2-9. COMPARATOR

For samples of which measurement values are known roughly, input the upper and lower limits to judge acceptability. The judgment result is displayed in “COMP” of the measurement window.



Fig. 4-28. Comparator

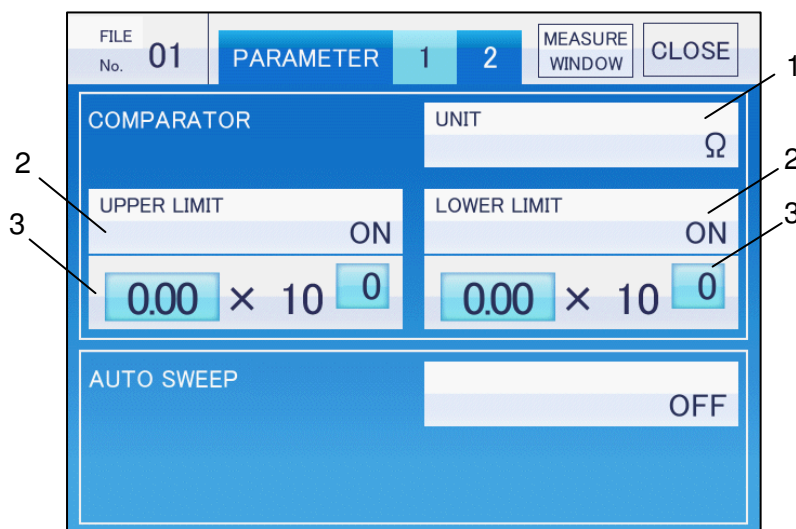


Fig. 4-29. Comparator

- (1) Touch “UNIT” to select from “ Ω ”, “ Ω/cm ”, or “ Ω/\square ”.
- (2) Switch “ON” or “OFF” of “UPPER LIMIT” and “LOWER LIMIT”.
Set “ON” to display the setting items.

(3) Input mantissa and exponent part.

Touch mantissa to display the numerical keypad. Input a value from 0.01 to 9.99.
Touch the exponent part to display the numerical keypad. Input a value from 10 to 30.

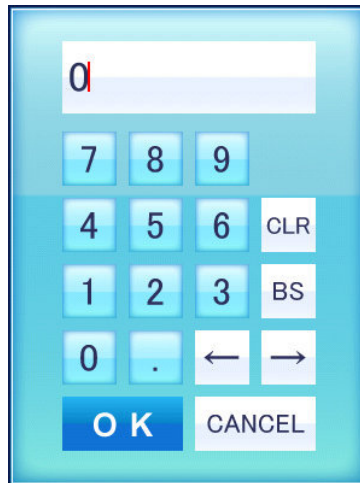


Fig. 4-30. Numerical Keypad

After inputting a value, touch “OK”.

POINT

- In the comparator setting, the use of the upper and lower limits can be selected. By using both values or either value, “OK” or “NG” is displayed in “COMP” of the measurement window.
- The upper limit is larger than the lower limit. Except under this condition, the error pop-up window is displayed.
- Comparator conditions
 Setting value: Upper limit \geq Lower limit
 Judgment criteria:
 Upper limit \geq Measurement value \geq Lower limit: OK
 Measurement value > Upper limit or Lower limit > Measurement value: NG
 OVER, UNDER, Others: — — — (Not determinable)

4-2-10. AUTO SWEEP



Fig. 4-31. AUTO SWEEP

- (1) Switch “ON” or “OFF” of “AUTO SWEEP”.
Set “ON” to display the setting items.



Fig. 4-32. AUTO SWEEP

- (2) Select “VOLTAGE” from “1-10V”, “10-100V”, “100-1000V”, or “1-1000V”.



Fig. 4-33. Applied Voltage

(3) Select "CYCLE" from "OFF", "10 sec", "30 sec", "1min", "5min", "10min", or "EXT".



Fig. 4-34. CYCLE

Touch "EXT" to display the numerical keypad for input.

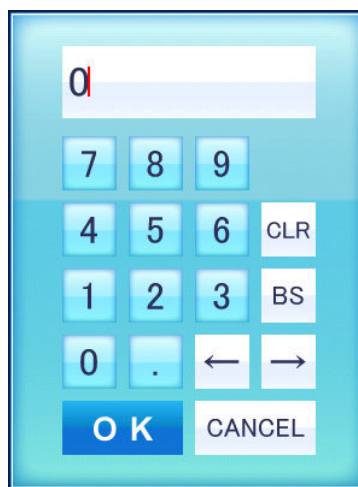


Fig. 4-35. Numerical Keypad

After inputting the time, touch "OK". 1 to 999 seconds can be set.

4-3. Results List

Measurement result is displayed. Up to 2000 results can be saved.

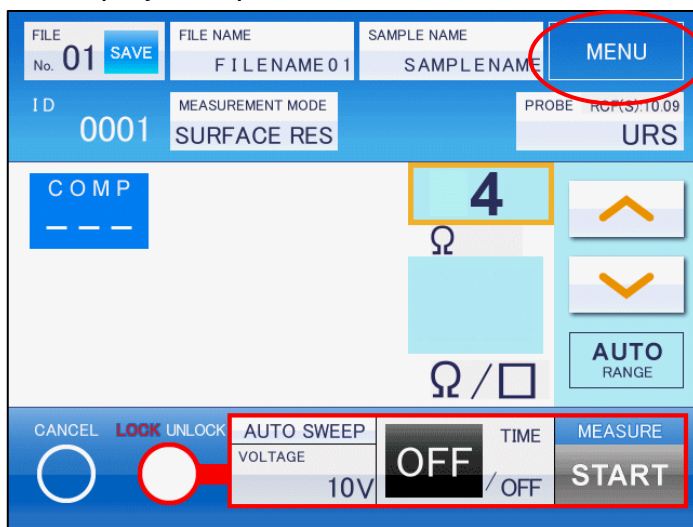


Fig. 4-36. Measurement

(1) Touch “MENU” in the measurement window. “MENU” window is displayed.

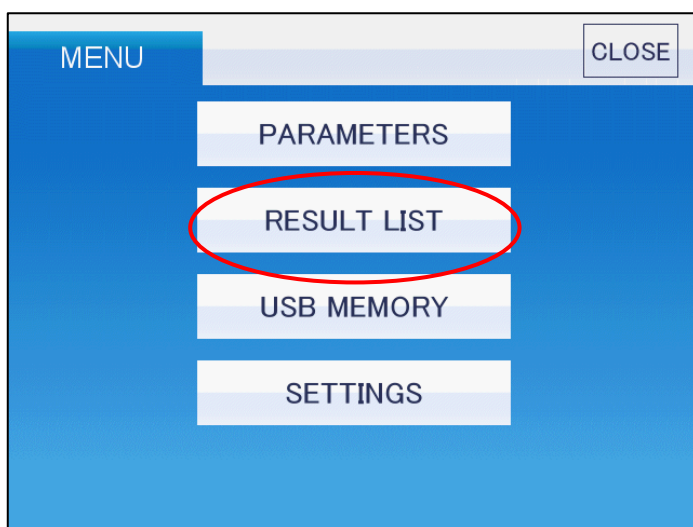


Fig. 4-37. MENU

(2) Touch “RESULT LIST”. The result list window is displayed.

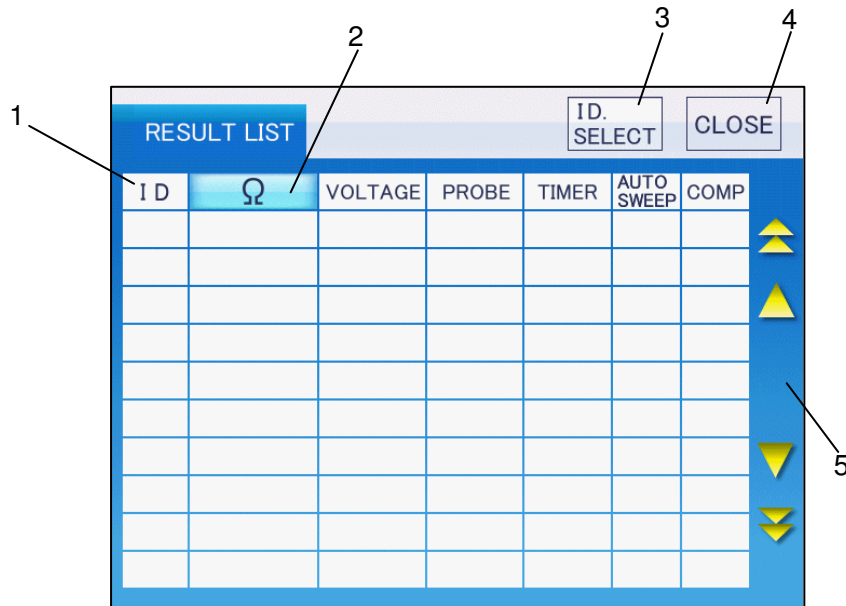


Fig. 4-38. Result List

Table 4-3. Contents of Result List

No.	Window indications	Contents
1	RESULT LIST	The measurement result saved in measurement order is displayed. The ID number is assigned automatically.
2	Unit button	Touch the button to switch “Ω”, “Ω/□”, or “Ω·cm”.
3	ID. SELECT	Touch the panel to display the numerical keypad. By inputting the ID number to be displayed, entered measurement result is displayed in the first line.
4	CLOSE	The menu window is returned.
5	Scroll button	Scroll measurement result. Touch $\Delta \nabla$ to scroll by 1 unit. Touch $\triangle \nabla$ to scroll by 50 units.

POINT

Up to 2000 data is saved in the memory.

By continuing more than 2000 measurements, an error message is displayed. In this case, back up required data, delete measurement data, and measure again. (Refer to “4-4. USB Memory” to back up data.)

4-4. USB Memory

Connect an USB memory to the USB connector “USB_B” of Hiresta-UX to output measurement result and back up measurement parameters.

To handle Hiresta-UX data with an USB memory (at backup or restoration), save data just below the USB memory. The data in a folder can not be restored.

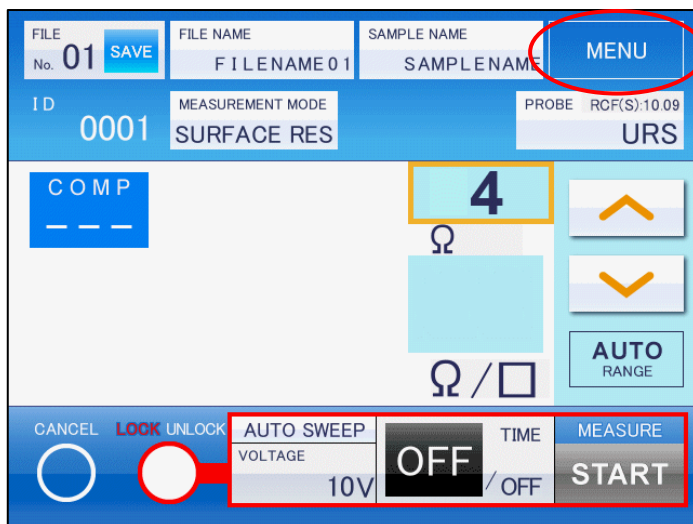


Fig. 4-39. Measurement

(1) Touch “MENU” in the measurement window. “MENU” window is displayed.

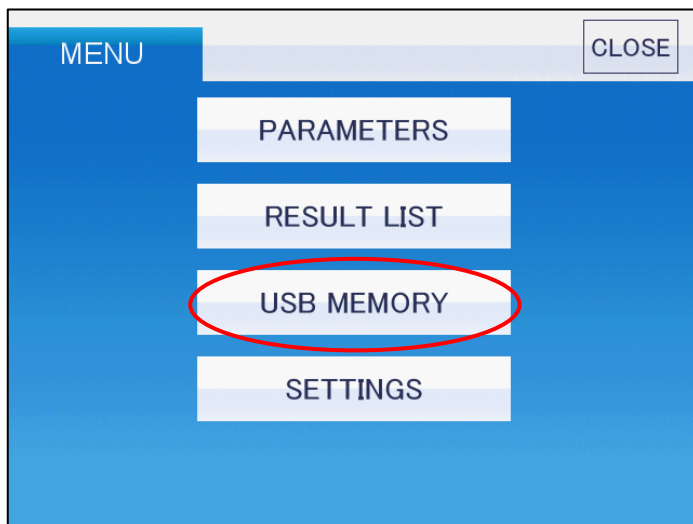


Fig. 4-40. MENU

(2) Touch “USB MEMORY”. “USB MEMORY” window is displayed.

(3) Connect an USB memory.

(4) Touch each item in “DATA OUTPUT” and “BACKUP”.

POINT

Do not remove or insert an USB memory during data transfer.
Data or the unit may be broken.

4-4-1. OUTPUT ALL DATA

Output all saved measurement result in CSV format to an USB memory.

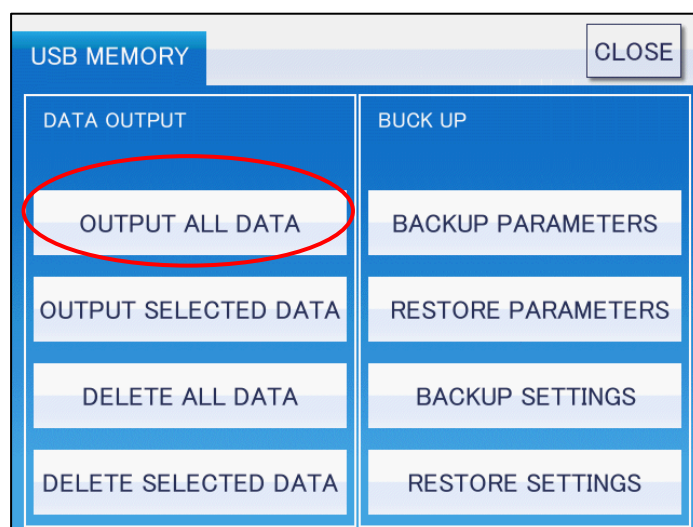


Fig. 4-41. USB Memory

(1) Touch "OUTPUT ALL DATA" to display the check window.

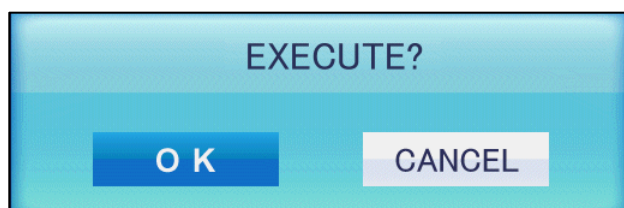


Fig. 4-42. Check Window

(2) Touch "OK". All data is copied into an USB memory.

* Measurement Data Output to an USB Memory

The data output to an USB memory is output in CSV format.
Refer to “Fig. 4-43. Output Contents Example” for the contents.

No.	SAMPLE NAME	PROBE	VOLT (V)	TIME (SEC)	THICKNESS	RCF (S)	RCF (V)	COMP UP	COMP LO	COMP UNIT	R (ohm)	Rs (ohm/sq)	Rv (ohm-cm)	COMP
1	9	SAMPLE	URS	10	0	1.00E+00	10.09	0.273	0.00E+00	0.00E+00	ohm	OVER E+1	---	---
2	8	SAMPLE	URS	10	0	1.00E+00	10.09	0.273	0.00E+00	0.00E+00	ohm	OVER E+1	---	---
3	7	SAMPLE	URS	10	0	1.00E+00	10.09	0.273	0.00E+00	0.00E+00	ohm	8.47E+10	---	2.31E+11
4	6	SAMPLE	URS	10	0	1.00E+00	10.09	0.273	0.00E+00	0.00E+00	ohm	1.14E+10	---	3.11E+10
5	5	SAMPLE	URS	10	0	1.00E+00	10.09	0.273	0.00E+00	0.00E+00	ohm	OVER E+1	---	---
6	4	SAMPLE	URS	10	0	1.00E+00	10.09	0.273	0.00E+00	0.00E+00	ohm	4.53E+10	---	1.24E+11
7	3	SAMPLE	EXT	10	0	1.00E+00	10	10	0.00E+00	0.00E+00	ohm	OVER E+1	---	---
8	2	SAMPLE	EXT	10	0	1.00E+00	10	10	0.00E+00	0.00E+00	ohm	OVER E+1	---	---
9	1	SAMPLE	EXT	10	0	1.00E+00	10	10	0.00E+00	0.00E+00	ohm	OVER E+1	---	---

Fig. 4-43. Output Contents Example

Table 4-4. Contents of Output Measurement Data

No.	Window indications	Contents
1	No.	Unique ID
2	SAMPLE NAME	Sample name
3	PROBE	Types of used probes
4	VOLT (V)	Applied voltage
5	TIME (SEC)	Timer (Unit: Sec.)
6	THICKNESS	Sample thickness (Unit: mm)
7	RCF (S)	Resistivity correction factor of surface resistivity
8	RCF (V)	Resistivity correction factor of volume resistivity
9	COMP UP	Comparator upper limit
10	COMP LO	Comparator lower limit
11	COMP UNIT	Comparator unit
12	R (ohm)	Resistance value
13	Rs (ohm/sq)	Surface Resistivity
14	Rs (ohm-cm)	Volume Resistivity
15	COMP	Comparator ON/OFF

4-4-2. OUTPUT SELECTED DATA

The consecutive IDs of saved measurement results are output to an USB memory.

