3574-E16

In-line Refractometer

PRM-100α

Instruction Manual

Cat.No.3574

ATAGO®

PRODUCT REGISTRATION & WARRANTY CARD

https://www.atago.net/registration/english/registration.php

CONTENTS

1. Precautions for Use

Introduction

Thank you for purchasing the "In-line refractometer PRM-100α". Before using your PRM-100α, 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 PRM-100αsafely, 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 PRM-100α correctly.

Explanation of indications

 WARNING	If this indication is neglected and the instrument is handled incorrectly, serious injury or death may result.
 CAUTION	If this indication is neglected and the instrument is handled incorrectly, injury and/or property damage may result.

Explanation of symbols

	This symbol denotes an item of which to be warned or cautioned. The contents of warning are described in detail in or near the △.
	This symbol denotes an action that must not be performed (a prohibited item). The contents of prohibition are described in detail in or near the ○.
	This symbol denotes an action that must be performed. 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 aware of its properties and wear 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

◇ Keep the detection section except for the wetted sensor part away from water.
Do not operate the instrument while the connecting ports of the display section is wet.
(The instrument is protected against submersion in water, it may not be operated submerged in water.)
Do not place the display section in places that are frequently wet or have constant exposure to water.

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

⚠ CAUTION

◇Do not pass corrosive materials over the prism or through the sample inlet unit.

◇Cleaning liquids up to 160 ˚C can be used for CIP or SIP. The momentary difference between the sample liquid temperature and the cleaning liquid temperature must be no more than 80 ˚C. When using cleaning liquids at temperatures over 160˚C, the power switch must be turned off.

◇If sample material has collected on the prism, please refer to Page 48 "13.Cleaning the Prism" of this manual for cleaning instructions.

◇Turn off the power switch before leaving the unit out of serviced for an extended period of time.

◇When relocating the unit, pack it fully to guard against shocks during transit and enclose it in the corrugated fiberboard box in which it had been delivered.

◇Carefully read this instruction manual and fully understand the function and operation of each part of the instrument before use.

◇Inspect each part of the instrument for damage or defects that may have occurred in the shipping or manufacturing process.

◇Check the necessary operations such as zero setting according to the instruction manual.

◇The manufacturer shall not be liable for any and all damages resulting from uses of the instrument that deviate from those intended by the manufacturer, which are the measurement of Brix, sugar content, and concentration of liquid solutions.

◇The prism is a consumable item and is not covered under warranty.
Special care should be taken to avoid scratching or damaging the prism.

◇The manufacturer shall not be liable for any effect the use of this instrument may have on the consumption or application of the measured materials or related processes, etc.

Handling of plug

WARNING

◇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 short circuiting the unit, smoking or fire.

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

◇Ensure the grounding pin is properly connected when connecting the power cable to an AC outlet.

◇The disconnecting device of the main unit is the power cable.
Make sure that there is no obstacle in vicinity of the plug.

Connecting Compontents

WARNING

◇Turn off the power switch and unplug the unit from the AC outlet before connecting the individual components with connecting cables.
Connecting components while the unit power is on increases the likelihood of electrical shock.

Conditions to be observed when using

Environmental conditions

◇Use the instrument at an altitude below 2,000m (above sea level).
◇Use the instrument indoors.
◇Use the instrument where the temperature is between 5 to 40˚C.
◇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 instrument 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.
◇Use this instrument under the condition where humidity is 80% at 31˚C or lower, falling linearly to 50% at 40˚C.
◇Main supply voltage fluctuation should not to exceed ±10% the nominal voltage.
◇Installation categories (Overvoltage Categories) : II
◇The pollution degree is 2 (according to IEC60664).

Handling

◇Do not drop the instrument or subject it to any strong shock.
◇The power cable may be damaged by:
- 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. Refractive Index and Brix(%)

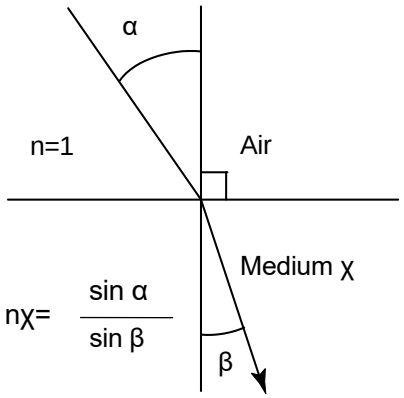
(1)What is refractometer?

When a straw is placed into a glass filled with water, the straw appears to bend. When a straw is placed into a glass filled with sugar water, the straw appears to bend much more sharply than in the case of water alone.

This phenomenon is known as the refraction of light. The refractometer is an instrument that measures the Refractive Index by utilizing this principle (the Refractive Index increases in proportion to the concentration of the solution), and was developed by Dr. Ernst Abbe at the end of the 19th century.

(2)What is the Refractive Index?

If the Refractive Index of air under atmospheric pressure is 1, then when light enters medium χ, the ratio of the sine of the incident angle α measured against the phase boundary to the sine of the refracting angle β is called the Refractive Index of the mediumχ.



The Refractive Index varies with the wavelength of light and temperature and is represented as follows:

n_D^t

n : Represents the Refractive Index
t : Temperature (˚C)
D : D-line of natrium (589nm)

For example, Refractive Index of water at 20˚C under the D-line is: n_D^{20} = 1.33299:

(Generally expressed as nD = 1.33299.)

Note The Refractive Index is based upon the supposition that the Refractive Index in a vacuum is 1 and is called the absolute Refractive Index. Generally, however, this index is seldom used.

(3)Brix(%) scale

The PRM-100α is programmed with the Brix(%) scale, based on the Refractive Index of water (nD = 1.33299) as the reference (0%). The Brix(%) scale represents the weight of sucrose expressed by percentage (sucrose weight in grams contained in 100 grams of sucrose solution).

Therefore, this scale corresponds with the sucrose concentration. However, most samples are comprised of ingredients other than sugar. The total concentration of these ingredients is represented by the Brix(%), so this makes the Brix(%) scale a practical tool for measuring concentrations.

Note The Brix(%) scale is recommended by ICUMSA (International Committee of Uniform Method of Sugar Analysis) and is expressed in % mas (Sucrose) in international units (SI unit).

(4)Temperature correction

The Refractive Index of a substance varies with temperature. Thus, when using a refractometer to measure the Refractive Index of a liquid, the measurement value will vary with the sample temperature.

The Brix or concentration value displayed by this product is automatically compensated by the internal software based on the measured temperature and the same value is always displayed as if measurements were made at 20˚C (in case of a sample temperature of 5 to 100˚C).

3. Unpacking and Installation

(1) Unpacking

①Unpack the unit and visually check for any damages that may have occurred during transit.

②Make sure that the following components are included:

- PRM-100α detection section 1
- PRM-100α calculation display section 1
- Detection section - display section connecting cable (hereinafter the DS-2 cable) 1
- Recorder output cable (4-20mA) 1
- 3K clamp band 3S.....1
- O-ring (Silicon) 1
- O-ring (EPDM).....1
- Plain washer.....4
- Hexagon socket head bolt (cross-recessed for assembling a spring washer) 2
- Instruction manual (this manual) 1
- Inspection certificate 1

memo These components are available with PRM-100αand built to standard specifications.

(2)Installation

Note Remove the socket caps from the display section (three caps) to access the terminals (Fig. 3-1).

①Run the unit from a power supply of 100V AC to 240V AC, 50/60Hz.

②Install the unit in an ambient temperature range of 5 to 40 ˚C.

③This unit contains precision components.

Avoid installing this unit in places that are exposed to direct sunlight or near a heat source, or where dust or corrosive gases may accumulate.

④Install this unit in a location that is protected from strong vibration.

Exercise care during installation to avoid any impact or shock to the instrument, as such stress may affect the performance of electronic components.

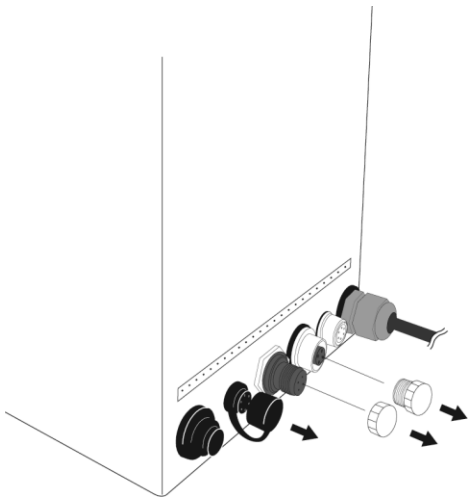


Fig. 3-1

4. Names and Functions of Components

(1)Detection Section (Fig. 4-1 and Fig. 4-2)

①Prism

Sample material contacts the prism surface to allow for the measurement of its refractive index, Brix and/or concentration.

②Sample inlet unit mounting part

Mount the sample inlet unit on this part.

③Detection section - Display section connection terminal

Connect the DS-2 cable to this terminal.

④Air cooling fin

Dissipates heat to preserve the unit's electronic components when measuring high temperature samples.

⑤Mark to show the position of the thermo sensor.

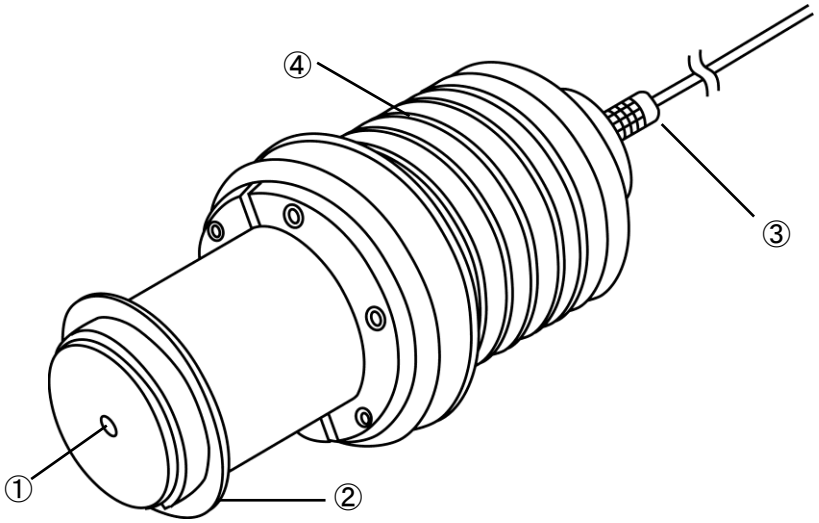


Fig. 4-1

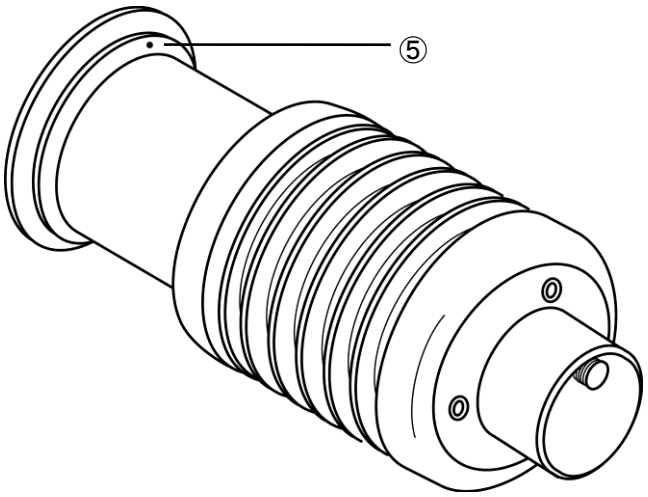


Fig. 4-2

(2)Display Section

(2-1) Operator section (Fig. 4-3)

①START/STOP key

Start or stops measurement (turning the power on automatically begins measurement).

②SCALE key

Chooses from among the measurement value display modes nD (refractive index), Brix (sucrose reading scale) and the SET UP mode.

③ENTER key

Used to carry out reference level adjustment and manipulate the SET UP mode.

For operating instructions, see the respective items.

④← → keys

Cursor movement keys.

Use to move the digit position when setting a numerical value in the SET UP mode.

The cursor is positioned on the blinking digit.

⑤↑ ↓ keys

Numerical value change keys.

Use to change the numerical value in SET UP mode.

⑥Measurement indicator

Indicates the current mode of measurement; that is continuous or halted.

During use, the yellow light is blinks.

⑦SET UP mode indicator

Yellow light will be turned on at the SET UP mode.

