3921-E03

Automatic Digital Refractometer RX-007 α

Instruction Manual

Cat.No.3921

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Contents

1. Precautions for use

Introduction

Thank you for purchasing the "Automatic Digital Refractometer RX-007 α". Before using your RX-007 α, read this instruction manual carefully and understand how to use it. After reading this manual, keep it on hand for future reference.
In this manual "For safe use " describes the important items necessary for safety. Read it carefully.

For safe use --- Be sure to observe the following.

This operation manual describes the items which you are required to observe in order to use the RX-007 α safely to prevent injury to you and other people and damage to your property. The explanation of the indications and symbols of those items are as follows. Understand them first and then read the following pages to use your RX-007 α correctly.

Explanation of indications

WARNING	If this indication is neglected and the instrument is handled incorrectly, the user may be seriously injured and may result in death.
CAUTION	If this indication is neglected and the instrument is handled incorrectly, the user may be injured and the user's property may be damaged.

Explanation of symbols

	This symbol denotes an item which you are warned (or cautioned) of. The contents of warning are described in detail in or near the △.
	This symbol denotes an action which you must not do (a prohibited item). The contents of prohibition are described in detail in or near the ○.
	This symbol denotes an action you must do. The contents of instruction are described in detail in or near the ●.

Handling of this instrument

⚠ WARNING

◇When measuring a substance harmful to the human body, be well aware of its properties and put on protective gloves, mask, etc.

◇If the instrument begins to smell abnormally, overheat, or emit smoke, turn off the power switch and disconnect the power plug immediately.
Fire or malfunction may result if the instrument is continued to be used.
Ask your ATAGO distributor for an inspection.

◇Do not attempt to repair, modify, or disassemble the instrument yourself.
Improper servicing may result in fire, electrical shock, or burns.

◇If the instrument is dropped or is subjected to a strong shock, have it inspected by an ATAGO distributor.
Fire or malfunction may result if the instrument is used.

⚠ CAUTION

◇Do not apply water or sample over any part other than the surface of the prism.
Application on any other part of the instrument may result in a malfunction.

◇If this instrument is used to measure very hot or highly acidic samples, the prism may be damaged resulting in inaccurate measurements.

Handling of this instrument (Continued)

⚠ CAUTION

◇The prism is made of optical glass. Do not tap or contact its surface with any metal tool such as a spoon or tweezers. If the surface of the prism is damaged, inaccurate measurements will occur.

◇After taking a measurement, completely wipe off any sample on the surface of the prism and surrounding area with tissue paper soaked in water. Then remove any remaining moisture completely with dry tissue paper.

◇If you have measured a sample of polymer or fats and oils, wipe it off with tissue paper soaked in alcohol or neutral detergent. Then remove any remaining moisture completely with dry tissue paper.

◇Always turn off the power switch after use.

◇When transporting the instrument, place it in its original box.

◇If you intend to turn off and turn on the power switch, wait one minute or more. If you turn on the power switch again immediately after you turn it off, the instrument may malfunction.

◇Carefully read this instruction manual and fully understand the function and operation of each part of the instrument before use.
◇Check that each part of the instrument operates normally before use.
◇Check the necessary operations such as zero setting according to the instruction manual.
◇The manufacturer shall not be held responsible for any or all damages as a result of use of the instrument for those other than its intended purposes (measurement of Brix, concentration of liquid, RI).
◇The prism mounted on the sample stage that is in contact with a sample under measurement is a consumable item.
◇Ensure that if use of the instrument has undesired effects on the consumption of the measured materials, etc., ATAGO shall not be held responsible for the result.

Handling of plug

⚠ WARNING

◇Be sure to use the power cable included with the RX-007α.
If a power cable other than the one included is used, the rated voltage and polarity of the power may change, and may cause smoking or fire.

◇Do not insert the power plug in an outlet other than AC100 to 240V.
Inserting the power plug in any other outlet may result in shortcircuiting the unit, smoking or fire.

◇Do not use the power cable if damaged or broken.
If used, fire, electrical shock, or burns may result.
For a new power cable, contact your ATAGO distributor.

⚠ CAUTION

◇Do not insert or disconnect the power plug with wet hands.

◇Be sure to hold and pull the plug when disconnecting the power cable from the outlet.
If the cable is pulled improperly, the plug may be broken, and may result in fire or electrical shock.

Operation of thermostatic function

⚠WARNING

◇Take extra precautions when setting the unit to a high temperature.

◇Take sufficient care of oneself when the unit is set to a high temperature. Burns may occur if the sample or sample stage is touched.

Connection of optional component (printer, etc.)

⚠CAUTION

◇When connecting optional components, be sure the unit is turned off and disconnect the power plug from the outlet.
If you connect any optional components while the power is on, an electrical shock may result.

●Items to be observed when using●

Environmental conditions

◇Use the instrument at an altitude below 5,000 m (above sea level).
◇Use the instrument indoors.
◇Use the instrument on a flat level surface.
◇Use the instrument where the temperature is between 15 to 30℃.
◇Use the instrument where the humidity is below 90%RH.
◇Do not leave the instrument in a location exposed to direct sunlight or near a heating unit where the temperature may rise.
◇Do not change the environmental temperature of the product suddenly.
◇Do not place the instrument in a place where it may be subject to strong vibrations.
◇Do not use the instrument where there is much dust.
◇Do not leave the instrument where the temperature is extremely low.
◇Do not leave the instrument in a damp place.
◇Do not place or drop heavy objects on the instrument.

Handling

◇Do not drop the instrument or subject it to any strong shock.
◇The power cable may be damaged if mis-handled in any of the following manner.
- Bending the cable.
- Pulling the cable.
- Twisting the cable.
- Placing the cable under heavy objects.
- Catching the cable between objects.

Daily maintenance

◇If the instrument becomes dirty, wipe it with a soft cloth.
◇Do not use benzine, paint thinner, etc. to clean the instrument.

2. Unpacking and installation

(1) Unpacking

a) Remove the main unit from the box and check the exterior for any damage.

b) Check that the following items are included.

◎Automatic Digital refractometer RX-007 α

- Main unit of RX-007 α……1
- AC power cable……1
- Plastic spoon……3
- Dropping pipette……3
- Dustproof filter (A set 12pcs)……1
- Instruction manual (this book) ……1
- Inspection certificate……1
- Test report……1

◎Digital printer DP-RX(Optional)

- Main unit of DP-RX……1
- Printer paper (thermal paper)……1
- AC adaptor……1
- Signal cable……1
- Instruction manual……1

※Printer paper (thermal paper) for long-term storage is also availavle refer to P.55.

(2) Installation

a) Use a power output of AC100 to 240V (50Hz/60Hz) .

b) Place RX-007 α in a place where the ambient temperature is 15 to 30℃.

c) Since RX-007 α consists of precision parts, do not place it in a location where it will be exposed to direct sunlight or near a heat source, where it may be subject to strong vibrations, or where dust or corrosive gas will be produced.

d) Place RX-007 α on a vibration-free level surface. When installing, do not drop or subject it to any strong shock.

3. Implements to be prepared before measurement

(1) Implements used to apply samples (Fig. 3-1)

a) Plastic spoon
b) Plastic rod with a rounded end
c) Dropping pipette made of polyethylene

Prepare one of the above implements. a) is proper for samples having low viscosity such as fruit juices, energy (sports) drinks, etc. b) is proper for samples with higher viscousity. c) is not proper for the continuous measurement of different samples. Any sample remaining in the pipette will be mixed with the next sample and an error in measurement will be made.

> Note:
> Never use implements made of glass, metal, or porcelain which can damage the surface of the prism.
> If the surface of the prism is damaged,accurate measurement of samples may not be possible.

(2) Washing bottle made of polyethylene (Fig. 3-2)

Prepare a washing bottle with a nozzle made of polyethylene and fill it with water.
It is very convenient for dripping 2 - 3 drops of water to wash the surface of the prism.

(3) Paper or cloth to wipe off samples

a) Soft tissue paper
b) Gauze washed once

Prepare either of the above. a) is proper for wiping samples having low viscosity such as fruit juices, energy (sports) drinks, etc. Use b) for samples having high viscosity. a) cannot wipe off samples having high viscosity easily and will stick to the prism and sample stage.

C)ethyl alcohol

Use ethyl alcohol to clean the prism surface and to wipe off the measured samples. As for the container that holds the alcohol, it is recommended to use a closed container made of glass like a hand-lap (Fig.3-3).

(4) Others

A wastebasket for used tissue paper and a writing instrument to record measured values are useful. When using a printer, check thermosensitive roll paper.

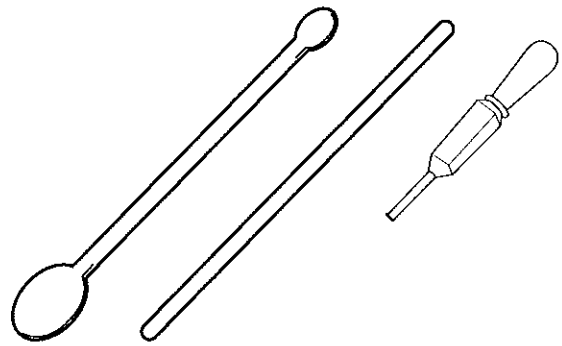


Fig. 3-1

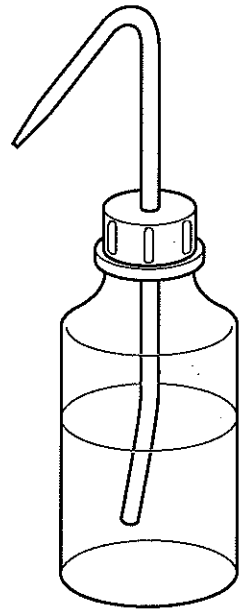


Fig. 3-2

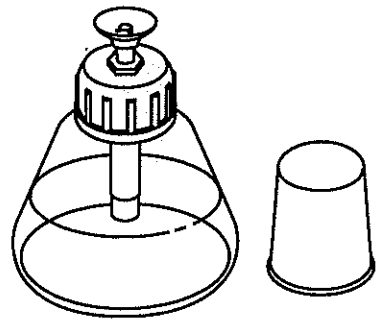


Fig. 3-3

4. Names and functions of components

(1) Main unit of the RX-007α (Figs. 4-1,4-2 and 4-3)

a) Sample stage
Drop a sample into the central conical part of the sample stage. The prism is located in the center of the sample stage.The stage was designed to resemble a large dish so that any splashes of sample can be wiped off promptly.

b) Prism
The unit irradiates light internally to the contact interface between a sample and the surface of the prism to detect the refractive index (Brix) of the sample.
* The white dot that is visible in the prism is the temperature sensor.

c) Cover plate
The cover plate blocks out external light during measurement.
Before taking any measurement, always close the cover plate.

d) Power switch
This switch powers on the unit. Setting it to the | position powers the unit ON. Setting it to the O position powers it OFF.

e) Power terminal
Connect the AC power cable connector to this terminal.

f) Printer output terminal
This output terminal is used to connect the unit to a digital printer DP-RX.

g) RS-232C output terminal
When connecting the unit to a computer use this output terminal.

h) Intake fan for cooling
This fan circulates air to cool the internal temperature of the RX-007α.

i) Exhaust fan for cooling
This fan radiates heat from inside the RX-007α.

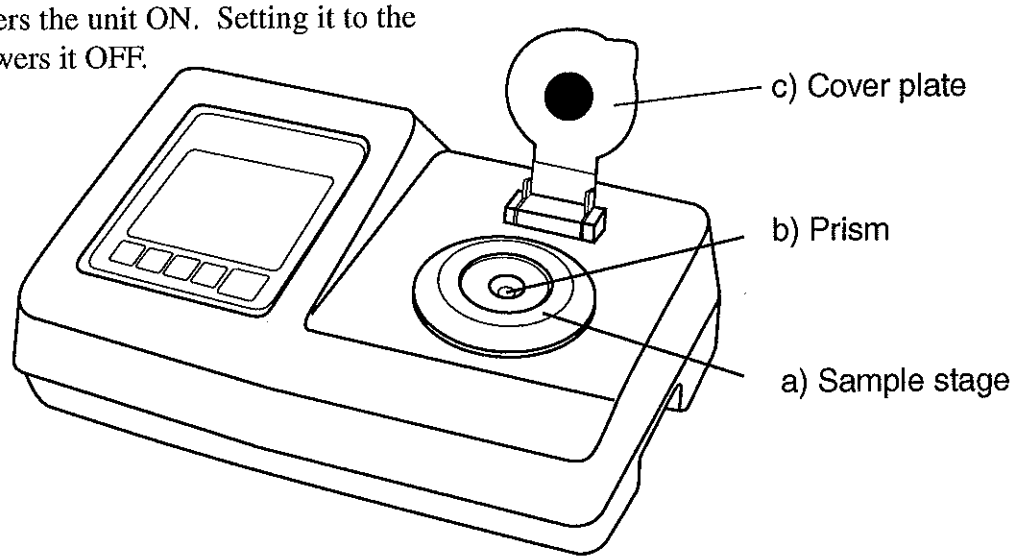


Fig. 4-1

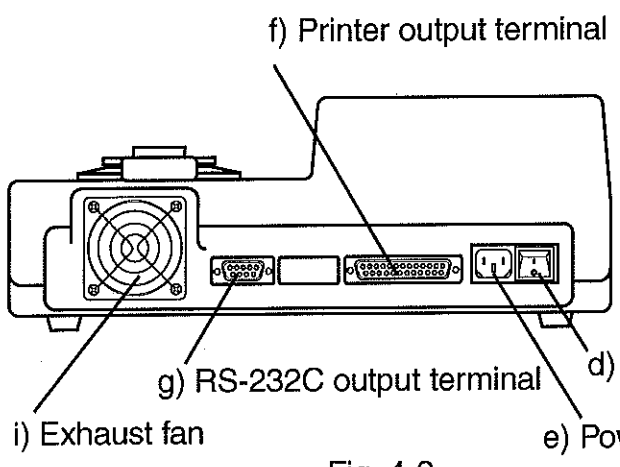


Fig. 4-2

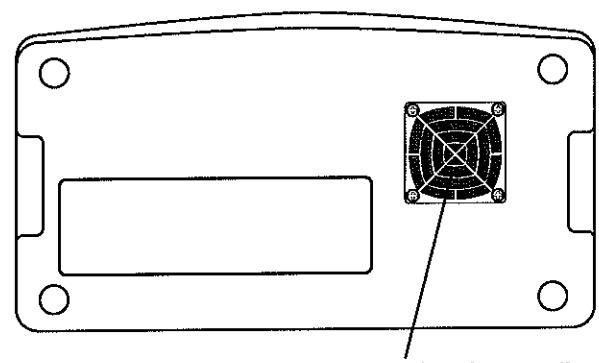


Fig. 4-3

(2) Control panel of the RX-007 α

(2)-1 For standard Brix display

a) Mode number
- indicates a method of measurement and detection.

b) Date and time
- indicates the current date (day, month, year) and time.

c) Name of scale
- indicates the name of the scale.

d) Measurement
- indicates a measurement value.

e) Measurement temperature (FIX)
- indicates the measurement temperature.

f) Current temperature (PRESENT)
- indicates the current temperature on a real-time basis.

g) Setting temperature (TARGET)
- indicates the setting temperature made by us of the thermostatic function.

h) SW1, SW2, SW3, and SW4 keys
To learn about the roles of each key, see the corresponding section.

i) START key
Sample measurement begins by pressing this key.

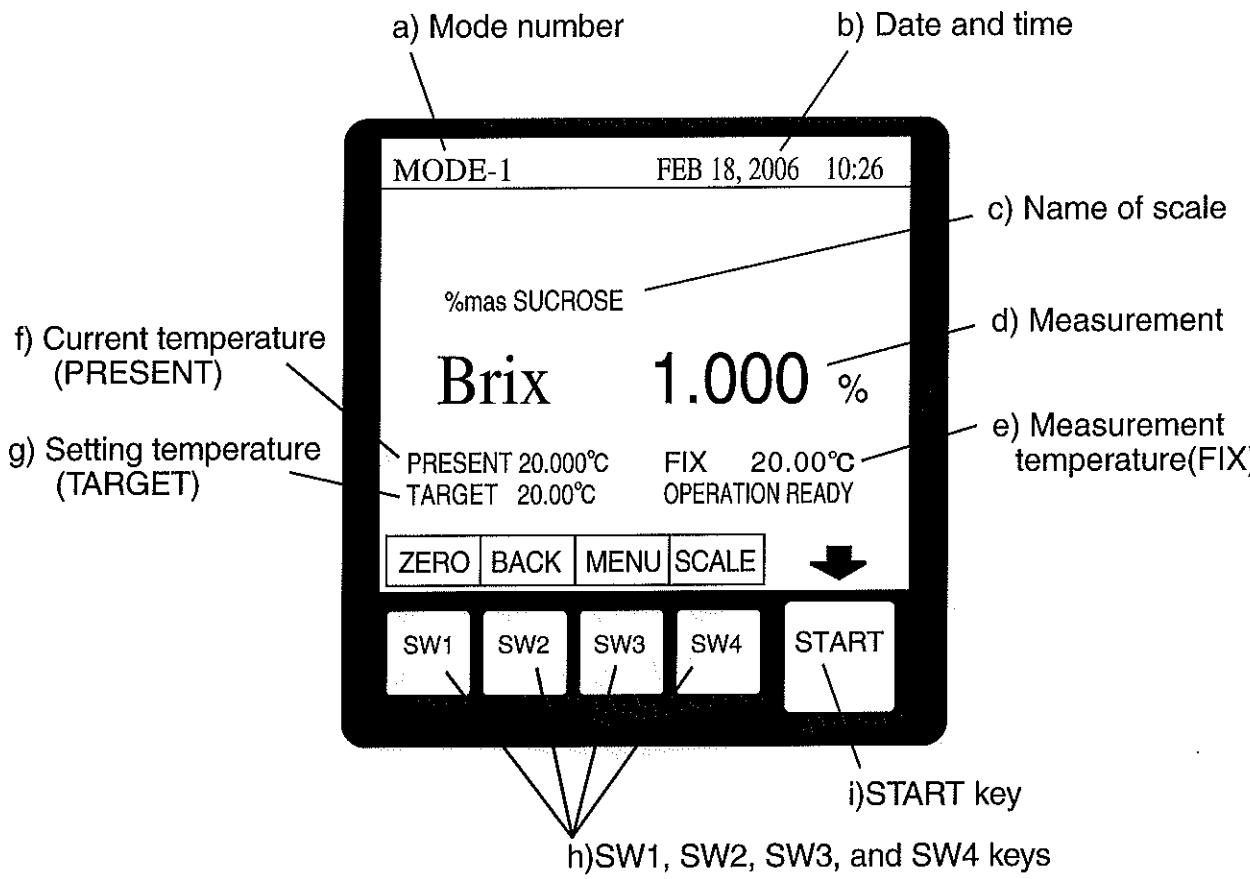


Fig.4-4

(2)-2 When the top and bottom limit bar or the user scale is set (Fig. 4-5)

a) Mode number
- indicates a method of measurement and detection.

b) Date and time
- indicates the current date (day, month, year) and time.

c) Sample name
- indicates the sample name entered in advance. SAMPLE A is an example.

d) Top and bottom limit bar
- indicates the bar along with the predetermined top and bottom limits. When measurement is completed, the bar indicates an approximate figure for the measurement.

e) Measurement
- indicates the measurement taken.

f) Measurement unit
- indicates the unit of measurement.

g) Measurement temperature (FIX)
- indicates the measurement temperature.

h) Current temperature (PRESENT)
- indicates the current temperature on a real -time basis.

i) Setting temperature (TARGET)
- indicates the setting temperature made by use of the thermostatic function.

j) SW1, SW2, SW3, and SW4 keys
To learn about the roles of each key, see the corresponding section.

k) START key
Sample measurement begins by pressing this key.

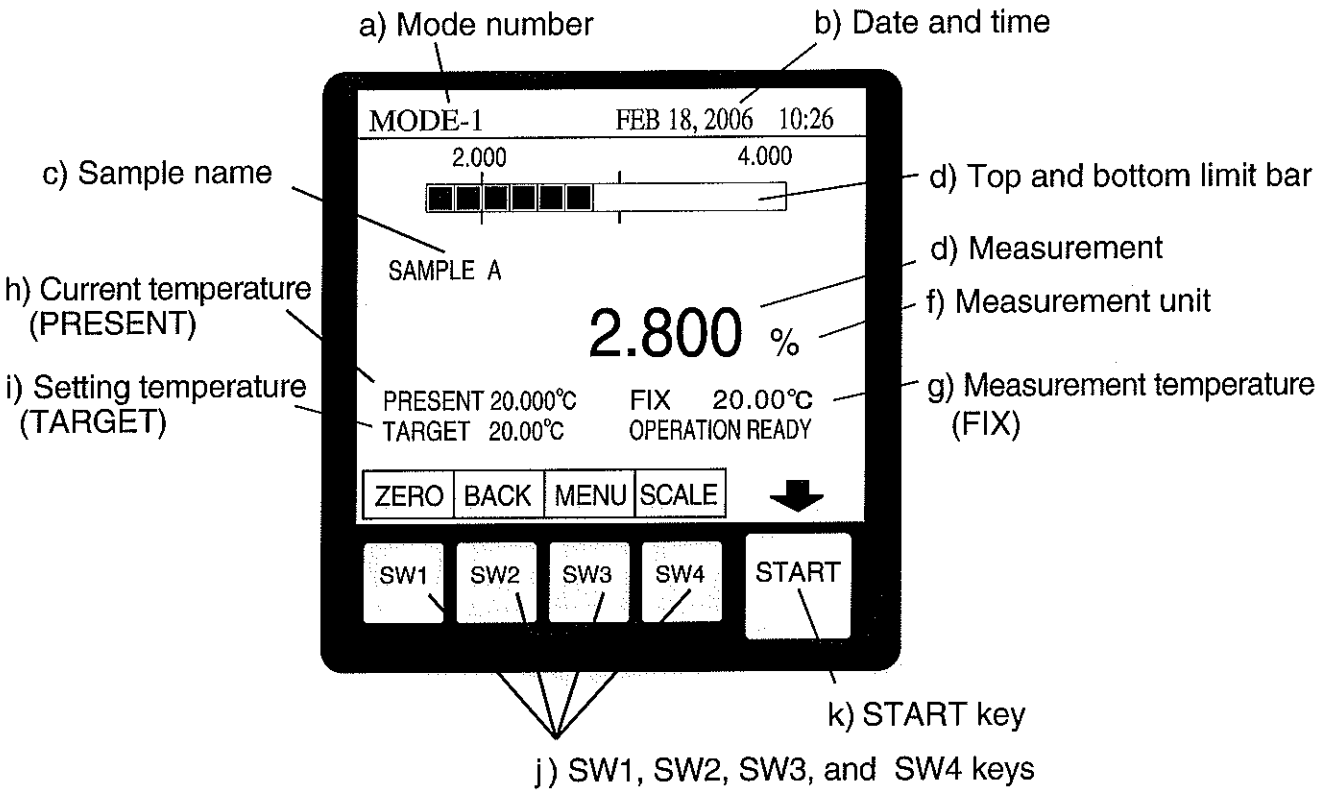


Fig. 4-5

(2)-3 For standard refractive index(RI) display (Fig.4-6)

a) Mode number
- indicates a method of measurement and detection.

b) Date and time
- indicates the current date (day, month, year) and time.

c) Name of scale
- indicates the name of the scale.

d) Measurement
- indicates a measurement value.

e) Measurement temperature (FIX)
- indicates the measurement temperature.

f) Current temperature (PRESENT)
- indicates the current temperature on a real-time basis.

g) Setting temperature (TARGET)
- indicates the setting temperature made by us of the thermostatic function.

h) SW1, SW2, SW3, and SW4 keys
To learn about the roles of each key, see the corresponding section.

i) START key
Sample measurement begins by pressing this key.