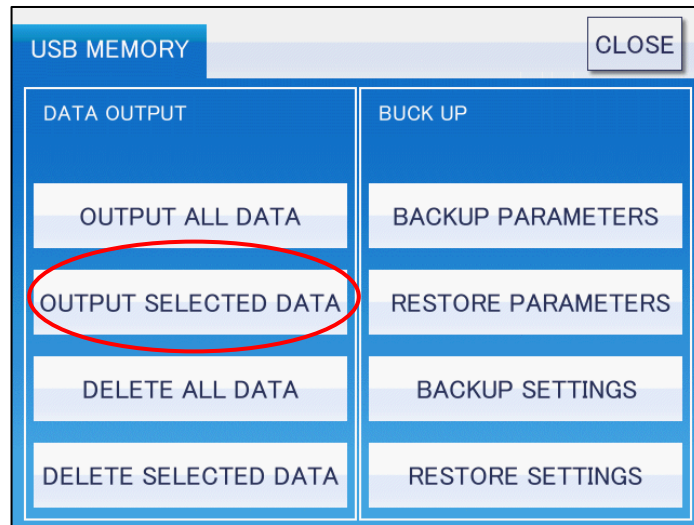


Fig. 4-44. USB Memory

(1) Touch “OUTPUT SELECTED DATA” to display the check window.

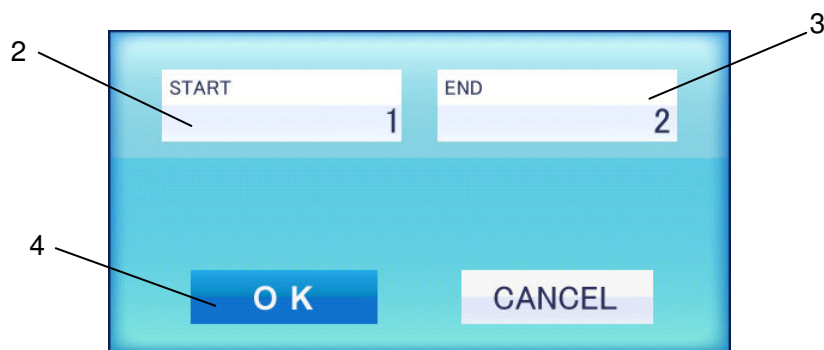


Fig. 4-45. Selection Data Output

(2) Touch “START” to input the first ID number to be saved. The numerical keypad is displayed.

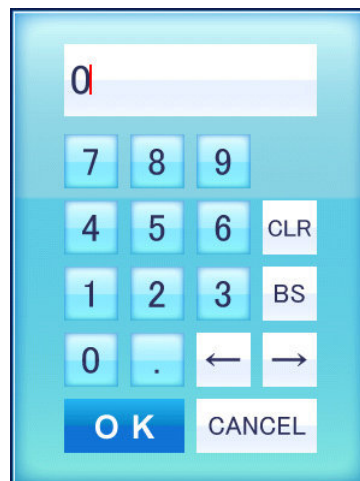


Fig. 4-46. Numerical Keypad

- (3) Touch “END” to input the last ID number. The numerical keypad is displayed.
- (4) Touch “OK”. The measurement result of a selected ID number is copied into an USB memory.

4-4-3. DELETE ALL DATA

Delete all measurement results.

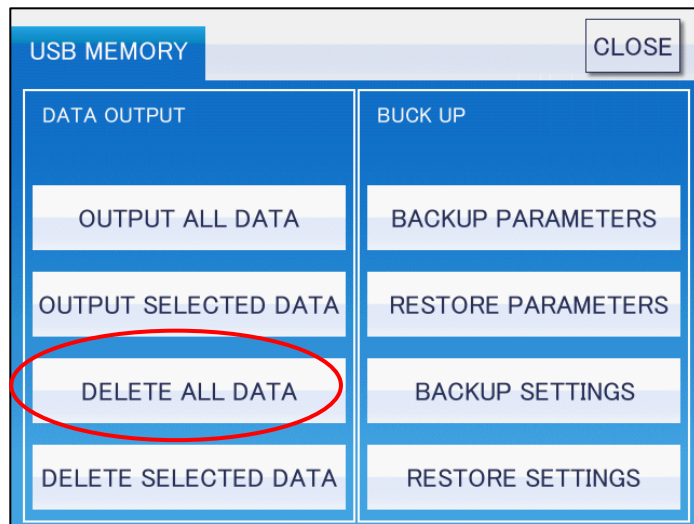


Fig. 4-47. USB Memory

- (1) Touch “DELETE ALL DATA”. The check window is displayed.

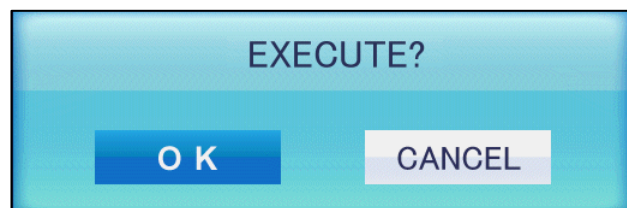


Fig. 4-48. Check Window

- (2) Touch “OK”. All data is deleted.

4-4-4. DELETE SELECTED DATA

The consecutive IDs of saved measurement results are deleted.

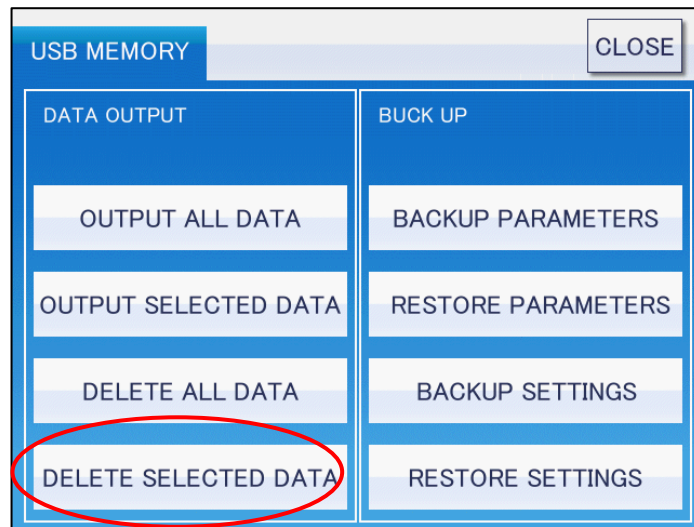


Fig. 4-49. USB Memory

(1) Touch "DELETE SELECTED DATA". The check window is displayed.

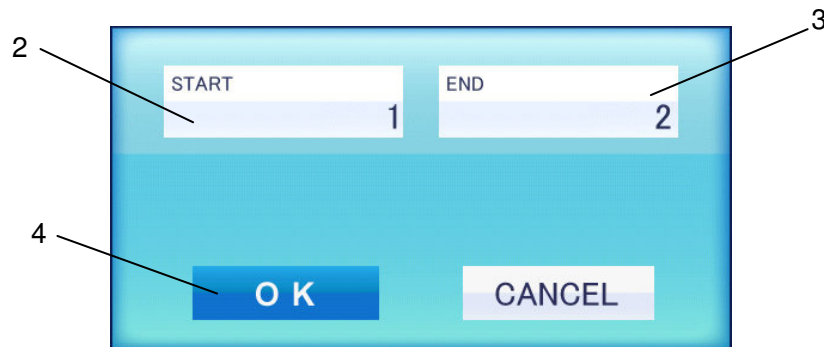


Fig. 4-50. Selection Data Output

(2) Touch "START" to input the first ID number to be deleted. The numerical keypad is displayed.

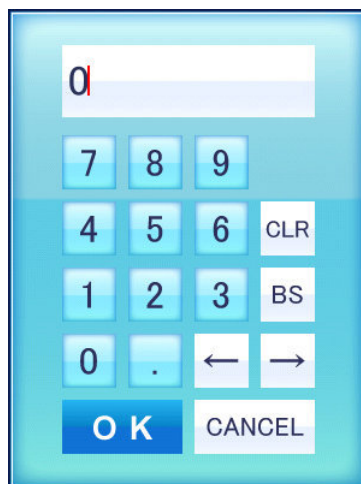


Fig. 4-51. Numerical Keypad

(3) Touch “END” to input the last ID number. The numerical keypad is displayed.

(4) Touch “OK”. The measurement result of a selected ID number is deleted.

4-4-5. BACKUP PARAMETERS

Back up all measurement parameters saved in Hiresta-UX to an USB memory.

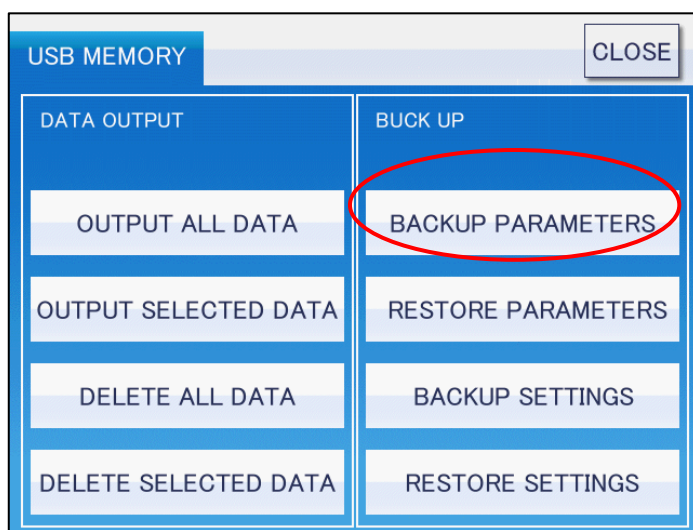


Fig. 4-52. USB Memory

(1) Touch “BACKUP PARAMETERS”. The check window is displayed.



Fig. 4-53. Check Window

- (2) Touch "OK".
All data is backed up to an USB memory.

4-4-6. RESTORE PARAMETERS

Restore the measurement parameters saved in an USB memory in Hiresta-UX.

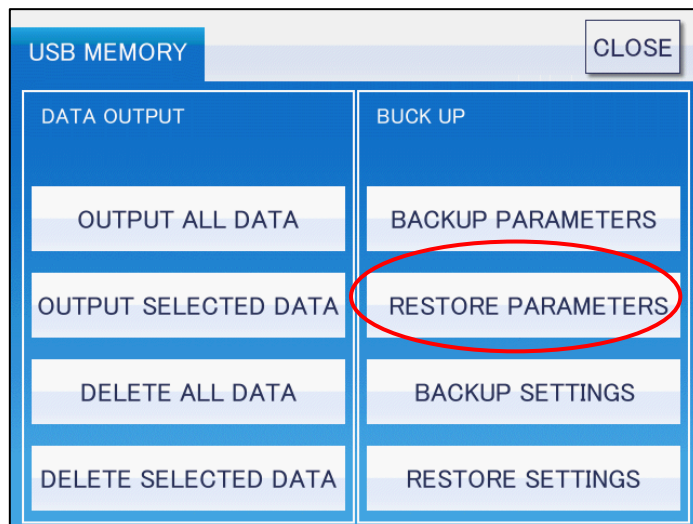


Fig. 4-54. USB Memory

- (1) Touch "RESTORE PARAMETERS". The check window is displayed.

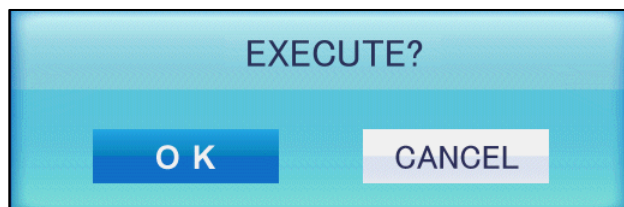


Fig. 4-55. Check Window

- (2) Touch "OK". The measurement parameters saved in an USB memory are restored.

4-4-7. BACKUP SETTINGS

Back up Hiresta-UX setting in an USB memory.

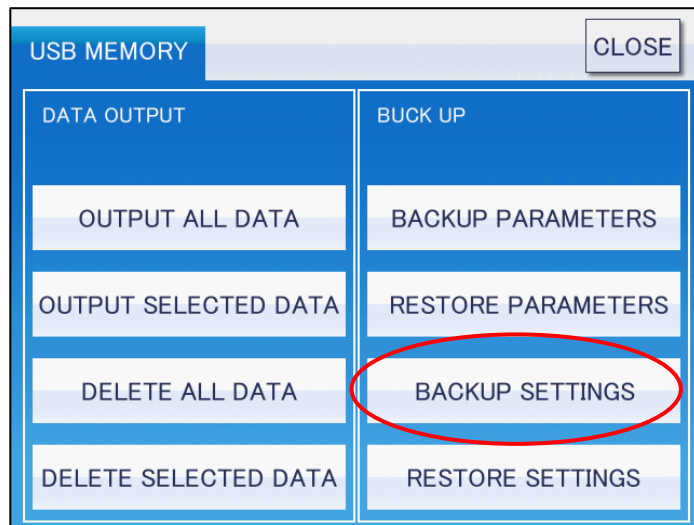


Fig. 4-56. USB Memory

(1) Touch "BACKUP SETTINGS". The check window is displayed.

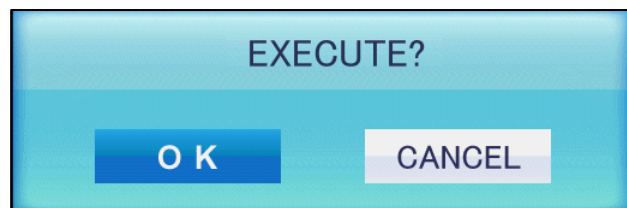


Fig. 4-57. Check Window

(2) Touch "OK". Hiresta-UX setting is backed up in an USB memory.

4-4-8. RESTORE SETTINGS

Restore the unit setting saved in an USB memory in Hiresta-UX.

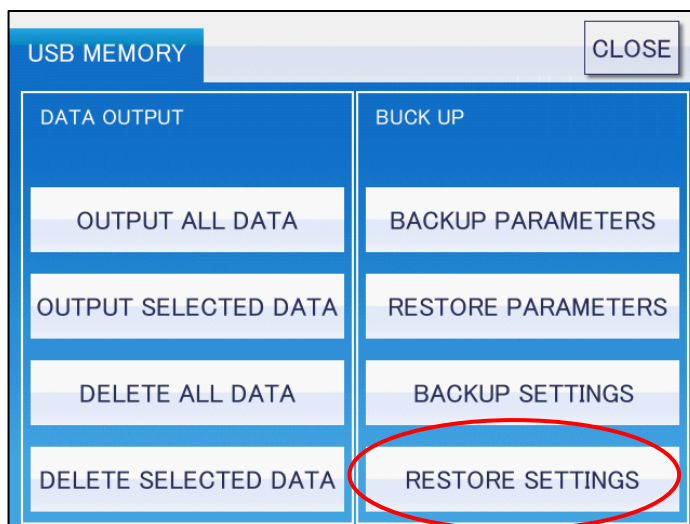


Fig. 4-58. USB Memory

Touch "RESTORE SETTINGS". The check window is displayed.

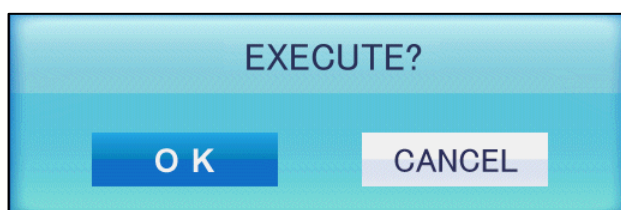


Fig. 4-59. Check Window

(2) Touch "OK".

The unit setting saved in an USB memory is restored.

4-5. SETTINGS

Set Hiresta-UX.

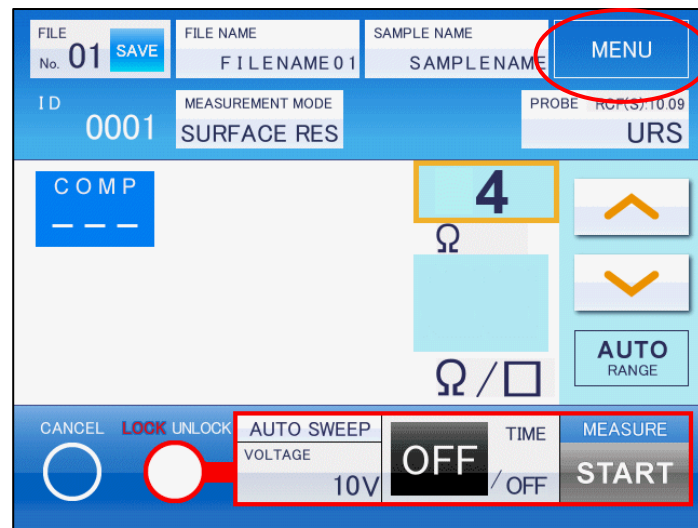


Fig. 4-60. Measurement

(1) Touch “MENU” in the measurement window. The menu window is displayed.