⑧H.over and L.over displays

If a high-limit or low-limit alarm is set in the SET UP mode and then the high or low limit is exceeded, the corresponding display illuminates.

⑨Temperature display

Displays the temperature of the prism during measurement.

⑩Measurement value display

Displays measurement or set value digitally.

⑪Mode display

Displays the mode in which numerical values are shown on the measurement value display.

Calculation display section front view

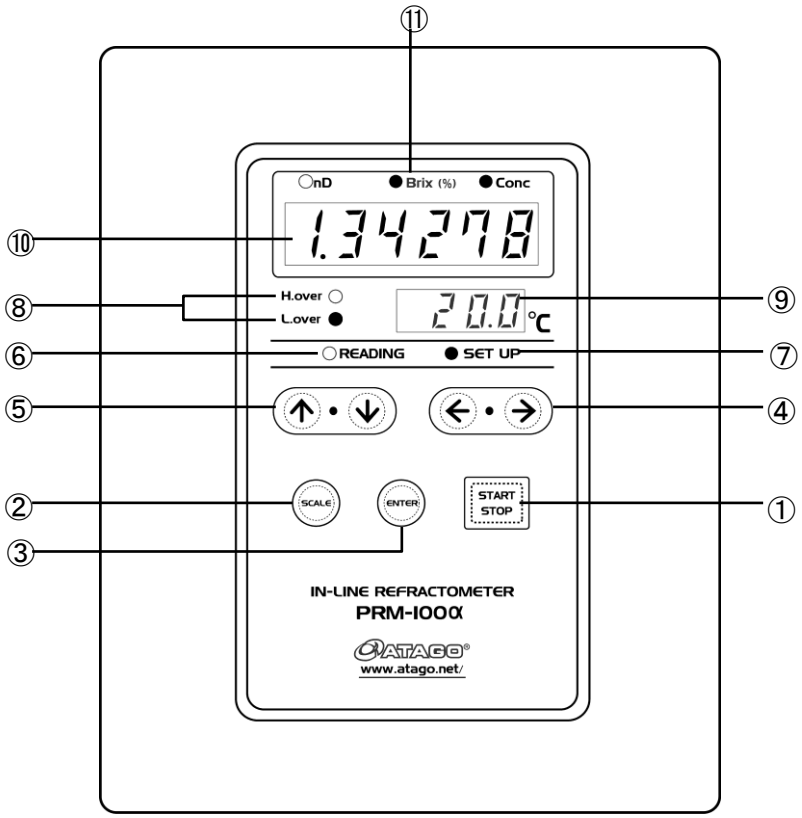


Fig. 4-3

(2-2) Rear section (Fig. 4-4)

①Power key

Press to turn on the calculation display section.

②Alarm output terminal

Use to handle alarm signals.

③RS-232C output terminal

Use to connect the calculation display section to a personal computer.

④Recorder output terminal

Use to connect the calculation display section to a recorder.

⑤Detection section - display section connection terminal:

Connect the DS-2 cable to this terminal.

⑥Power cable

Insert into a 100V AC to 240V AC outlet.

Calculation display section rear view

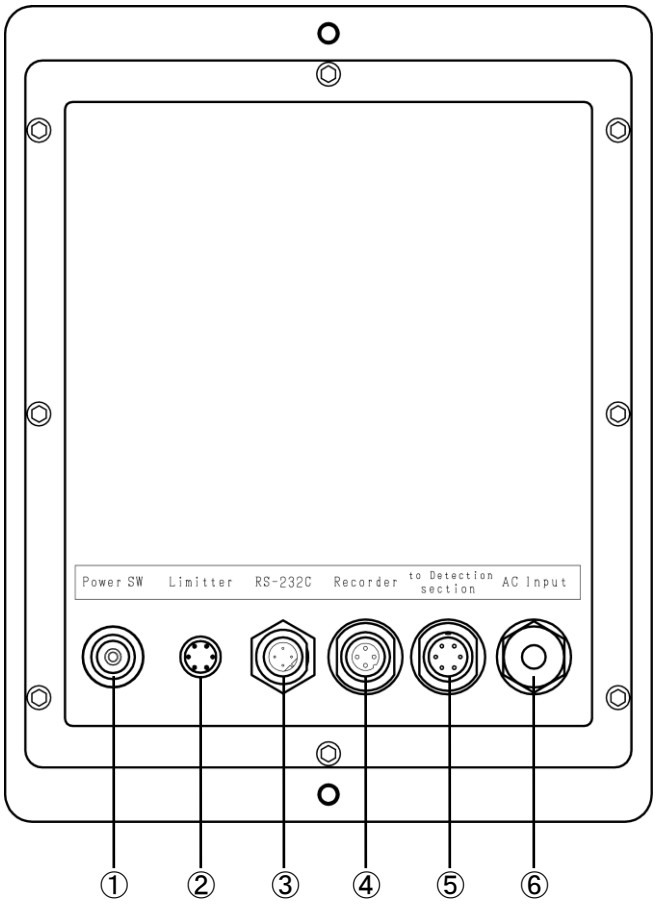


Fig. 4-4

5. Mounting the Detection Section

⚠ WARNING	◇Turn the power switch on the display section to OFF and unplug it from the AC outlet prior to mounting the detection section. Mounting the detection section with the unit turned on may increase the likelihood of electric shock.

⚠ CAUTION	◇Make sure that the piping and equipment are clear of any fluid before mounting the detection section on the piping and equipment.

(1)Types of Sample Inlet Unit (Fig. 5-1)

Two types of sample inlet units are available as pipe fittings: straight type and L type.

The straight type should be installed on straight sections of piping.

The L type inlet should serve as the joining piece for piping intended to align in an L shape (Fig. 5-4 on page 14).

There are three ways to connect a sample inlet to a pipe: IDF/ISO clamp union (ferrule), IDF/ISO screw union (screw), and JIS Flange.

Other sample inlets available include small diameter series compression fitting (outer diameter 10mmφ) and hose connector (outer diameter 12mmφ).

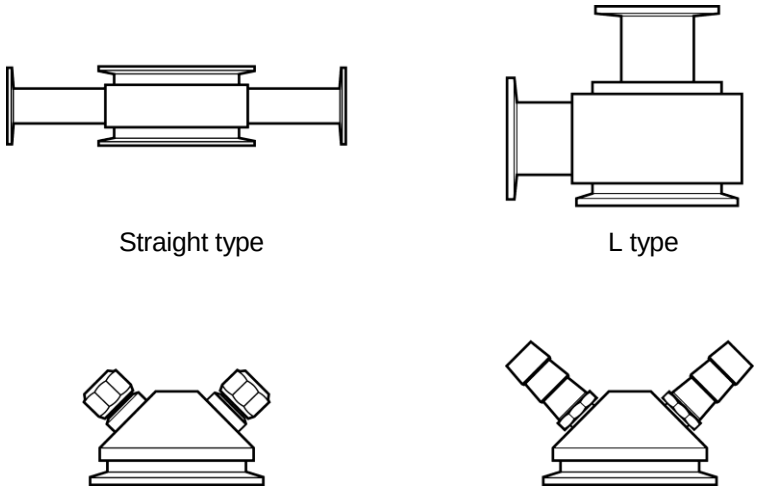


Fig. 5-1

(2)Mounting the Sample Inlet Unit (Fig. 5-2)

Fit the sample inlet unit into the leading section of the detection part, and secure the sample inlet unit with the attached clamp and O-ring provided.

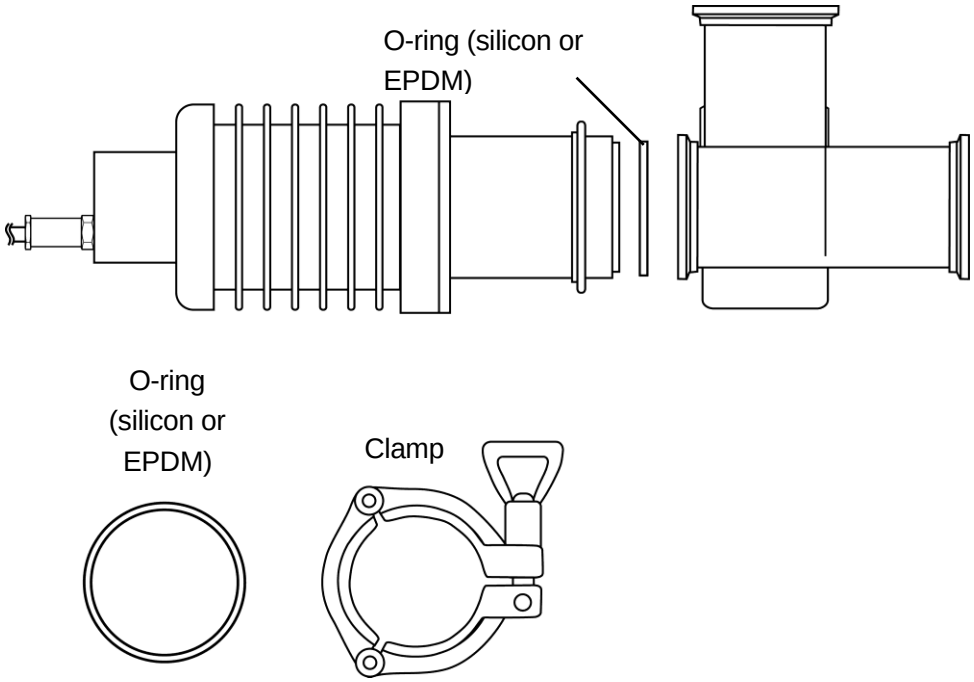


Fig. 5-2

Support of detection section

Since the detection section weighs 3.2kg, it may not be supported by connection with the sample inlet unit alone. Therefore, support the detection section, as shown below. If you cannot get the support, we will supply the following parts.

- Pipe hanger (RE-67157)
- Hanger pin (RE-67156)
- Stand (RE-67155)

For the support bar, prepare a pipe having an outer diameter of 19.0mm and an inner diameter of 16.0 to 17.0mm.

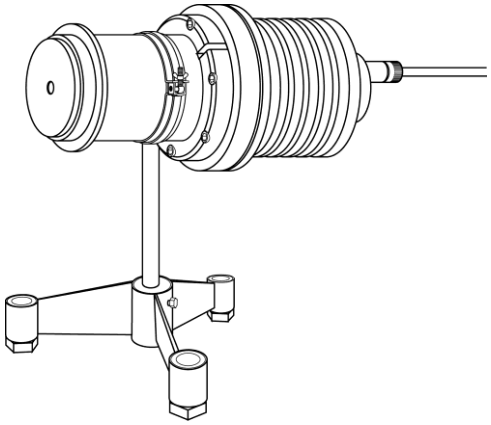


Fig. 5-3

(3) Mounting on the Piping (main) (in the case of L type)

Mount the detection section on the piping, observing the flow direction of the fluid to ensure it will hit the prism surface of the detection section (Fig. 5-4).

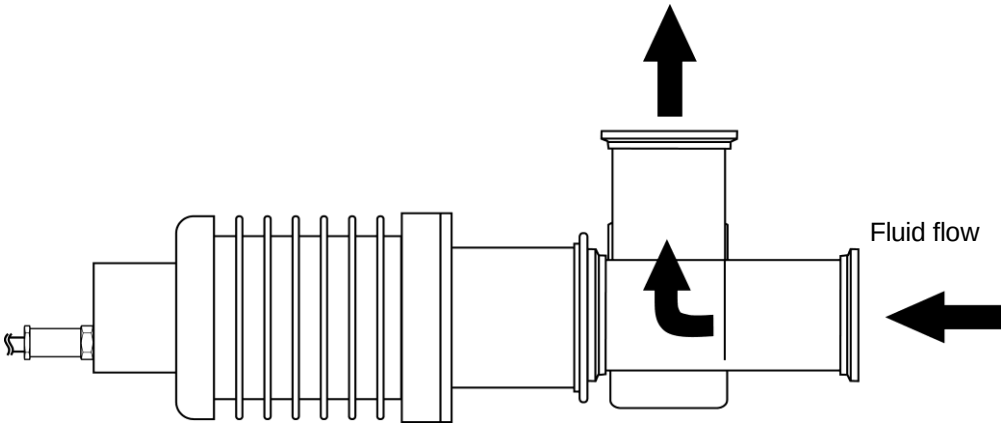


Fig. 5-4

(4) Mounting on the Piping (main) (in the case of straight type)

When mounting the detection section to the piping, keep it positioned parallel to or below the piping to ensure the flow of sample passes over the prism.