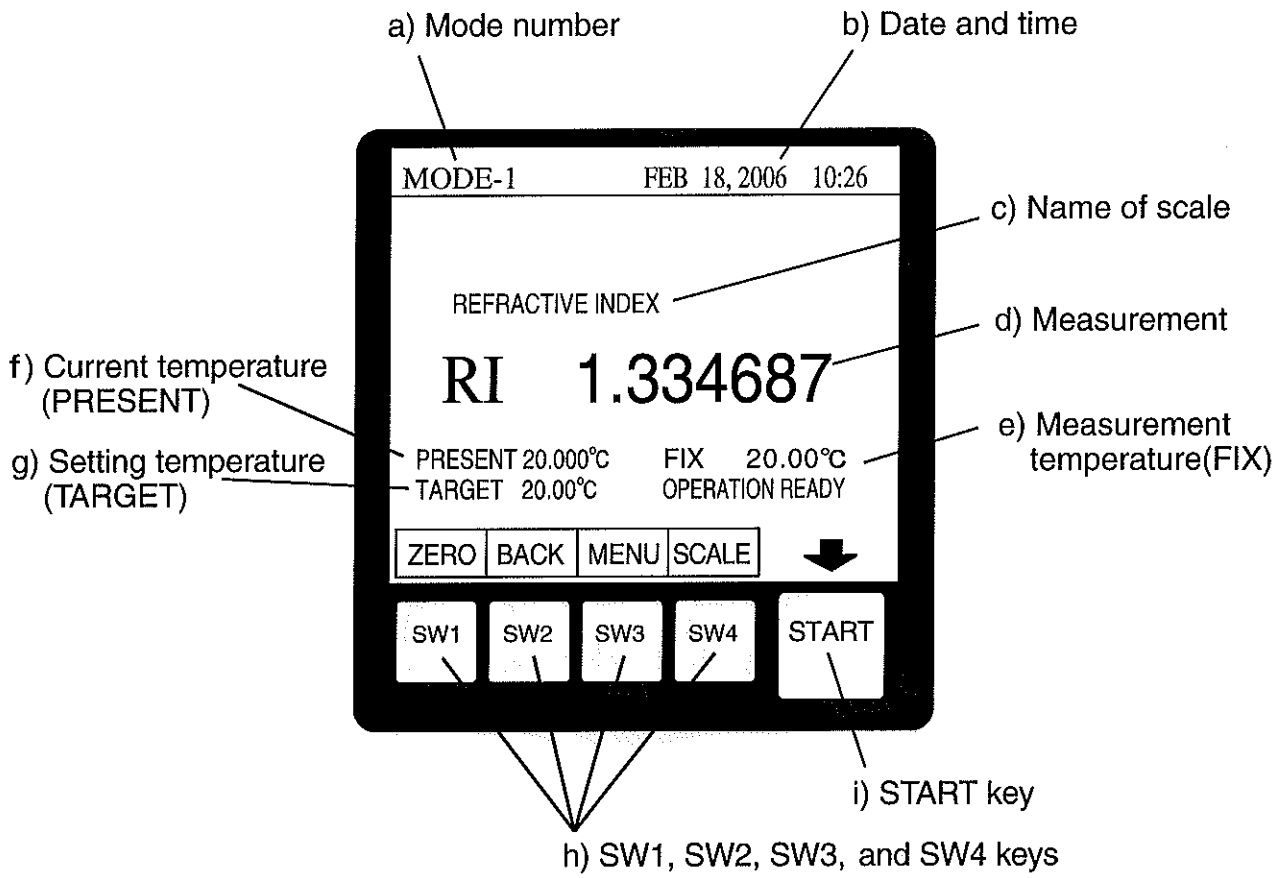


Fig.4-6

(3) Digital printer DP-RX (Optional)

(3)-1 Top of the main body (Fig. 4-7)

a) Paper cover
Open this cover to replenish a printer paper.

b) Paper cutter
Cut the printer paper with this paper cutter.

c) Power switch
Slide it to the "I" position to power the unit on.

d) Paper feed switch
Push this switch to feed the printer paper out. Before feeding the printer paper, be sure the "OFF LINE" lamp is lit (when the "ON LINE" lamp is lit, the printer paper will not advance).

e) On-line switch
Pressing this switch toggles the switch between on-line and off-line.

f) Power lamp
Powering on the unit lights up the lamp.

g) On-line lamp
The lamp is lit when the unit is on-line.

h) Off-line lamp
The lamp is lit when the unit is off-line. This lamp blinks on and off when no printer paper is present when the printer paper has been exhausted.

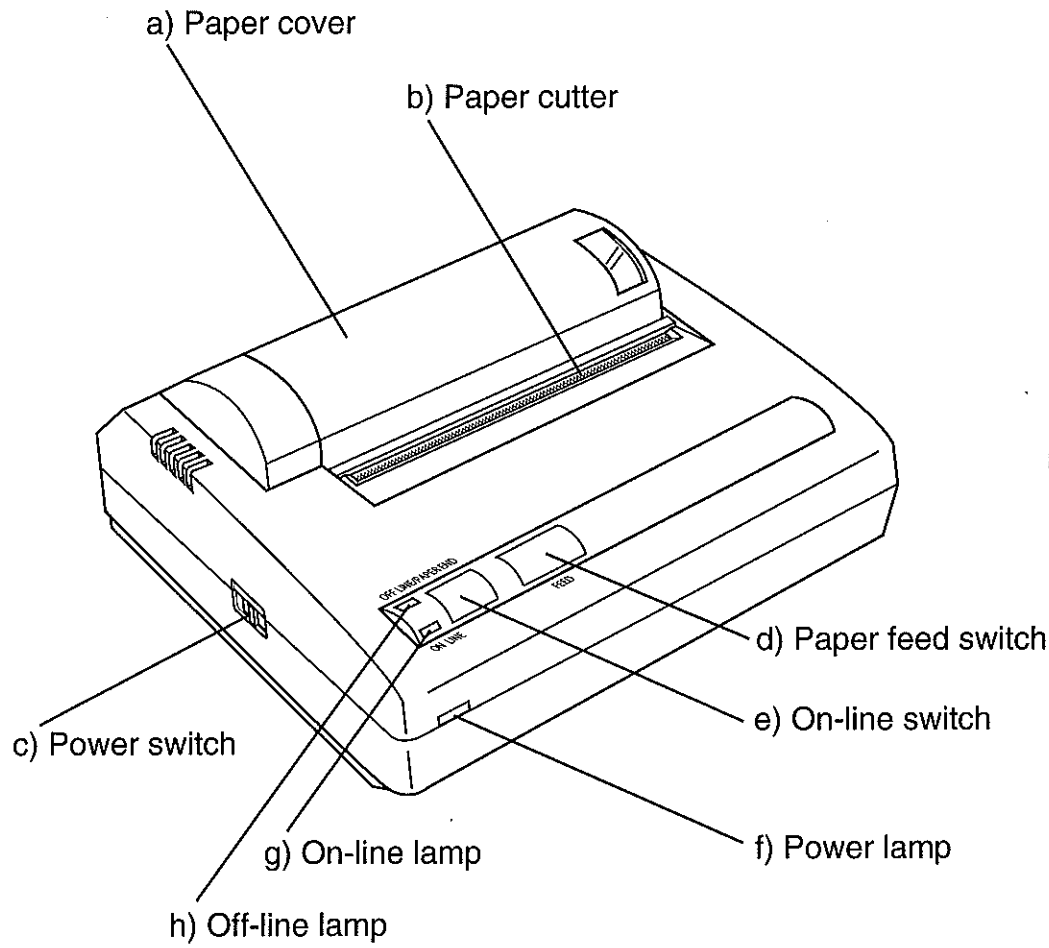


Fig. 4-7

(3)-2 Rear of the main body (Fig. 4-8)

a) Serial input terminal
This terminal is not used to connect the unit to an RX-007 α.

b) Parallel input terminal
This terminal connects to the RX-007 α.

c) Power terminal
Connect the printer power cable to this terminal.

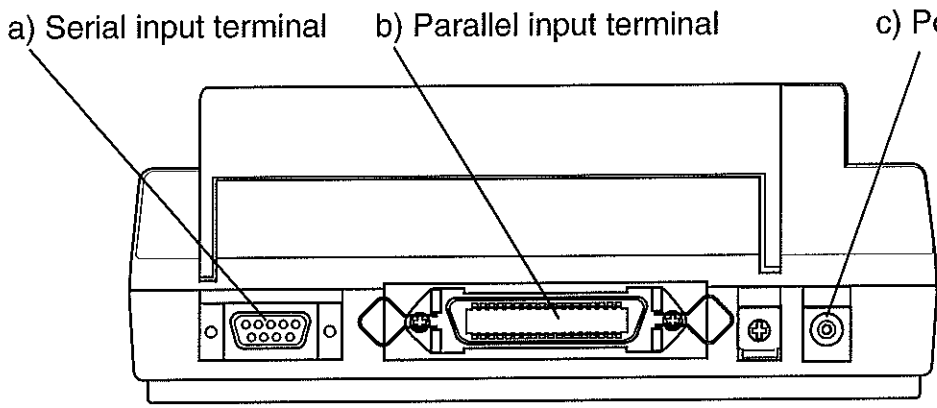


Fig. 4-8

(3)-3 Bottom panel (Fig. 4-9)

a) Back lid
No need to use.

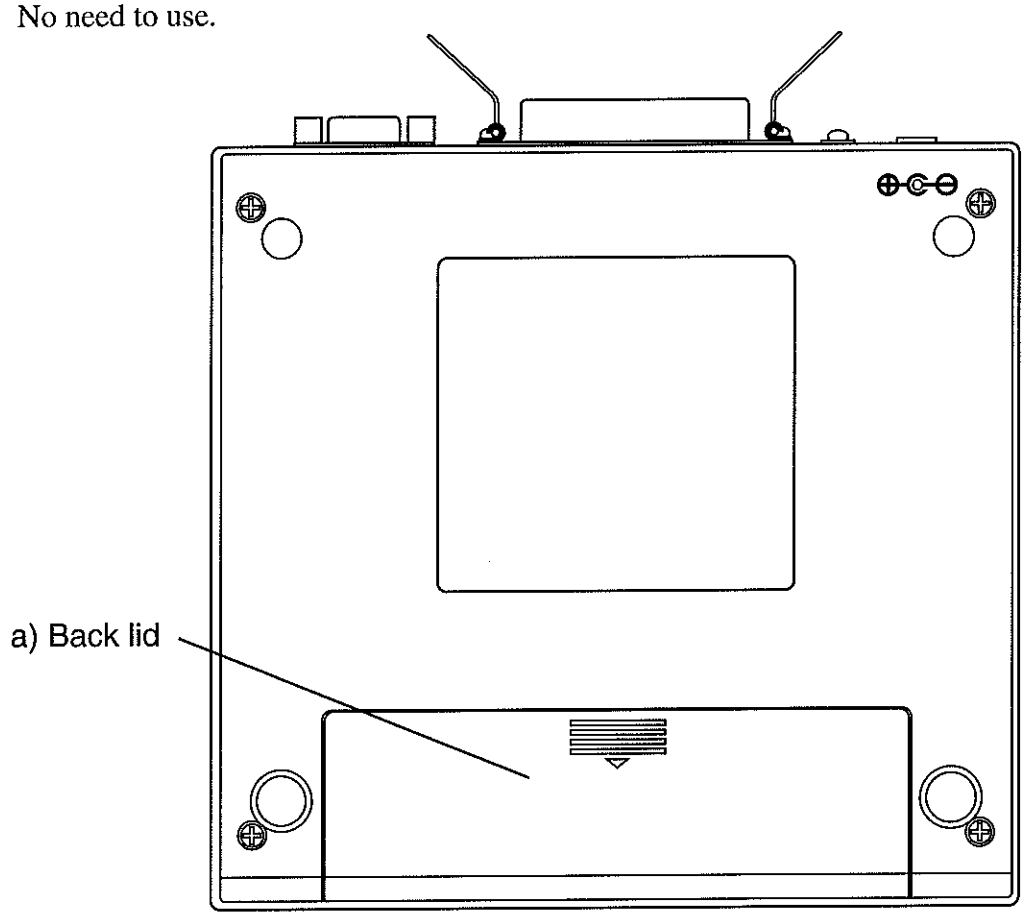


Fig. 4-9

5. Making the connections

(1) Connecting the AC power cable (Fig. 5-1)

Insert the connector of the AC power cable to the AC power input terminal located at the back of the RX-007 α.

* Do not plug the AC power cable into the power outlet yet.

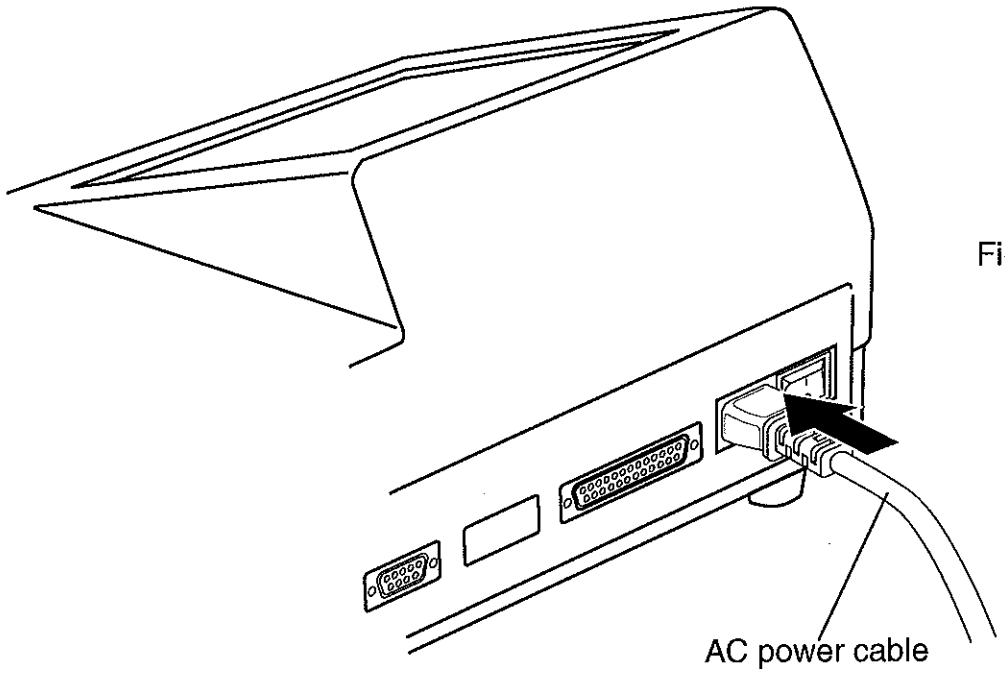


Fig.5-1

(2) Connecting the digital printer DP-RX (Optional) (Fig.5-2)

a) Connect the signal cable connector to the printer output terminal located at the back of the RX-007 α, and the other end to the connector to the parallel input terminal of the printer.

b) Please connect the connector of AC adapter attached to DP-RX to the power supply terminal on the back side of DP-RX. Then, please connect the plug of AC adapter to an indoor wall socket.

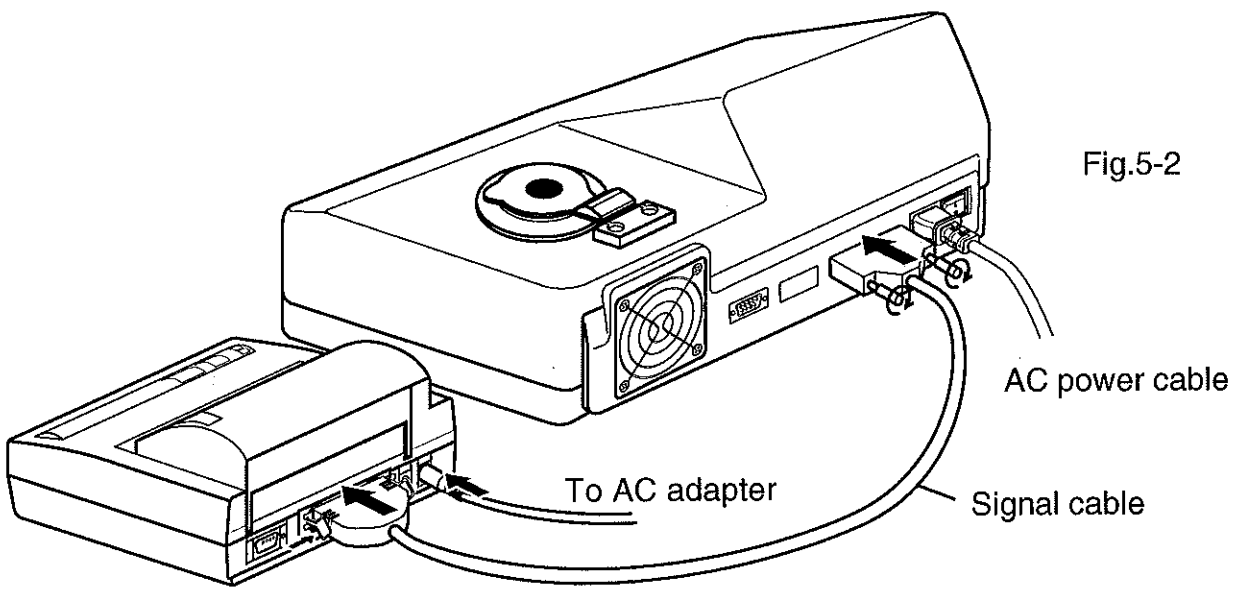


Fig.5-2

6. Power-on

⚠ CAUTION

◇After turning off the power switch, wait for more than one minute before powering on. If the switch is turned on again immediately after turning off, a malfunction may occur.

Power on the unit as follows:

(1) Plug the AC power cable into an indoor AC100 to 240V power outlet. At this time, be sure to connect the ground wire (Fig. 6-1).

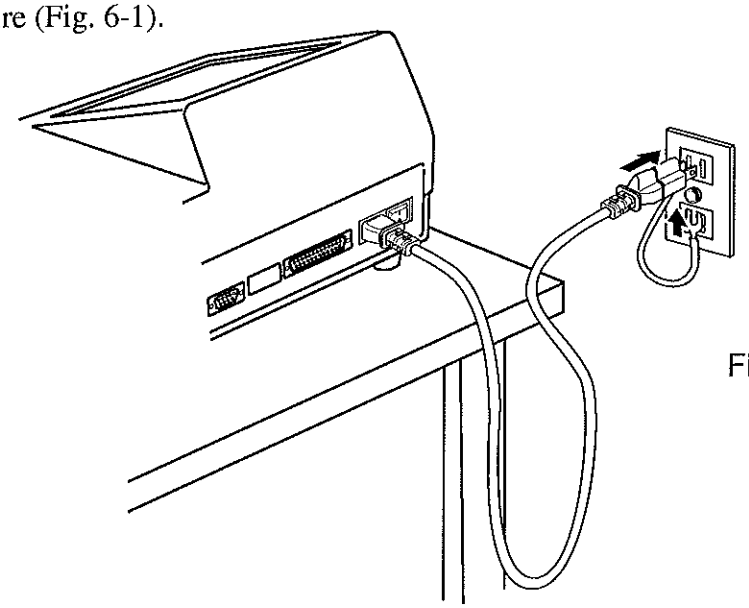


Fig.6-1

(2) If the digital printer DP-RX (optional) is connected, slide the power switch to the I position first.

(3) Tilt the power switch located at the back of the RX-007 α to the I position to power the unit on.

(4) Step 3 powers on the RX-007 α and DP-RX. The RX-007 α will display the screen as shown in Fig. 6-2. Three seconds later, the display switches to one of the screens illustrated in the measurement (or ZERO SET END) display screen.

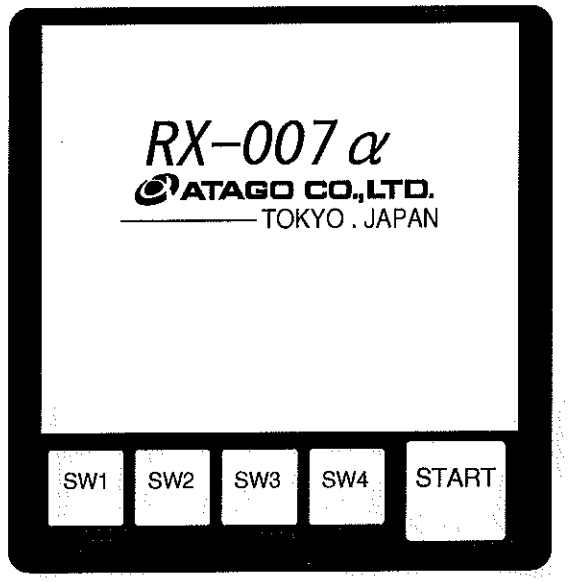


Fig.6-2

In the situation where the power switch is turned on and the liquid-crystal-display screen is not displaying properly, turn off the power. Wait for at least 1 minute, and then turn on the power switch again.