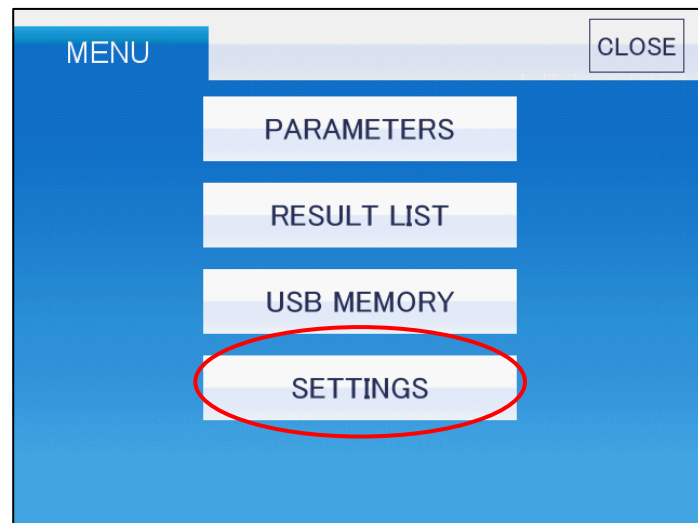


Fig. 4-61. Menu

(2) Touch “SETTINGS”. “SETTINGS” window is displayed.

(3) Touch each item to run it.

4-5-1. REMOTE MODE

Operate Hiresta-UX through a PC.

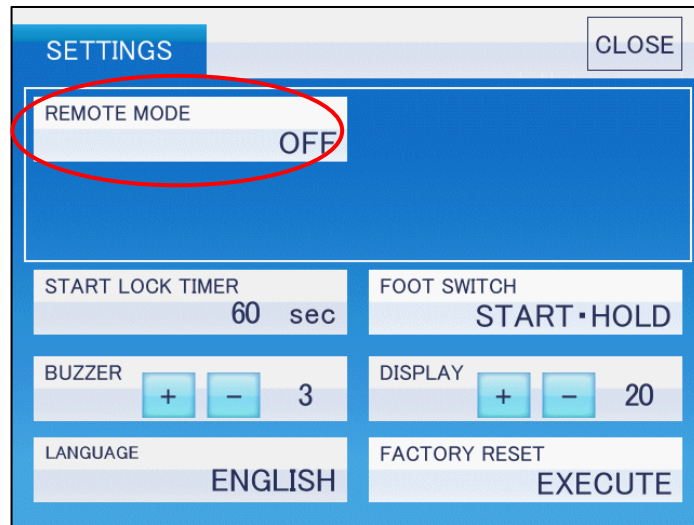


Fig. 4-62. Remote Mode

Touch "REMOTE MODE" to switch "ON" or "OFF".
Set "ON" to display each setting item.
Refer to "Section 7: Remote Mode" for the operation in the remote mode.

4-5-2. START LOCK TIMER

Touch [START LOCK TIMER] button to set the time until start is locked again after unlock.

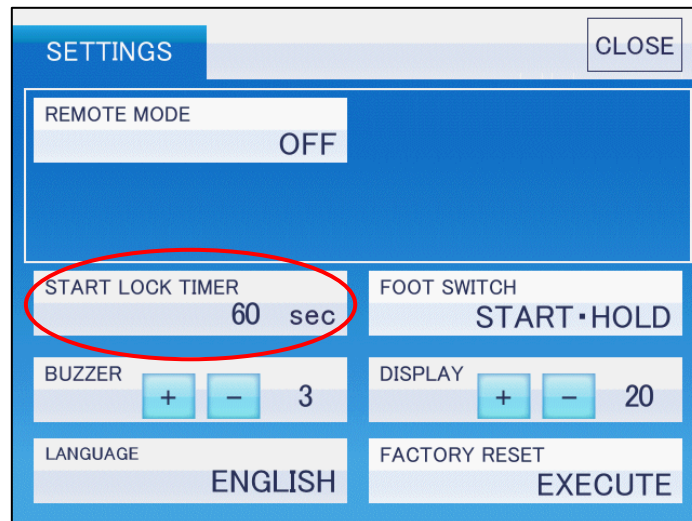


Fig. 4-63. Start Lock Timer

Select a start lock timer from “OFF”, “10 sec”, “30 sec”, “1 min”, “5 min”, “10 min”, or “EXT”.



Fig. 4-64. Start Lock Timer

Touch “EXT” to display the numerical keypad for input.

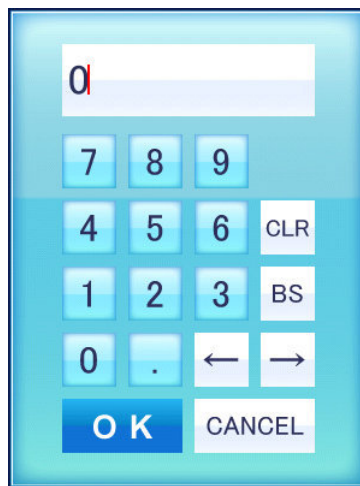


Fig. 4-65. Numerical Keypad

After inputting time, touch “OK”. 1 to 999 seconds can be set.

4-5-3. FOOT SWITCH

When connecting the optional foot switch, set the operation.

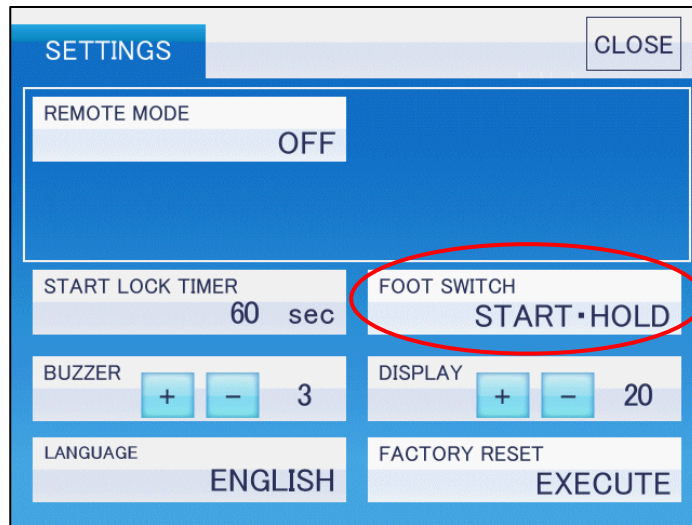


Fig. 4-66. Foot Switch

Touch “FOOT SWITCH” to select “START·HOLD” or “INTERLOCK” .

- **START·HOLD**

Measurement can be started or ended with the foot switch.

Operate the start lock function in the measurement window of Hiresta-UX.

- **START LOCK**

Start lock function can be operated with the foot switch. At this time, the start lock button can not be operated in the measurement window.

POINT

By setting “START LOCK”, the lock can not be released even by touching [START LOCK] button. To release the lock in the measurement window, set “FOOT SWITCH” to “START·HOLD”.

4-5-4. BUZZER

Set the buzzer volume when touching panels.

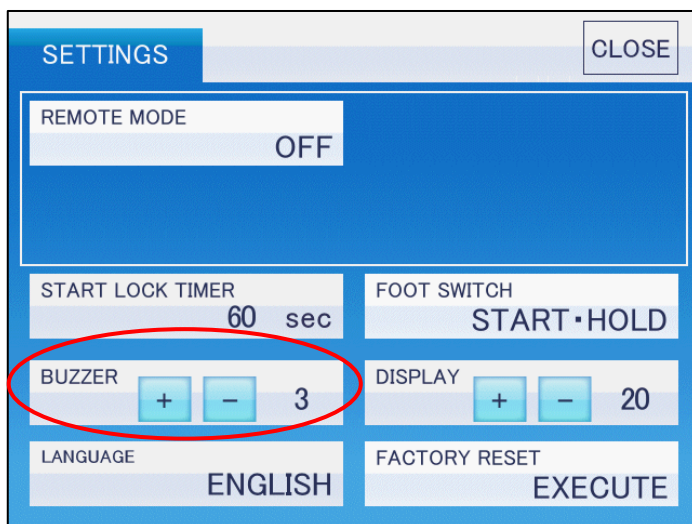


Fig. 4-67. Buzzer Volume

Touch [+] or [-] button to set the volume.

4-5-5. DISPLAY

Set window brightness.

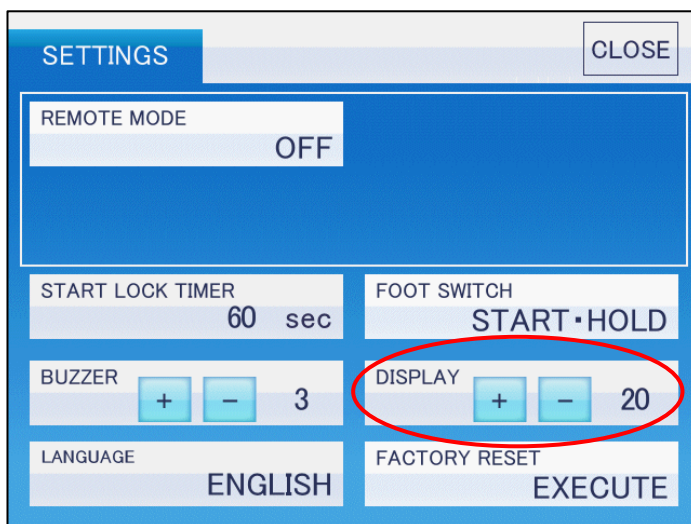


Fig. 4-68. Window Brightness

Touch [+] or [-] button to set the brightness.

4-5-6. LANGUAGE

Set a display language.

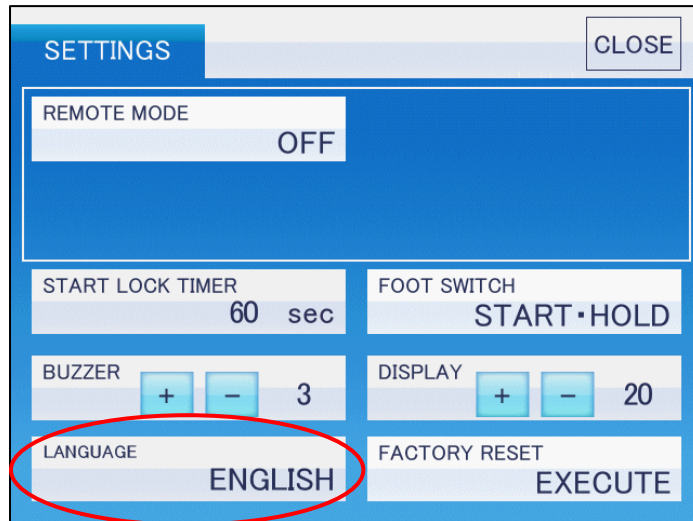


Fig. 4-69. Language

Touch “Language” to select “English”.

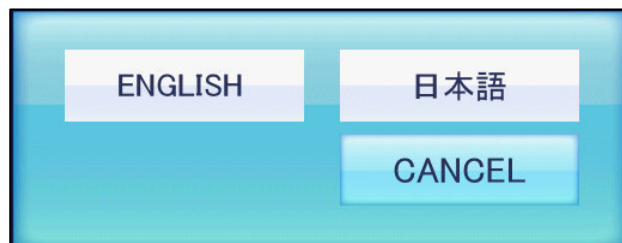


Fig. 4-70. Language

4-5-7. FACTORY RESET

Restore Hiresta-UX to default.

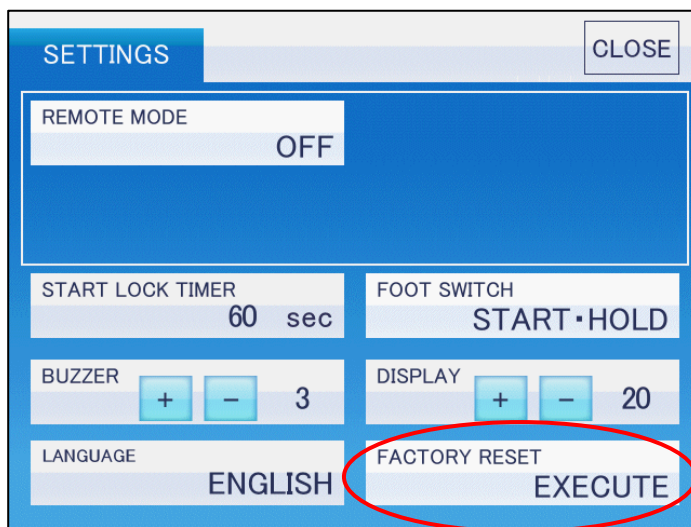


Fig. 4-71. FACTORY RESET

(1) Touch “FACTORY RESET”. The check window is displayed.

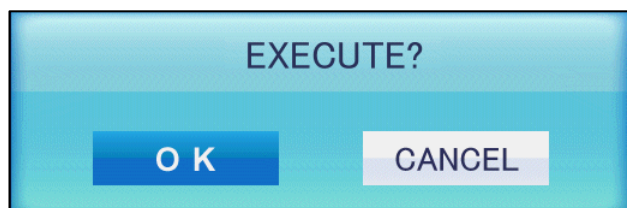


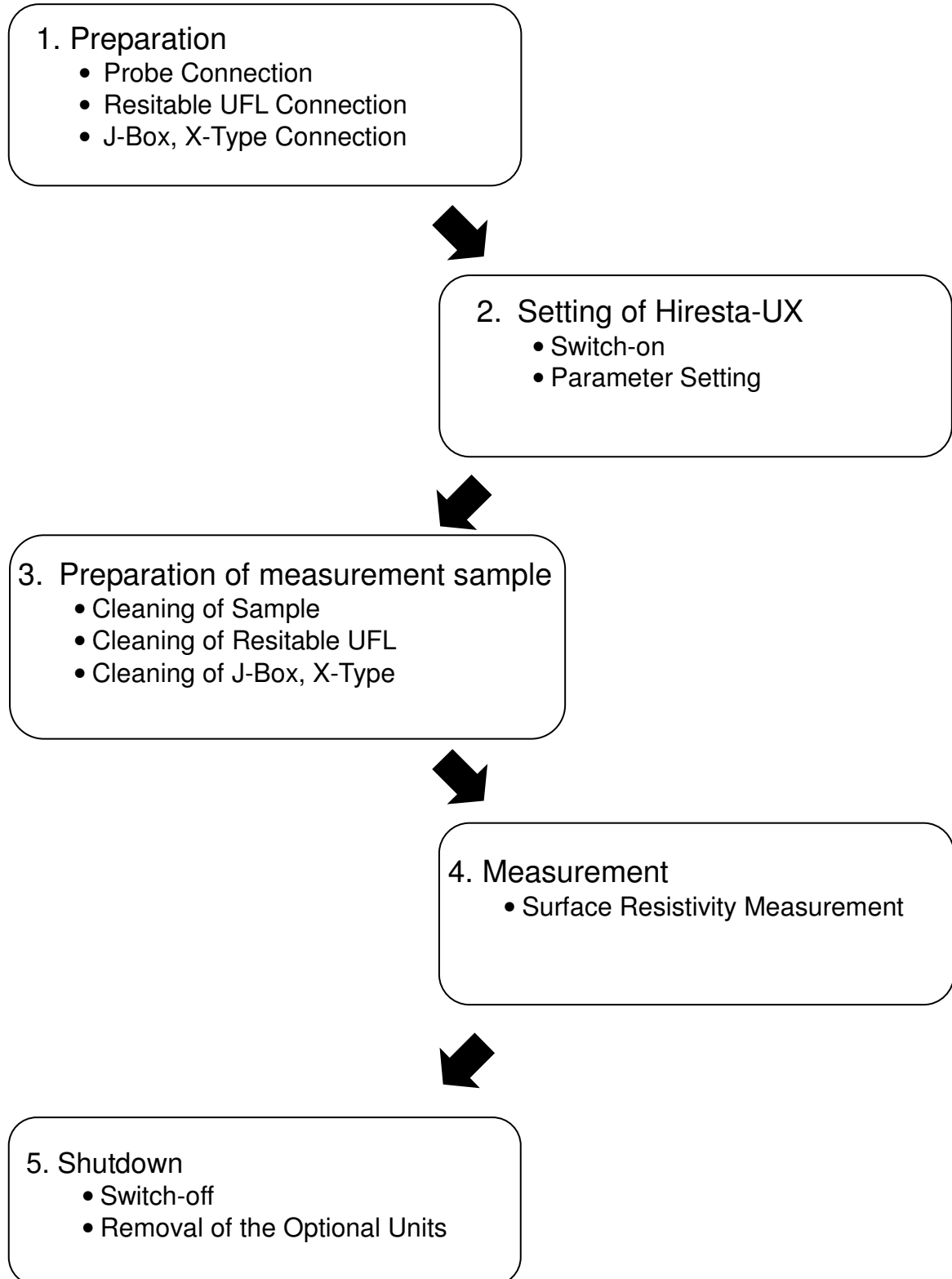
Fig. 4-72. Check Window

(2) Touch “OK”. All measurement results and parameter settings are deleted.
The setting is restored to default.