Mounting the detection section as shown in Fig. 5-5 is not advised, as low pressure or flow rate may prevent the sample from contacting the prism sufficiently, interfering with measurement.

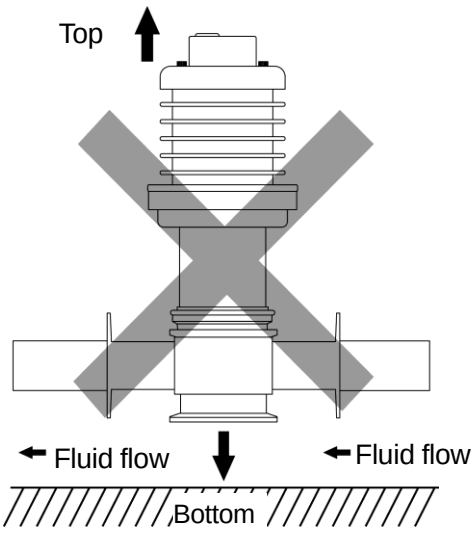


Fig. 5-5

(5) Position of the thermo sensor

There is a built-in thermo sensor near the prism.

As the position of the thermo sensor is marked (Fig. 5-6), mount the detection section to keep the mark upstream in case the sample temperature widely varies.

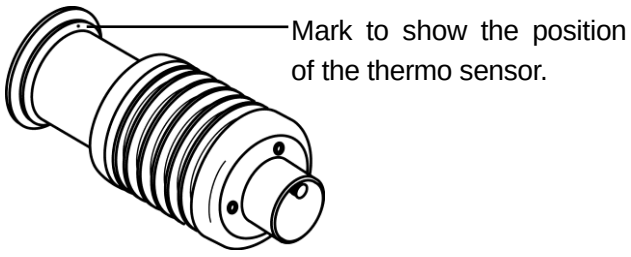


Fig. 5-6

6. Mounting the Display Section

> **WARNING**
>
> ◇Turn the power switch of the display section to OFF and unplug it from the AC outlet prior to mounting the detection section.
> Mounting the detection section with the unit turned on may increase the likelihood of electric shock.

It is recommended that the display section is mounted in a control box.
The display section is equipped with a wall-mount handle on the rear face, allowing the part to be mounted to a wall surface (Fig. 6-1).
When mounting the display section on a panel, use up to two flat washers to adjust the thickness of the panel as needed and bolt the display section.
The table assumes panel thicknesses of 1 to 5mm (Table 6-1).

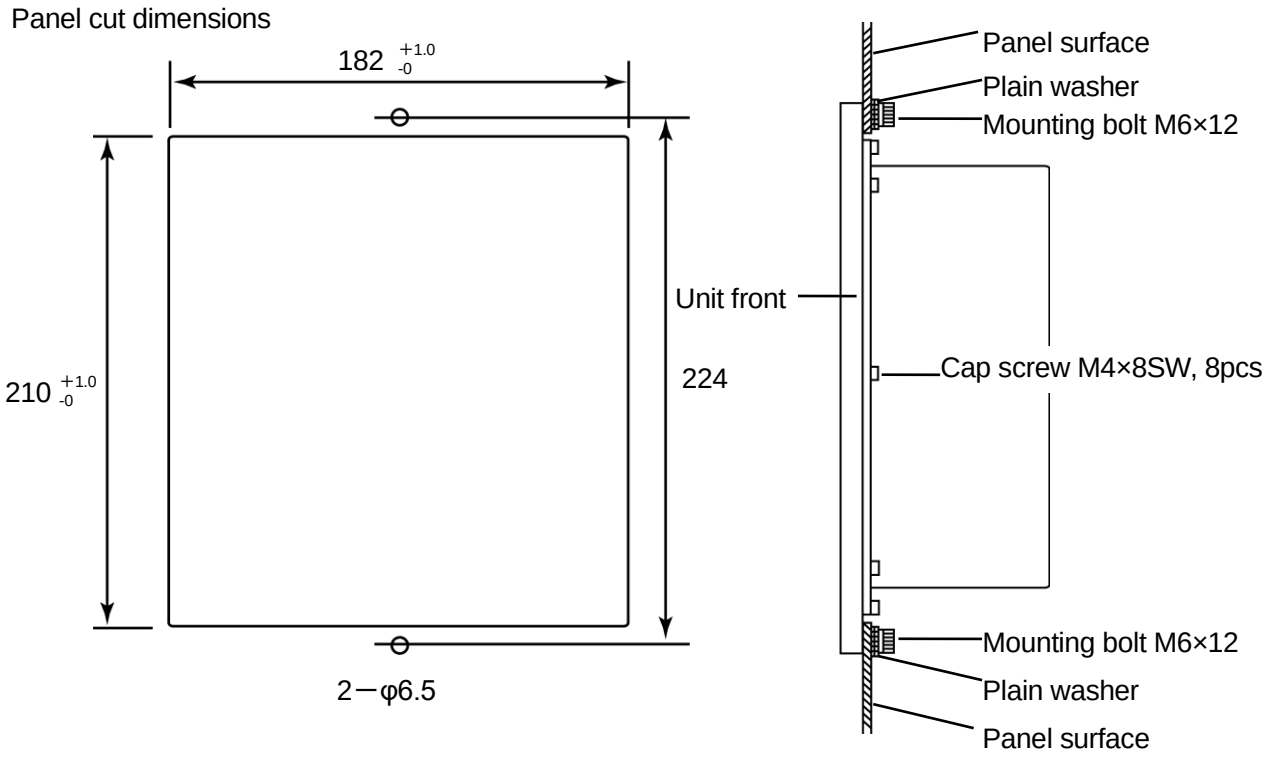
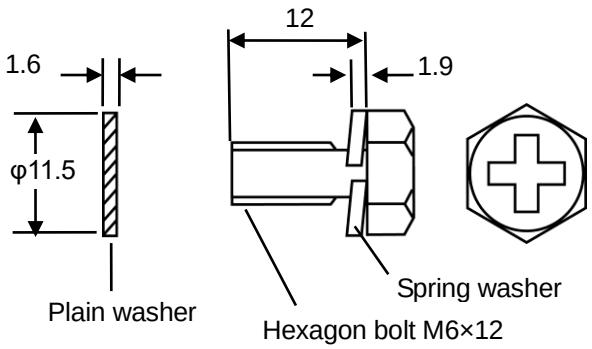


Fig. 6-1



Accessories:
Hexagon bolt·····2
Plain washer·····4

Fig. 6-2

Table 6-1

Panel thickness	Plain washer	Schematic
1mm	2pcs	
2mm	2pcs	
3mm	1pcs	
4mm	1pc	
5mm	0pc	

7. Connecting the Detection Section to the Display Section

> ⚠ WARNING ◇Turn the power switch of the display section to OFF and unplug it from the AC outlet prior to attaching or detaching the DS-2 cable to or from the terminal.

Note Remove the socket caps from the display section to access the terminals (Fig. 7-1).

After mounting the detection section on the piping, connect it to the display section with the DS-2 cable (included) (Fig. 7-2).

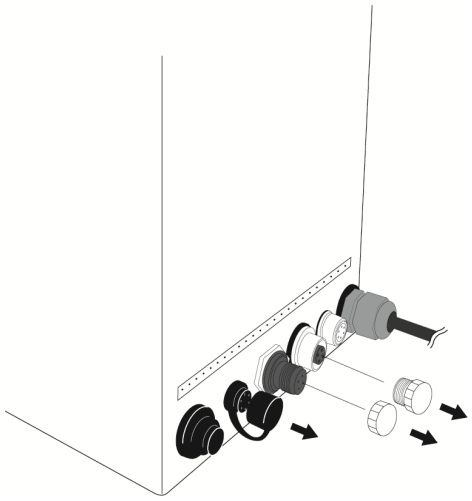


Fig. 7-1

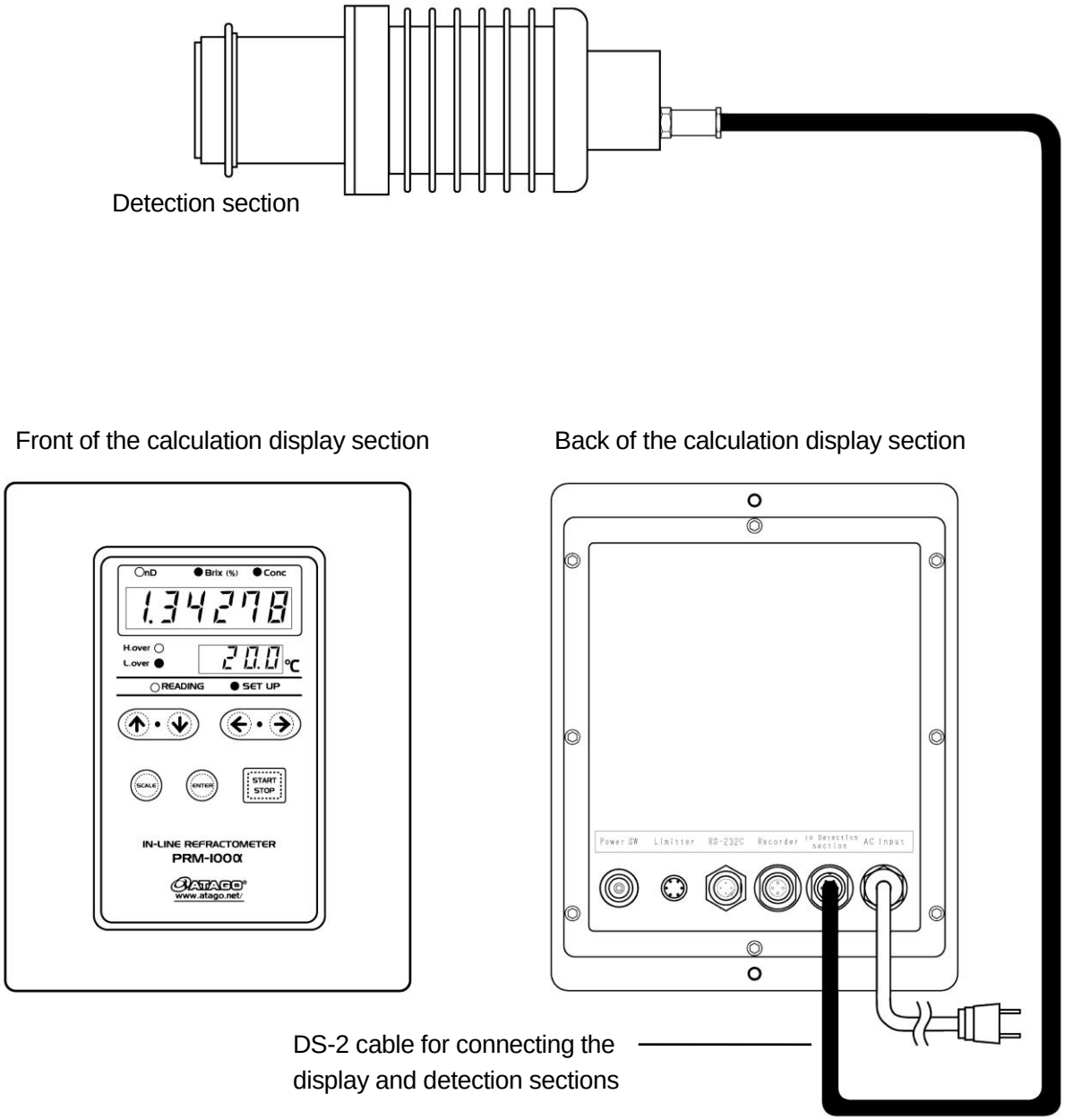

Detection section
Front of the calculation display section
Back of the calculation display section
nD
Brix (%)
Conc
1.34278
H.over
L.over
20.0 ℃
READING
SET UP
SCALE
ENTER
START
STOP
IN-LINE REFRACTOMETER
PRM-1000α
ATAGO
www.atago.net/
Power SW
Limitter
RS-232C
Recorder
to Detection section
AC Input
DS-2 cable for connecting the
display and detection sections

Fig. 7-2

8. External Output

> ⚠ WARNING ◇Turn the power switch of the display section to OFF and unplug it from the AC outlet prior to attaching or detaching the DS-2 cable to or from the terminal.