7.Display screens frequently used in this manual

(1) measurement (or ZERO SET END) display screen(Fig.7-1 to 7-6)

The "measurement (or ZERO SET END) display screen" used in this manual refers to the following four types of screen:

Fig.7-1

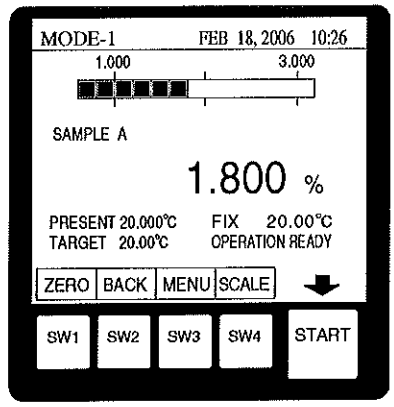


Fig.7-2

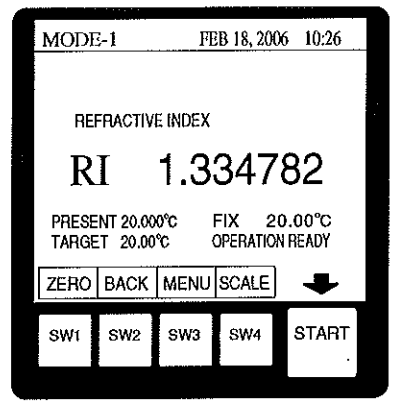


Fig.7-3

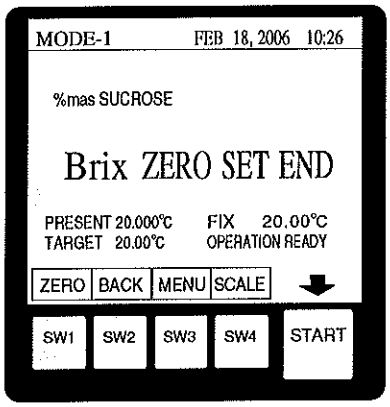


Fig.7-4

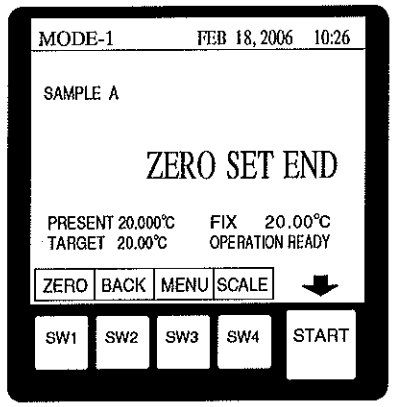


Fig.7-5

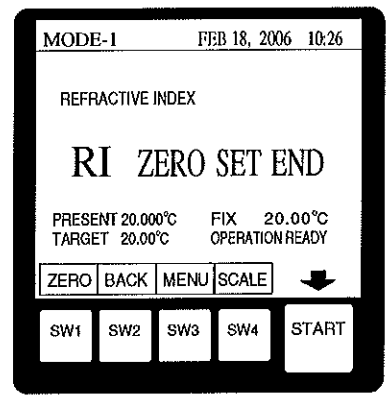


Fig.7-6

(2) SETUP MENU screen(Fig.7-7)

The "SETUP MENU screen" used in this manual refers to the following screen.

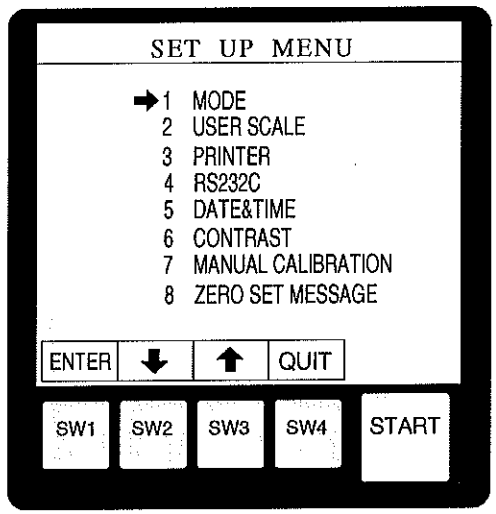


Fig.7-7

8. Setting the date and time

If the unit displays the wrong date and/or time, correct it as follows:

(1) While you are in a screen as in the measurement (or ZERO SET END) display screen, press the SW3 (MENU) key.

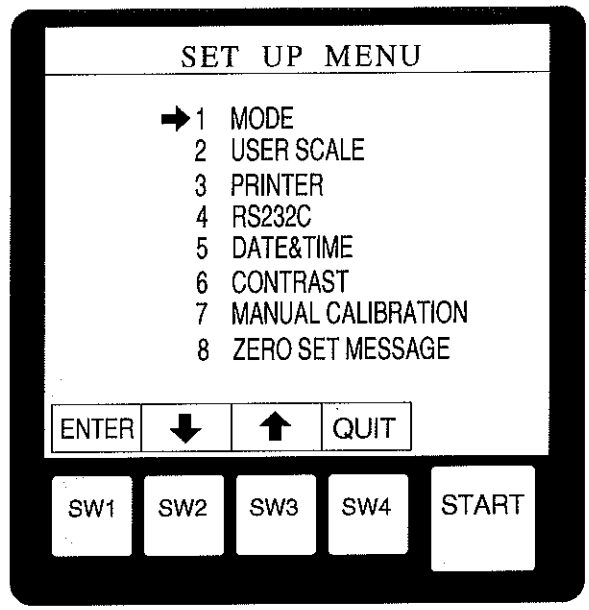


Fig. 8-1

(2) A screen as illustrated in SET UP MENU screen is displayed (Fig. 8.1). Use the SW2(↓) or SW3(↑) key to set the arrow (→) to 5 DATE & TIME. Then press the SW1(ENTER) key.

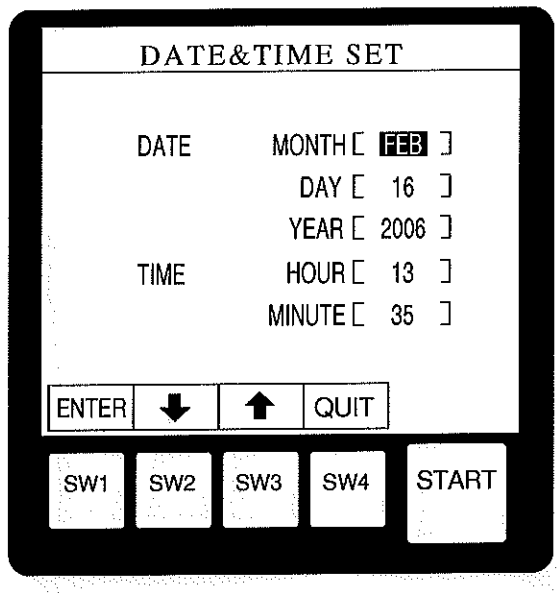


Fig. 8-2

(3) A screen as shown in Fig. 8-2 is displayed. The MONTH should be blinking. To correct the month press either the SW2(↓) or SW3(↑) key, then press the SW1(ENTER) key.

(4) Next, the DAY begins to blink. Correct the DAY, YEAR, HOUR and the MINUTE values in the same manner. If the wrong number is entered, press the SW4(QUIT) key and repeat setting from step 1.

(5) After the final MINUTE value is entered, press the SW1(ENTER) key. A "beep" will sound and the unit switches back to the SET UP MENU screen. To return to a measurement display screen, press the SW4(QUIT) key.

(6) The display should return to a screen as illustrated in the measurement (or ZERO SET END) display. Date and time setting is now complete.

9. Setting the measurement display screen

The measurement display screen of the RX-007α is set in one of the two display modes of the "Standard Brix display (Fig. 4-4)," "Top and bottom limit bar or user scale display (Fig. 4-5)," or "Standard refractive index display (Fig.4-6)."
If the displayed screen is not the desired one, press the SW4(SCALE) key repeatedly until the desired screen is displayed (Fig. 9-1).
The last screen displayed when the power is turned off will also be displayed when the unit is turned on again.

* The screen "Standard Brix display" is set at the factory prior to shipping.When displaying the screen of a sample name different from the currently displayed sample name in the "Top and bottom limit bar or user scale display" mode, see "(2) How to select the measurement display screen" found on page 35 or "(5) How to select the measurement display screen" located on page 38.

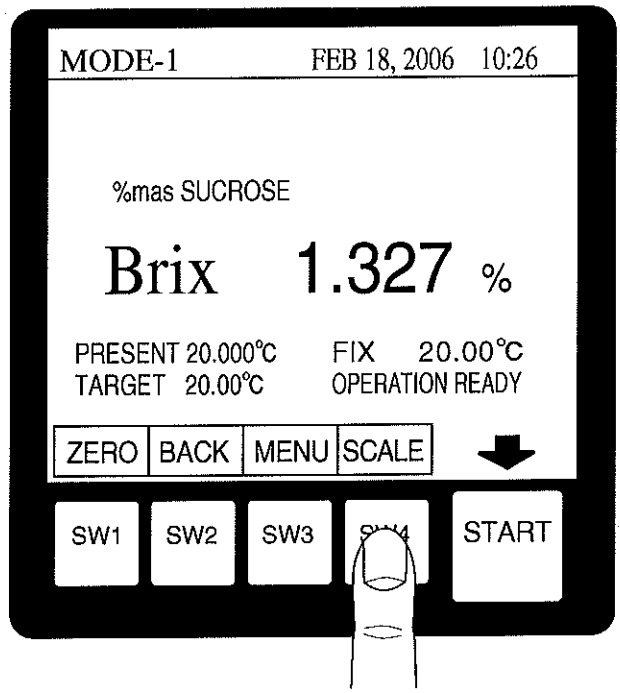


Fig. 9-1

10. Setting a mode

(1) Types of modes

The RX-007 α has the following two measurement modes.

MODE-1	The thermo-module in the RX-007 α operates. The temperature can be set freely by the user. If droplets of a sample are applied onto the prism and then the start key is pressed, measurement begins after the sample reaches the target temperature.
MODE-2	The unit starts measurement immediately after droplets of a sample are applied onto the prism and the start switch is pressed. The measurement value is displayed in 20 seconds.The time to begin measurement after the start key is pressed can be delayed Manually (The factory default WAIT TIME is set at 40secounds). The user can turn on and off the thermo-module in RX-007 α freely.

The RX-007 α is set in "MODE-1" and its target temperature is set to 20.00℃ when shipped from the factory. Confirm that the mode number is set to MODE-1 and the target temperature is set to 20.00℃ on the screen as shown in the measurement (or ZERO SET END) display screen.
When necessary, change the setting according to the procedures in the following section.

(2) How to set a mode

(2)-1 How to set to MODE-1

a) While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3 (MENU) key.
b) The unit switches to a screen as shown in SET UP MENU screen . Check that the arrow(→) is at "1 MODE", then press the SW1(ENTER) key. If the arrow is positioned elsewhere, use the SW2 (↓) or SW3(↑) key to move the arrow(→) to "1 MODE", then press the SW1(ENTER) key.
c) The unit switches to a screen typically shown in Fig. 10-1. The MODE value should be blinking. Use the SW2(↓) or SW3(↑) key to change the blinking number to [1] for MODE-1 or [2] for MODE-2, then press the SW1(ENTER) key.
d) The display switches to a screen as shown in Fig. 10-2.
The temperature integer part of the TARGET TEMP. value should be blinking. Use the SW2(↓) or SW3(↑) key to set the blinking number to [20] for 20℃, then press the SW1 (ENTER) key.

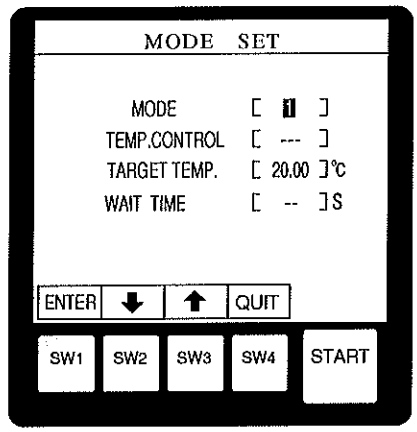


Fig.10-1

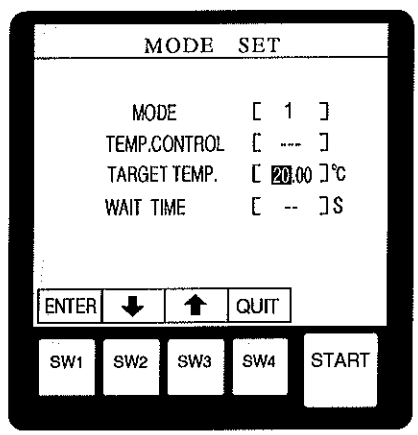


Fig.10-2

e) Then, the temperature fractional part of the TARGET TEMP. value should be blinking as shown in Fig. 10-3. Use the SW2(↓) or SW3 (↑) key to set the blinking number to [00], then press the SW1(ENTER) key. If a mistake is made in setting, press the SW4(QUIT) key and repeat the setting operation from step 1.

f) A "beep" will sound and the unit switches back to the SET UP MENU screen. Press the SW4(QUIT) key to return to measurement (or ZERO SET END) display screen (FIg.7-1 to Fig.7-4)

g) The unit switches back to a screen as shown in the measurement (or ZERO SET END) display screen.
Setting the mode is now complete.

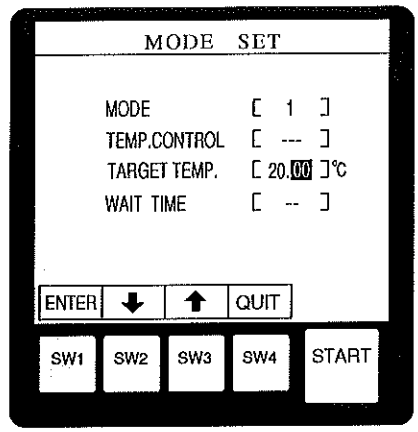


Fig. 10-3

(2)-2 How to set to MODE-2

a) While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3(MENU) key.

b) The unit switches to a screen as shown in SET UP MENU screen. Check that the arrow (→) is at "1 MODE", then press theSW1 (ENTER) key.
If the arrow is positioned elsewhere, use the SW2(↓) or SW3(↑) key to adjust the arrow (→) to "1 MODE", then press the SW1(ENTER) key.

c) The unit switches to a screen typically shown in Fig.10-1. The MODE value should be blinking.
Therefore use the SW3(↑) key to change the number to [3], then press the SW1(ENTER) key (Fig.10-4).

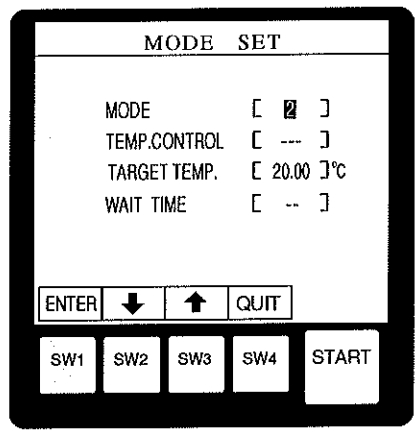


Fig. 10-4

d) The display switches to a screen as shown in Fig. 10-5.
The TEMP. CONTROL should be blinking. Use the SW2(↓) or SW3(↑) key to set to ON if the temperature is to be controlled or OFF if the temperature will not be controlled. Then press the SW1(ENTER) key.

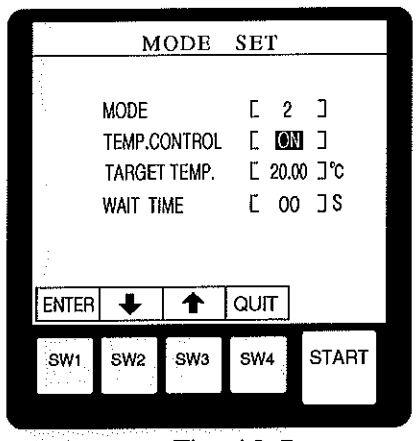


Fig. 10-5

e) If the TEMP. CONTROL is set to ON in (4) above, the TARGET TEMP. should blink (Fig. 10-6. If the TEMP. CONTROL is set to OFF, the WAIT TIME in (g) should blink.)
The temperature integer part of the TARGET TEMP. value should be blinking. Use the SW2 (↓) or SW3(↑) key to set the blinking to [20] for 20℃, then press the SW1(ENTER) key.

f) Then, the temperature fractional part of the TARGET TEMP. value should be blinking as shown in Fig.10-7. Use the SW2(↓) or SW3 (↑) key to set the number to [00], then press the SW1(ENTER) key.

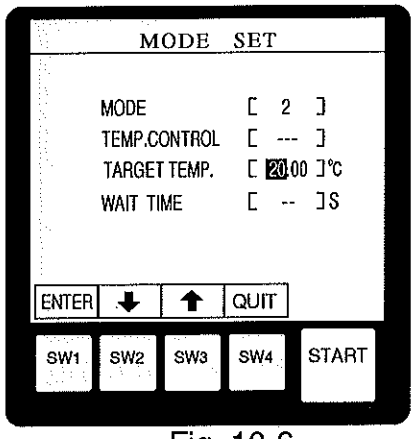


Fig. 10-6

g) The unit switches to a screen as shown in Fig. 10-8.
The WAIT TIME should be blinking. Use the SW2(↓) or SW3(↑) key to set the seconds (0 - 99 seconds), then press the SW1(ENTER) key.
If a mistake is made in setting, press the SW4 (QUIT) key and repeat the setting operation from step 1.

* The WAIT TIME is the time the RX-007α will wait prior to measurement begins after the start switch is pressed.
If the value is set to 0 second, the unit begins measurement immediately after the start switch is pressed and indicates the measured value in 4 seconds.

h) A "beep" will sound and the unit switches back to the SET UP MENU screen.
Press the SW4(QUIT) key to return to measurement (or ZERO SET END) display screen.

i) The unit switches back to a screen as shown in the measurement (or ZERO SET END) display screen.

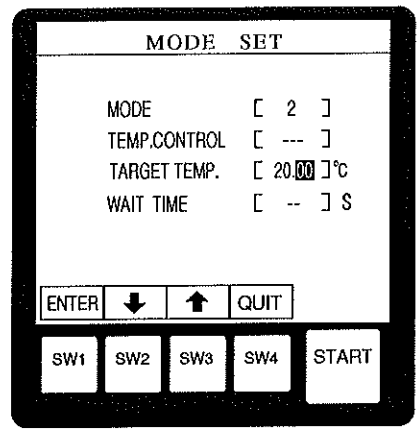


Fig. 10-7

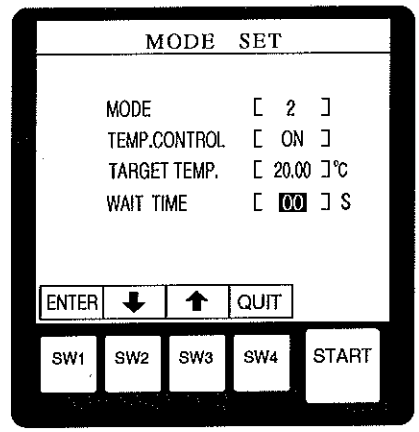


Fig. 10-8

11. Setting digital printer DP-RX(Optional)

If the digital printer DP-RX is connected, install the printer paper and set the printer according to the following procedure.

* Prior to setting, connect RX-007 α to the DP-RX and that the latter is powered on.

(1) Installing printer paper

a) Open the printer paper cover as illustrated in Fig. 11-1.

b) Cut the end of the printer paper so that it is straight (Fig.11-2).

c) Insert the end of the printer paper into the printer as shown in Fig. 11-3. The printer paper will automatically feed, about 10 cm of paper from the paper outlet (Fig. 11-4).

* The printer paper is coated with a thermo sensitive agent (outer side). The uncoated side does not print.
Take care to use the coated side of the paper.

d) Having installed the printer paper, close the cover.

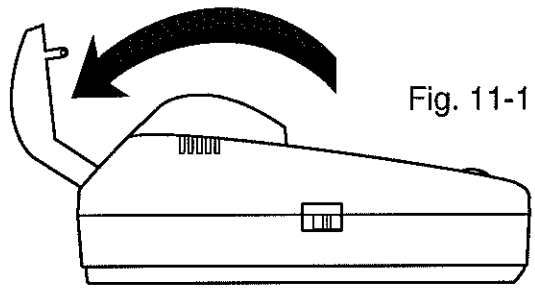


Fig. 11-1

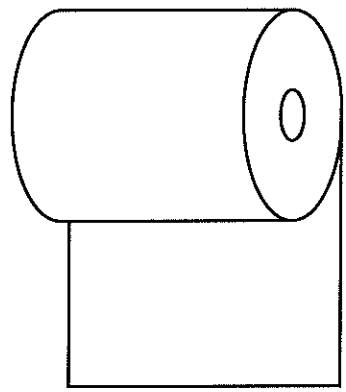


Fig. 11-2

(2) Paper feed

If spacing is needed between printed lines, press the online switch (the off-line lamp will light), then press the paper feed switch. Before printing, press the online switch again (the online lamp will light).

* The printer will not print the measurement unless the online lamp is lit.

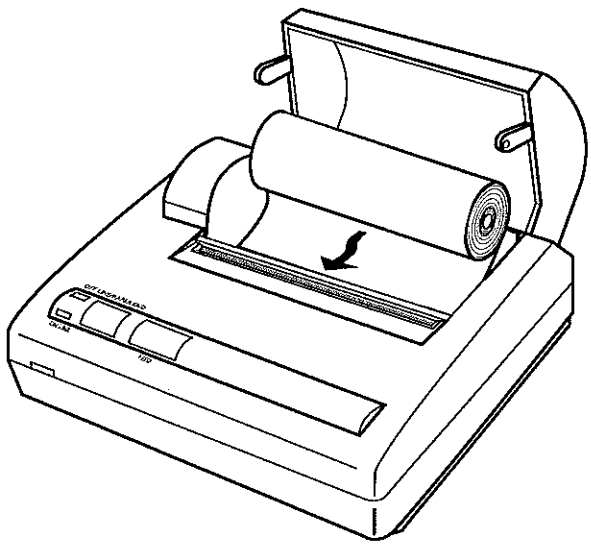


Fig. 11-3

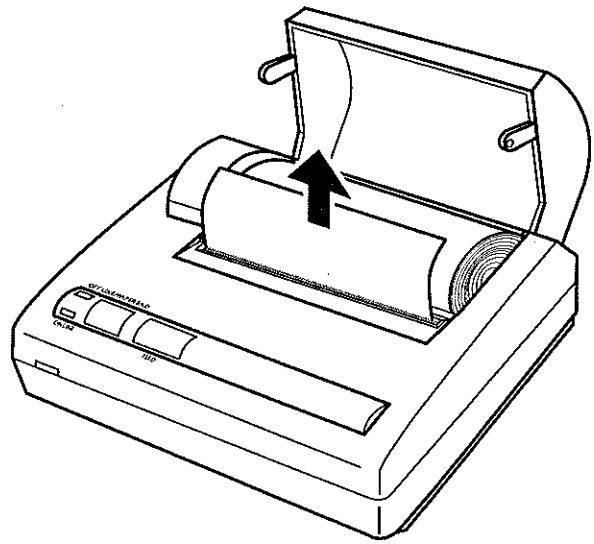


Fig. 11-4

(3) How to set printing items on the printer

Printing items on the printer are set with the RX-007α. The following items will be set.

- Printing a date after each measurement
- Printing a time after each measurement
- Printing the average
- A start number for to begin a sample
- The measuring scale (Brix , User scale and RI) can be selected.

<How to set>

a) While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3(MENU) key.

b) The unit switches to a screen as shown in SET UP MENU screen . Use the SW2(↓) or SW3(↑) key to adjust the arrow(→) to "4 PRINTER", then press the SW1(ENTER) key.

c) The display switches to a screen as shown in Fig. 11-5. In this figure the printout items are set as shown below.