(3) Turn off the power switch by the window instructions.

Section 5: Surface Resistivity Measurement

5-1. Measurement Flow



5-2. Measurement Method 1

5-2-1. Preparation

- (1) Set a probe by referring to “2-2-1. Probe Connection”.
- (2) Prepare a measurement table. When using Resitable UFL, set Resitable UFL by referring to 2-2-2. Connection of Resitable UFL (Option).

POINT

Highly-sensitive measurement is effected by an electromagnetic field.
Measure on the exclusive measurement table, Resitable UFL.

5-2-2. Hiresta-UX Setting

- (1) Turn on the power switch of Hiresta-UX.
 - (2) Select measurement parameters in the measurement window.
Set the following measurement parameters.
Touch Item 1 to 3 in the measurement window to display the setting window. For “4. Comparator”, display the comparator setting with “2” tab by touching “MENU”-“PARAMETERS”.
1. Probe (Refer to “4-2-6. PROBE”.)
 2. Voltage (Refer to “4-2-7. VOLTAGE”.)
 3. Timer (Refer to “4-2-8. TIMER”.)
 4. Comparator (Refer to “4-2-9. COMPARATOR”.)

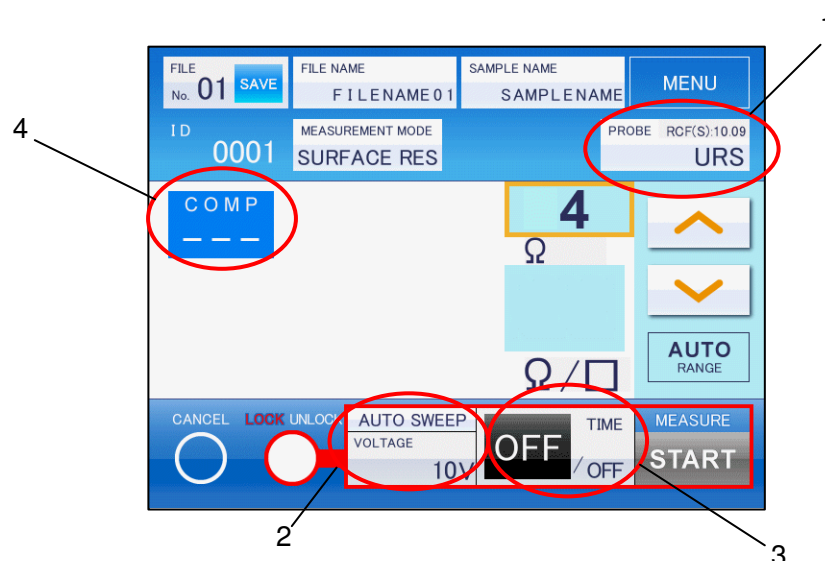


Fig. 5-1. Measurement Parameter Setting

POINT

- Consider sample resistance (refer to “10-1. Measurement Characteristic”.) and insulation resistance to confirm applied voltage. Applied voltage also can be set in the measurement window.
- It takes some time to stabilize measurement data in the range of $10^{10}\Omega$ or more resistance. Refer to “Table 5-1. Timer Time Indications” to set it. Depending on samples, the timer time changes.

Table 5-1. Timer Time Indications

Applied voltage Measurement range	10V	100V	250V	500V	1000V
$10^{10}\Omega$	30 secs.	10 secs.	10 secs.	10 secs.	10 secs.
$10^{11}\Omega$		30 secs.	30 secs.	30 secs.	30 secs.
$10^{12}\Omega$				1 min.	1 min.
$10^{13}\Omega$					5 mins.
$10^{14}\Omega$					10 mins.

5-2-3. Preparation of Measurement Samples

- (1) Wipe off the Resitable UFL surface with ethanol-soaked cloth. When using the measurement table except Resitable UFL, clean the table by the use method.
- (2) Put sample on the surface of Resitable UFL.

POINT

When waste, dust, or dirt attaches to the surfaces of the measurement table or sample, measurement can not be run correctly. Data repeatability is bad. The characteristics of high-resistivity samples change largely depending on temperature and humidity.

Resitable UFL has the surfaces of metal and insulating plates (Teflon®). When sample is put on the metal surface, measurement is run by the method based on JIS K 6911. However, for thin samples such as paper and film, etc., current may not flow between ring electrodes rather than to flow into the metal surface of Resitable UFL to interrupt measurement. In this case, measurement can be run stably in the Teflon® side of Resitable UFL.

5-2-4. Measurement

WARNING

High voltage (up to DC 1000V) is applied on the probe electrodes.
Never touch them while high voltage is applied to prevent electric shocks which may lead to death.

CAUTION

Do not press the probe electrode into sample or release it while high voltage is applied. By the operation while high voltage is applied, temporary discharge causes sample damage, and unit break.
Do not turn the main power off during measurement. Before the main power off, the [Start Lock] button must be off. Omission the process causes unit break.

(1) Check that the measurement window is displayed.

(2) Touch “RANGE” to set “AUTO”.

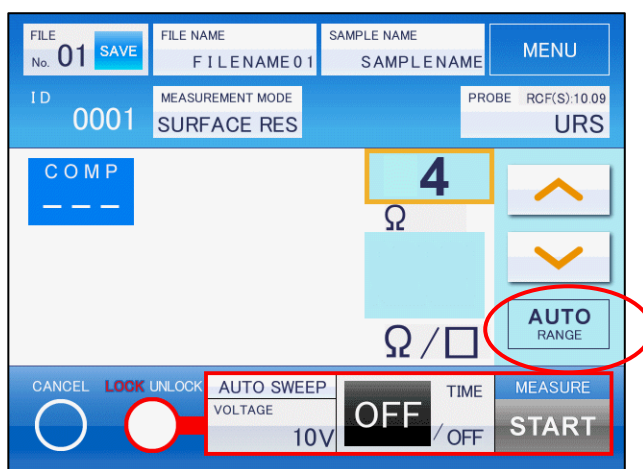


Fig. 5-2. Range Change

POINT

Press [Δ] or [∇] to set the measurement start range. When a resistance value is known, it is useful to set the range to the value.

At the automatic range change, the range is up-and-down repetitively depending on samples. In this case, change the range to the manual one (available during measurement) and press [Δ] or [∇] to set the range.

- (3) Press the probe electrode into sample. Press the probe electrode into sample so that the whole surface of the probe outer electrode is pressed evenly into sample. Refer to “Fig. 5-3. Way to Press the Probe”.

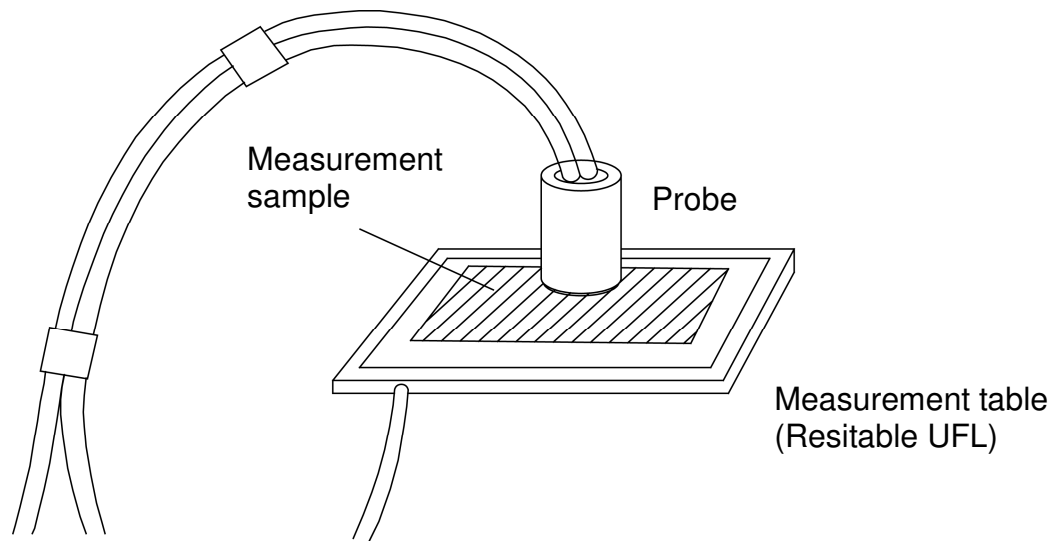


Fig. 5-3. How to Press the Probe

- (4) Press [START LOCK] button to release the lock.

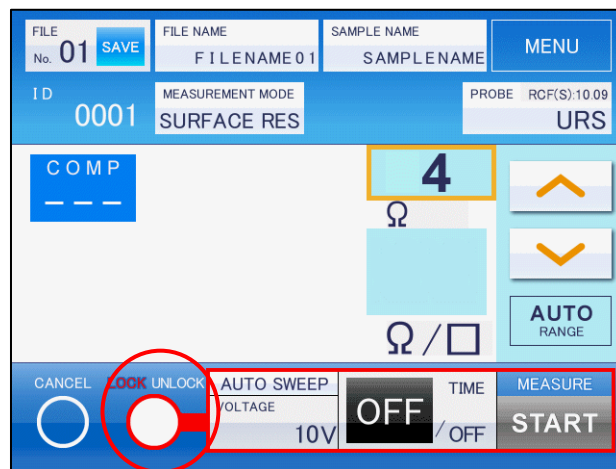


Fig. 5-4. Lock Release

(5) Touch [START] button. Measurement starts and data are displayed.

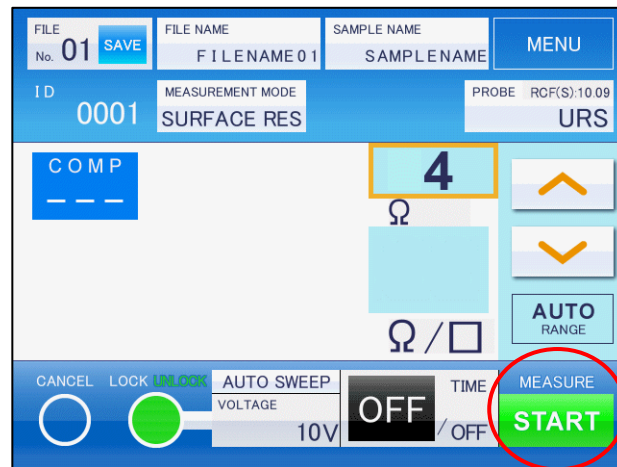


Fig. 5-5. Measurement Start

(6) When measurement is completed, touch [HOLD] button. Measurement is ended.

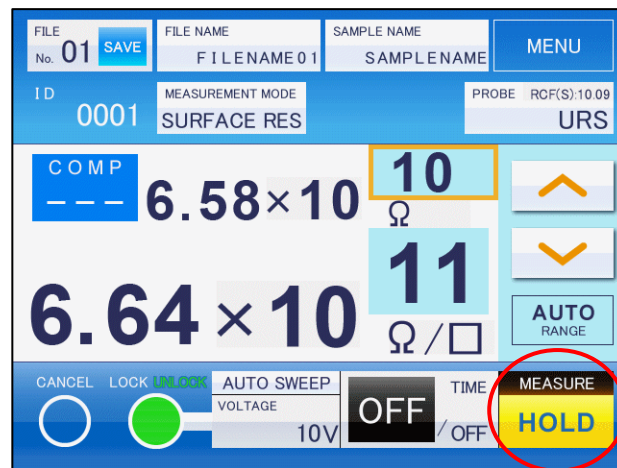


Fig. 5-6. Measurement End

* At timer measurement, measurement is ended automatically after preset time passes.

POINT

Touch [HOLD] button during timer measurement to suspend measurement.
Touch [HOLD] button during measurement to cancel measurement.

Measurement data are not saved.

After the second measurement, the values of the previous measurement are displayed.

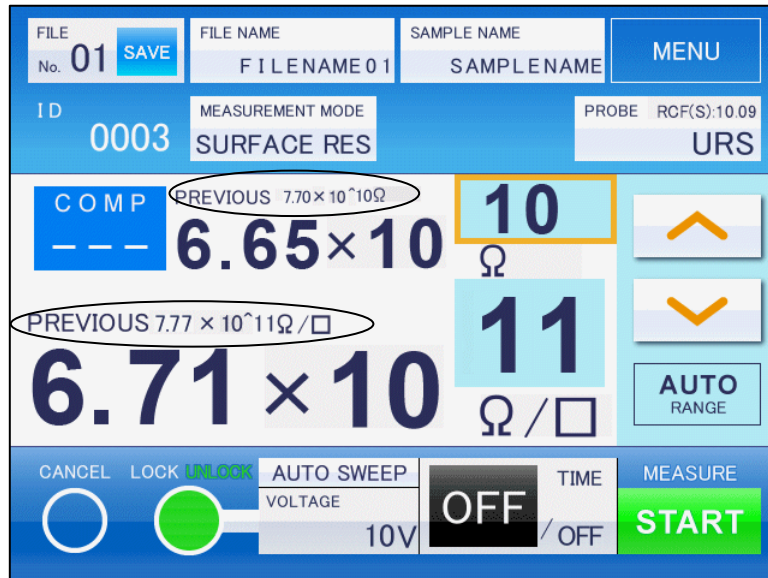


Fig. 5-7. Values of the Previous Measurement

- (7) Release the probe from sample.
- (8) Remove sample from Resitable UFL.

5-3. Measurement Method 2 (When using J-Box X-Type)

When using J-Box X-Type, measurement is run based on “JIS K 6911-2006”.
Fully read the instruction manual of J-Box X-Type before use.

5-3-1. Preparation

Set J-Box X-Type by referring to “2-2-3. Connection of J-Box X-Type (Option)”.

5-3-2. Hiresta-UX Setting

(1) Turn on the power switch of Hiresta-UX.

POINT

For the performance to the specifications, more than 30 minutes of warm-up is required after power-on.

(2) Refer to (2) of “5-2-2. Hiresta-UX Setting” to set measurement parameters.

5-3-3. Preparation of Measurement Samples

(1) Open the top cover of J-Box X-Type.

(2) Wipe off the electrode surface of J-Box X-Type with dust-free paper.

(3) Put sample on the electrode surface of J-Box X-Type.

(4) Close the top cover of J-Box X-Type.

POINT

When waste, dust, or dirt attaches to the surface of the measurement table or sample, measurement can not be run accurately.

Data repeatability is bad. The characteristics of high-resistivity samples change largely depending on temperature and humidity.

Put sample on the electrode surface to cover the surface.

When the electrode is protruded from sample, measurement can not be run accurately.

5-3-4. Measurement

- (1) Check that the measurement window is displayed.
- (2) Touch “RANGE” to set “AUTO”.

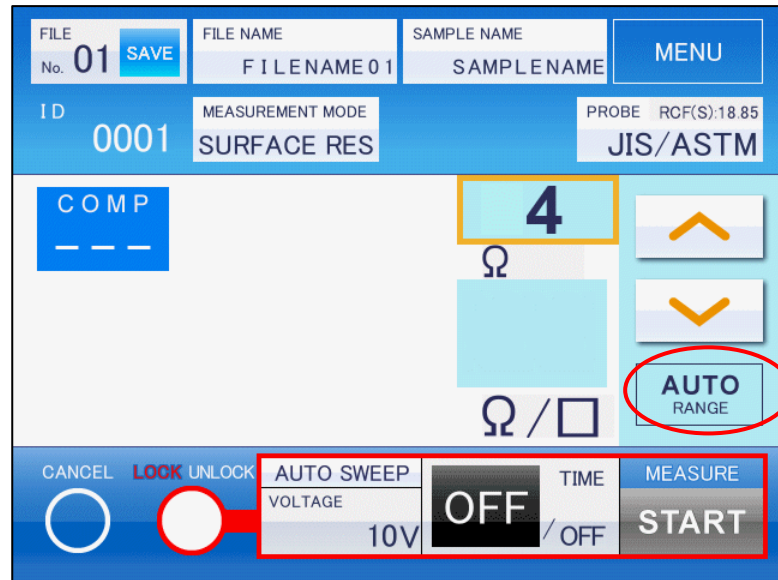


Fig. 5-8. Range Switching

POINT

Press [Λ] or [V] to set the measurement start range. When a resistance value is known, it is useful to set the range to the value. At the automatic range change, the range is up-and-down repetitively depending on samples. In this case, change the range to the manual one (available during measurement) and press [Λ] or [V] to set the range.