The display section contains three external output ports: a recorder output (4 to 20mA) port, an RS-232C output port, and an alarm output cable port (Fig. 8-1).

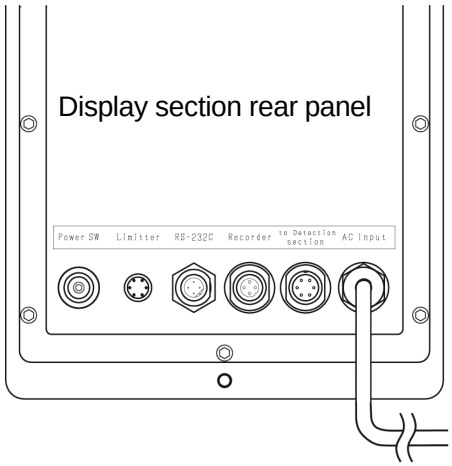


Fig. 8-1

(1)Recorder Output (Fig. 8-2 and Fig. 8-3)

Refractive index (Brix and concentration measurements) and temperature (-5 to 160˚C) are generated as recorder outputs (4 to 20mA) by the detection section.

Insert the recorder output cable (included) into the port on the rear of the display section.

See "(3) Setting recorder output" on Page 29 for SET UP mode instructions.

Wire number plug front view

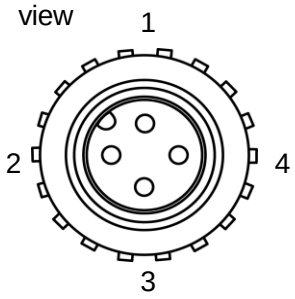


Fig. 8-2

Table 8-1 Lead wire color

Pin number	Cord color	Signal name	Output
1	Red	Refractive Index (Brix, concentration) +	4 to 20mA
2	Black	Temperature +	4 to 20mA (-5 to 160˚C)
3	Red & White (stripe)	Refractive Index (Brix, concentration) -	4 to 20mA
4	Black & White (stripe)	Temperature -	4 to 20mA (-5 to 160˚C)

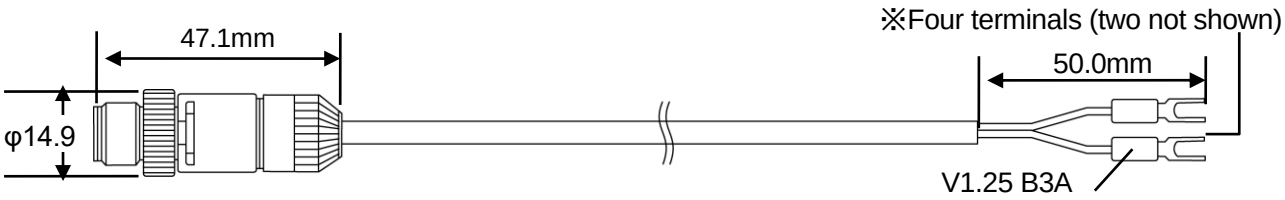


Fig. 8-3

(2)RS-232C Output

This unit provides RS-232C outputs for use with a PC via an external output port installed on the rear panel of the calculation display section.

Use the exclusive connecting cable (option) to collect RS-232C outputs.

Keep the calculation display section and PC at most 15m apart.

①Dedicated cable specifications (Fig. 8-4 and Fig. 8-5)

Wire number plug front view

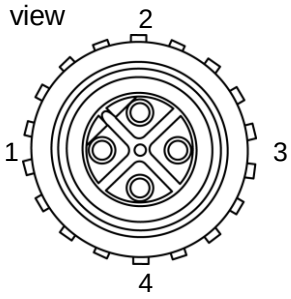


Fig. 8-4

Table 8-2 Lead wire color

Calculation display section			D－Sub connector (PC side)		
Pin number	Cord color	Signal name	Pin number	Cord color	Signal name
1	Red	RXD	2	Red & White (stripe)	RXD
2	Red & White (stripe)	TXD	3	Red	TXD
3	Black	GND	5	Black	GND
			7	－	RTS
			8	－	CTS

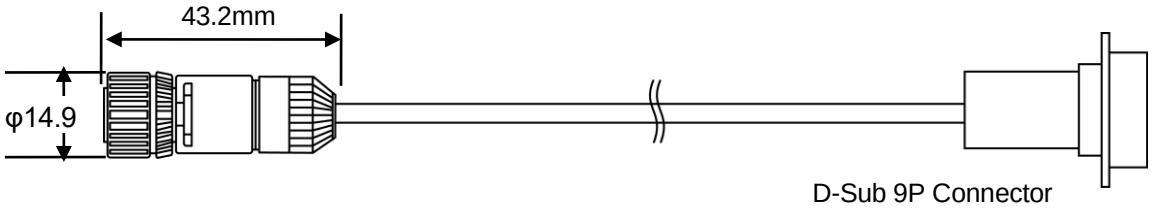


Fig. 8-5

②Communications parameters

Baud rate : 4800bps
Data length : 8bit
Parity : ODD
Stop bits : 1bit

③Transmitted data format

a.aaaaa,bbb.bb,ccccc1,ccccc2,ccccc3,ccccc4,ccccc5,ddd.d,xxxxx

a.aaaaa : Refractive Index
bbb.bb : Brix
ccccc1 : Conc1
ccccc2 : Conc2
ccccc3 : Conc3
ccccc4 : Conc4
ccccc5 : Conc5
ddd.d : Temperature
xxxxx : Scale : nD Brix Conc1 Conc2 Conc3 Conc4 Conc5

(3) Alarm Output (high- and low-limiter output)

The alarm output functions based on the established range of acceptable measurement values.

When a value is detected that falls outside of the acceptable range alarm output is transmitted from the detection section.

The high-limiter and low-limiter output circuit has a photocoupler with a transistor open collector in the final stage. See the diagram on the following page before using the limiter circuit.

①Dedicated cable (option) specifications (Fig. 8-6 and Fig. 8-7)

Table 8-3 Lead wire color

Wire number plug front view

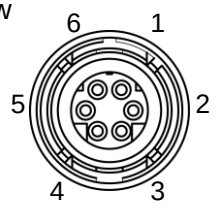


Fig. 8-6

Pin number	Cord color	Signal name	
1	Brown	High-limiter output	+
2	Red	Low-limiter output	+
3	Black	Limiter Com	−
4	Yellow	This pin is not applicable to this unit.	
5	White	This pin is not applicable to this unit.	
6	Green	This pin is not applicable to this unit.	

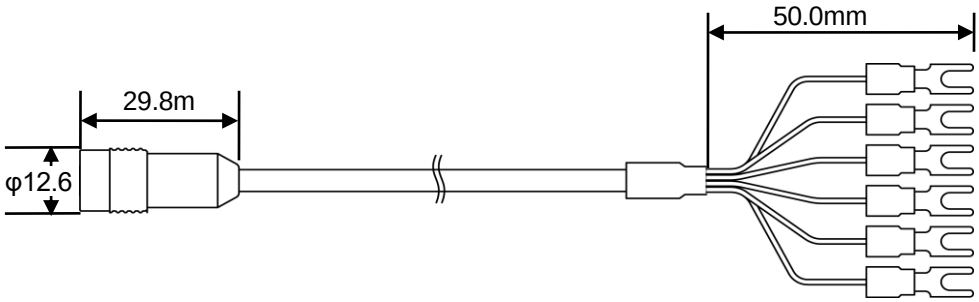
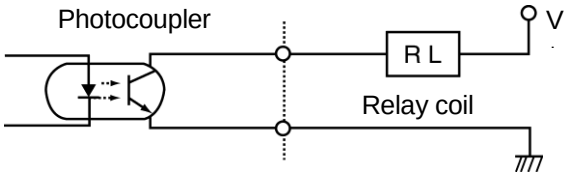


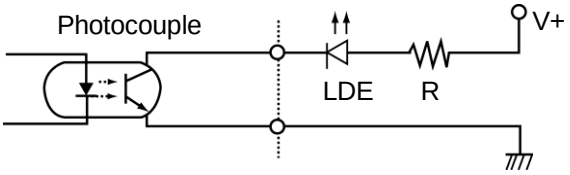
Fig. 8-7

②High- and low-limiter output typical applications

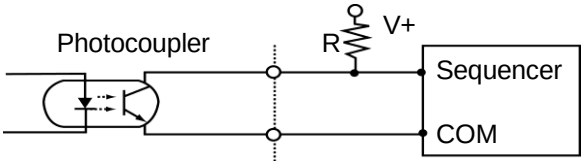
a. Drive a relay



b. Turn on a LED



c. Feed a sequencer or the like at the signal level (TTL)



※R (resistance) and V+ are not necessary if the input to a sequencer or the like is pulled up.

Table 8-4 Recommended photocoupler operating conditions (Type TLP523-2)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply voltage	V cc	−	5	24	V
Forward current	I F	−	16	20	mA
Collector current	I c	−	−	40	mA
Operating temperature	T opr	- 25	−	85	˚C

9. Turning On the Power

⚠ WARNING	◇This instrument is designed to plug into outlets providing alternating current between 100V and 240V. Voltages outside of this range may increase the likelihood of short circuiting, smoking, or fire. ◇Do not use power cables that are damaged, broken or modified. Use of such cables may increase the likelihood of fire, electrical shock or burns. Contact ATAGO or an authorized ATAGO distributor for repair or replacement cables.

⚠ CAUTION	◇Do not handle plugs with wet hands. ◇When disconnecting the power cable from an AC outlet, hold it by the plug; pulling the cable could damage it, increasing the likelihood of fire or electric shock. ◇When plugging the power cable to an AC outlet, ensure that the ground pin is connected as well.

①Make sure that the DS-2 cable is functioning properly.

②Ensure each output cable (recorder, RS-232C, alarm) is wired and plugged in correctly.

③Plug the AC power cable of the display section into a 100V to 240V AC outlet and turn the power switch to the ON position.
Measurement will begin a few seconds later.

10. Setting Measurement Value Display Modes

(1) Common Operation

- When the unit is measuring a sample, use the START/STOP key to stop measurement.
  During measurement, keys other than the START/STOP key are disabled.
  Measurement must first be stopped to change the scale.
- When measurement has stopped, the display will read "StoP."
  Pressing the SCALE key when "StoP" is displayed will allow you to check the last result.
- Pressing SCALE again will display the value of the last result in the next scale, i.e. Brix, nD, Conc 1 to 5.
  Press SCALE again to reach "SET UP."
- In "SET UP" mode, the SCALE key is the cancel key.
- One of the following modes may be selected in "SET UP" mode: "1.bIAS," "2.ALAr," "3.rEC," "4.Conc," "5.dP." ,"6.CH."

(2) Change from nD Mode to Brix

①During measurement, the READING light blinks and the display will show nD readings (Fig. 10-1).
By pressing the START/STOP key, the READING light will turn off and "StoP" will display, ceasing measurement (Fig. 10-2).
The "nD" light will remain illuminated.

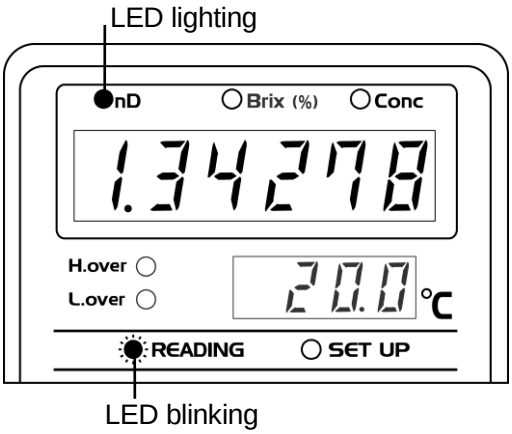


Fig. 10-1

②Press SCALE twice and the "Brix (%)" light will blink, indicating Brix mode is selected.

③Press ENTER to confirm this selection.
The "Brix (%)" light will remain illuminated.