- Print a date after each measurement.
  →DATE PRINT [ON]
- Print a time after each measurement.
  →TIME PRINT [ON]
- Do not print the average.
  →AVERAGE CNT. [OFF]
- Start the sample number with 0001.
  →SAMPLE CNT. [0001]
- Select only the Brix as the printout data.
  →PRINT DATA Brix [ON]
  USER [OFF]
  RI [OFF]

d) The DATE PRINT [ON] should be blinking. If printing the dateis desired, press the SW1 (ENTER) key. If printing the date is not desired, use the SW2(↓) or SW3(↑) key to display [OFF], then press the SW1(ENTER) key.

e) Only when the DATE PRINT [OFF] is set, the TIME PRINT [ON] blinks. Setting can be completed similarly as in d).

f) Next, the AVERAGE CNT. [OFF] should be blinking. If printing the average is not desired, press the SW1(ENTER) key. If printing the average is desired, use the SW2(↓) or SW3(↑) key to set a number in [ ] between 2 - 20. The number represents the number of measurements to be taken prior to the average being printed.
For example, if the number is set to 3, the average is printed after measurement is made 3 times). After setting the number, press the SW1(ENTER) key.

g) The "00" for thousands and hundreds in the SAMPLE CNT. [0001] should be blinking. If printing the sample number beginning with 0001 is desired, press the SW1(ENTER) key, and the"00" for tens and units will start blinking. Then press the SW1(ENTER) key. If printing the sample number beginning with a different number, use the SW2(↓) or SW3(↑) key to display the desired number in [ ] and press the SW1(ENTER) key.

h) The Brix [ON] of the PRINT DATA should be blinking. If printing Brix is desired, press the SW1 (ENTER) key. If printing the Brix is not desired, use the SW2(↓) or SW3(↑) key to display [OFF], then press the SW1(ENTER) key. If a mistake is made in setting, press the SW4(QUIT) key and repeat the setting operation from the beginning.

i) Setting the USER and RI of the PRINT DATA is done similarly. When completed, press the SW1(ENTER) key. The display switches back to the SET UP MENU screen. If a mistake is made in setting, press the SW4(QUIT) key and repeat the setting operation from the beginning.

* The measurement data to be printed can be combined with the three scales of the measurement data (Brix, user scale or RI). Select the necessary measurement data.

j) When the screen displayed is in the SET UP MENU screen, press the SW4(QUIT) key, and the display switches back to a screen as shown in the measurement (or ZERO SET END) display screen.

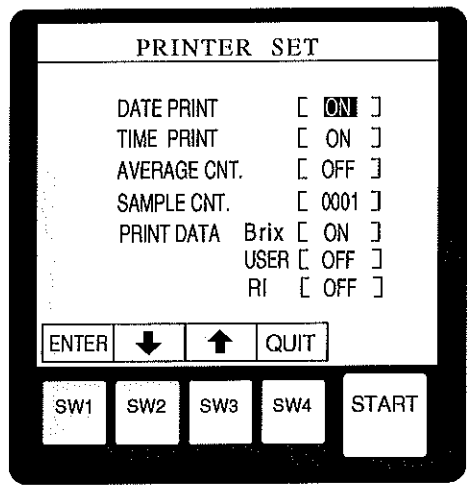


Fig. 11-5

12. How to measure

Operating Suggestions for Accurate and Stable Measurement Values

To get accurate (Brix ±0.005%) and stable measurement values, the Automatic Digital Refractometer RX-007α must be operated with special attention paid to a number of steps during measurements. It is recommended to read each one of the following items carefully for through understanding before operating the RX-007α.

1. Installation Site and Environment

Be sure to place the RX-007α on a flat surface, such as a desk or laboratory table inside. Also, the RX-007α is recommended to be used at temperatures between 15 and 30℃ (59 and 86 ° F). A built-in thermo module allows for measurements with the prism stage kept at constant temperatures. Match-up between the ambient temperature and the constant temperature (preset temperature by the thermo module) is as follows:

Ambient temperature	Constant temperature of the RX-007α
15 ℃ (59 ° F)	15, 20 ℃ (59, 68 ° F)
20 ℃ (68 ° F)	15, 20, 25 ℃ (59, 68, 77° F)
25 ℃ (77 ° F)	20, 25 ℃ (68, 77° F)
30 ℃ (86 ° F)	25 ℃ (77 ° F)

2. Grime on the Prism and Use of Alcohol

(1) Special Attention to Grimes on the Prism

As grime on the surface of the prism affects the accuracy of measurements significantly in measurements that provide measurement values as precise as the third decimal point in Brix, it must be removed to avoid measurement errors. The grime most commonly seen on prism surface is oil contents. Some tea drinks do contain tiny amounts of oil contents. Also, fingers often can be oily enough to accidentally leave oil on the surface when cleaning the prism. It is required that the prism be cleaned with alcohol before measuring a sample, and especially before conducting zero setting using air and distilled water.

(2) Use of Alcohol

Use ethanol mixed with the same amount or 1/3 of water.

Higher concentration of Ethanol might be a cause for grimes on the prism surface without evaporating.

How to Wipe off Samples

a) Remove the sample with a soft lint-free tissues such as Kimwipe.
b) Add distilled water and clean the prism surface with lint-free tissue paper.
c) Wipe off water with lint-free tissue paper.
d) Add a few drops to the prism surface and wipe clean with Kimwipe or apply some alcohol to Kimwipe and clean the prism surface.
Be sure not to touch the prism surface directly with your finger. Wipe off the alcohol with Kimwipe at the end.

3. ZERO SET ERROR

The RX-007α is intentionally programmed to indicate "ZERO SET ERROR" as an error message. This is because zero setting of the RX-007α requires both zero setting using air, and another zero setting using distilled water as a set. When "ZERO SET ERROR" is indicated, slow down and start again by conducting zero setting with air.

12. How to measure

(1) Zero Setting

(1)-1 Zero Setting

Zero setting is conducted using a two-tiered approach: Once with air and once again with distilled water. Both are conducted together in a continuous process. Be sure to conduct zero setting every time the RX-007 α is switched on and when preset temperatures of the constant temperature function. Zero setting also needs to be conducted when the "ZERO SET ERROR" message is indicated. Zero setting cannot be conducted when the constant temperature function is turned off. Be sure to set up the RX-007 α so that the constant temperature function is functional even in MODE-2.

* Conduct zero setting with the measurement reading screen or the ZERO SET END screen is displayed on the display panel.

(1)-2 How to Conduct Zero Setting

First, conduct zero setting with air.

a) Clean the prism surface and close the cover plate. (Fig.12-1)

b) Press SW1 (ZERO). "ZERO SET START" and "READING ... " will be displayed on the display panel as the RX-007 α conducts zero setting with air. (Fig.12-2)

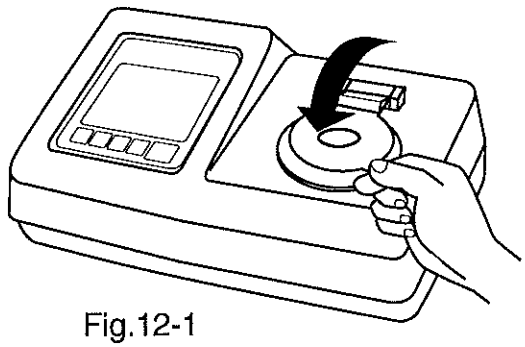


Fig.12-1

"ZERO SET ERROR" will be displayed when the prism surface is grimed or covered with liquid. Clean the prism surface and then press SW1 (ZERO) again.

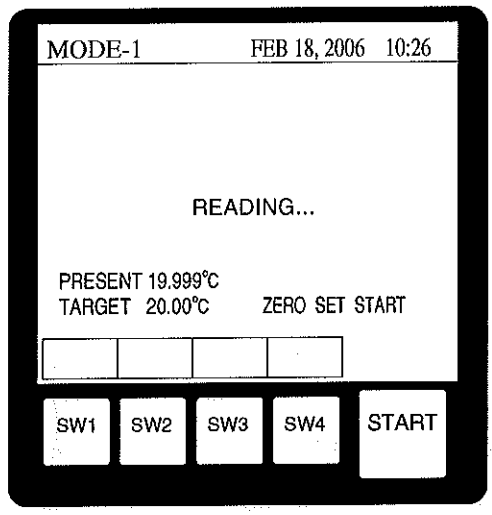


Fig.12-2

c) The display shown in Fig.12-3 will be displayed when zero setting with air is completed. "SET WATER AND PRESS SW1" is displayed on the display panel, meaning zero setting with air has been completed successfully.

If zero setting with distilled water does not begin within 1 minute after the zero setting with air is complete, the RX-007 α will cancel the completion of zero setting with air and indicate "ZERO SET ERROR" on the display panel.

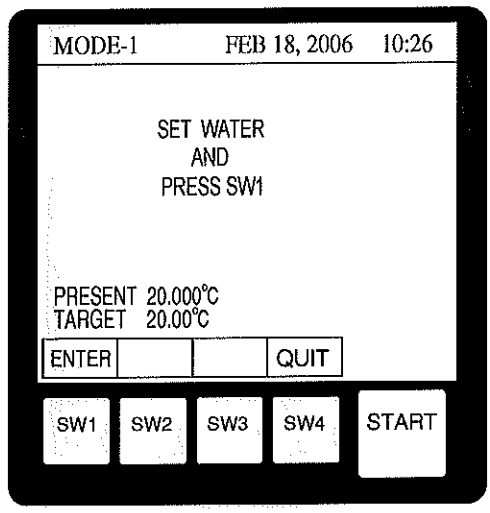


Fig.12-3

⚠CAUTION

Be sure to use distilled water to conduct zero setting. Using liquid that is Brix 0.05% or higher will cause the RX-007 α to indicate "ZERO SET ERROR". In such a case, clean the prism surface and start again by conducting zero setting with air.

d) Put 0.1 ml of distilled water on the prism surface and close the cover plate. Then, press SW1 (ENTER). (Fig.12-4)
The display panel will return to "WAITING... " (Fig.12-5)
About 70 seconds later (depending on the temperature of the distilled water being used), the display panel will change to "READING... " Another 20 seconds later, "ZERO SET END" will be displayed upon completion of zero setting. Zero setting has now been completed successfully.

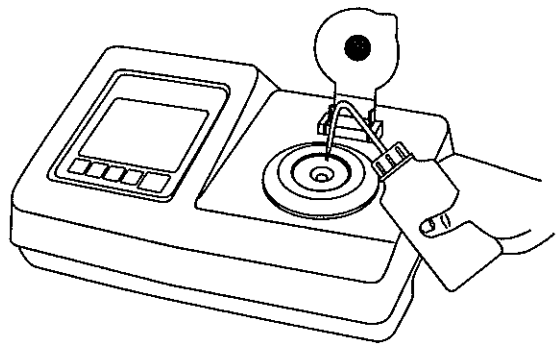


Fig.12-4

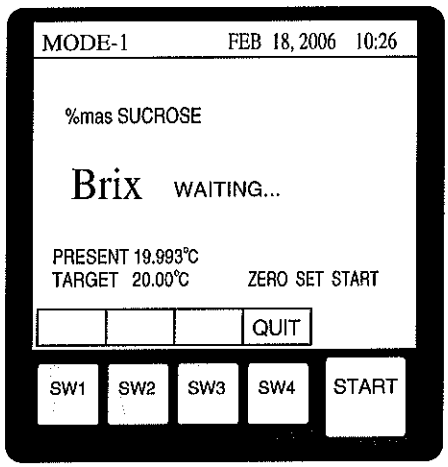


Fig.12-5

Fig.12-6

ZERO SET ERROR

To maintain high accuracy the RX-007 α requires special precision during the process of zero setting, and it indicates the "ZERO SET ERROR" message even when one single misconduct is detected. (Fig.12-7)
When "ZERO SET ERROR" is indicated on the display panel, start again by conducting zero setting with air.

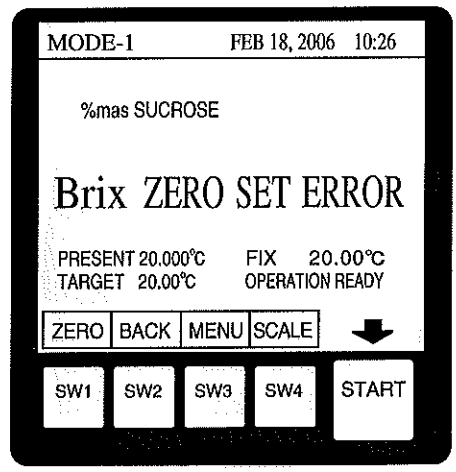


Fig.12-7

12. How to measure

ZERO SET MESSAGE

The RX-007 α is a digital refractometer that enables measurements at high precision. A small change in the temperature of the RX-007 α (or ambient temperature), even a few degrees, may cause fluctuation in measurement values. Given this factor, the RX-007 α is programmed to indicate blinking "ZERO SET" on the "ZERO SET END" and measurement reading screens, as shown in Fig.12-8, when the temperature of the RX-007 α (or ambient temperature) changes for a few degrees. Be sure to conduct zero setting when this occurs.

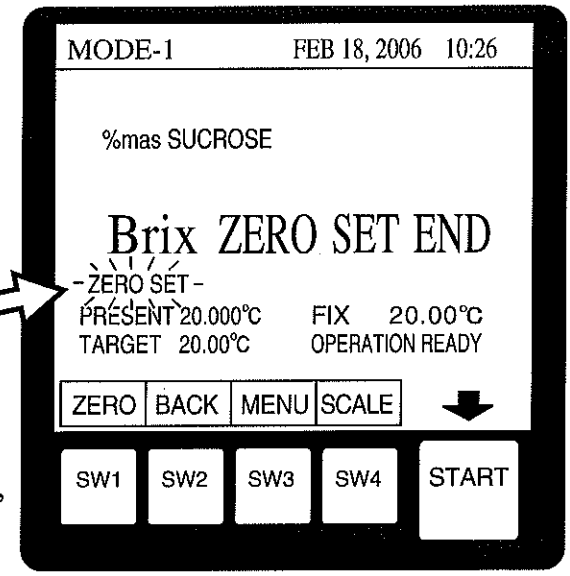


Fig.12-8

In case your measurements do not require high precision, this function can be deactivated so that the "ZERO SET" message will not be displayed.

How to Deactivate the Function

a) Press the SW3 (MENU) key on the measurement reading (or ZERO SET END) screen.
b)Using the SW2 (↓) or SW3 (↑) key, select "8. ZERO SET MESSAGE," and then press the SW1 (ENTER) key. (Fig.12-9)
c) The ZERO SET MESSAGE screen will be displayed on the panel. Using the SW2 (↓) or SW3 (↑) key, select [OFF] or [ON]. (Fig.12-10)
d) After selecting [OFF], return to the former screen by pressing the SW4 (QUIT) key.

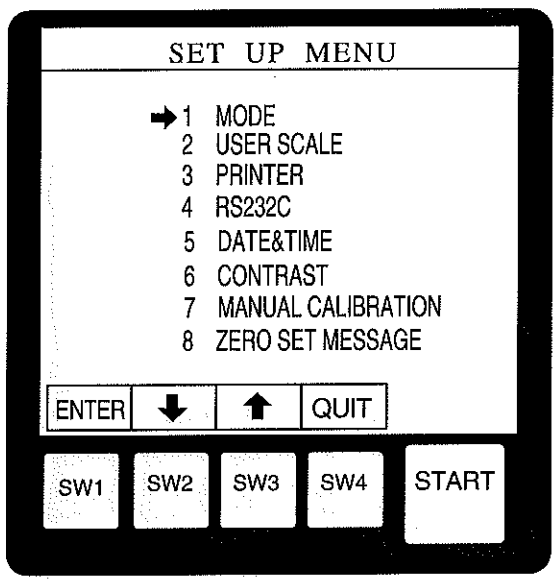


Fig.12-9

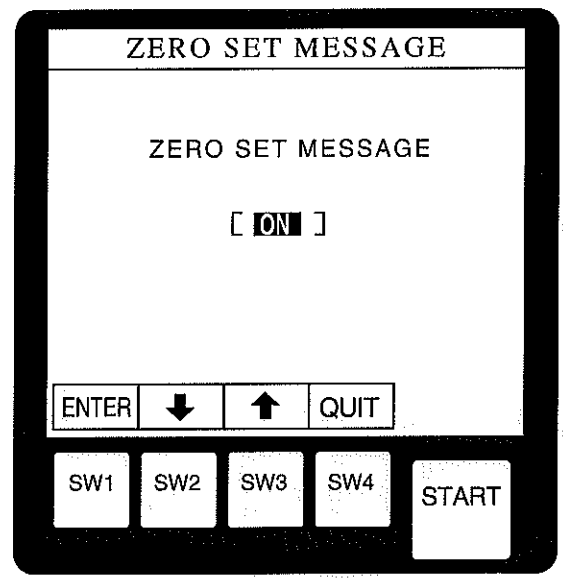


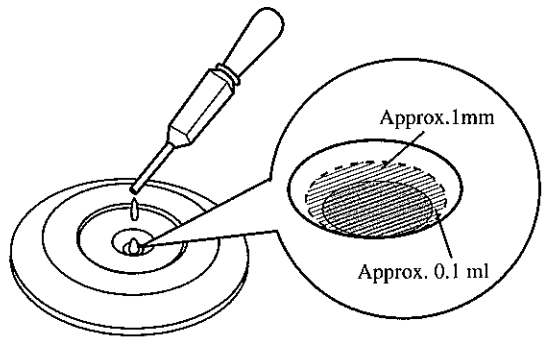
Fig.12-10

To Ensure Stable Measurement Values

The RX-007α allows for Brix 0.001% and is a very high-resolution model. Here is some advice to help ensure stable measurement values at the third decimal point percent.

(1) Be sure that the prism surface is kept clean at all times.
Even the slightest grime found in liquid that is Brix0.300% can fluctuate the value at the thousandth digit. When you conduct zero setting or measurements, even if the prism surface appears to be clean, apply a few drops of diluted ethanol with a same amount or 1/3 of water and wipe clean with lint-free tissue paper such as Kimwipe. Next, apply a few drops of distilled water and wipe clean with Kimwipe. Then, finally, wipe the prism surface with Kimwipe again to make sure it is dry. Be sure not to touch the prism surface directly with your finger.

(2) Be sure that to keep the amount of sample used to approximately 0.1 ml. When an excessive amount of sample is used, it may cause temperature convection resulting in unstable measurement values. The best amount of sample to be used (approximately 0.1 ml) is shown in the figure. It is about two or three drops from a dropper.



(3) It is recommended that the same sample be measured more than once. Accidental errors cannot be detected if the sample is measured only once. When you measure the same sample repeatedly, be sure to clean the prism surface and then put a few drops of the sample on the prism surface each time.

Example:

	Using same drops for measurement (Press START repeatedly)		
	First time	Second time	Third time
First drops	0. 325	0. 327	0. 326
Second drops	0. 326	0. 324	0. 326
Third drops	0. 327	0. 325	0. 326

Average=0.326

For example shown above, the average 0.326 will be used as the measured value.

1. If one of the three measurement values obtained by using three different drops of the same sample differs markedly from the other two, it means there is something wrong so do not count that measurement value. Try fourth drops if needed.
2. If the measurement values obtained for the first and second drops are almost the same, skip measuring the third drops.
3. If measurement values still vary after measuring the sample for several times, it is recommended to exclude the highest and lowest values and to use an average value of the remaining values obtained.

(4) When measuring teas, the following is recommended when measuring different drops of the same tea sample.When you finish measuring the first drops and before putting the second drops on the prism surface.

a) Remove the first drops by using a dropper. Use the dropper a few times to suck up the sample making sure no sample is left on the prism surface.

b) Leaving the prism surface as it is, suck up a new sample using the dropper - Be sure the dropper is empty - and put a few drops (approx. 0.1 ml) on the prism surface.
Cleaning the prism surface using ethanol, distilled water, or Kimwipe between first and second drops is not necessary.

(2) Measuring a Sample

⚠ CAUTION

◇Be sure not to spill water or a sample on any parts but the prism surface of the RX-007α.
◇The prism surface is made of optical glass. Do not hit or poke the surface with a metal spoon or forceps. Scratches on the prism surface may cause dysfunction in measurements.
◇Be sure to wipe the sample off the prism surface and the surrounding areas using soft tissue paper (Kimwipe) impregnated with alcohol, and then dry it completely with dry tissue paper.
◇Be sure to clean the prism surface with tissue paper impregnated with alcohol or mild detergent after measuring a macro molecule or oil contents, and then dry it completely with dry tissue paper.

* Measure a sample when a measurement reading or the ZERO SET END display is indicated on the display panel.

⚠ CAUTION

When measuring samples in MODE-1, the measurement time could take long in some cases. The reason for this effect is because the sample(liquid), adapted to the room temperature (ambient temperature), could take time to reach the target temperature once the operation has started (for example : set at 20.00℃).
To be able to get highly accurate measurement values with the RX-007α, the instrument will only start when the sample's temperature shall equally match the target temperature. The smaller the difference between the actual sample temperature and target temperature, the faster it becomes to display the measured values as the sample adapts to the target temperature more quickly.

(2)-1 Measuring a sample (In MODE-1)

* Before measuring, power on the unit and wait for the current temperature (PRESENT) reads the same as the target temperature (TARGET) ±0.5℃ (between 19.5℃ to 20.5℃ when the target temperature is set to 20.00℃).

a) Wipe off the prism surface and sample stage using Kimwipe with alcohol.
b) Drop at least 0.1ml of the sample onto the prism surface (Fig.12-11).
c) Close the cover plate gently (Fig.12-12).
d) Press the START key. The display will switch to a screen as shown in Fig. 12-13, Fig. 12-14, or Fig. 12-15.
* To interrupt the measurement process press the SW4(QUIT) key. However, if the target temperature has matched to the current temperature, measurement cannot be stopped.

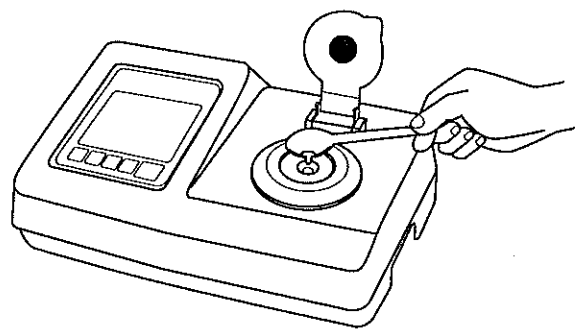


Fig. 12-11

e) The display will change and indicate "READING..." when the temperature (PRESENT) reaches the preset temperature (TARGET), and then 20 seconds later will change again to the measurement reading screen as shown in Fig.12-16, Fig.12-17, or Fig. 12-18. If the digital printer, DP-RX (optional), is connected, it will print out the measurement results. The measurement has now been completed successfully.