- (3) Press [START LOCK] button to release the lock.

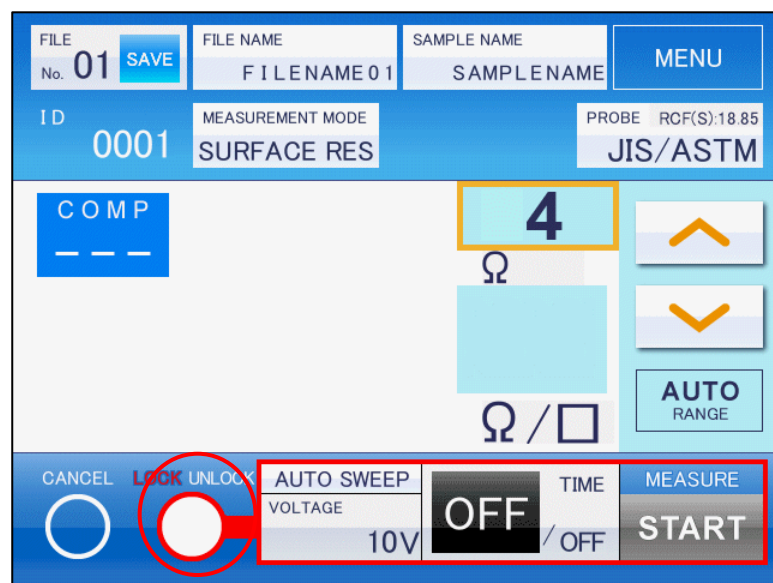


Fig. 5-9. Lock Release

(4) Touch [START] button. Measurement starts and data are displayed.

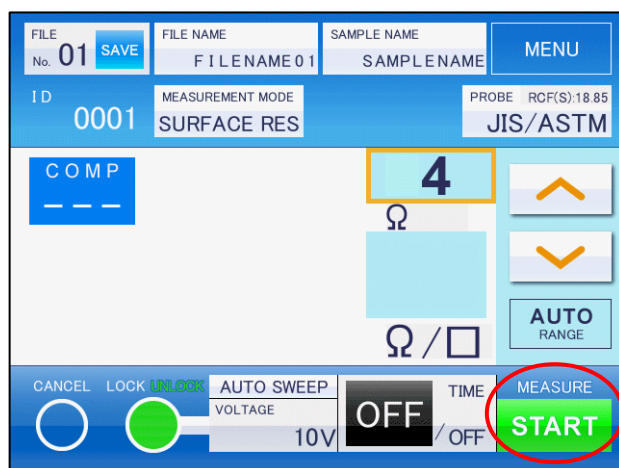


Fig. 5-10. Measurement Start

POINT

The top cover of J-Box X-Type is an interlock. Measurement can be run only while the cover is closed. When the cover is opened during measurement, measurement is suspended.

(5) When measurement is completed, touch [HOLD] button. Measurement is ended.

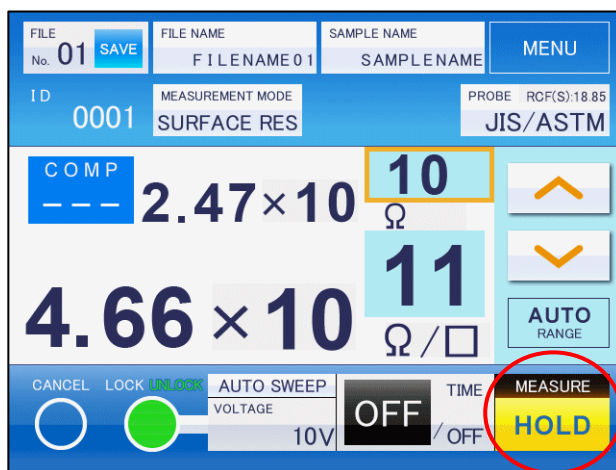


Fig. 5-11. Measurement End

* At timer measurement, measurement is ended automatically after preset time passes.

POINT

Touch [HOLD] button during timer measurement to suspend measurement.
 Touch [HOLD] button during measurement to cancel measurement.
 Measurement data are not saved. After the second measurement, the values of the previous measurement are displayed.

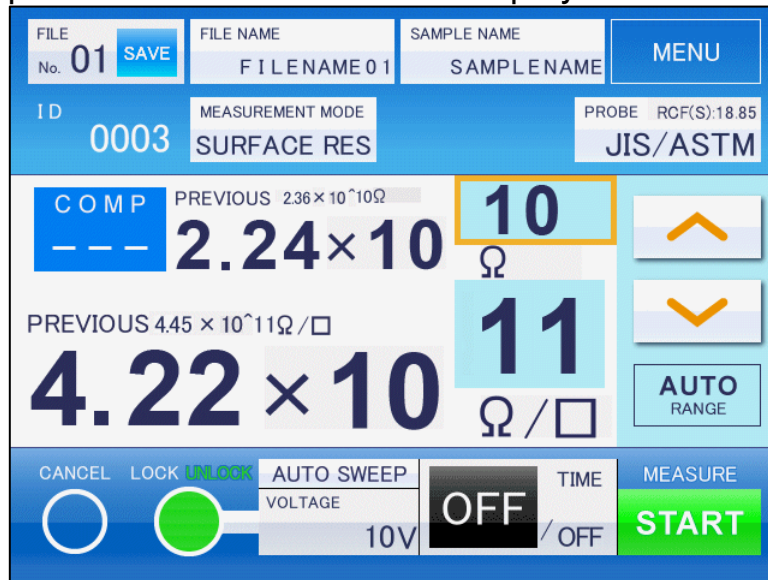


Fig. 5-12. Values of the Previous Measurement

- (6) Open the top cover of J-Box X-Type.
- (7) Remove sample from J-Box X-Type.

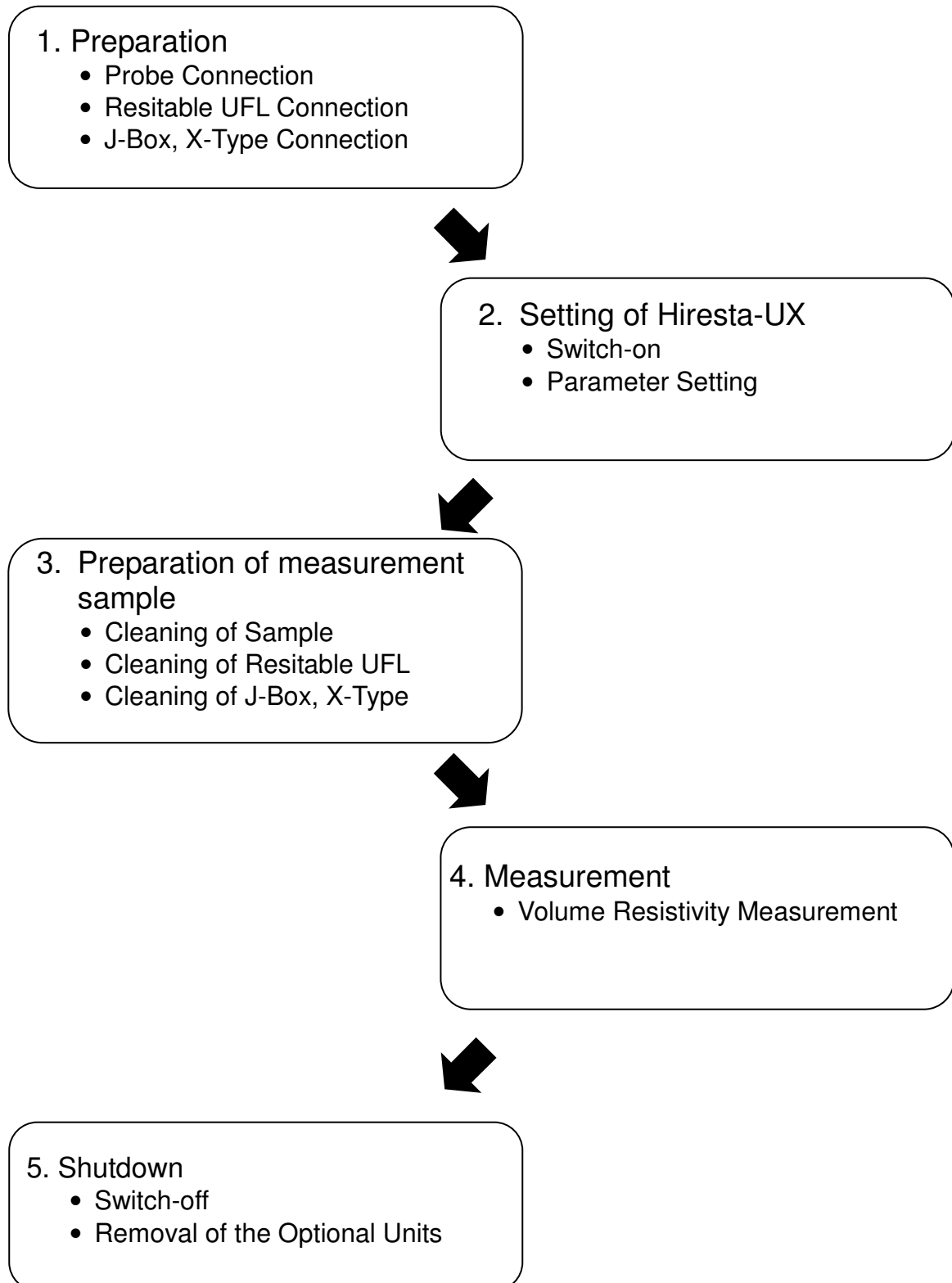
5-4. Shut Down

- (1) Check that Hiresta-UX is not measuring.
- (2) Turn off the power switch of Hiresta-UX.
- (3) Remove the probe and Resitable UFL.
- (4) Wipe off the Resitable UFL surface with ethanol-soaked cloth.
- (5) Open the top cover of Hiresta-UX and store the probe checker and the probe.
- (6) Close the top cover of Hiresta-UX.
- (7) For other optional items, read the instruction manuals and store them.

Section 6: Volume Resistivity Measurement

For volume resistivity measurement, Resitable UFL of the optional item or J-Box X-Type is required. Always measure with the item.

6-1. Measurement Flow



6-2. Measurement Method 1 (When Using Resitable UFL)

6-2-1. Preparation

- (1) Set the probe, Resitable UFL, and the foot switch by referring to “2-2-2. Connection of Resitable UFL (Option)”.

6-2-2. Hiresta-UX Setting

- (1) Turn on the power switch of Hiresta-UX.
- (2) Touch “MEASUREMENT MODE” in the measurement window to change to “VOLUME RES”.

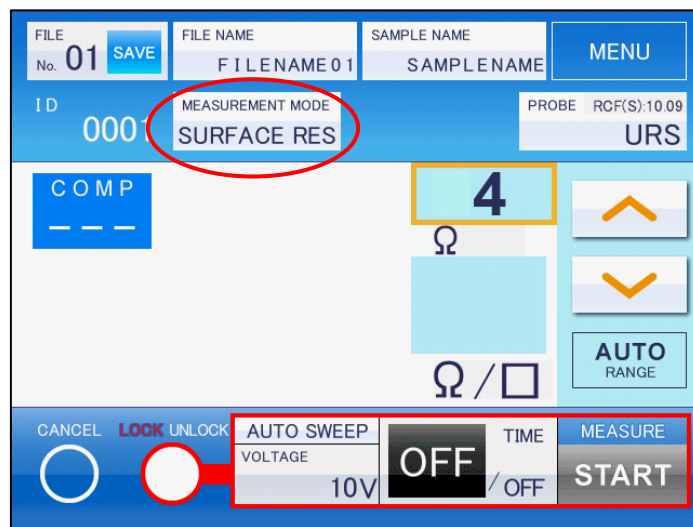


Fig. 6-1. Volume Resistivity

- (3) Select measurement parameters in the measurement window. Set the following measurement parameters.

Touch Item 1 to 4 in the measurement window to display the setting window. For “5. Comparator”, display the comparator setting with “2” tab by touching “MENU”-“PARAMETERS”.

1. Probe (Refer to “4-2-6. PROBE”.)
2. Applied voltage (Refer to “4-2-7. VOLTAGE”.)
3. Timer (Refer to “4-2-8. TIMER”.)
4. Sample thickness (Refer to “4-2-4. THICKNESS”.)
5. Comparator (Refer to “4-2-9. COMPARATOR”.)

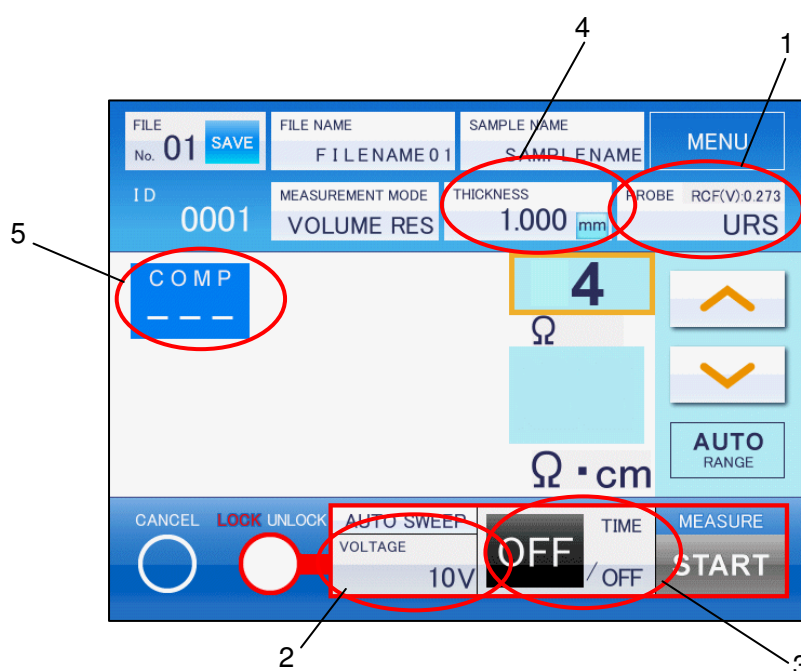


Fig. 6-2. Setting of Measurement Parameters

POINT

Consider sample resistance (refer to “10-1. Measurement Characteristic”.) and insulation resistance to confirm applied voltage.

Applied voltage also can be set in the measurement window.

It takes some time to stabilize measurement data in the range of $10^{10}\Omega$ or more resistance.

Refer to “Table 5-1. Timer Time Indication” to set it. Depending on samples, the timer time changes.

6-2-3. Preparation of Measurement Samples

- (1) Wipe off the Resitable UFL metal surface with ethanol-soaked cloth.
- (2) Put sample on the metal surface of Resitable UFL.

6-2-4. Measurement

WARNING

High voltage (up to DC 1000V) is applied on the metal surface of Resitable UFL. Never touch it while high voltage is applied to prevent electric shocks which may lead to death.

High voltage (up to DC 1000V) is applied on the probe electrode.

Never touch it while high voltage is applied to prevent electric shocks which may lead to death.

WARNING

Always put on the attached insulated gloves at measurement. When the probe slips out of a hand, the gloves prevent touching directly the metal surface of Resitable UFL. Before putting on gloves, check that they do not have a hole. If they have a hole, they are not protective.

Change them with new ones.

CAUTION

Do not press the probe electrode into sample or release it while high voltage is applied.

By pressing the electrode into sample or release it while high voltage is applied, temporary discharge causes sample damage, and unit break.

Do not turn OFF the unit power switch during measurement.

Always turn off the power switch while [START LOCK] is OFF.

- (1) Put on the attached insulated gloves.
- (2) Check that the measurement window is displayed.
- (3) Touch "RANGE" to set "AUTO".

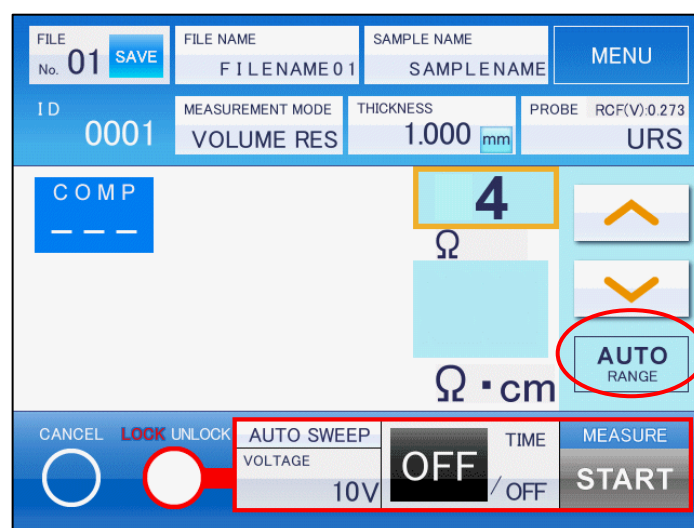


Fig. 6-3. Range Switching

POINT

- Press [\wedge] or [\vee] to set the measurement start range. When a resistance value is known, it is useful to set the range to the value.
- When switching to the automatic range, the range is up-and-down repetitively depending on samples. In this case, change the range to the manual one (available during measurement) and press [\wedge] or [\vee] to set the range.