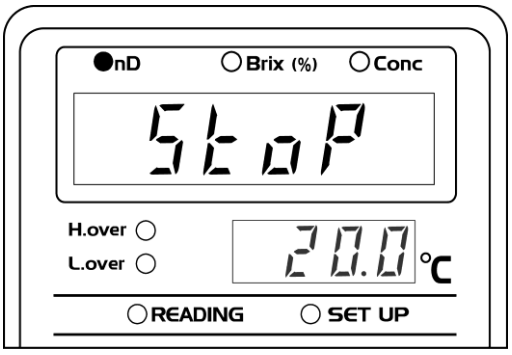


Fig. 10-2

④Press START/STOP to resume measurement.
The READING light will blink, and measurements will be displayed as Brix (%) values (Fig. 10-3).

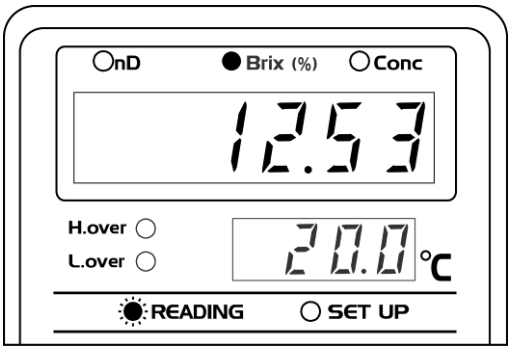


Fig. 10-3

(3) Change from Brix Mode to nD

①During measurement, the READING light blinks, and the display will show Brix (%) readings (Fig. 10-4).
By pressing the START/STOP key, the READING light will turn off, and "StoP" will display, ceasing measurement (Fig. 10-2).
The "Brix (%)" light will remain illuminated.

②Press SCALE until the "nD" light blinks, indicating refractive index mode is selected.

③Press ENTER to confirm this selection.
The "nD" light will remain illuminated.

④Press START/STOP to resume measurement.
The READING light will blink and measurements will be displayed as nD values (Fig. 10-5).

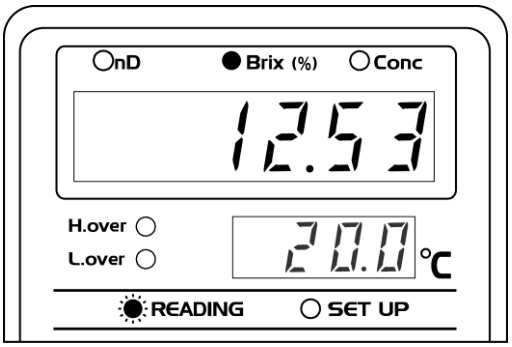


Fig. 10-4

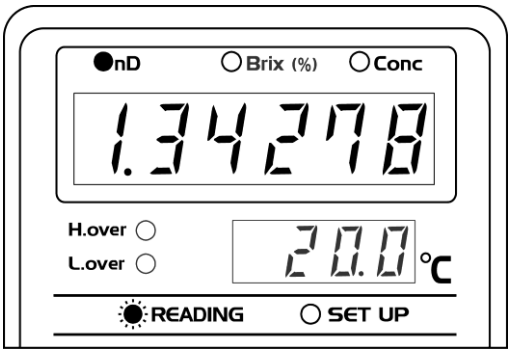


Fig. 10-5

(4) Change from Brix Mode to Conc

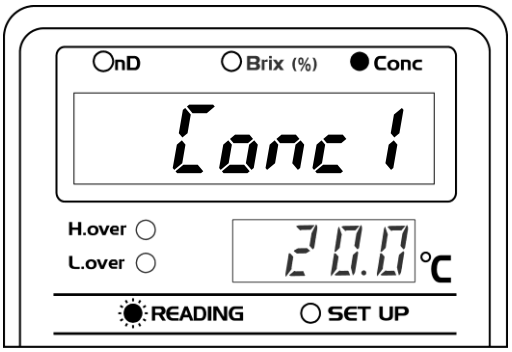
①During measurement, the READING light blinks, and the display will show Brix (%) readings (Fig. 10-4).
By pressing the START/STOP key, the READING light will turn off, and "StoP" will display, ceasing measurement (Fig. 10-2).
The "Brix (%)" light will remain illuminated.

②Press SCALE twice and the "Conc" light blinks, indicating Conc1 mode is selected. After “Conc1” is displayed, the last value will be displayed.

③Press ENTER to confirm this selection.
The "Conc" light will remain illuminated.

④Press START/STOP to resume measurement.
The READING light will blink, and measurements will be displayed as Conc1 values (Fig. 10-6).

In case of a concentration scale (Conc) not programmed, "- - - -" will display.



↓ 0.5sec

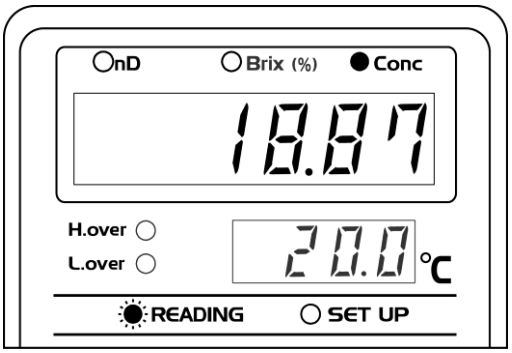
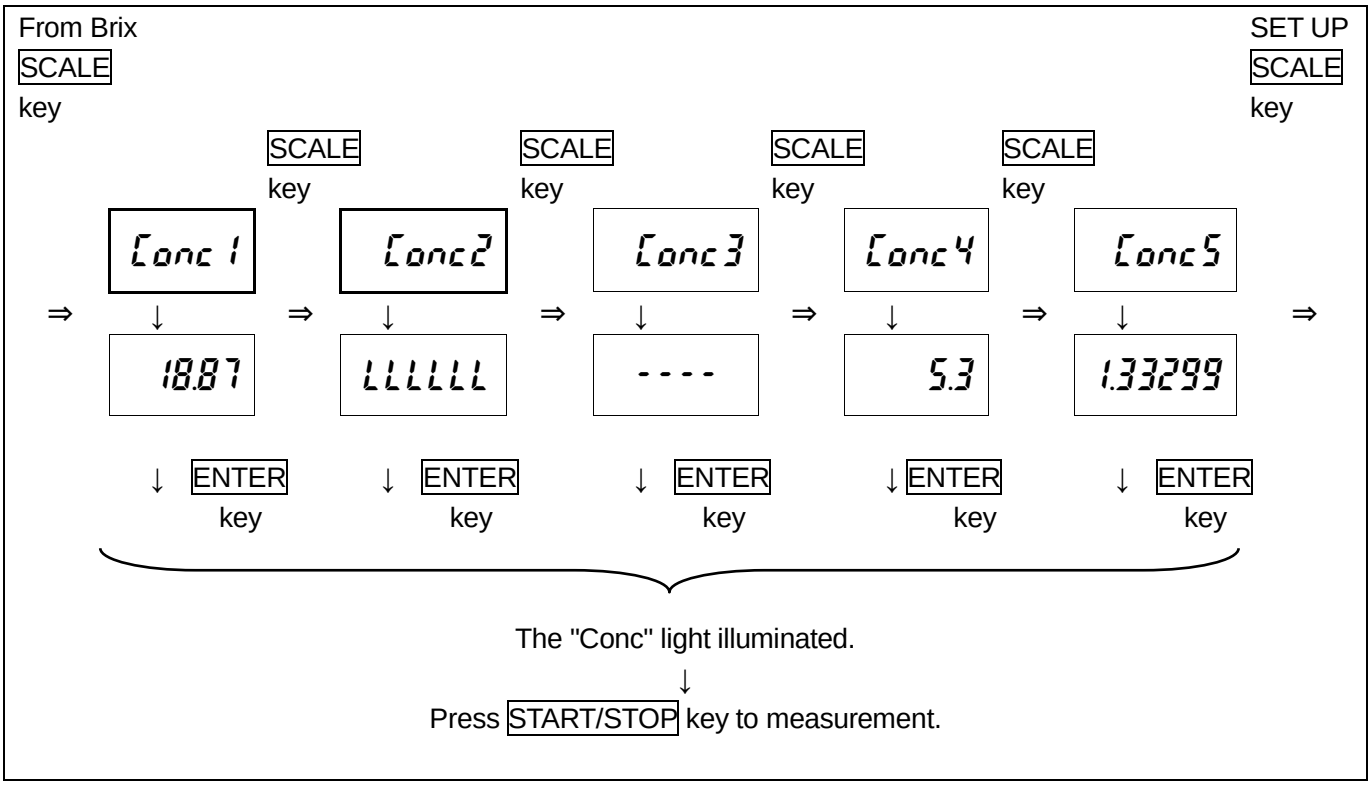


Fig. 10-6



(5) Confirmation of Measurement Values at Each Mode

This operation is for confirming measurement values at each mode when or after concentration scale (Conc1 to 5) is set.

①Press START/STOP to stop measurement.

②"StoP" will be displayed on the measurement value display.

③Press SCALE key once and the last value will be displayed.

④Press SCALE again to display results in the next measurement mode, (i.e. nD, Brix, Conc1 to 5, in turn).
Pressing SCALE while Conc5 is displayed will bring up "SET UP" mode.

⑤ "StoP" will be displayed if left inactive for 10 seconds.

11. Setting Measurement SET UP Mode

(1) Calibration Procedure

①Make sure that the detection section (sample inlet unit) is properly mounted on the piping.

②Let distilled water or a reference sample flow into the piping.

※If the last measurement value was LLLL.LL or HHHH.HH, the screen for setting the bias will not appear.

③Turn on the power as instructed in "9.Turning On the Power," on page 22.

④Perform calibration in the appropriate measurement scale for your sample (i.e. nD, Brix, or Conc1 to 5). The example below is for calibration in Brix measurement mode.

⑤ Press the START/STOP key to pause the measurement.

⑥Press the SCALE key three times.
The SET UP light will then blink, and "SEt" will be displayed on the measurement value display (Fig. 11-1).

※If left inactive for 10 seconds, the display returns to the "StoP" screen, following three short error beeps (Fig. 11-2).

⑦Press the ENTER key.
The SET UP light comes on and "1. bIAS" will appear on the measurement value display (Fig. 11-3).

※If left inactive for 10 seconds, the display returns to the "StoP" screen, following three short error beeps (Fig. 11-2).

Press the SCALE key to return to the previous "SEt" screen (Fig. 11-1) (During the SET UP operation, the SCALE key serves as the cancel key).

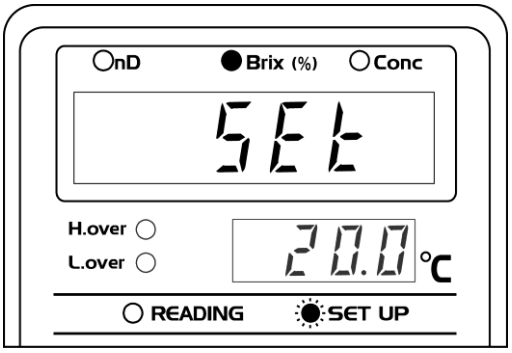


Fig. 11-1

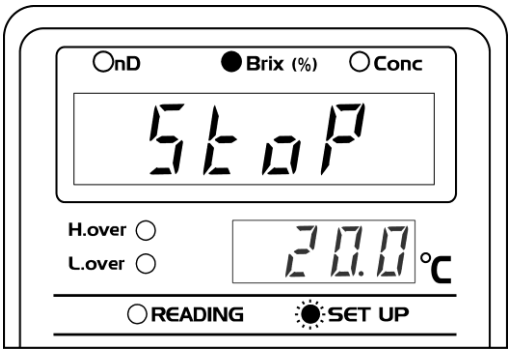


Fig. 11-2

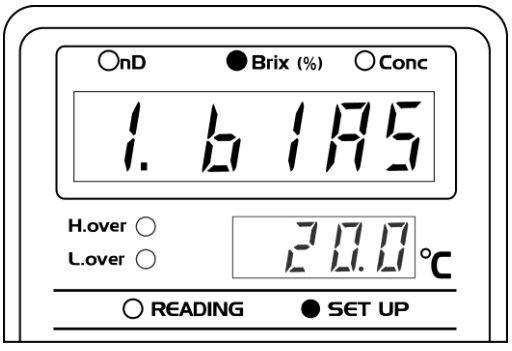


Fig. 11-3

⑧Press the ENTER key to access the SET UP mode. The most recent measurement value will be displayed.

※If the last measurement value was LLLL.LL or HHHH.HH, the screen for setting the bias will not appear.

Press the SCALE key to return to the previous "1. bIAS" screen (Fig. 11-3).