Fig. 12-12

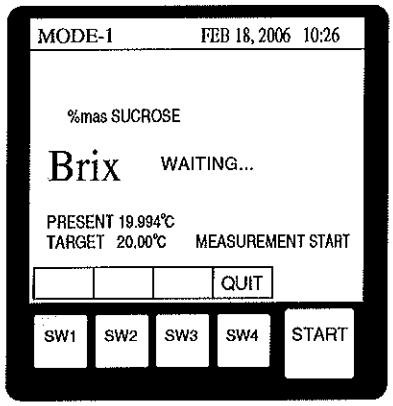
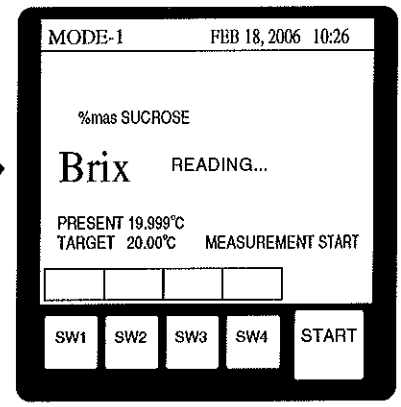


Fig. 12-13



READING display

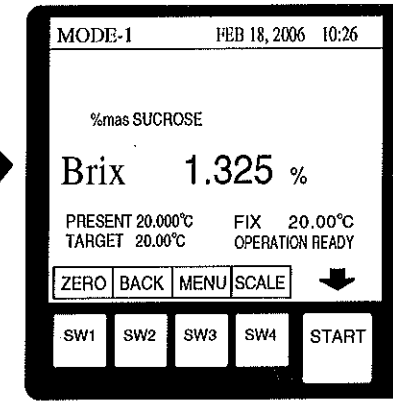


Fig. 12-16

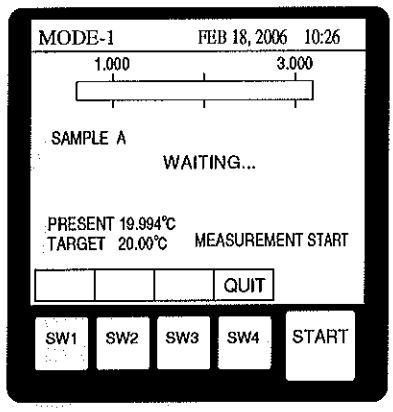
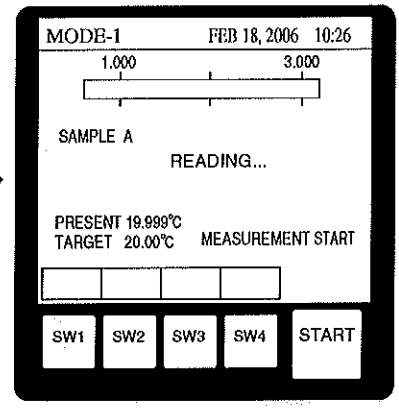


Fig. 12-14



READING display

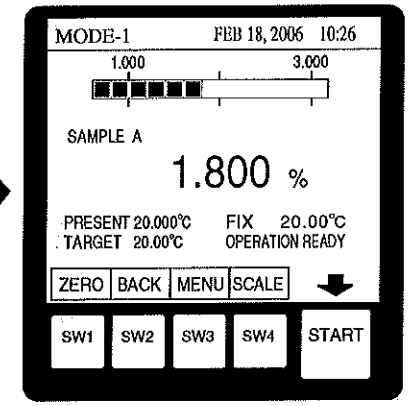


Fig. 12-17

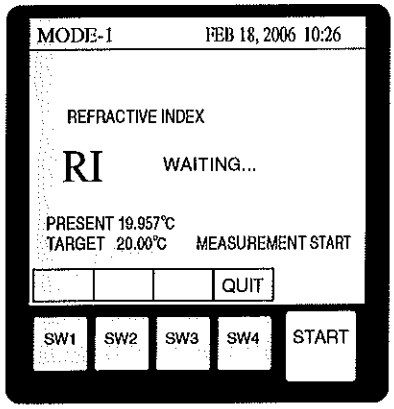
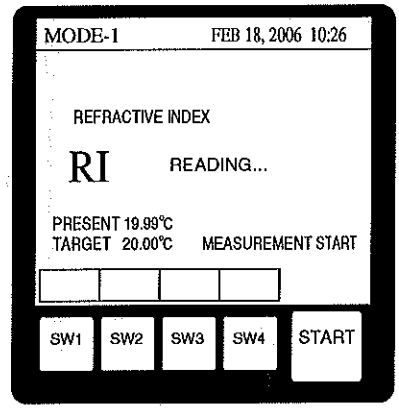


Fig. 12-15



READING display

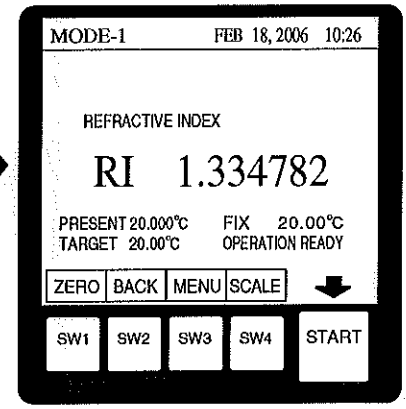


Fig. 12-18

(2)-2 Measuring a Sample (in MODE-2)

* When the thermo module is activated, be sure to allow enough time for the temperature reading (PRESENT) to change and fall within ± 0.5 ℃ of the preset temperature (TARGET) after switching on the RX-007α. If the preset temperature is 20.00 ℃, for instance, wait until the temperature reading settles between 19.5℃ and 20.5℃.

a) Clean the prism surface with alcohol.
b) Drop 0.1 ml of a sample onto the prism surface. (Fig. 12-19)
c) Close the cover plate calmly. (Fig. 12-20)
d) Press the START key. The display on the panel will turn to what is shown in Fig. 12-21, Fig.12-22, or Fig.12-23 below and the measurement will begin. (When WAIT TIME is set, the display on the panel will turn to Fig. 12-24, Fig. 12-25, or Fig.12-26 after the waiting time has passed.
e) The measurement will finish in approximately 20 seconds and the display will change to the measurement reading screen. WAIT TIME is preset for 40 seconds before shipment.
If the digital printer, DP-RX (optional), is connected, it will print out the measurement results. The measurement has now been completed successfully.

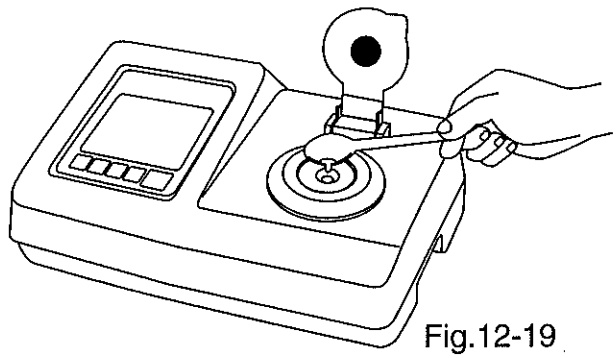


Fig.12-19

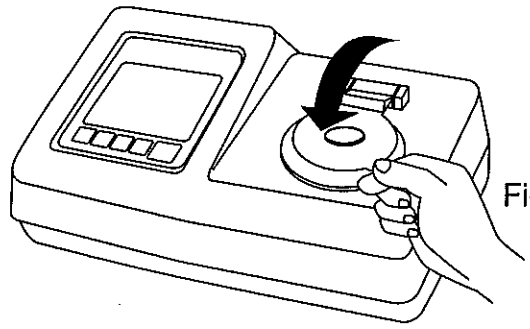


Fig.12-20

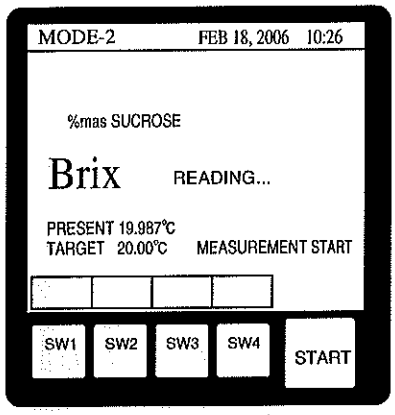


Fig.12-21

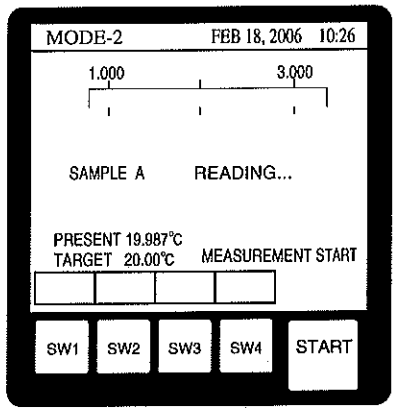


Fig.12-22

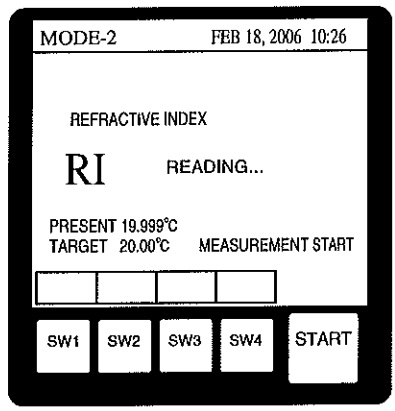


Fig.12-23

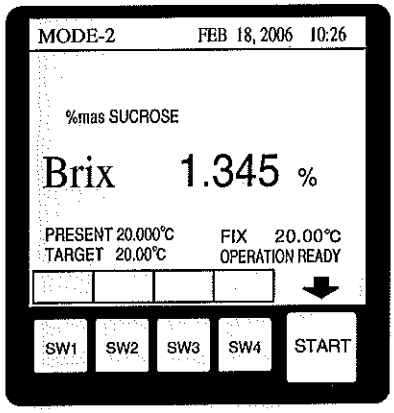


Fig.12-24

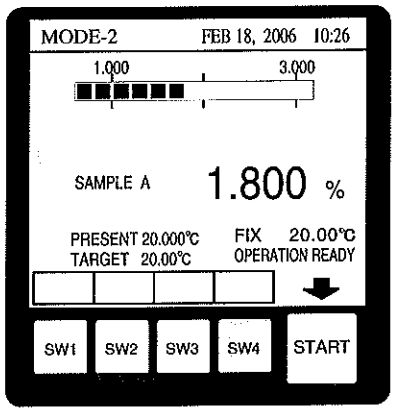


Fig.12-25

Fig.12-26

13. Using the top and bottom limit bar

The RX-007 α can be set to display the top and bottom limit bar by setting the top and bottom limits in the control range (tolerance) of Brix or User scale for each type of sample. The measurement value can be checked to see if it is within the tolerance. The procedure for setting is described below.

(1) Method of setting

a) While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3(MENU) key. The display will switch to a screen as shown in SET UP MENU screen.

b) With the SW2(↓) or SW3(↑) key, adjust the arrow(→) to 2 USER SCALE. Then press the SW1(ENTER) key.

c) The display changes to the screen shown in Fig.13-1. The scale No.[01] will start blinking. If No. 01 has been entered, use the SW2(↓) or SW3(↑) key to select a scale No. which has not been entered yet, then press the SW1(ENTER) key.

d) The SCALE [USER] should be blinking(Fig.13-2). Using the SW2(↓) or SW3(↑) key, adjust to either [Brix] or [RI] and press the SW1(ENTER) key.

e) The first digit in the top limit "LIMIT HIGH" should be blinking. Using the SW2(↓) or SW3(↑) key, adjust the number to a desired value and press the SW1(ENTER) key. This moves the prompt to the next digit. Set to the desired number by the same procedure.

f) Similarly, set the bottom limit "LOW" in the same manner, and press the SW1(ENTER)key.

* When setting the figure 2.000, enter the value "02.000".

g) Input the final digit for the bottom limit and press the SW1(ENTER) key. This moves the prompt to the sample name [NAME]. The first character should be blinking. Using the SW2(↓) or SW3 (↑) key, enter a desired sample name by entering one character at a time. Pressing ↓ and/or ↑ changes the letter or value in the order of A, B, C, ... X, Y, Z, 0, 1, ... 8, 9, (space), .(period), -. If a mistake is made in setting, press the SW4 (QUIT) key and repeat the setting operation from the beginning.

h) Finally, press the SW1(ENTER) key while PRINT [N] is displayed. The unit will "beep" and the display switches to the SET UP MENU screen. Press the SW4(QUIT) key to return to a screen as shown in the measurement (or ZERO SET END) display screen.

* If the digital printer DP-RX is connected, use the SW2(↓) or SW3(↑) key to display YES[Y] and press the SW1 (ENTER) key if printing of the setting screen is desired. The printer starts printing and the display switches to a screen as shown in SET UP MENU screen. Press the SW4(QUIT) key to return to the measurement (or ZERO SET END) display screen.

* If the digital printer DP-RX is connected, set the measurement items to be printed on page 25 as shown below.

●When printing the sample name

Printing of Brix	Printing of RI
Brix [OFF]	Brix [OFF]
USER [ON]	USER [ON]
RI [OFF]	RI [OFF]

At this time, if the measurement value is out of the set upper or lower limit, an error message is printed.

●When the sample name does not need to be printed

Printing of Brix	Printing of RI
Brix [ON]	Brix [OFF]
USER [OFF]	USER [OFF]
RI [OFF]	RI [ON]

In this case, the measurement value is printed even if it is out of the upper or lower limit.

* Up to about 10 letters can be input as a sample name. "NOTHING-01" is the factory setting. If the number of letters of the sample name is few, several spaces should be inputted so that the print by the DP-RX will be read easily.

  * Example: The upper limit for Brix scale is set to 3.000% and lower limit to 1.000%. The sample name is SAMPLE A

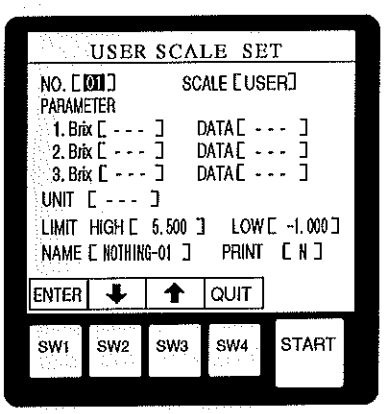


Fig.13-1

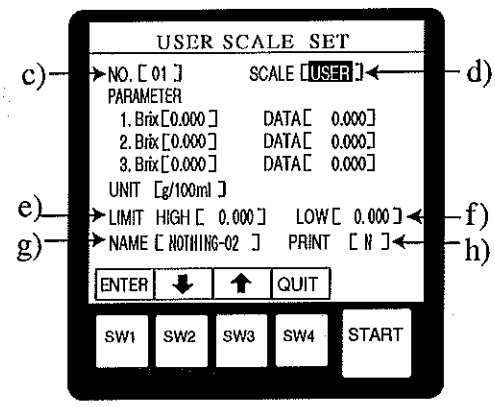


Fig.13-2

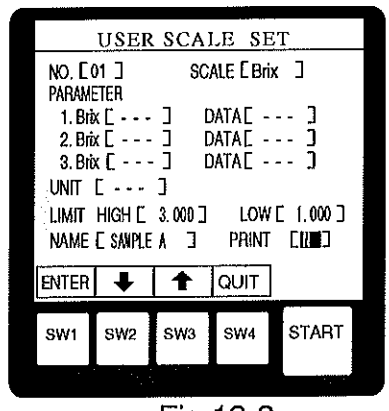


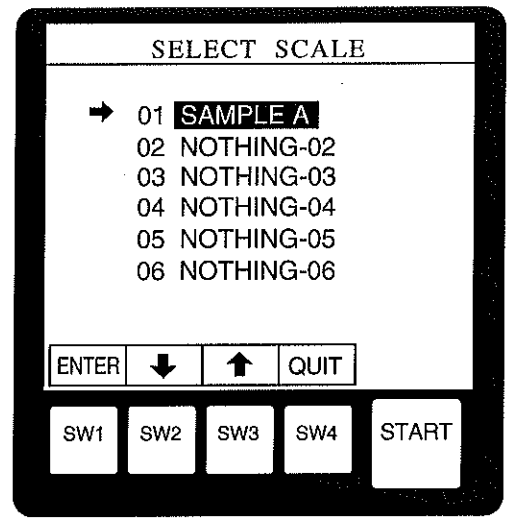
Fig.13-3

(2) How to select the measurement display screen

a) While in a screen as shown in the measurement (or ZERO SET END) display screen, press SW4 (SCALE) key a few times until a screen as shown in Fig. 13-4 appears.

* In the example of Fig. 13-4, the scale No. 1 has a sample name "SAMPLE A", No. 2 has a sample name "NOTHING -02", and "SAMPLE A" is selected as the display screen.

b) Using the SW2(↓) or SW3(↑) key, set the arrow (→) to a desired user scale number and press the SW1(ENTER) key. The unit will "beep" and the display switches to a screen as shown in Fig. 4-5. From this point on, the display will switch to a screen as shown in Fig. 4-5 each time a measurement is taken.



Numbers 01 through 30 can be selected as the scale. If the SW2(↓) key is pressed and held, the No. 7 and the sequential scale numbers are displayed

Fig.13-4

(3) Actual measurement

Measure according to the instructions on pages 31 - 33 while you are in a screen as shown in Fig. 4-5. The measurement result is displayed in a screen as shown in Fig. 13-4. If the measurement value is out of the upper or lower limit, "OUT OF SCALE" is displayed.

To determine how much the measurement value is out of the limit values, perform the following steps:

a) When the refractive index is read

Press the SW4(SCALE) key repeatedly until the "refractive index display" screen appears. The measurement value is displayed. To return to the original screen, press the SW4(SCALE) key repeatedly until the "top and bottom limit bar display" screen appears.

b) When Brix is read

Press the SW4(SCALE) key repeatedly until the "Brix display" screen appears. The measurement value is displayed. To return to the original screen, press the SW4(SCALE) key repeatedly until the "top and bottom limit bar display" screen appears.

The top and bottom limit bar roughly indicates where the measurement value is in the upper and lower limits.

top and bottom limit bar

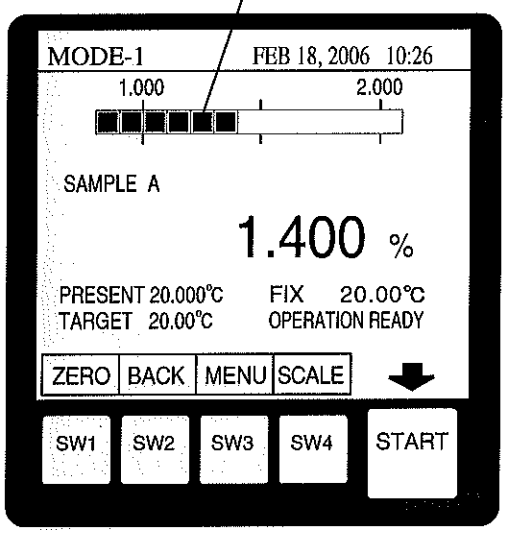
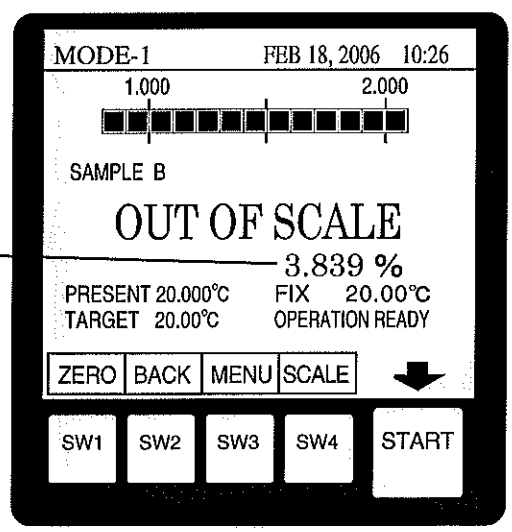


Fig.13-5

Display of 「OUT OF SCALE」



Measurement Value

Fig.13-6

14. Setting a user scale

The RX-007α can display concentration (user scale) according to each type of sample, as well as"Brix" and "Refractive index (RI)".

(1) User scale

Input 3 points of the relationship between the Brix and concentration, and the unit makes the conversion formula automatically.

(2) Setting procedure (See Fig.14-1.)

Press the SW3(MENU) key and select USER SCALE by using the SW2(↓) key, then press SW1(ENTER).

a) Select the scale No.
b) A set the SCALE to "USER".
c) Input 3 points of the relationship between the "Brix and concentration" to the PARAMETER.
d) Select the UNIT.
e) Input the top limit "HIGH" of the measurement range of the concentration.
f) Input the bottom limit "LOW" of the measurement range of the concentration.
g) Input the sample NAME.
h) Select PRINT [N] or [Y] to print out the contents of the setting.

*The contents of the above setting are saved in the RX-007α. However, it is recommended to print out and save them as a backup.

Press the SW1(ENTER) key while with PRINT [N]. The unit will "beep" and the SET UP MENU screen is displayed. If the digital printer DP-RX is connected, use the SW2(↓) or SW3(↑) key to display YES[Y] and press the SW1 (ENTER) key if the printing of the setting screen is desired. After the printing is completed, the screen switches to the SET UP MENU screen. Press the SW4 (QUIT) key to return to the measurement (or ZERO SET END) display screen.

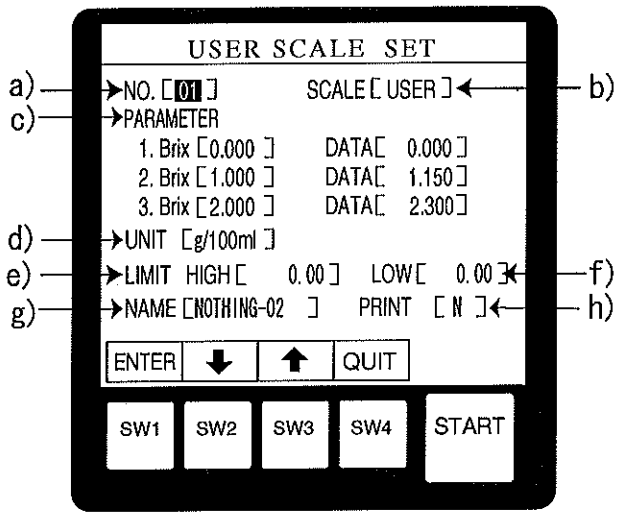


Fig.14-1

(3) Printing the user scale

Select "3, PRINTER" while in the SET UP MENU screen and set the PRINT DATA (fig. 14-2).
Every item to be printed should be set [ON] according to "How to set printing items on the printer (Refer to P.25)". Also, measurement data for all two types (Brix and user scale) can be printed at the same time.

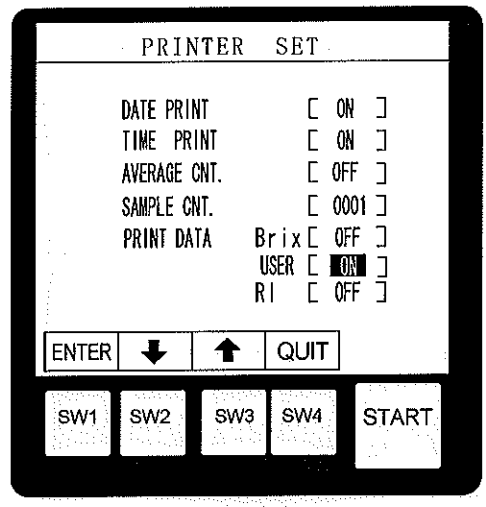


Fig.14-2

Examples for Printing (For RS-232C, refer to P.47)

Printing of Brix , the user scale and RI

```
No.0001  FEB.  18 2006 16:38
   RI = 1.336445   Brix= 2.401%
   SAMPLE A = 1.923%   t=20.00
```

Printing of the Brix and the user scale

```
No.0005  FEB.  18 2006 16:54
   Brix = 2.548%
 SAMPLE B = 3.625       t=20.00
```

Printing of only the user scale (SALT G-01)

```
No.0006  FEB.18,  2006  16:57
   SALT G-01 = 2.65g/100g t=20.00
```

(4) Method of setting

Example: Displaying the concentration of salt in the range from 0 to 0.8g/100g

a)While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3(MENU) key. The display will switch to a screen as shown in SET UP MENU screen.

b)Using the SW2(↓) or SW3(↑) key, adjust the arrow(→) to 2 USER SCALE. Then press the SW1(ENTER) key.

c)The display changes to the screen shown in Fig. 14-1. The scale No.[01] will start blinking. If No.01 has been entered, use the SW2(↓) or SW3(↑) key to select ascale No. which has not been entered yet, then press the SW1(ENTER) key.

d)The SCALE [USER] should be blinking. Press the SW1(ENTER) key. If [Brix] or [RI] is blinking, adjust the to [USER] using the SW2(↓) or SW3(↑) key and press the SW1(ENTER) key.

e)The digit 0 of "1.Brix[0.000]" of the PARAMETER should be blinking. Using the SW2(↓) or SW3(↑) key, adjust the number and press the SW1 (ENTER) key. As the blinking moves to the next digit, set the number similarly.

f)After setting the last digit, press the SW1(ENTER) key, and the prompt moves to DATA[ ]. Set this item in the same manner.

g) Continue the above operation the other DATA. After setting the last 3.DATA[ ], press the SW1 (ENTER) key, and the prompt moves to the UNIT[ ]. Press the SW2(↓) or SW3(↑) key, and the unit changes in the order of, g/100g, %vol, %mas, mol/1, g/100ml, %, and (having no units). When the corresponding unit is displayed, press the SW1(ENTER) key.

h)The first digit in the top limit "LIMIT HIGH" should be blinking. With the SW2(↓) or SW3(↑) key, adjust the blinking to a desired value and press the SW1(ENTER) key. This moves the prompt to the next digit. Then start making a setting similarly.