(4) Press the probe electrode into sample. Refer to “Fig. 5-3. How to Press the Probe”.

(5) Press [START LOCK] button to release the lock.

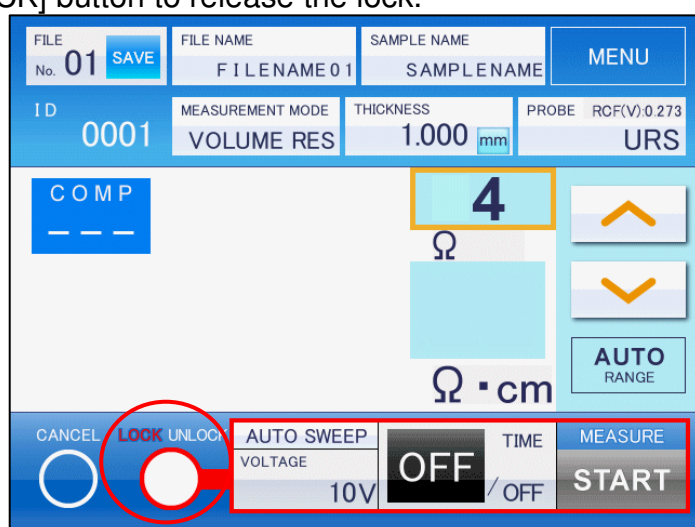


Fig. 6-4. Lock Release

(6) Touch [START] button. Measurement starts and data are displayed.

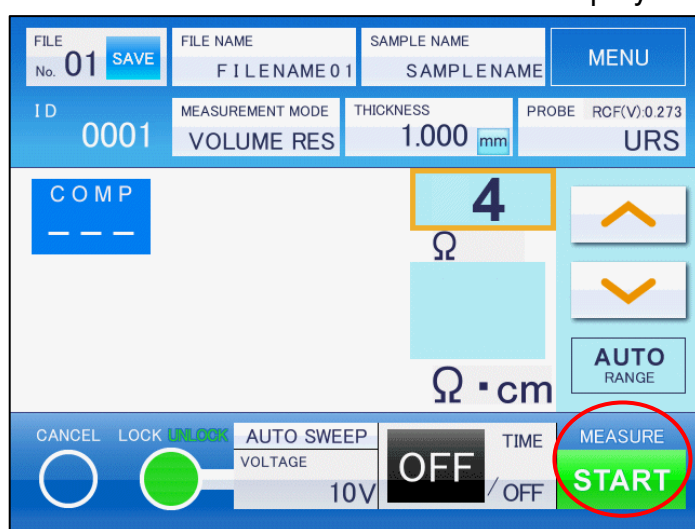


Fig. 6-5. Measurement Start

(7) When measurement values are stable, touch [HOLD] button. Measurement is ended.

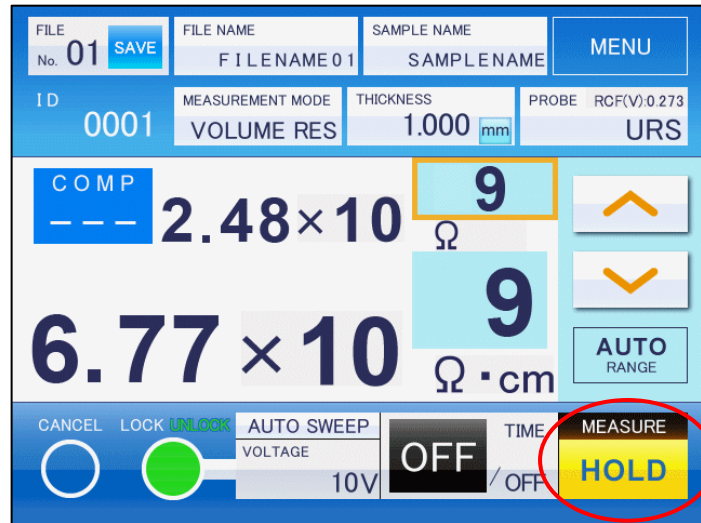


Fig. 6-6. Measurement End

* At timer measurement, measurement is ended automatically after preset time passes.

POINT

- Touch [HOLD] button during timer measurement to suspend measurement.
- Touch [HOLD] button during measurement to cancel measurement. Measurement data is not saved.
- After the second measurement, the values of the previous measurement are displayed.

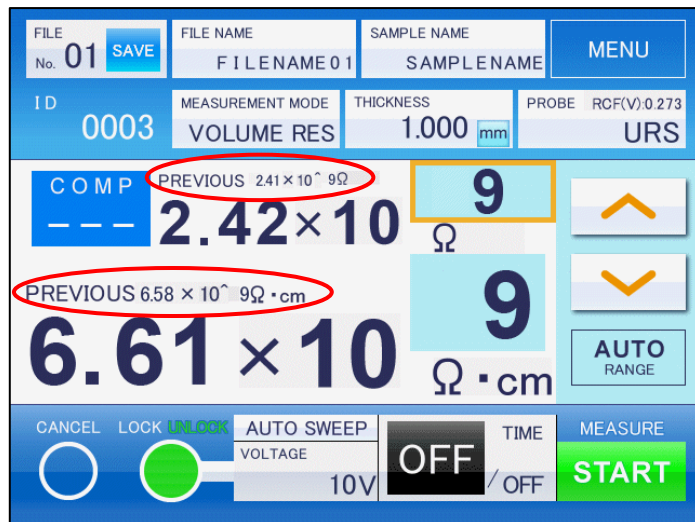


Fig. 6-7. Values of the Previous Measurement

(8) Release the probe from sample.

(9) Remove sample from Resitable UFL.

6-3. Measurement Method 2 (When using J-Box X-Type)

When using J-Box X-Type, measurement is run based on “JIS K 6911-2006”.
Fully read the instruction manual of J-Box X-Type before use.

6-3-1. Preparation

Set J-Box X-Type by referring to “2-2-3. Connection of J-Box X-Type (Option) ”.

6-3-2. Hiresta-UX Setting

(1) Turn on the power switch of Hiresta-UX.

POINT

For the performance to the unit specifications, more than 30 minutes of warm-up is required after power-on.

(2) Refer to (2) of “6-2-2. Hiresta-UX Setting” to set measurement parameters.

(3) Touch “MEASUREMENT MODE” in the measurement window to change to “VOLUME RES”.

6-3-3. Preparation of Measurement Samples

(1) Open the top cover of J-Box X-Type.

(2) Wipe off the electrode surface of J-Box X-Type with dust-free paper.

(3) Put sample on the electrode surface of J-Box X-Type.

(4) Close the top cover of J-Box X-Type.

POINT

When waste, dust, or dirt attaches to the surface of J-Box X-Type electrode or sample, measurement can not be run accurately.

Data repeatability is bad. The characteristics of high-resistivity samples change largely depending on temperature and humidity.

Put sample on the electrode surface to cover the surface.

When the electrode is protruded from sample, measurement can not be run accurately.

6-3-4. Measurement

- (1) Check that the measurement window is displayed.
- (2) Touch “RANGE” to set “AUTO”.

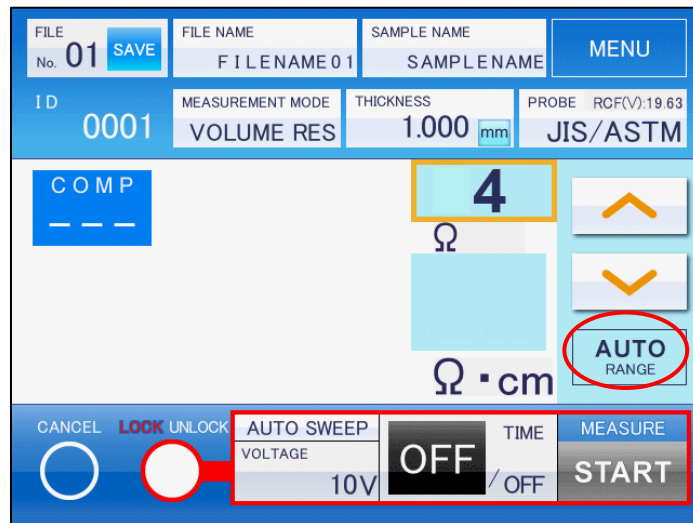


Fig. 6-8. Range Change

POINT

- Press [\wedge] or [\vee] to set the measurement start range. When a resistance value is known, it is useful to set the range to the value.
- When switching to the automatic range, the range is up-and-down repetitively depending on samples. In this case, change the range to the manual one (available during measurement) and press [\wedge] or [\vee] to set the range.

- (3) Press [START LOCK] button to release the lock.

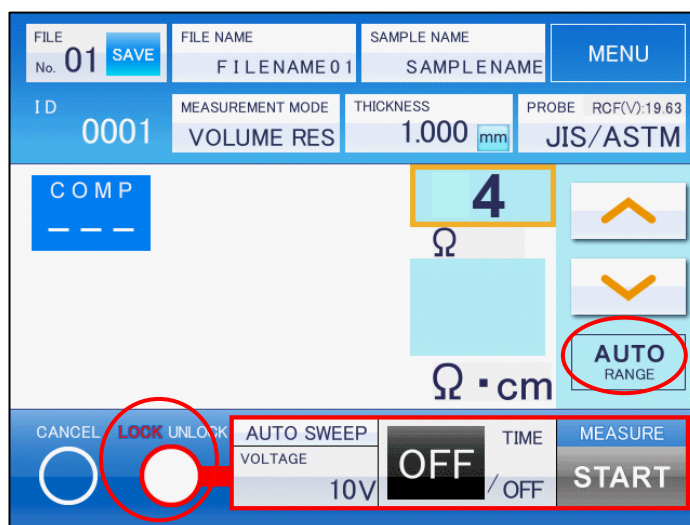


Fig. 6-9. Lock Release

- (4) Touch [START] button.

Measurement starts and data are displayed. At this time, “Measure” flashes.

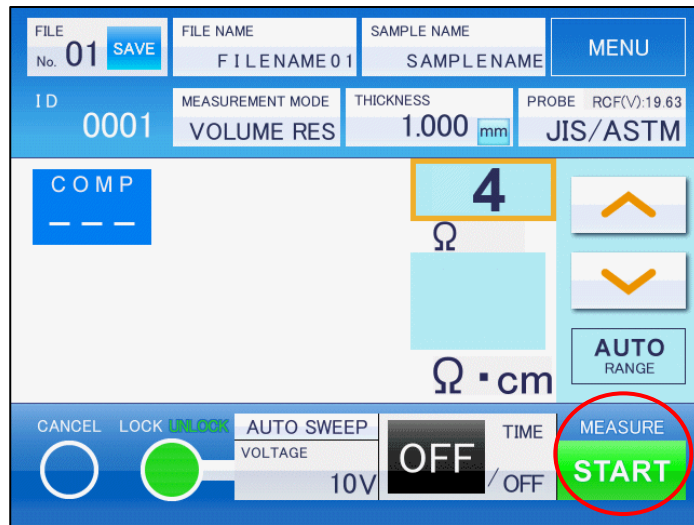


Fig. 6-10. Measurement Start

POINT

The top cover of J-Box X-Type is an interlock. Measurement can be run only while the cover is closed. When the cover is opened during measurement, measurement is suspended.

- (5) When measurement values are stable, touch [HOLD] button.
Measurement is ended.

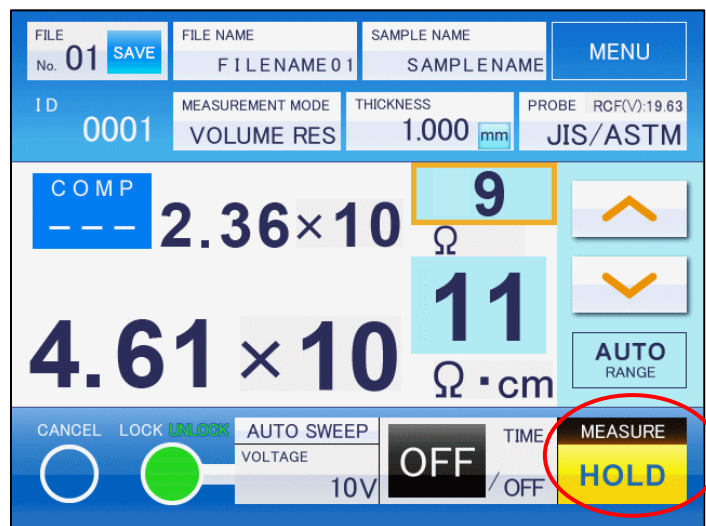


Fig. 6-11. Measurement End

* At timer measurement, measurement is ended automatically after preset time passes.

POINT

Touch [HOLD] button during timer measurement to suspend measurement.

Touch [HOLD] button during measurement to cancel measurement.

Measurement data are not saved.

After the second measurement, the values of the previous measurement are displayed.

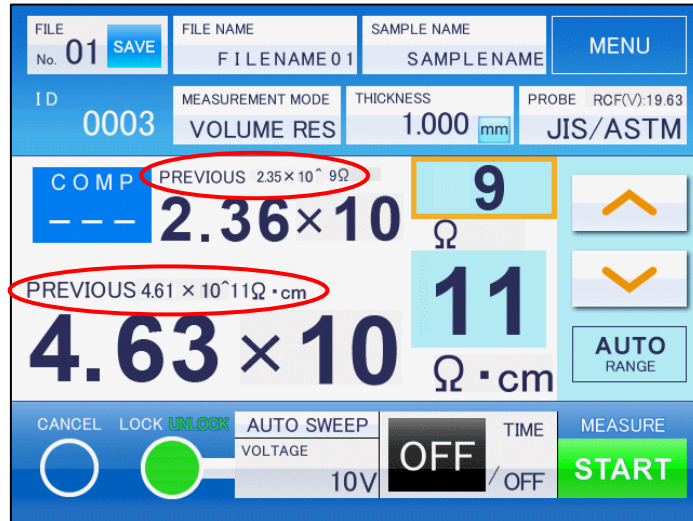


Fig. 6-12. Values of the Previous Measurement

(6) Open the top cover of J-Box X-Type.

(7) Remove sample from J-Box X-Type.

6-4. Shut Down

- (1) Check that Hiresta-UX is not measuring.
- (2) Turn off the power switch of Hiresta-UX.
- (3) Remove the probe and Resitable UFL.
- (4) Wipe off the surfaces of a probe and Resitable UFL with ethanol-soaked cloth.
- (5) Open the top cover of Hiresta-UX and store the probe checker and the probe.
- (6) Close the top cover of Hiresta-UX.
- (7) For other optional items, read the instruction manuals and store them.

Section 7: Remote Mode

7-1. Outline

Touch [START COM] in “SETTINGS” window to display the remote mode window. By serial communication with a USB memory, the resistance measurement by the Hiresta-UX, data reading and data output can be run.

Previously set communication parameters in the local environment and start this mode.



Fig. 7-1. Remote Mode

7-2. Control Function

- Measurement parameter setting and measurement operation are possible.
- The unit parameters can not be set.
- Measurement data can not be saved.
- The automatic range change and timer measurement are impossible.

7-3. Setting of Remote Mode

Set communication parameters in the local environment.

(1) Touch [SETTINGS] in MENU window.

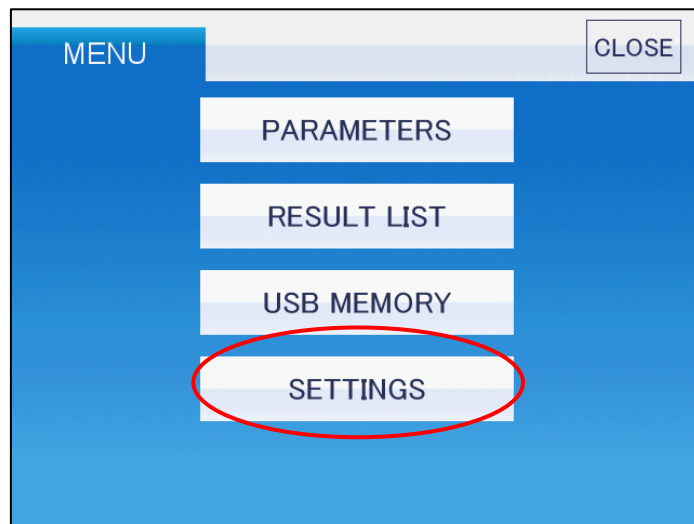


Fig. 7-2. MENU Window

(2) Touch [REMOTE MODE] in "SETTINGS" window.
"USB" (or "RS232C"), "START COM", and "COM. SETTINGS" are displayed.