⑨Use ← → key to move digit position and then use ↑ ↓ key to set a standard value (Fig. 11-4 and Fig. 11-5).

※Press the SCALE key to abort the change and return to the previous "1. bIAS" screen (Fig. 11-3).

Press START/STOP key to reset the factory default setting.

"CL" appears on the measurement value screen (Fig. 11-6), and it returns to the previous "1. bIAS" screen.

⑩After setting a standard value, press the ENTER key to start data writing.

The measurement value display turns off during the data writing process. This may take a while.

The bias is set and calibration is complete.

The "1. bIAS" screen will be displayed (Fig. 11-3).

⑪To abort while in the SET UP mode, press the SCALE key.

"StoP" will appear after 10 seconds of inactivity (Fig. 11-2).

To start taking measurements with the post-calibration data press the START/STOP key.

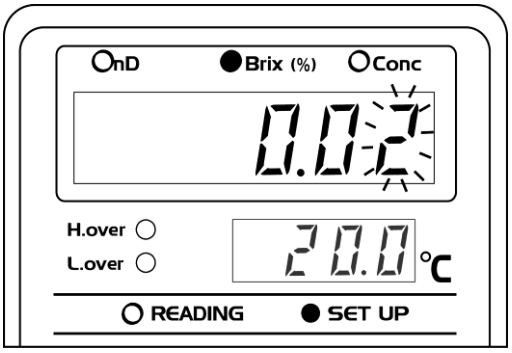


Fig. 11-4 Example using the Brix display

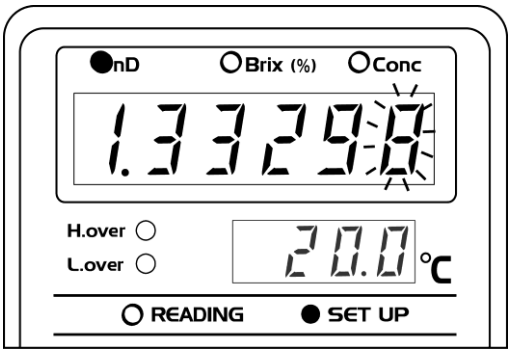


Fig. 11-5
Example using the Refractive Index display

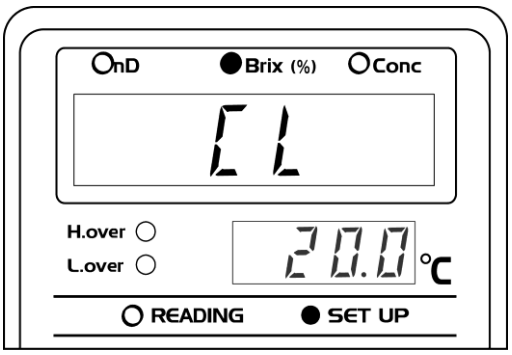


Fig. 11-6

The bias value

Scale.	Set value	Bias value	Reset the factory default setting. (CL)	
nD	A	A	A	Link
Brix	A'⇒A	A	A	Link
Conc1	C1	A +C1	C1	
Conc2	C2	A +C2	C2	
Conc3	C3	A +C3	C3	
Conc4	C4	A +C4	C4	
Conc5	C5	A +C5	C5	

(2) Setting alarms

①Choose the measurement scale for which the alarm is to be set (nD, Brix, or CONC 1 to 5).
The example below is for setting the alarm in Brix measurement mode.

② Press the START/STOP key to pause the measurement.

③Press the SCALE key three times.
The SET UP light will then blink, and "SEt" will be displayed on the measurement value display (Fig. 11-1).

④Press the ENTER key and the SET UP light comes on.
Using the ↑ ↓ keys, select "2. ALAr" (Fig. 11-7).

⑤Press the ENTER key to enter the Alarm setting screen.

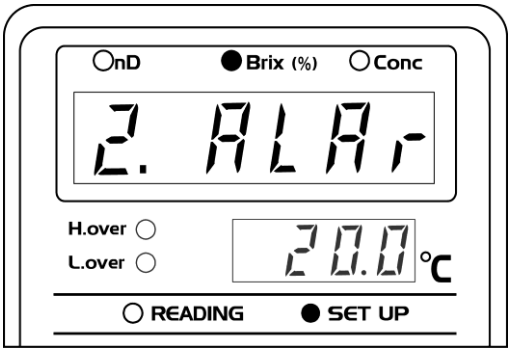


Fig. 11-7

⑥When L.OVER lights comes on.
Use the ↑ ↓ keys to change the value, and select the decimal place with the ← → keys (Fig. 11-8).

※Press the SCALE key to return to the previous "2. ALAr" screen.

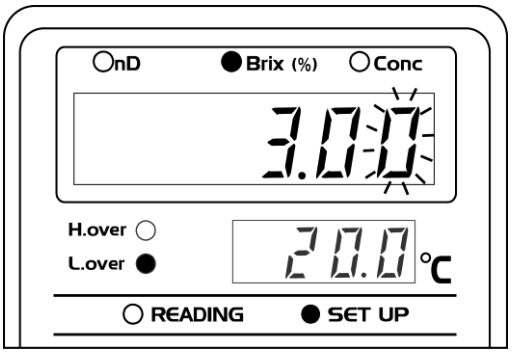


Fig. 11-8

⑦Press the ENTER key to set the selected value.
The H.OVER setting will appear next.
Adjust the H.OVER value in the same manner as in step ⑥ and press the ENTER key to confirm.

⑧Set the period of time the measurement values can continue to exceed programmed upper and lower limits, after which the alarm will be activated.
Use the arrow keys to select from 0 to 99 seconds.
The temperature display will then indicate "SEC" (Fig. 11-9).

⑨Press the ENTER key to confirm the changes.
The display will return to "2. ALAr ".

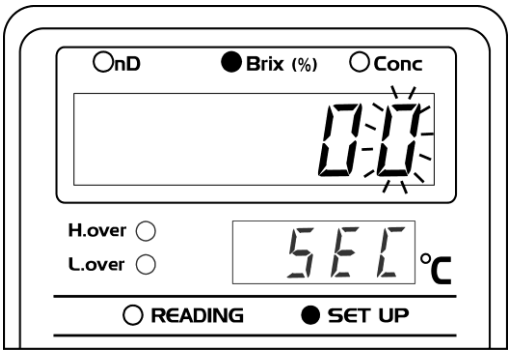


Fig. 11-9

(3) Setting recorder output

① Press the START/STOP key to pause the measurement.

②Press the SCALE key three times.
The SET UP light will then blink, and "SEt" will be displayed on the measurement value display.

③Press the ENTER key and the SET UP light comes on.
Using the ↑ ↓ keys, select "3. rEC" (Fig. 11-10).

④Press the ENTER key to enter the Recorder output setting screen.

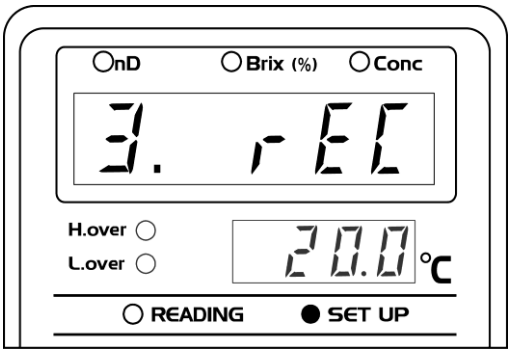


Fig. 11-10

⑤The temperature display will indicate "Lo" (Fig. 11-11), and the screen for setting the recorder output lower limit will appear.
Use the arrow keys to change the value.

※Press the SCALE key to return to the previous "3. rEC" screen.

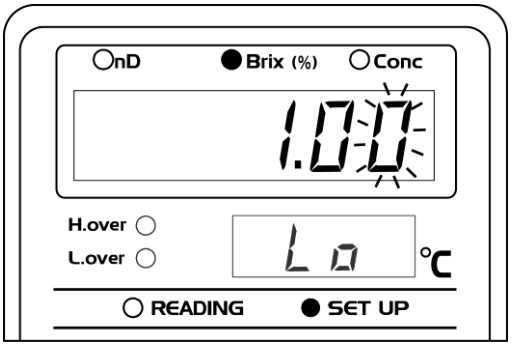


Fig. 11-11

⑥To confirm the changes, press ENTER.
The temperature display will indicate "Hi" (Fig. 11-12), and the screen for setting the recorder output upper limit will appear.
Use the arrow keys to change the value.

※Press the SCALE key to cancel the changes and return to the "3. rEC" screen.

⑦Press the ENTER key to confirm the changes.
The display will return to "3. rEC".

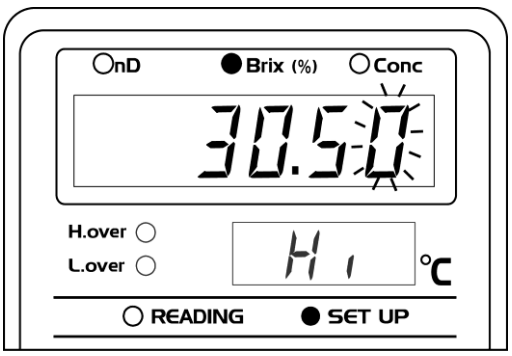


Fig. 11-12

(4) Setting Conc (User Scale)

In addition to the nD and Brix scales, this unit is equipped with Conc mode.
This is the User Scale, the feature that allows the user to display the sample Concentration of their choice.
To program a user scale, create a conversion table showing the refractive index of the sample and the Concentration at various temperatures.
Send the table from a computer to the display section via RS-232C port.
Five user scales can be programmed in the PRM-100α display section at 5 times.
The user scale can be overwritten and re-programmed.
In case of delete of the user scale, transfer the data table filled with 0.0 in all cells.
The instructions below are for programming a user scale, using Windows XP, Windows 7, and Windows 8 for RS-232C data transmission.

Windows XP, Windows 7, and Windows 8 are registered trade marks of Microsoft Corporation in the United States and other countries.

(4-1) Items to Prepare

- Data table (the refractive index of the sample and the Concentration, according to different temperatures)
  To create a data table, first prepare sample solutions at different Concentrations.
  Next, use an accurate refractometer to measure their refractive indices at different temperature points.
- Process In-line Refractometer PRM-100α (detection section and display section)
- Designated RS-232C cable (accessory available for purchase)
- Computer (Operating System: Windows XP, Windows 7, Windows 8)
- RS-232C-USB serial adapter (for computers without RS-232C ports).

(4-2) Creating Data Table

(4-2-1) Definition and Format of Data Table

① The data table consist of the following three definitions: temperature, Refractive Index, and Concentration.

②The maximum number of data points possible is: 6 for temperature and 7 for Concentration.

③The temperature is displayed by 3 digits and 1 decimal place (000.0).

The Concentration is expressed by a 6-digit number.

A decimal point can be placed anywhere within the 6 digits.

The Refractive Index (nD) is expressed by a 5-digit number.

In case of a 4-digit number, add a "0 (zero)" at the end to make it 5 digits long.

④Create a table based on the information above.

Table 11-1

	C1	C2	C3	C4	C5	C6	C7
T1	nD10	nD11	nD12	nD13	nD14	nD15	nD16
T2	nD20	nD21	nD22	nD23	nD24	nD25	nD26
T3	nD30	nD31	nD32	nD33	nD34	nD35	nD36
T4	nD40	nD41	nD42	nD43	nD44	nD45	nD46
T5	nD50	nD51	nD52	nD53	nD54	nD55	nD56
T6	nD60	nD61	nD62	nD63	nD64	nD65	nD66

※C1～C7：Concentration or dilution coefficient, etc.

Enter up to 7 points. Fill in any blank cells with "0.0".

Input condition :

C1＜C2＜C3＜C4＜C5＜C6＜C7

C1＞C2＞C3＞C4＞C5＞C6＞C7

※T1～T6：Measurement temperature

Enter up to 6 points. Fill in blank cells, if any, with "0.0".

Input condition:

T1＜T2＜T3＜T4＜T5＜T6

※nD10～nD66：Refractive Index (nD) by Concentration and by temperature

Input condition :

nD10＜nD11＜nD12＜nD13＜nD14＜nD15＜nD16

nD20＜nD21＜nD22＜nD23＜nD24＜nD25＜nD26

nD30＜nD31＜nD32＜nD33＜nD34＜nD35＜nD36

nD40＜nD41＜nD42＜nD43＜nD44＜nD45＜nD46

nD50＜nD51＜nD52＜nD53＜nD54＜nD55＜nD56

nD60＜nD61＜nD62＜nD63＜nD64＜nD65＜nD66

※Fill in any blank cells with "0.0."