* Input the "data of parameter 3" or a smaller value as the upper limit.
* Input the "data of parameter 1" or a larger value as the lower limit.

Up to 10 letters can be input as a sample name. If the number of letters of the sample name is few, several spaces should be inputted so that the print by the DP-RX will be easier read.

i) Similarly, make a setting for the bottom limit "LOW" as well, and press the SW1(ENTER) key.

* When setting the figure 2.000, enter the value "02.000".

j) Adjust the final digit for the bottom limit and press the SW1(ENTER) key. This moves you to the sample name [NAME]. The first character should then start blinking. With the SW2(↓) or SW3(↑) key, enter a desired sample name by entering one character at a time. Pressing ↓ and/or ↑ changes the value in the order of A, B, ... , Y, Z, 0, 1, ... 8, 9, □ (space), . (period), -.
If you made a mistake in setting, press the SW4 (QUIT) key and repeat the setting operation from the first.

k) Finally, press the SW1(ENTER) key while PRINT [N] is displayed, and the unit makes a "peep" and switches to a screen as shown in SET UP MENU screen. Here, press the SW4(QUIT) key to return to a screen as shown in the measurement(or ZERO SET END) display screen.

* If you have connected the digital printer DP-RX (Optional) and need to print this setting screen, use the SW2(↓) or SW3(↑) key to display [Y] and press the SW1(ENTER) key(Fig. 14-3).
The printer starts printing and the unit switches to a screen as shown in SET UP MENU screen.
Here, press the SW4(QUIT) key to return to a screen as shown in the measurement (or ZERO SET END) display screen.

When this machine fails or receives a repair or overhaul, the data you have set may be lost. Be sure to print out the data or write it down.

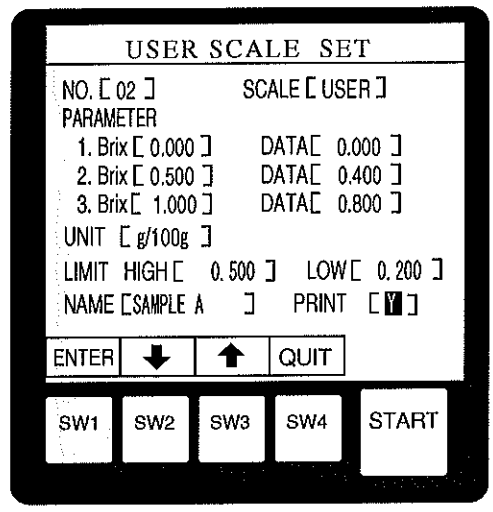


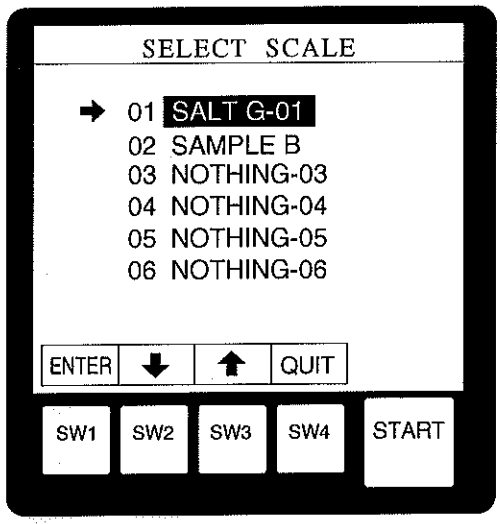
Fig.14-3

(5)How to select the measurement display screen

a)While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press SW4(SCALE) a until the displayed screen as shown in Fig. 14-4 appears.

* In the example of Fig. 14-4, the scale No. 1 has a sample name "SALT G-01", No. 2 has a sample name "SAMPLE B". "SALT G-01"i s selected as the display screen.

b)With the SW2(↓) or SW3(↑) key, set the arrow (→) to a desired user scale number and press the SW1(ENTER) key. The unit will "beep" and the display switches to a screen as shown in Fig. 4-5. From this point on, the display will switch to a screen as shown in Fig. 4-5 each time a measure -ment is taken.



Numbers 01 through 30 can be selected as the scale. If the SW2(↓) key is pressed and held, the No. 7 and the sequential scale numbers are displayed

Fig.14-4

(6) Actual measurement

Measure according to the instructions on pages 31 - 32 while in a screen as shown in Fig. 4-5. The measurement result is displayed in a screen as shown in Fig. 14-5.

If the measurement value is out of the upper or lower limit, the "OUT OF SCALE" massage will be displayed.

The out of scale value will be displayed in small characters at the bottom right of the screen as shown in Fig.14-6.

The top and bottom limit bar roughly indicates where the measurement value is in the upper and lower limits.

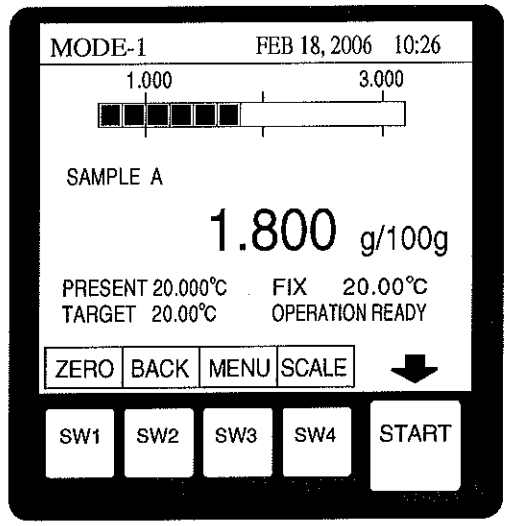


Fig.14-5

「OUT OF SCALE」

Measurement Value

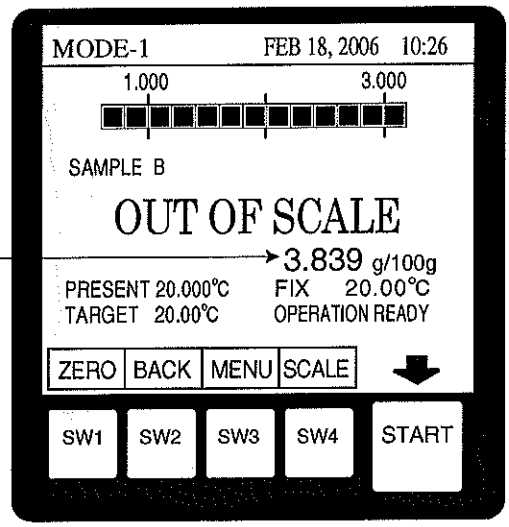


Fig.14-6

15. RS-232C Communication

The RX-007 α has a serial interface to communicate with a personal computer or laptop. With this interface, the measurement data can be sent from the RX-007 α to the computer. Since the RS-232C is an interactive standard, zero adjustment and measurement of the RX-007 α can be started with the computer. The commands are taken in through the RS-232C communication cable.

(1) RS-232C communication cable

For connection of the RX-007 α and a personal computer or laptop, use a standard RS-232C communication cable sold in the market.
The RS-232C input/output terminal of the RX-007 α is "D-Sub 9-pin male plug". Purchase the RS-232C communication cable accordingly (cross cable). Refer to the following table.

Input/Output terminal of RX-007 α	RS-232C communication cable	Input/Output terminal of personal computer
D-Sub 9-pin male	D-Sub 9-pin female — D-Sub 9-pin female	D-Sub 9-pin male
D-Sub 9-pin male	D-Sub 9-pin female — D-Sub 25-pin male	D-Sub 25-pin female

* Before purchasing a cable, check the type of the input/output terminal of the personal computer or laptop to be connected.

D-Sub 9-pin female — D-Sub 9-pin female Example of shape of Communication cable (Cross cable)

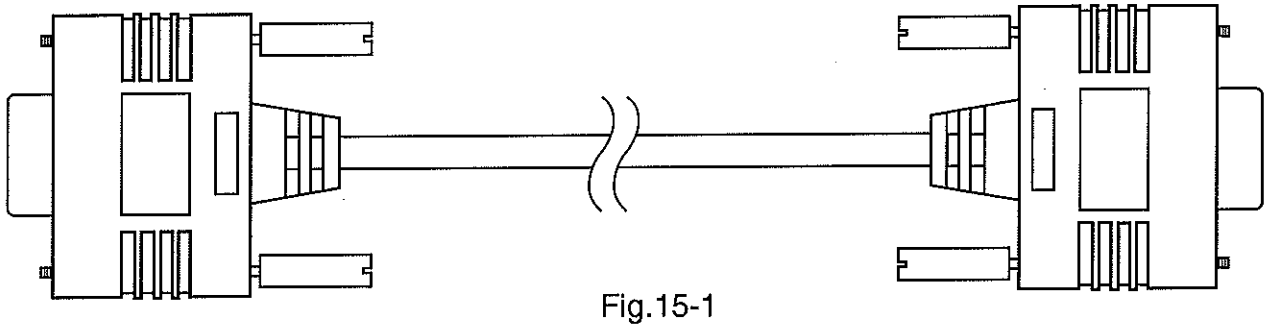


Fig.15-1

D-Sub 9-pin female — D-Sub 9-pin female Example of connection of Communication cable (Cross cable)

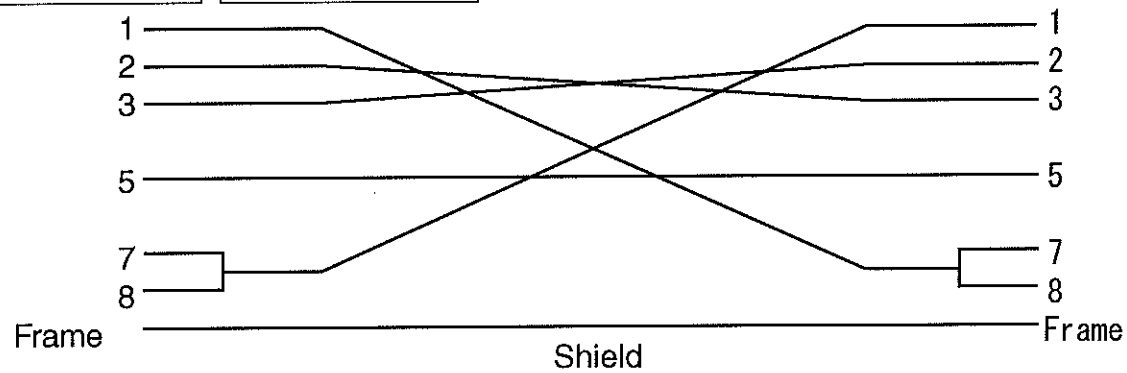


Fig.15-2

(2) Connecting the RS-232C communication cable

When connecting the RX-007 α and personal computer with the RS-232C communication cable, check that both machines are turned off.
After connecting the RS-232C communication cable, turn on the RX-007 α and personal computer (either one may be turned on first).

Windows 95, Windows 98, Windows Me, Windows 2000 and Windows XP are trademarks or registered trademarks of Microsoft Corporation, registered in the US and other countries.

(3) Preparation of a personal computer

a) Start up a personal computer installed with Windows 95, Windows 98, Windows Me, Windows 2000 or Windows XP.
Move the cursor to the start button at the bottom left of the screen and click the left button of the mouse.
b) Move the cursor to Program(P).
c) The menu screen pops up on the right side.
Move the cursor to the Accessory.
d) If Windows 95 is installed, move the cursor from the menu on the right side to the Hyperterminal and click the left button of the mouse. (Fig.15-3)
The screen shown in Fig. 15-5 pops up. Go to e).
If Windows 98, Windows Me or Windows 2000 is installed, move the cursor to Communication. (Fig.15-4)
The menu screen pops up on the right side. Move the cursor to the Hyperterminal in the menu and click the left button of the mouse.
If Windows 98 is installed, the screen shown in Fig. 15-5 pops up. Go to e).
If Windows Me or Windows 2000 is installed, the screen shown in Fig. 15-7 pops up. Go to g).
If Windows XP is installed, the screen shown in Fig. 15-6 pops up. Go to f).
e) If Windows 95 or Windows 98 is installed, the screen shown in Fig. 15-5 pops up. Move the cursor to the Hyperterm. exe. and double-click the left button of the mouse. The screen shown in Fig. 15-7 pops up. Go to g).

Fig.15-3 When Windows 95 is used

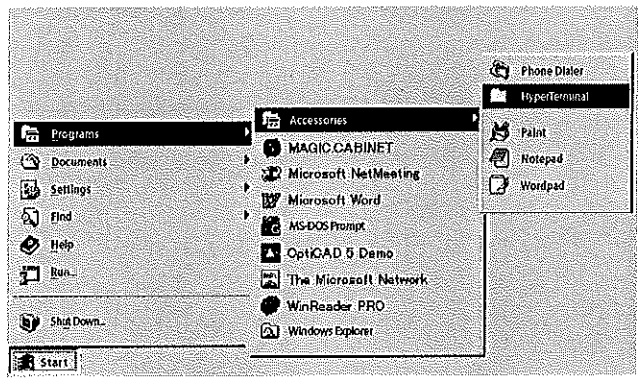
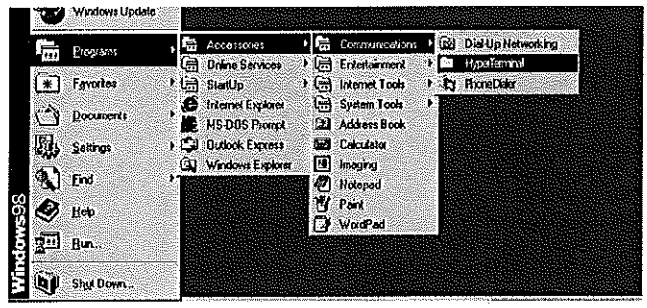
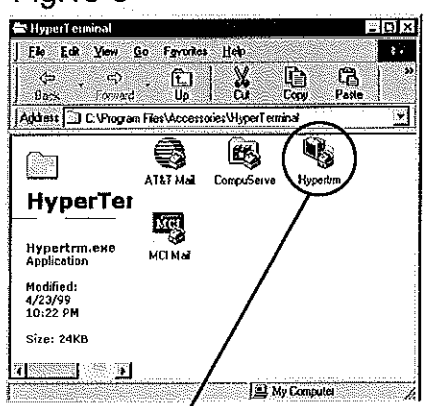


Fig.15-4 When Windows 98/Me/2000 is used



(Above screen is Windows98.)

Fig.15-5



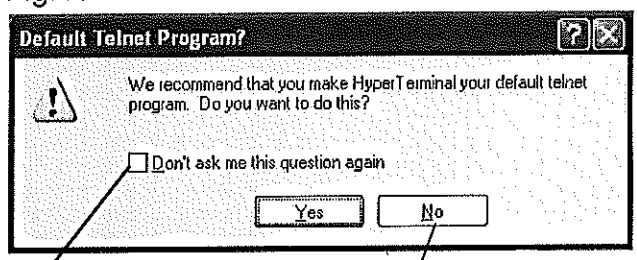
Move the cursor to this picture and double-click the left button of the mouse.

f) If Windows XP is installed, the screen shown in Fig. 15-6 pops up.
Do not put a check mark, and move the cursor to No and click the left button of the mouse.
The screen shown in Fig. 15-7 pops up.

g) The setting screen pops up. Input a proper name (Example: User scale) in the box of name and move the cursor to the OK and click the left button of the mouse(Fig. 15-7).

h) The screen shown in Fig. 15-8 pops up.
Click ▼ in the Connecting method (N) with the left button of the mouse and select "Direct to Com 1". Move the cursor to the OK and click the left button of the mouse. The screen shown in Fig. 15-9 pops up.

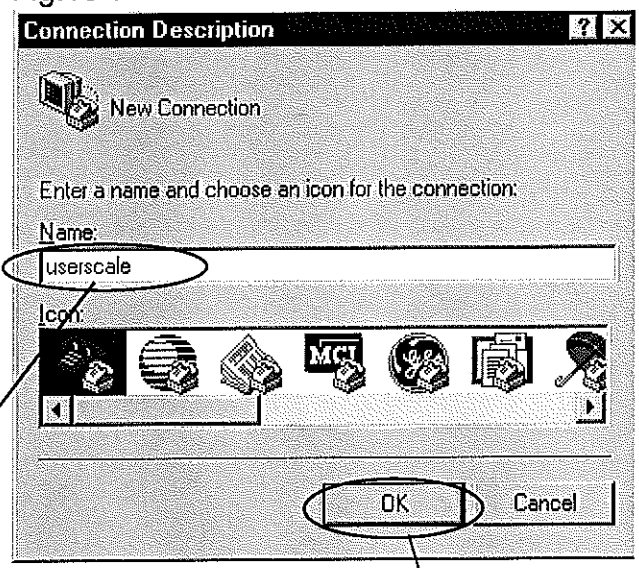
Fig.15-6 When Windows XP is used



Do not put a check mark here.

Move the cursor to No and click the left button of the mouse.

Fig.15-7



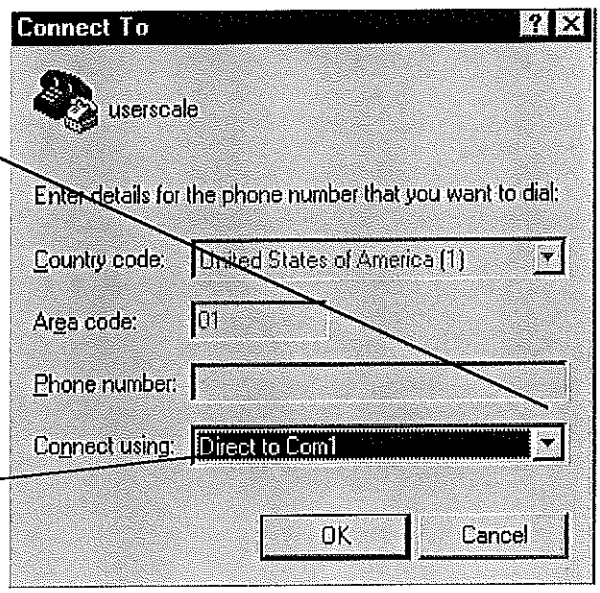
1. Name of file to record received data. As an example, "User scale" is used here.

2. After inputting name, move cursor to OK and click the left button of the mouse.

⚠ CAUTION

If there are multiple RS-232C terminals, check which communication terminal of the personal computer the cable is connected to (See the operation manual for the personal computer).

Fig.15-8



1. Move the cursor to ▼ and click the left button of the mouse, and menu pops up. Select on from menu.

2. Move the cursor to "Direct to Com 1" and click the left button of the mouse.

3. After setting, move the cursor to OK and click the left button of the mouse.

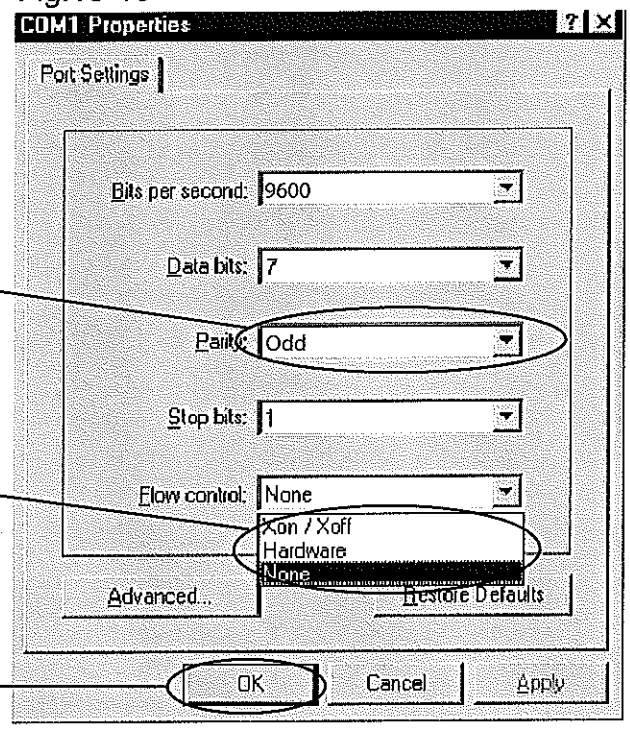
i) Set up the communication conditions.
The communication conditions of the RX-007 α are set up as in Fig. 15-9.
Set up these communication conditions on the com1 properties window. When changing the setting, click ▼ and select the item from the drop down menu (shown in Fig. 15-10).
After changing the setting, move the cursor to the OK button and click the left button of the mouse.

j) Click File with the left botton of the mouse and select Properties (Fig. 15-11).

Fig.15-9

BAUDRATE	9600
DATA LENGTH	7
PARITY	ODD
STOP BIT	1

Fig.15-10

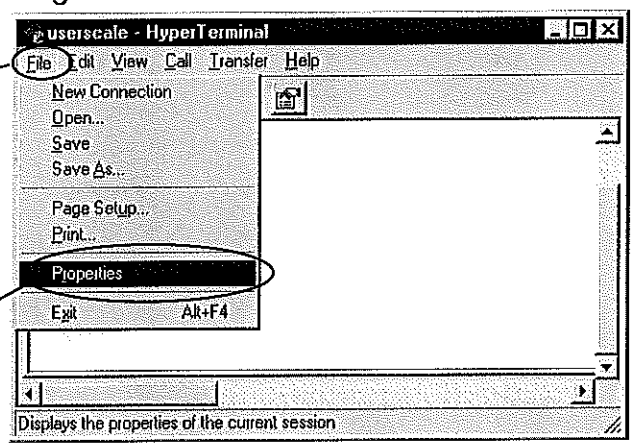


EVEN BIT → Even number
ODD BIT → Odd number
NONE BIT → None

Click ▼ on the "Flow control (F):" with the left button of the mouse. Then, move the cursor to "None" and click the left button of the mouse. Set the other items similarly.

After setting all the communication items, move the cursor to the OK and click the left button of the mouse.