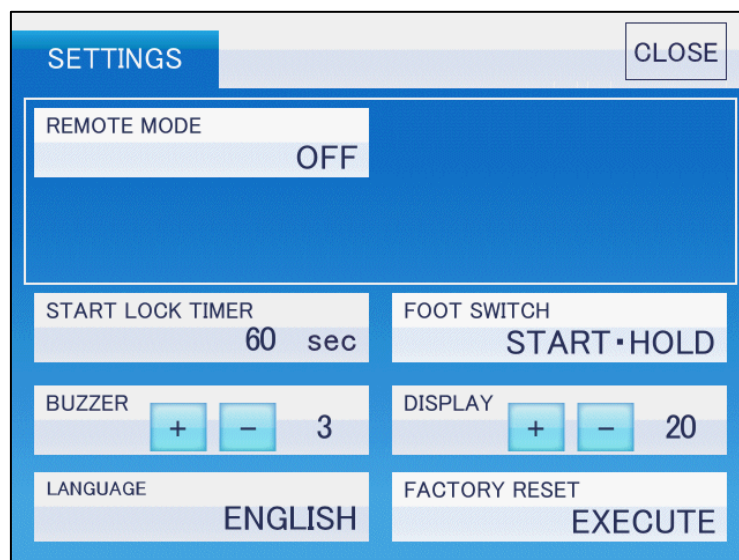


Fig. 7-3. SETTINGS Window

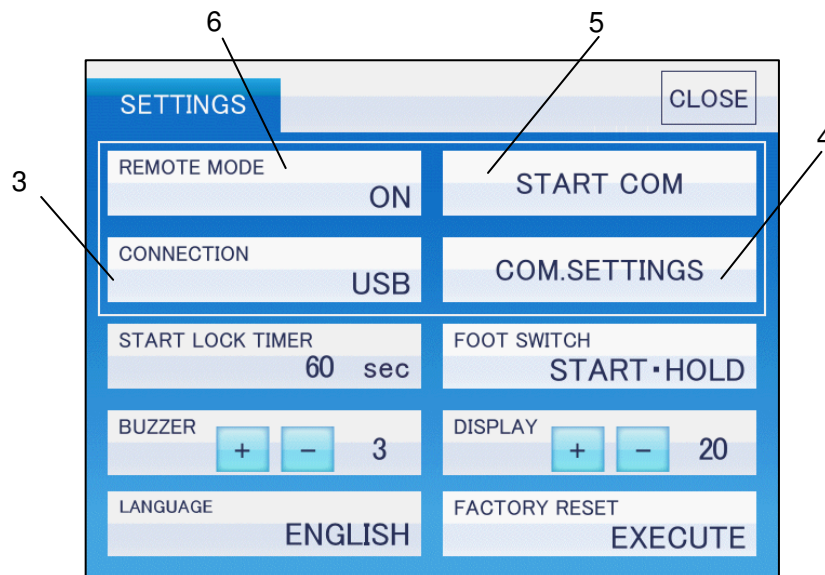


Fig. 7-4. Remote Mode Setting

- (3) Touch “CONNECTION” and select “USB”.
- (4) Touch “COM. SETTING” to set “BAUD RATE”, “DATA”, “PARITY”, “STOP”, and “FLOW CONTROL”.

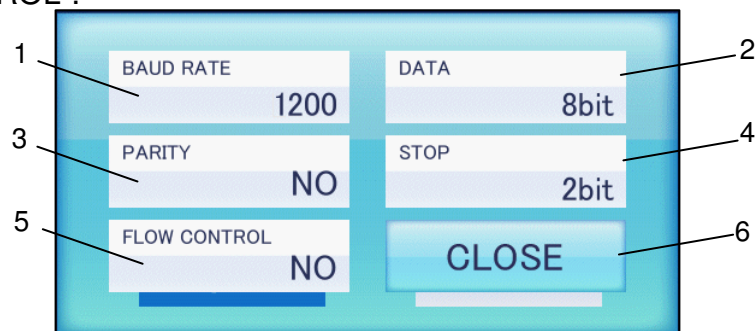


Fig. 7-5. Communication Setting

Table 7-1. Contents of Communication Setting

No.	Window indications	Contents
1	BAUD RATE	Select “1200”, “2400”, “4800”, “9600”, or “19200”.
2	DATA	Select “8bit” or “7bit”.
3	PARITY	Select “EVEN”, “ODD”, or “NO”.
4	STOP	Select “1bit” or “2bit”.
5	FLOW CONTROL	Select “YES” or “NO”.
6	CLOSE	“SETTINGS” window is displayed.

- (5) Touch “START COM” to start communication.
- (6) To release communication, set the remote mode to OFF in the procedure (2).

POINT

Always set communication parameter settings to the host unit ones.
In incorrect setting, remote control is impossible.

7-4. Formats of Transmitted and Received Data

7-4-1. Commands

Table 7-2. Commands List

Commands	Contents
RST ^L _F	Stop all operations of "Hiresta-UX" and initialize each setting. Initialization data Applied voltage : 10V, Measurement range: 10 ⁴ Ω Probe : URS, Sample thickness : 1.000mm RCFS : 10.00, RCFV : 10.00
RNGnn ^L _F	Measurement range setting nn=03 to 14 (Ω range)
PRBnn ^L _F	Measurement probe setting n=01: URS probe n=01: UR probe n=02: UR-100 probe n=03: UR-SS probe n=04: JIS/ASTM probe n=05: UA probe n=09: EXT probe
VLTn ^L _F	Setting of measured applied voltage nn=00 (0): 10V nn=22 : 40V nn=01(1) : 100V nn=23 : 50V nn=02(2) : 250V nn=24 : 60V nn=03(3) : 500V nn=25 : 70V nn=04(4) : 1000V nn=26 : 80V nn=05~09: Unused nn=27 : 90V nn=10 : 1V nn=28 : 100V nn=11 : 2V nn=29 : 200V nn=12 : 3V nn=30 : 250V nn=13 : 4V nn=31 : 300V nn=14 : 5V nn=32 : 400V nn=15 : 6V nn=33 : 500V nn=16 : 7V nn=34 : 600V nn=17 : 8V nn=35 : 700V nn=18 : 9V nn=36 : 800V nn=19 : 10V nn=37 : 900V nn=20 : 20V nn=38 : 1000V nn=21 : 30V * The values in parenthesis are commands when using Hiresta-UP.
MES ^L _F	Measurement start
HLD ^L _F	Measurement end
SRQ ^L _F	Status request Status transmission after command reception
PRQ ^L _F	Parameter request Parameter transmission after command reception

Commands	Contents
DRQ ^L _F	Measurement data request Measurement data transmission after command reception
RCF#xxxxx ^L _F	Data setting of the resistivity correction factor to EXT probe #=S: Surface Resistivity Correction Factor #=V: Volume Resistivity Calculation Factor xxxxx: Data Up to five characters (variable length) including a decimal point , 0.001 to 9999
THKxxxxx## ^L _F	Sample thickness data setting xxxxx: Data Up to five characters (variable length) including a decimal point, 0.001 to 9999 ##=MM : mm ##=UM : μm (thickness unit)

7-4-2. Return Data

Table 7-3. Return Data

Data	Contents
Measurement data	<p>D#R$\times.\times E\pm\times\times$, \$$\times.\times E\pm\times\times$LF</p> <p>#=N: Measurement data are valid. #=E: Error occurrence #=O: Over range #=U: Under range</p> <p>The first item (R$\times.\times E\pm\times\times$) : Resistance value ($\Omega$) The second item (\$$\times.\times E\pm\times\times$) : \$=S surface resistivity (Ω/\square) \$=V volume resistivity ($\Omega/\square$)</p>
Status	<p>STS###,\$\$,EnnLF</p> <p>###=MES : During measurement ###=HLD : Waiting for measurement \$\$=RS : Surface Resistivity Measurement Mode \$\$=RV : Volume Resistivity Measurement Mode nn=01 : Interlock error nn=02 : Measurement mode change error nn=03 : Invalid command nn=04 : The combination of measurement parameters is invalid.</p>
Parameters	<p>PRMRNGnn, VLTnn, PRBn, THK$\times\times\times\times##$, RCFS$\times\times\times\times$, RCFV$\times\times\times\times$LF</p> <p>The first item (RNGnn): Measurement range nn is based on the measurement range setting.</p> <p>The second item (VLTnn): Applied voltage n is based on the setting of applied voltage for measurement.</p> <p>The third item (PRBn): Probe n is based on the measurement probe setting.</p> <p>The fourth item (THK$\times\times\times\times##$): Sample thickness data $\times\times\times\times##$ is based on sample thickness data setting.</p> <p>The fifth item (RCFS$\times\times\times\times$): Surface resistivity correction factor of a selected probe</p> <p>The sixth item (RCFV$\times\times\times\times$): Volume resistivity correction factor of a selected probe</p>

7-4-3. Command Rules

Table 7-4. Commands List

Commands	Before measurement	During measurement
RST ^L _F	○	○
RNGnn ^L _F	○ ^{*1}	○
PRBn ^L _F	○	×
VLTnn ^L _F	○ ^{*1}	×
MES ^L _F	○	×
HLD ^L _F	×	○
SRQ ^L _F	○	×
PRQ ^L _F	○	×
DRQ ^L _F	○ ^{*2}	○
RCF#xxxxx ^L _F	○	×
THKxxxxx## ^L _F	○	×
D#R _{x.xx} E±xx... ^L _F	○ ^{*2}	○
STS###,\$\$,Enn ^L _F	○	○
PRMRNGnn... ^L _F	○	○

○: available ×: Unavailable

*1 When setting the range out of the measurement range at a preset applied voltage, the applied voltage setting comes first and it is set automatically to the range in the nearest range.

*2 Immediately after power-on, error data are returned to DRQ command immediately after initialization as DER_{x.xx}E±xx...^L_F.

7-5. Sample Program

- Operating system : WINDOWS XP(32bit)
- PC: Recommended specifications or more by the above operating system. One COM port is required.
- Required software (for report preparation): Microsoft Excel 2003
- The example of VBA sample program is as follows.

Option Explicit

' Declaration

Public Declare Function CreateFile Lib "Kernel32" Alias "CreateFileA"

(ByVal lpFileName As String, _
 ByVal dwDesiredAccess As Long, _
 ByVal dwShareMode As Long, _
 ByVal lpSecurityAttributes As Long, _
 ByVal dwCreationDisposition As Long, _
 ByVal dwFlagsAndAttributes As Long, _
 ByVal hTemplateFile As Long) _
 As Long

'Argument lpFileName: File name Specify "COM1" etc.
 ' dwDesiredAccess: Open method &H80000000| &H40000000 for reading and writing
 ' dwShareMode: Share mode No share 0
 ' lpSecurityAttributes: Security attribution No use 0
 ' dwCreationDisposition: Existing file processing Open an existing file &H3
 ' dwFlagsAndAttributes: No file attribution 0
 ' hTemplateFile: No template file is used. 0

Public Declare Function SetCommState Lib "Kernel32"

(ByVal hfile As Long, _
 lpDCB As DCB) _
 As Long

'Argument HandlePort: Specification of the obtained handle by CreateFile
 ' dcb: DCB structure

Public Declare Function WriteFile Lib "Kernel32"

(ByVal hfile As Long, _
 lpBuffer As Any, _
 ByVal nNumberOfByteToWrite As Long, _
 lpNumberOfBytesWritten As Long, _
 ByVal lpOverlapped As Long) _
 As Long

'Argument HandlePort: Specification of the obtained handle by CreateFile
 ' Buffer: Specification of a transmitted data pointer
 ' NumberOfByte2Write: Specification of the number of transmitted data bytes
 ' NumberOfBytesWritten: Specification of the pointer to store the number of transmitted data bytes
 ' Overlapped: Specification of NULL for Argument unrelated to communication

```

Public Declare Function ReadFile Lib "Kernel32"
(ByVal hfile As Long, _
lpBuffer As Any, _
ByVal nNumberOfByteToRead As Long, _
lpNumberOfBytesRead As Long, _
ByVal lpOverlapped As Long) _
As Long
'Argument HandlePort: Specification of the obtained handle by CreateFile
' lpBuffer: Specification of a received data pointer
' lpBuffer: Specification of a received data pointer
' NumberOfByte2Read: Specification of the number of received data bytes
' NumberOfBytesRead: Specification of the pointer to store the number of received data bytes
' Overlapped: Specification of NULL for Argument unrelated to communication

Public Declare Function CloseHandle Lib "Kernel32" (ByVal hfile As Long) As Long
'Argument PortName:      Handle

Public Declare Sub Sleep Lib "Kernel32" (ByVal dwMilliseconds As Long)
'Argument dwMilliseconds: Time setting
.....

' Structure
.....

Public Type DCB 'Port setting
DCBlength As Long
BaudRate As Long
fBitFields As Long
wReserved As Integer
XonLim As Integer
XoffLim As Integer
ByteSize As Byte
Parity As Byte
StopBits As Byte
XonChar As Byte
XoffChar As Byte
ErrorChar As Byte
EofChar As Byte
EvtChar As Byte
wReserved1 As Integer
End Type

Public Type PARMS ' Parameter
Probe As Integer
Voltage As Integer
Range As Integer
Correction As Double
Thickness As Double
mode As eMode
End Type

Enum eMeasure
normal = 0 ' Measurement result
Er
OverR
UnderR
End Enum

```

```

Enum eMode 'Measurement mode
S = 0
    V
End Enum

.....

' Constant
.....

Const GENERIC_READ As Long = (&H80000000) ' Reading constant
Const GENERIC_WRITE As Long = (&H40000000) 'Writing constant
Const FILE_ATTRIBUTE_NORMAL As Long = (&H80)
Const OPEN_EXISTING As Long = &H3 ' Existing file processing
Const NO_PARITY = 0 ' No parity
Const TWO_STOP_BITS As Long = 2 '2 bits
Const PURGE_TXCLEAR As Long = &H4
Const PURGE_RXCLEAR As Long = &H8
Const FILE_SHARE_READ As Long = &H1

Const com_port_no As String = "COM11" ' Port number setting
Public pDCB As DCB
Public Type PARMS ' Parameter setting
Public hfile As Long
Private Flag As Boolean

.....

' Transmission Flow
.....

Public Sub sendCommand(ByVal strSend As String)

    Dim byteArray() As Byte
    Dim sendSize As Long
    Dim leng As Long
    Dim lBytesWritten As Long

    strSend = strSend & Chr(10)
    byteArray() = StrConv(strSend, vbFromUnicode)
    sendSize = (UBound(byteArray) + 1) * LenB(byteArray(0))
    WriteFile hfile, byteArray(0), sendSize, lBytesWritten, 0
End Sub
.....

' Reception Flow
.....

Public Sub ReceiveCommand()
    Dim charCode As Byte
    Dim lbytesRead As Long
    Dim recevData As String
    Do
        ReadFile hfile, charCode, 1, lbytesRead, 0
        If charCode = 10 Then
            receivedData (recevData)
            Exit Sub
        End If
    End Do
End Sub

```

```

receivedData (recevData)
    Exit Sub
End If
recevData = recevData & Chr(charCode)
Loop
End Sub

Public Sub receivedData(ByVal data As String)

    If Mid(data, 1, 2) = "DN" Then
        Call setDRQ(data, eMeasure.normal)
    ElseIf Mid(data, 1, 2) = "DE" Then
        Call setDRQ(data, eMeasure.Er)
    ElseIf Mid(data, 1, 2) = "DO" Then
        Call setDRQ(data, eMeasure.OverR)
    ElseIf Mid(data, 1, 2) = "DU" Then
        Call setDRQ(data, eMeasure.UnderR)
    ElseIf Mid(data, 1, 3) = "STS" Then
        Call setSRQ(data)
    ElseIf Mid(data, 1, 3) = "NOW" Then
        MsgBox "Now Probe is not ext.", vbCritical, "Error"
        Flag = True
    End If

End Sub

Public Sub setSRQ(ByVal data As String)
    Dim results() As String
    Dim i As Integer
    results = Split(data, ",")
    Select Case Mid(results(1), 1, 6)
        Case "RS"
            pParms.mode = S
        Case "RV"
            pParms.mode = V
    End Select
End Sub

Public Sub setDRQ(ByVal data As String, ByVal status As eMeasure)
    Dim results() As String
    Dim i As Integer
    results = Split(data, ",")
    Select Case status
        Case eMeasure.normal
            Dim resistance As String
            Dim resistanceltem As String
            Dim mode As eMode
            For i = 0 To results.Length - 1
                Select Case Mid(results(i), 1, 1)
                    Case "R"
                        resistance = results(i).Remove(0, 1)
                    Case "S"
                        resistanceltem = results(i).Remove(0, 1)
                        mode = S
                    Case "V"
                        resistanceltem = results(i).Remove(0, 1)