※If the measured value is outside the range in this table, "LLLLLL" or "HHHHHH" is displayed.

※If the measured temperature is outside the range in this table, "d. Err" is displayed.

(4-2-2) An Example of How to Create Data Table

To create a data table, first prepare sample solutions of different concentrations.
Then, use an accurate refractometer to measure their refractive indices at different temperatures.
This chapter explains the procedure of creating a data table for caustic soda (NaOH) solutions.

[Items to prepare]

- ATAGO RX-5000α Cat.No. 3261 - A precision refractometer (with an internal constant temperature feature, if possible)
- A circulating constant temperature bath (unnecessary for a refractometer with an internal constant temperature feature)
- Sample solutions of different concentrations (example: NaOH solutions)

①Prepare 6 NaOH solutions diluted with distilled water to the following concentrations:
0.00%, 10.00%, 20.00%, 30.00%, 40.00%, 50.00%
Use distilled water as the 0.00% sample.
Table 11-2 is the data of conversion between temperature and refractive index of water.

Table 11-2

Temperature	5˚C	10˚C	20˚C	30˚C	40˚C	50˚C	60˚C
nD	1.33388	1.33369	1.33299	1.33194	1.33061	1.32904	1.32725

②Next, measure the other 5 NaOH solutions with the refractometer.
Change the temperature to 5.0˚C, 10.0˚C, 20.0˚C, 30.0˚C, and 40.0˚C and measure.
Record the concentration, temperature, and Refractive Index.

Note For a data table, use a measurement range that is wider than the range of the actual sample the PRM-100α will be measuring.
Accordingly, the user scale in this case has the temperature range of 5 to 40˚C and the concentration range of 0.00 to 50.00%.

③Enter the concentration, Refractive Index, and temperature, following the data table format.
The Table 11-3 below is the compilation of the measurement results of the NaOH solutions expressed in the format of theTable 11-2.

How to read the Table 11-3:
The 20.00% solution measures nD 1.38310 at 20 ˚C.
The 30.00% solution measures nD 1.40570 at 10 ˚C.

Table 11-3

	0.00%	10.00%	20.00%	30.00%	40.00%	50.00%	0.0
5.0˚C	1.33388	1.36050	1.38500	1.40640	1.42370	1.43590	0.0
10.0˚C	1.33369	1.36010	1.38440	1.40570	1.42280	1.43480	0.0
20.0˚C	1.33299	1.35910	1.38310	1.40410	1.42090	1.43260	0.0
30.0˚C	1.33194	1.35780	1.38160	1.40240	1.41900	1.43050	0.0
40.0˚C	1.33061	1.35640	1.38010	1.40070	1.41710	1.42840	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

※Fill in any blank cells with "0.0"

(4-3) Transferring Data

A data table needs to be re-formatted for the user scale to be transferred to the PRM-100α.

Save the data in the format of a text editor for Windows.

Connect the computer and the calculation display section via the designated RS-232C cable and transfer the data.

(4-3-1) Connecting Data Cable

Make sure that all the power is turned off, and the detection and calculation display sections of the refractometer are connected.

Connect the computer and the calculation display section via the special RS-232C cable.

Turn the power on.

(4-3-2) Text File Format

Here is an example of formatting the NaOH data table created earlier, using a text editor.

Table 11-4

∗T	5	5.0	10.0	20.0	30.0	40.0	0.0	
∗N	2	0.00	10.00	20.00	30.00	40.00	50.00	0.0
∗C	1	1.33388	1.36050	1.38500	1.40640	1.42370	1.43590	0.0
∗C	2	1.33369	1.36010	1.38440	1.40570	1.42280	1.43480	0.0
∗C	3	1.33299	1.35910	1.38310	1.40410	1.42090	1.43260	0.0
∗C	4	1.33194	1.35780	1.38160	1.40240	1.41900	1.43050	0.0
∗C	5	1.33061	1.35640	1.38010	1.40070	1.41710	1.42840	0.0
∗C	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

How to read the Table 11-4:

∗T indicates the temperature data. The number "5" indicates the number of data.
The numbers to the right are the actual temperature readings.
Enter "0.0" where no data are present.

∗N indicates the concentration data. The number "2" indicates the number of decimals.
Enter "0.0" where no data are present.

∗C indicates the Refractive Index data. The values have been compensated for each temperature point from 1 through 6. Enter "0.0" where no data are present.
Press the TAB key to proceed to the next cell.

Example : ∗T (TAB) 5 (TAB) 5.0 (TAB)

(4-3-3) Creating Text File

①Start up a personal computer installed with Windows.
Click the Start button at the bottom left of the screen.
②Click program.
③Click Accessories.
④Click Notepad.
⑤The Notepad should appear (Fig. 11-13).

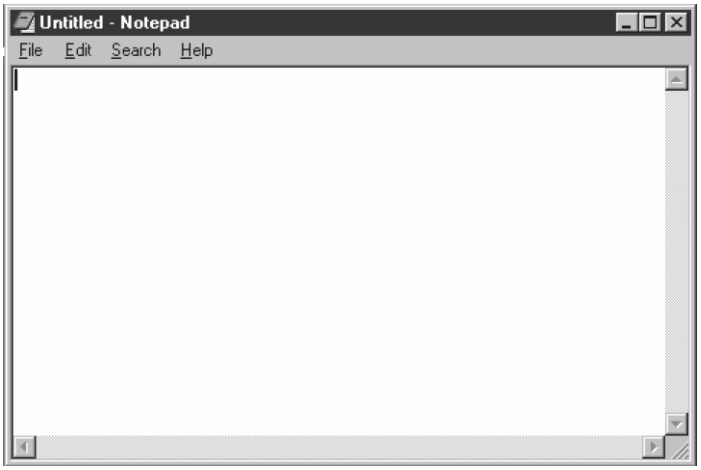


Fig. 11-13

⑥Create a text file as in Fig. 11-14 based on Data Table 11-2.

- Enter everything with half-sized characters. See Fig. 11-15 for meaning of individual numeric values.
- When completed, it becomes the screen of Fig. 11-16.
- Moreover, TAB codes are not displayed on the screen, so move the blinking cursor character by character and check the number of TAB codes.

Note The □ mark in Fig. 11-14 is not displayed on the screen.

- Line feed codes are not displayed on the screen either.
  Move the blinking cursor character by character, and the line shifts at a line feed code so that you can confirm it.

Note The ↵ mark in Fig. 11-14 is not displayed on the screen.

□ : Represents one character of a TAB code. (Press the Tab key once.)
A TAB code is automatically adjusted to the width of one character by the computer.

↵ : Represents one character of a line feed code. (Press the Enter key once.)

○ : If line feed codes are correctly entered, the cursor comes to this position.

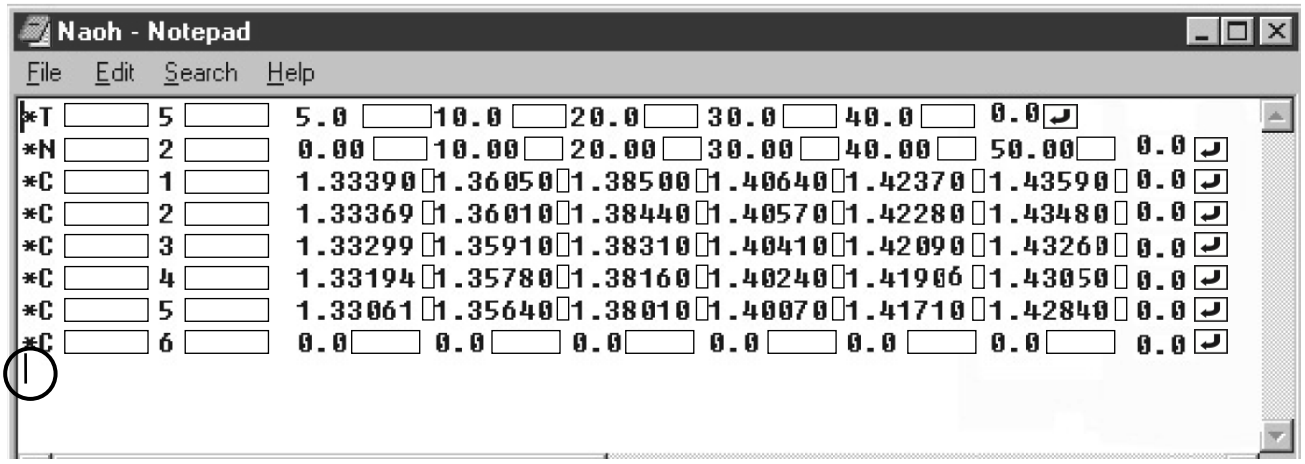


Fig. 11-14

A. Enter the number of measured temperature points.

B. Enter the number of digits after the decimal point for a concentration.
   See the examples of entry.

C. Always enter these values.

D. Enter the temperature.
   Enter 0.0 for an unmeasured (unused) value.
   When entering 10.0 C: Wrong 10
   Correct 10.0

E. Enter a concentration.
   Enter 0.0 for an unmeasured (unused) value. Enter the number of digits after the decimal point for a concentration in a column.

F. Enter the values of refractive indexes (nD) at each concentration.Enter 0.0 for an unmeasured (unused) value.
   Be sure to enter up to five digits after the decimal point. When entering 1.33300: Wrong 1.333

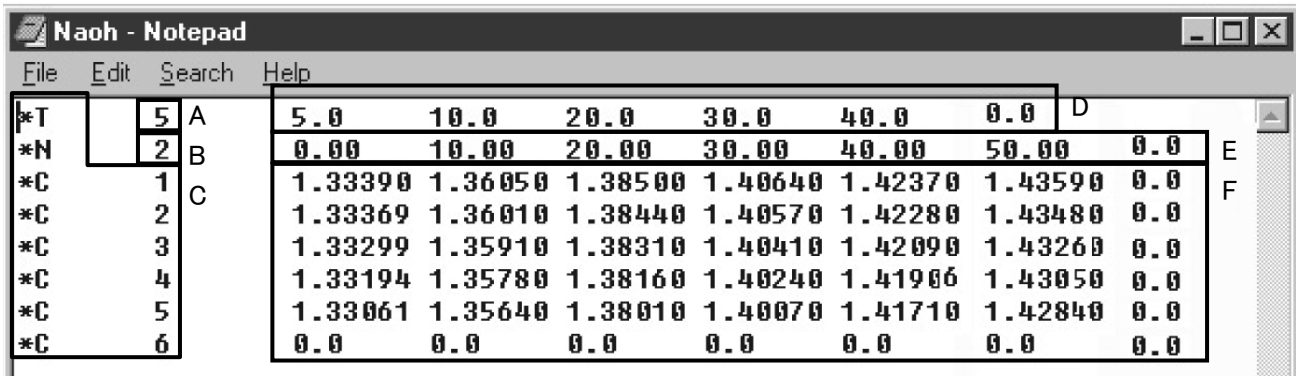


Fig. 11-15

Examples of entry

- If you enter concentrations as 0.0%, 10.0%, 20.0%, enter 1 for the number of display digits of a concentration.
- If you enter concentrations as 10.000%, 20.000%, 30.000%, enter 3 for the number of display digits of a concentration.
- If you enter concentrations as 0.20000, 0.40000, 1.00000, 1.50000, enter 5 for the number of display digits of a concentration.

Note 1

Resolution to the recorder output is 30000 data.

If above, the unit cannot output correctly. e.g., in case of 0.000-100.000, limit the range of recorder output to 0.000-30.000 or 20.000-50.000, or reduce the digit number such as 0.00-100.00 to make the data below 30000.

Example

0.000～30.000 : 30000 data

0.000～50.000 : 50000 data (above)

1.0000～5.0000 : 40000 data (above)

1.000～5.000 : 4000 data

Note 2

A displayable value is maximum seven characters including the decimal point.

e.g. 1.00000 10.0000 100.000 1000.00 10000.0

Note 3

Enter the alphabet in uppercase. (See your computer's manual)

The * mark is an asterisk (ten-key's multiplication symbol).