Fig.15-11

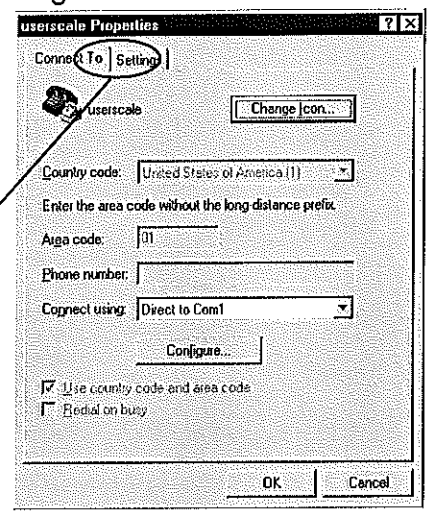


1. Move the cursor to "File " and click the left button of the mouse.

2. Move the cursor to "Properties" and click the left button of the mouse.

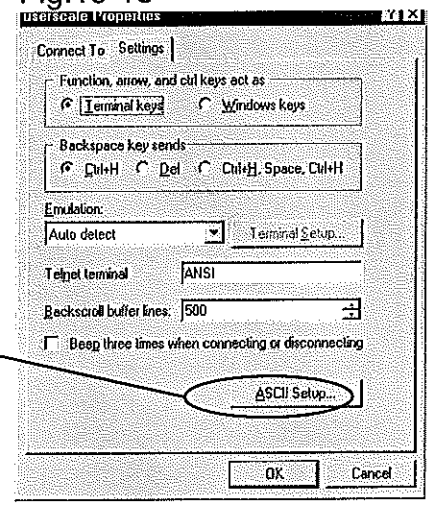
k) After the screen in Fig. 15-12 pops up, click Settings.
l) If Settings is clicked, the screen in Fig.15-13 pops up.
m) Set the ASCII code as shown in Fig.15-14. After setting, click OK(See Fig.15-14) with the left button of the mouse.

Fig.15-12



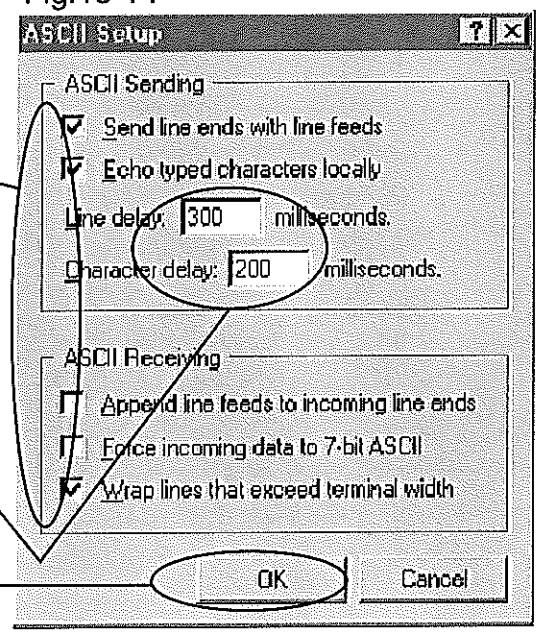
Move the cursor to Settings and click the left button of the mouse.

Fig.15-13



If the left button of the mouse is clicked on this button, the ASCII setting screen (Fig. 15-14) pops up.

Fig.15-14



1. Move the tip of the cursor to each box and click the left button of the mouse. The check mark is inserted and removed each time the left button is clicked.

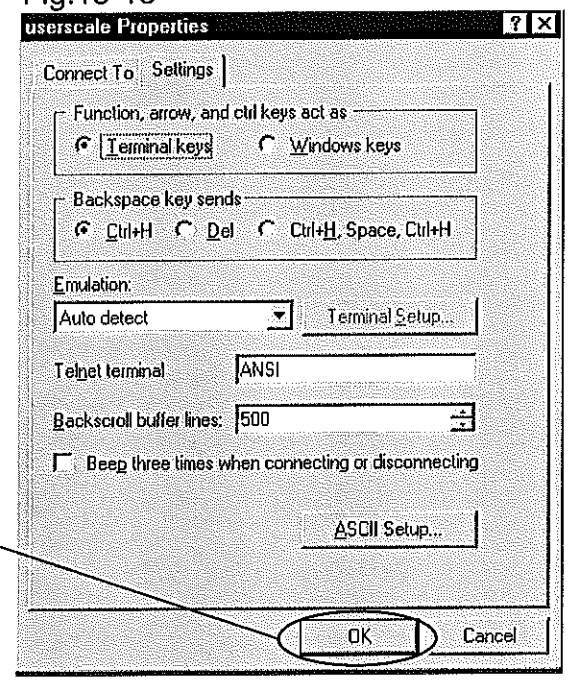
2. Move the tip of the cursor to the center of the white frame and click the left button of the mouse. Then, a blinking cursor appears and values can be inputted. Set as shown in Fig. 15-14.

3. After setting all items, move the cursor to OK and click the left button of the mouse, and the screen shown in Fig.15-15 pops up.

n) Click the left button of the mouse on the screen shown in Fig.15-14, and the screen changes automatically as shown in Fig.15-15 (same as Fig.15-13). Click OK.
o) If the OK button in Fig.15-15 is clicked, the screen changes as shown in Fig.15-16.

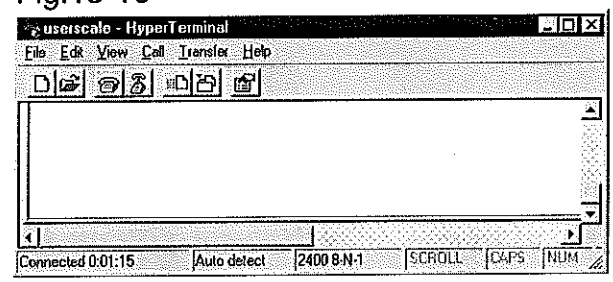
The personal computer is prepared by the above operation.

Fig.15-15



Move the cursor to the OK and click the left button of the mouse, and the screen changes as shown in Fig.15-16.

Fig.15-16



(4) Preparation of the RX-007 α

The condition of communication between the RX-007 α and personal computer or laptop is set below.
This communication condition has been set for the personal computer or laptop in (3) above (See page 42). Apply the same condition to the RX-007 α.
The following 4 items need to be set.

- BAUDRATE
- DATA LENGTH
- PARITY
- STOP BIT

As an example, the condition shown in Fig.15-17 is set below.

<Concrete method of setting>

a) While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3 (MENU) key.
b) The unit switches to a screen as shown in SET UP MENU screen. Use the SW2(↓) or SW3(↑) key to adjust the arrow(→) to "4 RS232C", then press the SW1(ENTER) key.
c) The unit switches to a screen as shown in Fig. 15-18. In this figure, the RS232C items are set as shown below.

- BAUDRATE: 9600BPS
- DATA LENGTH: 7BIT
- PARITY: ODD
- STOP BIT: 1BIT

d) "9600" of the "BAUDRATE" at the top should be blinking. If you do not need to change it, press the SW1(ENTER) key. If you need to change it, use the SW2(↓) or SW3(↑) key to set a desired value in [ ], then press the SW1 (ENTER) key.
e) "7" of the "DATA LENGTH" should be blinking. Set it similarly.
f) "ODD" of the "PARITY" should be blinking. Set it similarly.
If you made a mistake in setting, press the SW4 (QUIT) key and repeat the setting operation from the first.
g) "1" of the "STOP BIT" should be blinking. If you do not need to change it, press the SW1 (ENTER) key. If you need to change it to "2", use the SW2(↓) or SW3(↑) key to display "2", then press the SW1(ENTER) key. The unit makes a "peep" and switches back to a screen as shown in SET UP MENU screen.
h) While you are in a screen as shown in SET UP MENU screen, press the SW4(QUIT) key, and the unit switches back to a screen as shown in the measurement(or ZERO SET END) display screen. The RX-007 α is set by the above operation.

BAUDRATE	9600
DATA LENGTH	7
PARITY	ODD
STOP BIT	1

Fig.15-17

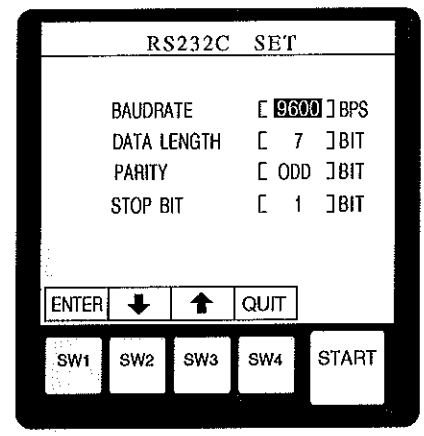


Fig.15-18

(5) Transmission from the RX-007α to the personal computer

(5)-1 Transmission method

a) Prepare all the items and set the personal computer as shown in Fig.15-16.
b) Drop a sample onto the prism surface of the RX-007α and press the START switch.
c) Immediately after the measurement is finished, the following is displayed on the screen of the computer.

<Example>
060218, 1026, RI=1.336445, Brix=2.401, SAMPLE A=1.923, Temp=20.00,,,,,,,

d) When zero setting is completed, the following is displayed on the screen of the computer.

<Example (When zero setting is completed normally)>
060218, 1026,,,,,,,,,,,,,,, ZERO SET END,
<Example (When zero setting is completed abnormally)>
060218 1026,,,,,,,,,,,,,,, ZERO SET ERROR,

(5)-2 Format of transmitted data

The format of the data transmitted from the RX-007α to the personal computer or laptop as follows.

a) When measurement is finished
YYMMDD, HHMM, RI=＊.＊＊＊＊＊＊, Brix=＊.＊＊＊, UUUUUUUUUU= ＊.＊＊＊＊＊,
Temp=TT.TT, C/RL/F
If a measurement value is an error, "Over" is output.
If the user scale (upper and lower limits) is (are) not set, "Over" is output, too.
b) When zero setting is completed normally
YYMMDD, HHMM, ZERO_SET_END, C/RL/F
c) When zero setting is completed abnormally
YYMMDD, HHMM, ZERO_SET_ERROR, C/RL/F

YYMMDD	: Year, month, day
HHMM	: Hour, minute
＊	: Measurement value
UUUUUUUUUU	: Sample name written in 10 letters (If number of letters is less than 10, (a) space(s) is(are) input).
＊	: Measurement value of user scale (Number of digits varies with scale up to 7, including decimal point.)
TT.TT	: Temperature
C/RL/F	: Carriage return
_	: Space (for 1 letter)

(6)Transmission from the personal computer to the RX-007α (reception by the RX-007α)

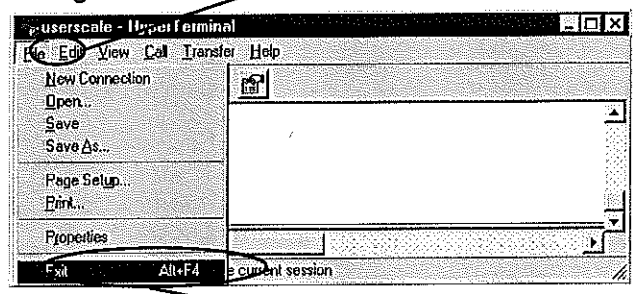
a)Complete all preparations and set the personal computer to the screen as shown in Fig.15-16 on Page 45.

b)Then type *ZERO (Case Sensitive) from the personal computer under this condition and press enter key. The RX-007α starts to zero set. Keep the prism surface of the RX-007α clean prior to any measurement.

c)Similarly, when you type *START from the personal computer and press enter key, the RX-007α starts to measure a sample. Drop the sample on the surface of the prism in advance.

1. Move the cursor to "File" and click the left button of the mouse.

Fig.15-19



2. Move the cursor to "Exit" of the Hyperterminal and click the left button of the mouse.

(7) How to end communication

a) Move the cursor to "File" on the screen of the personal computer and click the left button of the mouse (see Fig.15-19). A menu opens. Move the cursor to "Exit" and click the left button of the mouse.

b) Move the cursor to "Yes" and click the left button of the mouse (see Fig.15-20). The screen changes to the one as shown in Fig.15-21.

c) Move the cursor to "No" and click the left button of the mouse. This ends the hyper terminal. However, if you want to save the measured data transmitted from the RX-007α to the personal computer, move the cursor to "Save As" in Fig.15-19 and click the left button of the mouse to save it with a file name. Then click "End of hyper terminal" with the left button of the mouse.
The following operations are the same as above.

3. Move the cursor to "Yes" and click the left button of the mouse.

Fig.15-20

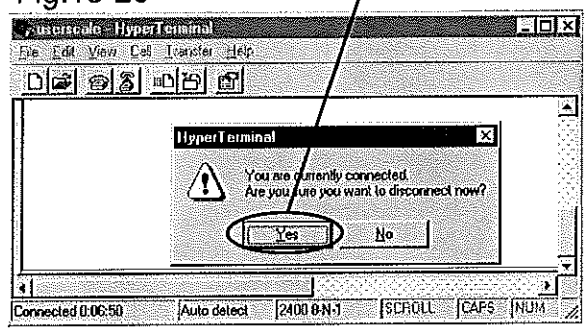
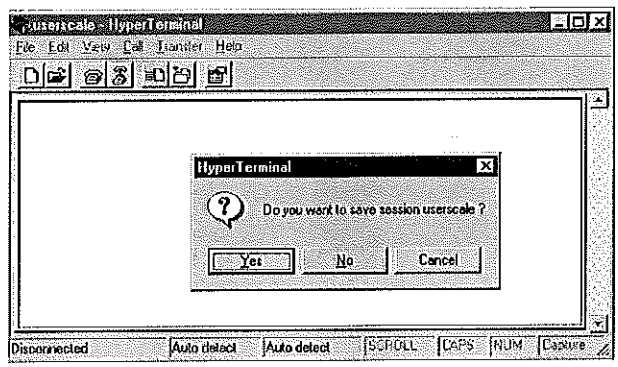


Fig.15-21



16. Manual calibration

* The following calibration can be performed in the range above Brix 0.2%.
* When "Refractive index display" is selected, this calibration canot be performed.

RX-007 α has a function to change the scale value manually within a certain range, as well as the zero adjustment function with air and distilled water.
If the value indicated by the RX-007 α is different from the value indicated by another refractometer or the value of the standard sucrose solution/liquid, it can be adjusted within a certain range.

Adjustable range	Brix : -0.050 to +0.050

Once the RX-007 α is calibrated manually, each measured refractive index or Brix value is shifted by the set change rate, as shown in Fig.16-1, when it is indicated. Calibration can be performed at only one point within the measurement range (above Brix 0.2%).

<Method of calibration and how to confirm it >

a) When calibrating, set the RX-007 α to MODE-1.
b) Perform zero adjustment with distilled water in advance.
c) Press the SW3(MENU) key while you are in the measurement(or ZERO SET END) display screen. The display switches to a screen as shown SET UP MENU screen.
d) Use the SW2(↓) or SW3(↑) key to adjust the arrow (→) to "7 MANUAL CALIBRATION", then press the SW1(ENTER) key. The display switches to a screen as shown in Fig. 16-2 or 16-3.

(1) When you are in a screen as shown in Fig.16-2

If the scale change rate of RX-007 α is currently set to "00"(where the change rate is 0), the display switches to a screen as shown in Fig.16-2. When RX-007 α is shipped from the factory, the change rate is set to "00" (where the change rate is 0).

<When simply confirming>

As the unit switches to a screen as shown in Fig.16-2, the scale change rate is "00" (where the change rate is 0 as set when shipped). If only confirmation is required, press the SW4(QUIT) key, and the unit switches back to a screen as shown in SET UP MENU screen. Press the SW4(QUIT) key again, and the display switches back to a screen as shown in the measurement (or ZERO SET END) display screen.

<When calibrating>

a) While in a screen as shown in Fig.16-2, drop the standard liquid or sample to be adjusted onto the prism surface and close the cover plate, then press the SW1(ENTER) key. After the current temperature(PRESENT) reaches the target temperature (TARGET), the unit starts measurement and switches to a screen as shown in Fig.16-3 after 4 second.
b) In the Brix display mode (Fig.16-7),press the SW2(↓) or SW3(↑) key, and the scale change rate and indicated Brix change. Set Brix to a desired value. (If a mistake is made during this operation, press the SW4(QUIT) key, and the display switches back to a screen as shown in SET UP MENU screen.)
c) Press the SW1 (ENTER) key. The unit switches back to a screen as shown in SET UP MENU screen. Press the SW4(QUIT) key again, and the display switches back to a screen as shown in the measurement(or ZERO SET END) display screen. "Manual calibration" is complete.

(2) When you are in a screen as shown in Fig.16-3

If the scale change rate of RX-007 α is currently set to "01" - "50" the display switches to a screen as shown in Fig.16-3.

<When simply confirming>

This screen shows the scale change rate set previously and Brix of the liquid used at that time. In the case of Fig. 16-3, for example, the scale change rate is "03".
Accordingly, the scale change rate is changed by 0.003% with liquid having Brix of 1.000%.
After confirmation is finished, press the SW4 (QUIT) key, and the display switches back to a screen as shown in SET UP MENU screen.
Press the SW4(QUIT) key again, and the display switches back to a screen as shown in the measurement (or ZERO SET END) display screen.

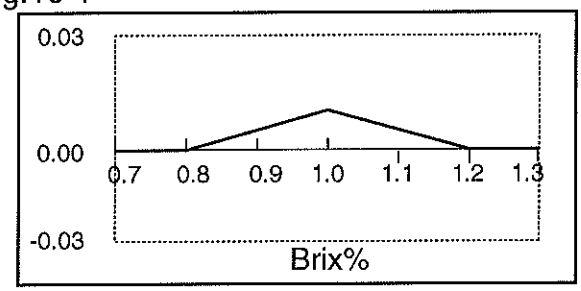
<When returning scale change rate to "00" (where the change rate is 0)>

a) In the Brix display mode(Fig. 16-4), press the SW2(↓) or SW3(↑) key, and the scale change rate and indicated Brix change. Set Brix to 0 (where the change rate is 0).
b) Press the SW1(ENTER) key. The display switches back to a screen as shown in SET UP MENU screen. Press the SW4(QUIT) key again, and the display switches back to a screen as shown in the measurement(or ZERO SET END) display screen.

<When calibrating with new standard sucrose solution or sample>

a) Set the scale change rate to "00" (where the change rate is 0) according to step a) of <When returning scale change rate to "00" (where the change rate is 0)> described above.
b) Press the SW1(ENTER) key, and the display switches back to a screen as shown in SET UP MENU screen.
c) Use the SW2(↓) or SW3(↑) key to adjust the arrow(→) to "8 MANUAL CALIBRATION", then press the SW1(ENTER) key. The unit switches to a screen as shown in Fig. 16-2.
d) Calibrate according to [When you are in a screen as shown in Fig. 16-2], <When calibrating>.

Fig.16-1



Example : When changing a Brix 1.000% solution by +0.01%, each measurement value is corrected around Brix 1.000%, as shown in the above graph.

When the scale change rate is set to "00" (i.e. the change rate is 0), a screen as shown in the Fig.16-2 or 16-3 appears.

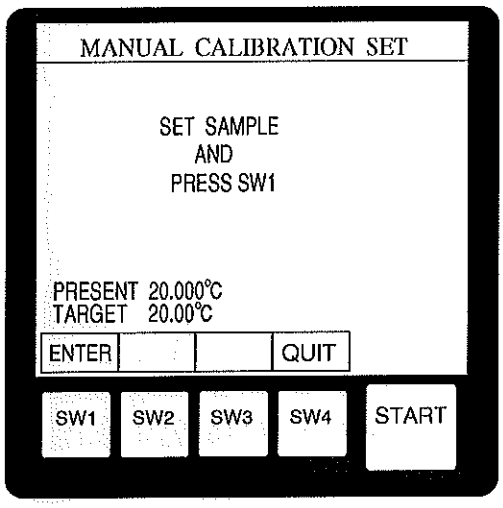


Fig.16-2

When the scale change rate is set to "01" to "50" and "- 01" to "- 50", a screen as shown in the Fig.16-3, 16-4 appears.

Example : In the case of refractive index display

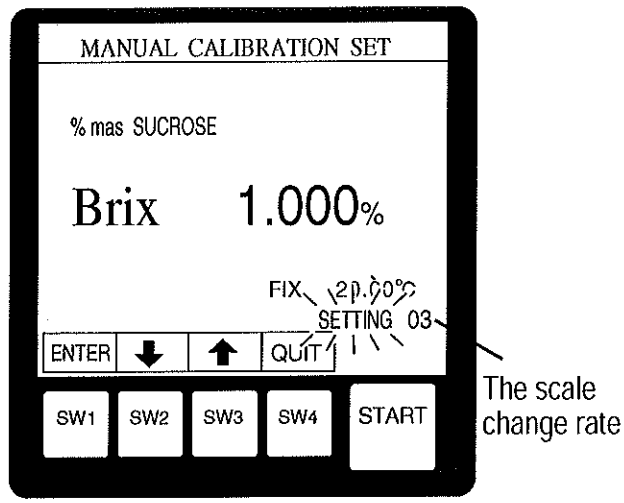


Fig.16-3

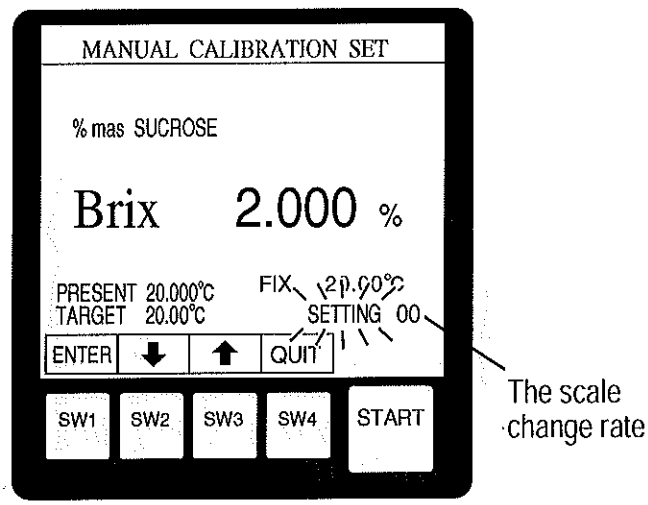


Fig.16-4

17. Adjusting the brightness of the screen

If the display screen of the RX-007 α is difficult to read due to the ambient lighting, adjust its brightness according to the following procedure.

a) While you are in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW3(MENU) key. The unit switches to a screen as shown in SET UP MENU screen.

b) Use the SW2(↓) or SW3(↑) key to adjust the arrow(→) to "6 CONTRAST". Press the SW1 (ENTER) key. The display switches to a screen as shown in Fig. 17-1.

c) The brightness becomes highest at the right end (HIGH) of the brightness scale and becomes lowest at the left end(LOW). Adjust to thedesired contrast with the SW2(↓) or SW3(↑) key.

d) Press the SW1(ENTER) key. The unit will "beep" and switches back to a screen as shown in SET UP MENU screen. Press the SW4(QUIT) key to return to a screen as shown in the measurement (or ZERO SET END) display screen.