```

```

        mode = V
    End Select
Next
    If mode = S Then
        MsgBox "Resistance value:" & resistance & "," & "Surface resistivity mode:"
        & resistanceltem, vbInformation, "Normal shutdown"
    Else
        MsgBox "Resistance value:" & resistance & "," & "Volume resistivity mode:"
        & resistanceltem, vbInformation, "Normal shutdown"
    End If
    Flag = True
Case eMeasure.Er
    MsgBox "Error occurrence", vbCritical, "Error"
    Flag = True
Case eMeasure.OverR
    If pParms.Voltage = 10 Then
        MsgBox "Measurement can not be run because of over-range.", vbCritical, "エラー"
        Flag = True
    Else
        pParms.Voltage = pParms.Voltage + 1
        If pParams.rang.Length = 1 Then
            Call sendCommand("VLT0" & Str(pParms.Voltage))
        Else
            Call sendCommand("VLT" & Str(pParms.Voltage))
        End If
        Flag = False
    End If
Case eMeasure.UnderR
    If pParms.Voltage = 38 Then
        MsgBox "Measurement can not be run because of under-range. ", vbCritical, "Error"
        Flag = True
    Else
        pParms.Voltage = pParms.Voltage - 1
        If pParams.rang.Length = 1 Then
            Call sendCommand("VLT0" & Str(pParms.Voltage))
        Else
            Call sendCommand("VLT" & Str(pParms.Voltage))
        End If
        Flag = False
    End If
End Select

End Sub

Public Sub setParams()
    pParms.Probe = 0
    pParms.Voltage = 28
    pParms.Range = 3
    pParms.Correction = 1
    pParms.Thickness = 1000
    Call sendCommand("PRB" & LTrim(Str(pParms.Probe)))
    If pParms.Voltage > 9 Then
        Call sendCommand("VLT" & LTrim(Str(pParms.Voltage)))
    End If
End Sub

```



```

Else
    Call sendCommand("VLT0" & LTrim(Str(pParms.Voltage)))
End If
If pParms.Voltage > 9 Then
    Call sendCommand("RNG" & LTrim(Str(pParms.Range)))
Else
    Call sendCommand("RNG0" & LTrim(Str(pParms.Range)))
End If
If pParms.mode = S Then
    Call sendCommand("RCFS" & LTrim(Str(pParms.Correction)))
Else
    Call sendCommand("RCFV" & LTrim(Str(pParms.Correction)))
End If
Call sendCommand("THK" & LTrim(Str(pParms.Thickness)) & "UM")
End Sub
Public Sub performRemote()
    Dim id As Integer
    Dim comPortName As String
    Dim ret As Long

    If Len(com_port_no) = 5 Then 'When the port number is 10 or more, "¥¥.¥" is added.
        comPortName = "¥¥.¥" & com_port_no
    Else
        comPortName = com_port_no
    End If

    hfile = CreateFile(comPortName, GENERIC_READ Or
        GENERIC_WRITE, 0, 0, OPEN_EXISTING, FILE_ATTRIBUTE_NORMAL, 0)
    If hfile = -1 Then
        MsgBox " The communication port can not be connected. Check the port. ",
            vbCritical, "WARNING"
        Exit Sub
    End If
    With pDCB
        .DCBlength = LenB(pDCB)
        .BaudRate = 19200
        .ByteSize = 8
        .fBitFields = 0
        .Parity = NO_PARITY
        .StopBits = TWO_STOP_BITS
    End With

    ret = SetCommState(hfile, pDCB)
    If ret = False Then
        MsgBox "SetCommState error: Communication setting is wrong. ", vbCritical, "WARNING"
        CloseHandle (hfile)
        Exit Sub
    End If
    Flag = False

    Call sendCommand("RST")
    Call sendCommand("SRQ")
    Call ReceiveCommand
    Call setParams
    Do

```

```
Call sendCommand("MES")
  Call Sleep(5000)
  Call sendCommand("HLD")
  Call sendCommand("STS")
  Call ReceiveCommand
  If Flag = True Then
    Exit Do
  End If
Loop
CloseHandle (hfile)
End Sub
```

Section 8: Maintenance and Inspection

8-1. Unit Inspection

Check the following items and use the unit in a proper condition.

8-1-1. Daily Inspection

Inspect the unit as follows before use and measure in a proper condition.

- (1) Prepare a probe checker. Probe checkers are different for every probe.
Therefore, prepare the matching checker for a probe.
- (2) Connect the probe to the main unit and turn on the power switch.

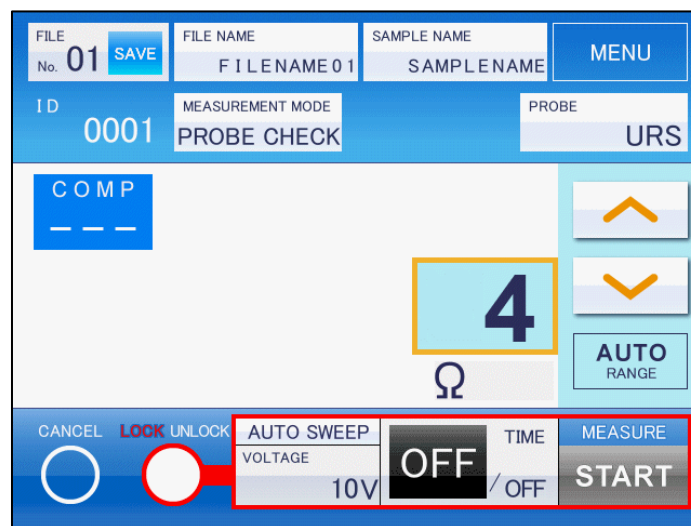


Fig. 8-1. Probe Check Selection

- (3) Touch [MEASUREMENT MODE] to set PROBE CHECK.
- (4) Press the probe against the probe checker to fit into the checker ditch and measure.

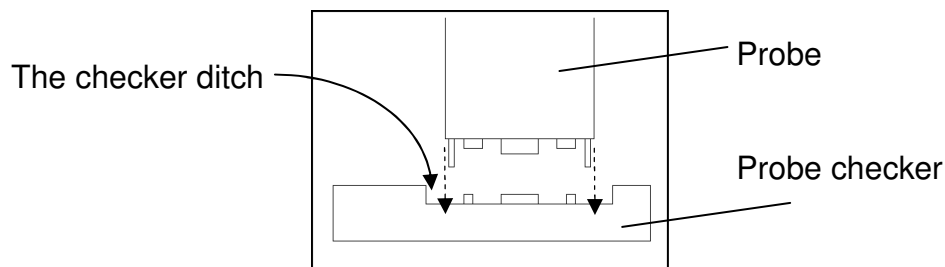


Fig. 8-2. Probe Check

- (5) Make (3) measurement and judgement at each applied voltage.
- (6) A resistance value is indicated in the probe checker. The measurement value should be within $\pm 3\%$.

POINT

The inspection by the probe checker is for checking the proper operation of the unit. The measurement accuracy of the unit is not guaranteed.

(CAUTION) Fully understand the instruction manual of a probe checker before use.

8-1-2. Periodical Inspection

It's required that calibration by a standard instruments every six months or every year. Manufacturer or, local distributor calibrate the unit. For the calibration of this unit, contact local distributor.

8-2. Handling of Probes

- Remove a used probe from the main unit and store it.
- When the probe electrode is contaminated, wipe off it with ethanol-soaked cloth.
- Do not put much power on the probe signal cable or curve it excessively. Disconnection may be caused to affect measurement data.
- When carrying the probe, always hold the main part. By having the cable while the probe hangs, the cable may be disconnected.

POINT

By measurement while the probe electrode is contaminated, measurement data may be affected.

Section 9: Troubleshooting

9-1. Troubleshooting

When troubles occur, check the following items and take measures against them by referring to the reference sections. When troubles are not solved even after checking the unit and taking measures against them, contact local distributor.

Table 9-1. Troubleshooting

Conditions	Causes
The unit can not be turned ON. (No display)	The power cable is not connected. (Refer to "1-1-1. Rear Panel".)
	The power switch is OFF. (Refer to "1-1-1. Rear Panel".)
The display is deep or light.	The display brightness is not well-adjusted. (Refer to "4-5-5. DISPLAY".)
The buzzer does not beep.	The buzzer volume is not well-adjusted. (Refer to "4-5-4. BUZZER".)
No PC output No remote control	The USB cable is not connected. (Refer to "2-2-4. USB Connection".)
	The power switch of a PC is OFF.
	Communication conditions are not proper. (Refer to "Section 7: Remote Mode".)
The local mode (remote mode) can not be set.	The ON or OFF setting of the remote mode is incorrect. (Refer to "4-5-1. Remote Mode".)
Measurement can not be run.	The probe is not connected. (Refer to "2-2-1. Probe Connection".)
	The probe electrode is contaminated. (Refer to "8-2. Handling of Probes".)
Volume resistivity can not be measured.	"J-Box X-Type" or "Resitable" is not connected. (Refer to "2-2-3. Connection of J-Box X-Type (Option)".)
	The measurement mode is not volume resistivity. (Refer to "Section 6: Volume Resistivity Measurement".)
The probe checker can not be measured.	The probe checker is contaminated. (Refer to "8-1-1. Daily Inspection".)
	The proper probe checker for a probe is not used. (Refer to "11-2. Optional Items".)

9-2. FAQ

- Measurement values discord.
 - The setting of the measurement unit is wrong. Change the unit and check the value of Ω/\square or $\Omega \cdot \text{cm}$.
 - Sample surface is different.
A part of the same sample may be different from the measurement value of the sample in the same lot.
 - Measurement environment is different.
When measuring high-resistivity sample, measurement values may fluctuate depending on measurement environment (such as temperature and humidity). When the measurement value discords from the previous one, check the measurement environment.
- Measurement values are “OVER RANGE”.
 - The switch of the measurement range is different.
When the range switch is “MANUAL”, measurement is run only in the preset range. When the measurement value of a sample cannot be expected, set the range switch to “AUTO”.
 - Applied voltage is improper.
The measurement range is fixed for each applied voltage as “Table 10-1. Resistivity Measurement Accuracy”.
When “OVER RANGE” is displayed, increase applied voltage.

Section 10: Specifications

10-1. Measurement Characteristic

(1) Main samples

Materials for countermeasure against static electricity, building materials, floor materials, various papers, packing materials, paint, fiber, concrete, ceramic, resin, film, etc.

(2) Measurement system

1. Constant voltage applying /leak current measurement system
2. Function of automatic correction of resistivity

(3) Resistivity measurement accuracy^{*1}

Conditions 1. Temperature: 23 degrees Celsius \pm 3 degrees Celsius

Humidity: 50% or less

2. After 30 minutes of warm-up

Table 10-1. Resistivity Measurement Accuracy

Applied voltage Measurement range (Ω)	Measurement Accuracy \pm (% of Reading + Digits)				
	1 to 10V	20 to 90V	100 to 400V	500 to 900V	1000V
0.80 to 9.99 $\times 10^3$	$\pm(2\%+3\text{dgt})$				
0.80 to 9.99 $\times 10^4$	$\pm(2\%+3\text{dgt})$	UNDER RANGE			
0.80 to 9.99 $\times 10^5$	$\pm(2\%+3\text{dgt})$				
0.80 to 9.99 $\times 10^6$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$		
0.80 to 9.99 $\times 10^7$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	
0.80 to 9.99 $\times 10^8$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$
0.80 to 9.99 $\times 10^9$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$
0.80 to 9.99 $\times 10^{10}$	$\pm(3\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$	$\pm(2\%+3\text{dgt})$
0.80 to 9.99 $\times 10^{11}$		$\pm(3\%+3\text{dgt})$	$\pm(3\%+3\text{dgt})$	$\pm(3\%+3\text{dgt})$	$\pm(3\%+3\text{dgt})$
0.80 to 9.99 $\times 10^{12}$				$\pm(4\%+3\text{dgt})$	$\pm(4\%+3\text{dgt})$
0.80 to 9.99 $\times 10^{13}$	OVER RANGE				$\pm(5\%+3\text{dgt})$
0.80 to 9.99 $\times 10^{14}$					$\pm(12\%+3\text{dgt})$

(Caution) The errors by sample residual current and charge are not included.

*1 Accuracy: Degree of bias (trueness)

Measurement accuracy indication: Combination of the percent accuracy of a reading value and one of the full scale percent

Digits is the indication of the full scale percent accuracy as the value of the lowest digit of the digital display

(3) Applied voltage

Conditions 1. Temperature: 23 degrees Celsius \pm 3 degrees Celsius

2. After 30 minutes of warm-up

Table 10-2. Applied Voltage

Applied voltage	Accuracy	Short-circuit current
10V	$\pm 1\%$	60mA
100V	$\pm 1\%$	1.5mA
250V	$\pm 1\%$	1.5mA
500V	$\pm 1\%$	1.5mA
1000V	$\pm 1\%$	1.5mA

10-2. General Specifications

(1) Measurement range change

Automatic or manual change

1. Automatic: Up level: 9.99, Down level: 0.80

2. Manual: Up/down and step system

(2) Timer

1. Range: OFF, 10 seconds, 30 seconds, 1 minute, 5 minutes, 10 minutes

2. Fluctuation: \pm (0.5%+0.5 second)

(3) Measurement sampling times

About two times/second

(4) Probe for measurement

Exclusive MCP probe

Adaptable for UA and UR series

(5) Display

640×480 7.5 inch full-color TFT-LCD touch panel

(6) Power voltage, frequency, consumption power

a.c.85 to 264V (47 to 63Hz)

92VA

(7) Ambient temperature, humidity

5 to 40 degrees Celsius, 80%RH or less (No condensation)

(8) External dimensions

When the upper cover is closed: 280(D) × 320(D) × 113 (H) mm

When the upper cover is opened: 280(D) × 320(D) × 200 (H) mm

(9) Weight

About 2.4kg

10-3. Packing Contents of Standard Specifications

Table 10-3. Packing Contents

Names	Models numbers	Parts numbers	Quantity
Hiresta UX	MCP-HT800	RMH014E	1
URS probe	MCP-HTP14	RMH214	1
Probe checker for URS	MCP-TRURS	RMH327	1
Protection gloves	MCP-GV	RMJ803	1
Instruction manual	———	ZRH2MAE	1

Section 11: Parts List

11-1. Maintenance Parts

The maintenance parts of Hiresta UX are as follows.

Table 11-1. Maintenance Parts

Parts names	Models numbers	Parts numbers	Quantity
URS probe	MCP-HTP14	RMH214	1 pc
Probe checker for URS	MCP-TRURS	RMH327	1 pc
Protective gloves	MCP-GV	RMJ803	1 pair
Instruction manual		ZRH2MAE	1 pc

11-2. Optional Items

The optional parts of Hiresta UX are as follows.

11-2-1. Probes

Table 11-2. Probes

Parts names	Models numbers	Parts numbers	Specifications and purposes
URS probe	MCP-HTP14	RMH214	Ring type probe Standard accessory
UR probe	MCP-HTP12	RMH212	Ring type probe Outer diameter of the outside electrode, $\phi 40\text{mm}$
UR-SS probe	MCP-HTP15	RMH215	Ring type probe Outer diameter of the outside electrode, $\phi 10\text{mm}$
UR-100 probe	MCP-HTP16	RMH216	Ring type probe For measurement up to $10^{16}\Omega/\square$
UA probe	MCP-HTP11	RMH211	2-pin type probe Electrode diameter $\phi 2\text{mm}$ Electrode distance 20mm

(Caution) Refer to “3-4. Correction Factor (RCF (S), RCF (V))” for probe electrode sizes.

11-2-2. Probe Checkers

Table 11-3. Probe Checkers

Parts names	Models numbers	Parts numbers	Specifications and purposes
For URS probe	MCP-TRURS	RMH327	Ring 500MΩ Standard accessory
For UR probe	MCP-TRUR	RMH326	Ring 500MΩ
For UR-SS probe	MCP-TRURSS	RMH328	Ring 500MΩ
For UR-100 probe	MCP-TRUR100	RMH321	Ring 500MΩ
For UA probe	MCP-TRUA	RMH325	Serial 2-pin 500MΩ

11-2-3. Optional Instruments

Table 11-4. Optional Instruments

Parts names	Models numbers	Parts numbers	Specifications and purposes
Resitable UFL	MCP-ST03	RMJ354	ps/pv measurement table
J-Box X-Type	MCP-JB04	RMJ351	Measurement box based on JIS K 6911-2006
URS probe Fixer	MCP-URSJG	RMJ360	
Foot switch X-Type	MCP-FS02	RMJ802	