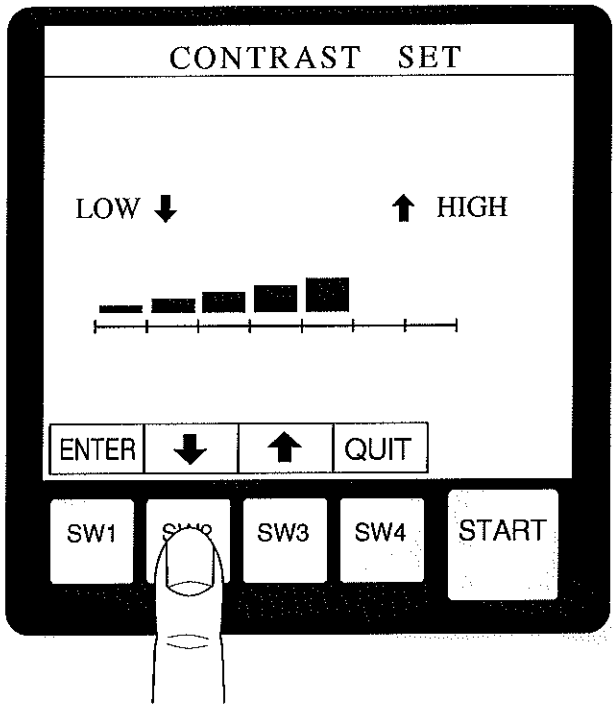


Fig.17-1

18. Recalling the past measurements

The RX-007 α is capable of recalling the previous 30 measurements.

<Procedure>

a) While in a screen as shown in the measurement (or ZERO SET END) display screen, press the SW2 (BACK) key. The display switches to a screen as shown in Fig. 18-1.

b) The data of the 8 latest measurements are displayed.
If the SW2 (↓) or SW3 (↑) key is pressed and held, the data of up to 30 latest measurements can be scrolled up or down.
The types of the measurement values, Brix and user scale, are in respect to the display made when they were measured. However, all the measurement value items are conformed to the previous measurement display screen.
For example, when changing the Brix display to user scale display, press the SW4(QUIT) key to return to the measurement display screen while you are in a screen as shown in Fig.18-1, 18-2 or Fig.18-3.
Press the SW4(SCALE) key repeatedly until the display switches to the desired measurement display screen, then press the SW2 (BACK) key.

* If the SW1(CLEAR) key is pressed and held for 1 second, all the data of the past measurements are cleared.

c) The letters of PRINT are displayed at the right bottom of the screen. While the digital printer DP-RX is connected, if the START key under the PRINT is pressed, the printer prints out the data of the latest 30 measurements.

d) Press the SW4 (QUIT) key, and the display switches back to a screen as shown in the measurement (or ZERO SET END) display screen.

Example: In the case of Brix display

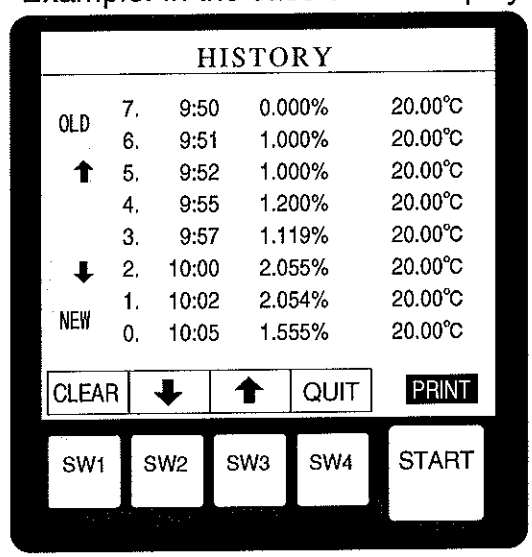
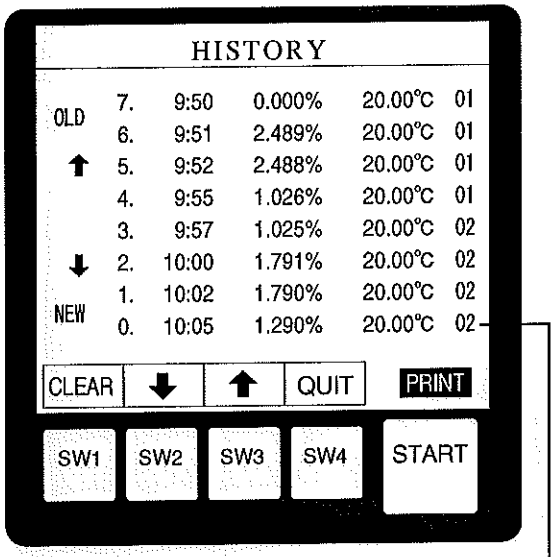


Fig.18-1

Example: In the case of user scale



Scale No.
01 indicates the measurement value of scale No. 01 and
02 indicates the measurement value of scale No. 02.

Fig.18-2

Example: In the case of RI scale

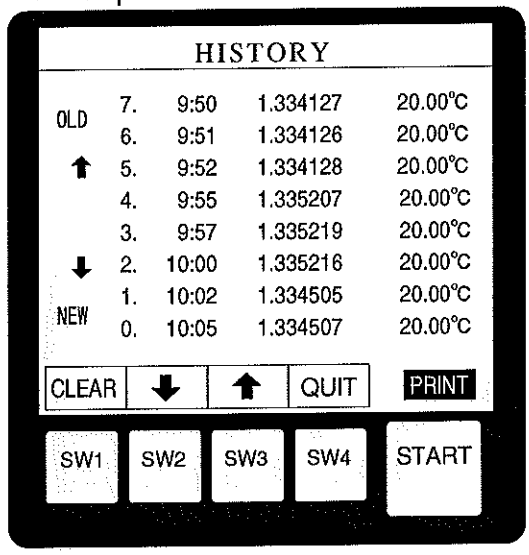


Fig.18-3

19. Error messages

The RX-007α displays an error message if erroneous or improper operation is found.
The error display includes the following:

Error message	Cause	Remedy and action to take
OUT OF RANGE	Measurement was started with prism empty.	Drop sample onto prism, and then press START key.
	Sample out of measurement range was measured.	Measure sample within the measurement range.
OUT OF SCALE	When the measurement value has exceeded the top or bottom limit bar at the Brix scale display screen.	The Brix value will be dispalyed below the error massage in small characters.
	When the measurement value has gone out of range of the programmed scale range by the user at the user scale display screen.	Only the error message is displayed. Please display the Brix scale.
	When the measurement value has exceeded the top or bottom limit bar of the programmed scale range by the user at the user scale display screen.	The measurement value will be dispalyed below the error massage in small characters.
ZERO SET ERROR	When the prism surface is grimed (dirty).	Clean the prism surface perfectly and start the Zero setting procedure over, starting with Zero set with air.
	When Zero setting is carried out with a liquid other than distilled water.	Start over by carrying out the Zero set with air.
	When Zero set with distilled water has not been carried out within 5 minutes after carrying out the Zero set with air.	Start over by carrying out the Zero set with air.
OUT OF CALIBRATION	Manual calibration was performed out of given range.	Referring to page 48, perform manual calibration within given range.
OUT OF ORDER	As the target temperature is lower than the lower limit of the target temperature (the room temperature -(minus) 5℃), the current temperature does not reach the target temperature.	Turn off power switch. Wait for at least 1 minute, and then turn on the power switch again. Immediately set the target temperature to the room temperature -(minus) within 5℃. (Further, the lower limit of the target temperature is the room temperature -(minus) 5℃.)
	Thermo-module had trouble while it was operating.	Turn off power and disconnect AC power cable from outlet, then call your ATAGO distributor.
MEMORY ERROR	When power was turned on, the unit did not start normally.	Turn off the power switch. Wait for at least 1 minute, then turn on the power switch again. If this message is displayed repeatedly, turn off the power switch and disconnect the AC power cable from the outlet, then call your ATAGO distributor.
THERMO-MODULE ERROR	When power was turned on, thermo-module did not start normally.	Turn off the power switch. Wait for at least 1 minute, then turn on the power switch again. If this message is displayed repeatedly, turn off the power switch and disconnect the AC power cable from the outlet, then call your ATAGO distributor.
RETURN TO MODE SET	Thermo-module did not start normally while mode was being set on "MODE SET" screen.	Press SW4(QUIT) key to return to the screen in Fig. 7-1 and set mode again. If this message is displayed repeatedly, turn off power and disconnect the AC power cable from the outlet, then call your ATAGO distributor.

20. Making the standard sucrose solution and check the RX-007 α

Inspect the RX-007 α to see if it displays the measurement value correctly. Perform the inspection periodically, e.g. once a month, also when the main unit of the RX-007 α was subjected to a strong impact or vibration or a measurement value is different from the usual measurement.
For the inspection, use both distilled water and standard sucrose solution. Make the standard sucrose solution according to the following procedure.

(1) How to make standard sucrose solution (2.000%)

* Make standard sucrose solution at a temperature of 20℃± 5℃.
* The sucrose solution of 3.000%, 4.000%, or 5.000% can be made by the following method. (When making sucrose solution of 5.000%, stir the solution well so that the sucrose will be completely dissolved).

[1] Items to be prepared

a. 10g of sucrose of special grade
b. 100g of distilled water
c. Direct-reading balance
(Weighing capacity: Min. 200g, Accuracy: ±0.001g)
d. 100ml beaker (Made of glass or polyethylene)
e. Spoon (Made of plastic)

[2] Procedure

a. Place the beaker on the balance and set the indication of the balance to 0.000g.
b. Put 2.000g of sucrose in the beaker.
c. Add 98.00g of distilled water to the sucrose so that the total weight will be 100.00g.
d. Take down the beaker from the balance and stir the mixture well until all the sucrose is dissolved.

Precautions for making the standard sucrose solution

* The unit of Brix of the refractometer is weight/ weight%.
* The sucrose solution should be made so that its total weight will be 100% (If the total weight is less than 100g, the relative error is increased).
* Keep the prepared sucrose solution in a sealed container.
* Purchase sucrose from a reagent shop, drug store or pharmacy.

(2) Inspection of RX-007 α with standard sucrose solution

a) Prepare the RX-007 α and perform the operation before starting measurement (according to the instruction manual).
b) Using distilled water left at room temperature, perform zero adjustment correctly.
c) Measure the Brix of the standard sucrose solution (about 5 times repeatedly).
d) If the deviation of the value of the standard sucrose solution indicated by RX-007 α is ±0.005%, the operation of RX-007 α is normal. If the deviation is ±0.006% or larger, check the purity of the sucrose, method of preparation of the sucrose solution, measuring method, etc., then repeat the inspection.
g) If the deviation is still ±0.006% or larger, call your ATAGO distributor.

21. How to clean and exchange the dustproof filter

The installation position of the intake fan for cooling and the exhaust fan of this instrument is shown in the figure below(Fig.21-1, Fig.21-2).
The dustproof filter for the Intake cooling fan and the exhaust cooling fan will be covered with dust after certain time of use. To ensure proper air circulation and to avoid overheating of the instrument, it is recommended to change the dustproof filter once every month or every other month.

(1) The Intake Cooling Fan (bottom face)

The intake portal is located at the underside of the instrument. To remove the cover unit, unscrew the four screws.
The cover and dustproof filter are detachable as shown in the figure 21-1.
Please exchange it for a new dustproof filter included in the accessories.

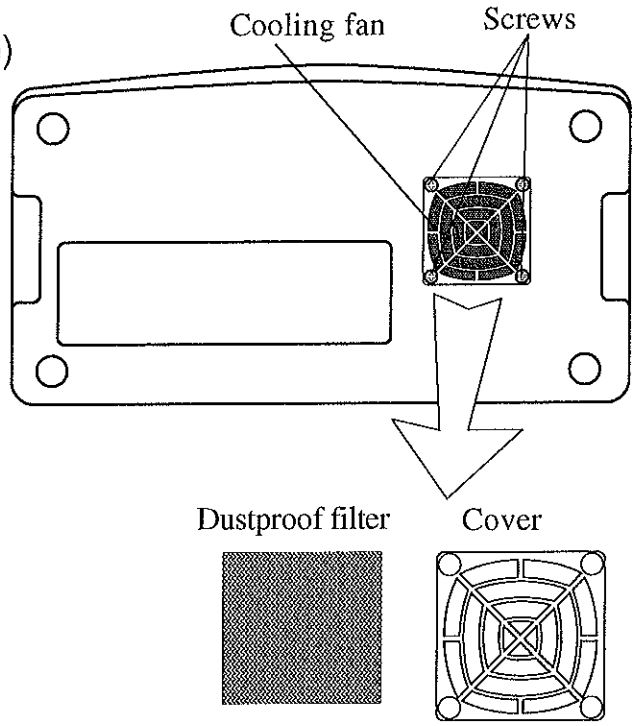


Fig.21-1

⚠ CAUTION

If the dustproof filter is full of dust, it might affect the measurement values.
If the dustproof filter is improperly installed or not installed at all, or used dirty, it could be a cause for the instrument to malfunction.
We recommend exchanging the filters with new ones every 1 to 2 months.

(2) The Exhaust Cooling Fan (back face)

The net on the exhaust portal should never be removed. Use the nozzle tip of a vacuum cleaner to remove any accumulated dust on the net.

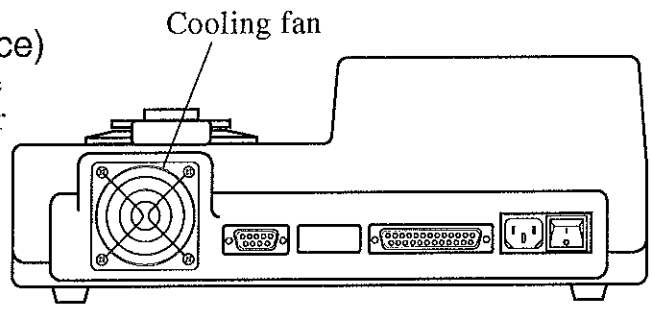


Fig.21-2

The RX-007 α is a highly accurate measuring instrument, care should be taken to use in a clean and dust free environment.

22. How to replace consumables and parts

(1) Supply of consumables and spare parts

The part numbers and rating of the consumables and parts of the RX-007 α which the customers can replace by themselves are as follows. For supplies, ask your ATAGO distributor.

Parts name	Parts No.	Remarks
Cover plate	RE-56157	
Thermo sensitive roll paper for DP-RX	RE-8412	4 rolls in a set Width: 112mm Length: 28m
Printer paper for long-term storage for DP-RX	RE-8414	4 rolls in a set Width: 112mm Length: 28m
Dustproof filter set (P.54)	RE-58001	A set of 12pcs

(2) How to replace the cover plate (See Fig. 22-1.)

The cover plate blocks out external light during measurement and is essential for accurate and stable measurement.
If the cover plate is broken or cracked, replace it according to the following procedure.

a) Open the cover plate and remove the two crossed screws from the cover plate support. The cover plate and the cover plate retainer can now be removed.
b) Match a new cover plate to the groove of the cover plate retainer and install it to the cover plate support with the crossed screws.

Note: Install the cover plate with the extended lip on the right side.

c) The cover plate is replaced by the above procedure. Close it to check it for any abnormality.

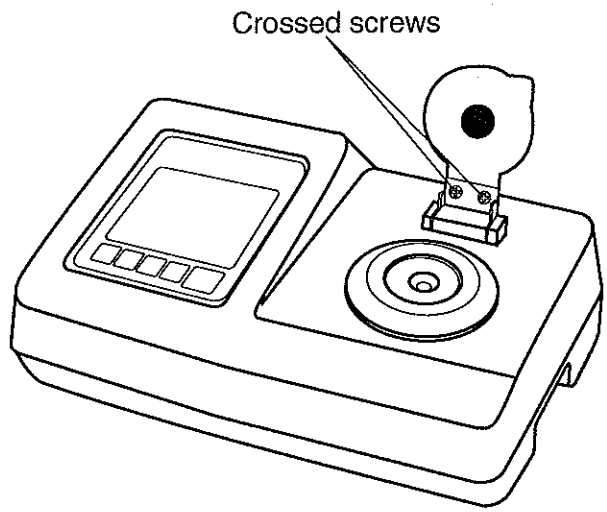


Fig.22-1

23. Refractive index and Brix

(1) What is a refractometer?

If you put a straw into a glass of water, the straw appears bent. If the water contains concentrations of sugar, the straw will appear more bent. This is called the "phenomenon of light refraction". The refractometer applies this principle (if a solution has a higher concentration, its refractive index rises proportionally). The refractometer is a measuring instrument devised by Dr. Ernst Abbe in Germany in the early 20th century.

(2) What is refractive index? (See Fig. 23-1.)

When light goes to medium x through air with an refractive index of air in the atmospheric pressure assumed as 1, the ratio of the sine of incident angle α against the interface to the sine of refractive angle β is called the refractive index of the medium x. Since the refractive index changes due to the temperature and wavelength of light.
The wavelength of light source of RX-007α is sodium D-line approximation.
Desired measurement temperature can be set into RX-007α.
On the display screen of RX-007α, refractive index is displayed as "RI" : abbreviation of Refractive Index.

Note: The refractive index measured by setting the refractive index of vacuum to 1 is called the absolute refractive index, but it is generally scarcely used.

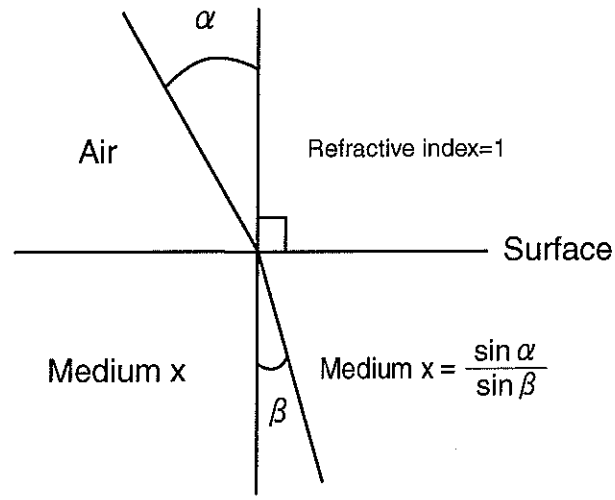


Fig. 23-1

(3) Brix scale

This instrument is equipped with the Brix scale on a refractive index of water (RI=1.33299) used as the reference (0%).
Brix means the scale of the weight (%) of sucrose (grams of sucrose contained in 100 grams of sucrose solution). Thus, if a sucrose solution is measured, it matches this concentration. However, almost all foods contain not only sugar, but also a variety of dissolved components such as salt and protein. The total concentration of these water-soluble materials is called the soluble solid content. When this sample is measured, Brix is almost consistent with the soluble solid content (%) and is used as a practical scale.
* The Brix scale is expressed in % mass (Sucrose) as the International System of Units (SI unit).

(4) Temperature correction

The refractive index of the same material will vary due to temperature. If the refractometer is used to measure a solution, a change occurs in the measured value depending on a difference in temperature. The Brix or concentration value displayed by this product is automatically corrected by the built-in computer based on the measured temperature and the same value is always displayed as if measurements are made at 20℃(in case of a sample temperature of 15 to 30℃).

24. Specifications of RX-007 α

Cat.No.	3921
Product name	Automatic Digital refractometer RX-007 α
Measuring system	Optical refraction critical angle detection system
Constant-temperature unit	Built-in thermo-module
Measurement items	(1) Brix (2) User scale (3) Refractive index (RI)
Measurement range	(1) Brix : 0.000 to 5.000% (2) RI : 1.330150 to 1.341500
Minimum indication	(1) Brix: 0.001% (2) RI : 0.000001 (3) Temperature : 0.01℃
Measurement accuracy	(1) Brix: ±0.005% * Refer the page26. (2) RI : ±0.000010 (at 20℃)
Temperature correction range for Brix	15.00 to 30.00℃ (Automatic Temperature Compensation)
Constant temperature setting range	10.00 to 40.00℃ (The lower limit is the room temperature- (minus) 5℃
Temperature display accuracy	±0.05℃
Environmental condition	Using temperature: 15 to 30℃, Using humidity: Max. 90%RH, Using altitude (Above sea level): Max. 5,000m
Display method	LCD dot display (320 × 240 dots), with back light
Display with top and bottom limit bar	Use to see roughly if measured value is in standard range. If top and bottom limits of standard value are set, top and bottom limit bar is displayed together with measurement value.
User scale	If 3 points of user scale corresponding to Brix are inputted, the main unit makes conversion formula automatically. Unit (%, g/100g, g/100ml, mol/l, %max, %vol, no unit) can be displayed.
History function	Up to 30 latest measurements can be displayed and can be printed.
Printer output	Digital printer DP-RX (Optional) is used. Output method : Conformed to Centronics specification Printed items : Brix/user scale/RI, temperature at measurement, year, month, day, time, measurement mode Sample No. and average value can also be printed.
Communication with computer	Communication method: RS-232C Output items: RI, Brix, user scale, and temperature at measurement Input items: Zero adjustment and start of measurement from computer
Zero adjustment	Zero point is adjusted with air and distilled water.
Manual calibration	Indicated value can be changed in a certain range .
Light source	LED (Approximating to wavelength of D line)
Materials	(1) Prism: Artificial crystal, (2) Sample stage: SUS 316
Input power source	AC100 to 240V 50/60Hz
Power consumption	480VA
Dimensions and weight	37 × 26 × 14cm, 6.5kg (Main Unit only)

25. Repair and warranty

The Automatic Digital Refractometer RX-007 α is a complicated precision electronic instrument consisting of optical (prism and objective lens) and electronic parts. Since light and electricity are combined in the operation of this instrument, their mutual actions may make it difficult to isolate operational problems.
For this reason, repair and adjustment can be complicated and each serviceman is required to have special knowledge of optics and electrical engineering.
Do not disassemble or perform any repair on the unit other than the basic inspection and replacement of parts described in this operation manual (unless you have taken the maintenance technology course in our company and has been certified).
The warranty of this unit is one year after the date of purchase. Any trouble detected during the warranty period will be performed without charge. After the warranty has expired, the cost of repairs will be subject to evaluation. Ask your ATAGO distributor concerning this matter.
During the warranty period, if a person who has not taken the maintenance technology course at our company and has opened and tampered with the components within the casing, the warranty will be invalidated and a charge for repair will be assessed.
The prism is considered a consumable item. Therefore, any damage to the prism is not covered under the warranty and is subject to repair costs.
All instruments received for repair are subject to a possible inspection fee. ATAGO does not warrant the problems which are caused by user's fault even though the unit is under warranty.

● Performance parts for repair

ATAGO will endeavor to secure the performance parts for repair up to seven years after manufacturing of this instrument is discontinued. Performance parts are those which are necessary to maintain the operation of this instrument. However, ATAGO may not be able to supply all parts due to discontinuation or modifications by our parts manufacturers. Please understand this matter. Performance part are available through your ATAGO distributor.

● Recommendation of periodic inspection and maintenance(Charged)

We recommend to have your RX-007 α inspected periodically (once in two years, or so) to ensure years of dependable and accurate use.
Ask your ATAGO distributor for the periodic inspection (charged).
Periodic inspection includes:

- Inspection, confirmation, and replacement of performance parts
- Inspection and adjustment of span
- Replacement of desiccant

When asking about repair or other matters, be sure to notify us of the serial No. of your RX-007 α.