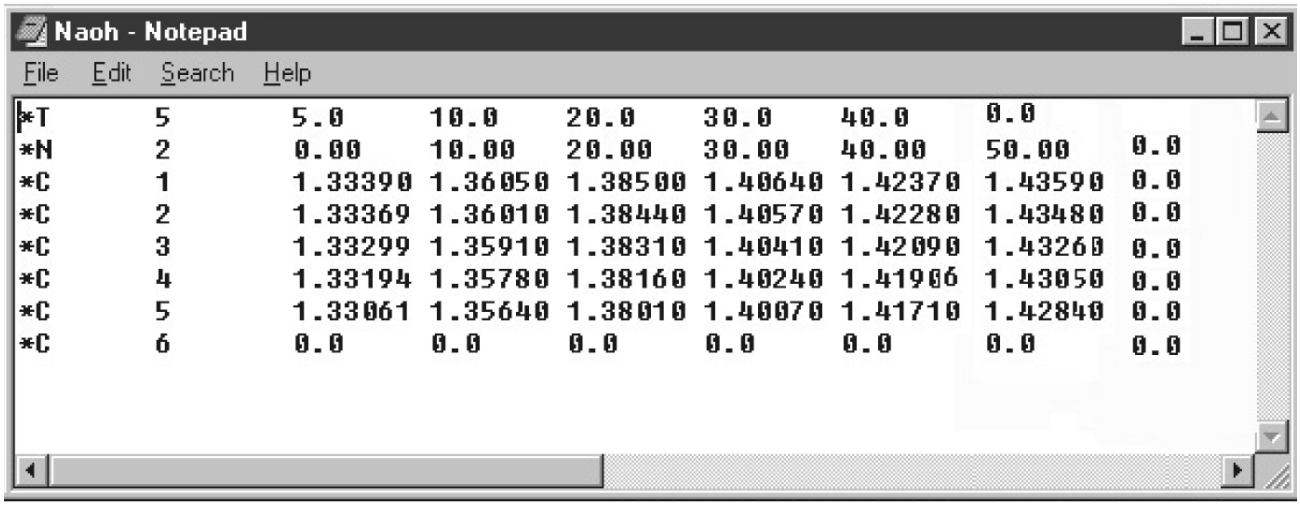


Fig. 11-16

⑦Once the data entry is complete (Fig. 11-16), save the file.

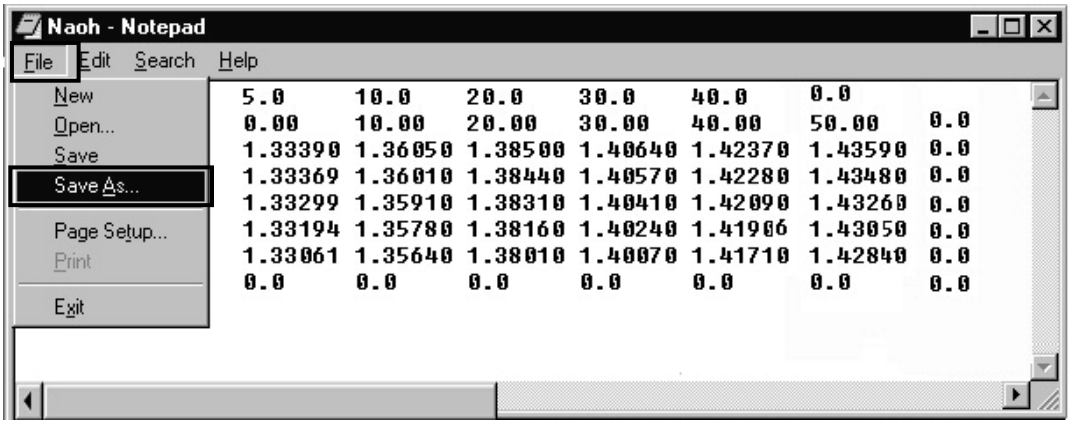


Fig. 11-17

⑧Open the file to make sure that the complete data are saved.

Click on File and then Exit to close (Fig. 11-18). A text file has been successfully created.

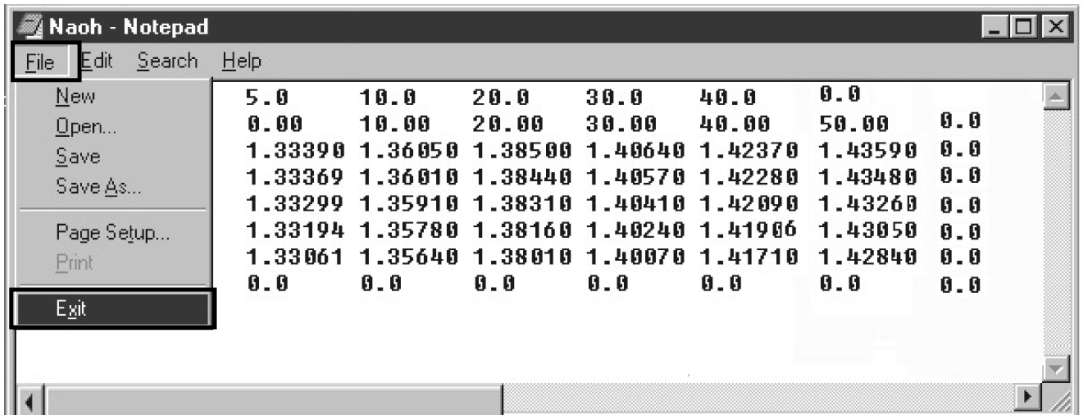


Fig. 11-18

(4-4) Preparing a PC for Data Transmission

Download a terminal emulator for PC serial communication.

Here, the open-source software “Tera Tarm” is used as an example.

※When the PC does not have a 9-pin D-sub connector, purchase a USB/serial adapter.

RE-55202 ： USB serial conversion adapter

Download Tera Term from a website, such as the one below:

http://ttssh2.sourceforge.jp/index.html.en/

①Start Tera Term.

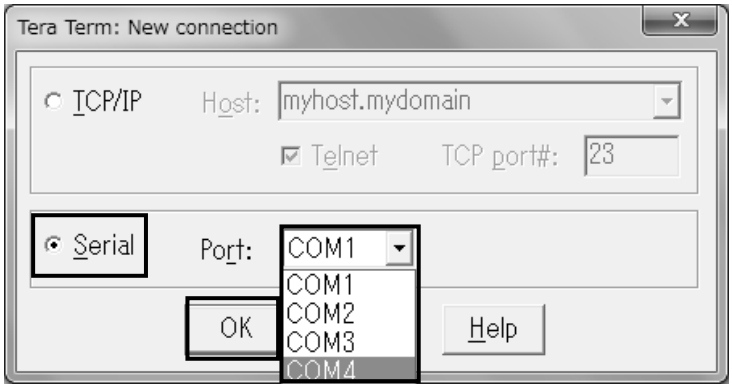
Select "Serial" on the New connection dialogbox.

Select the port number.

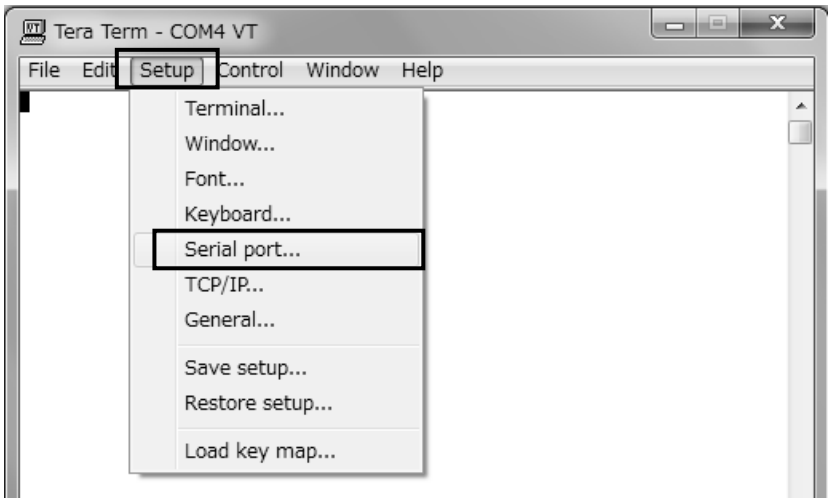
Click OK.

※Check the port number.

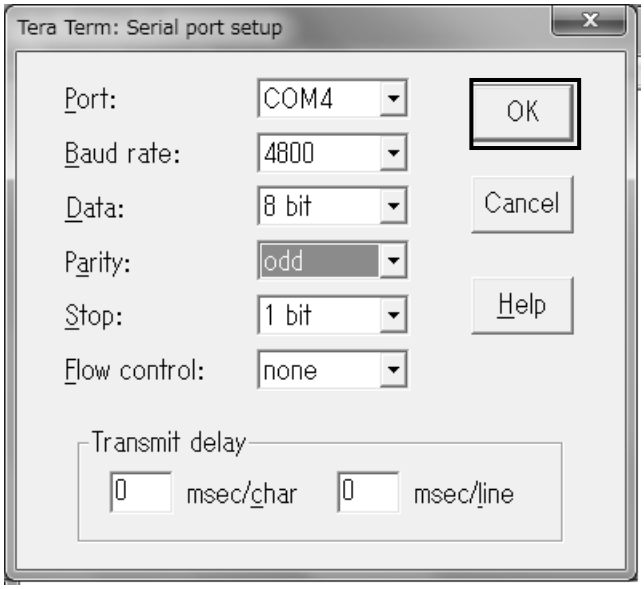
"Control Panel" → "System and Security" → "Device Manager" → "Port"



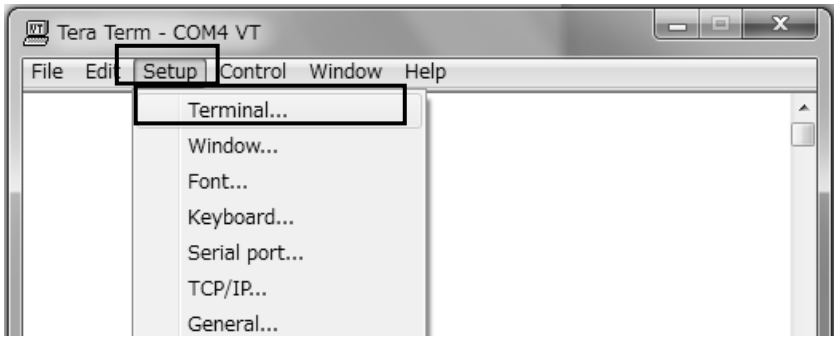
②Click Setup, and then Serial port.



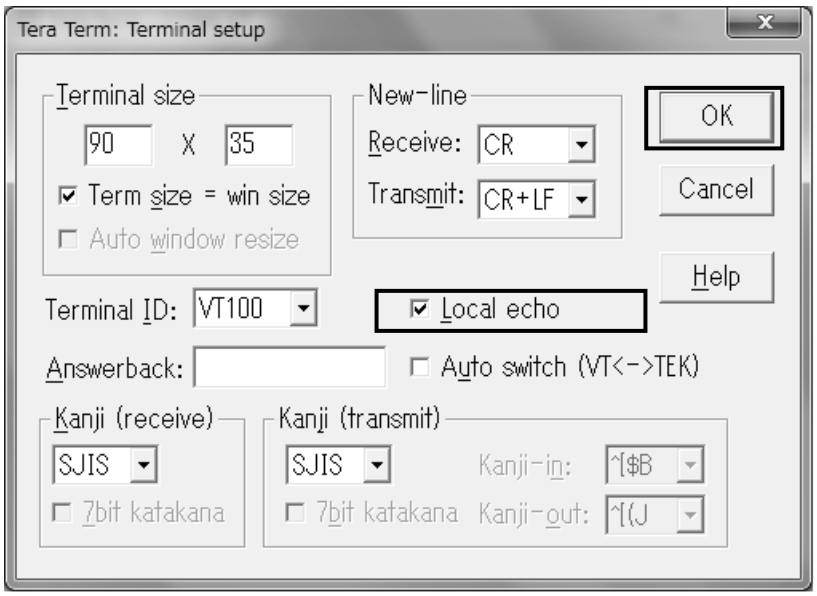
③The serial settings are conformed to the instrument settings.
Enter the port number selected in step 1.
Click OK.



④Click Setup, and then Terminal port.



⑤Enter the settings as shown below and Click OK.
※Make sure that the "Local echo" is checked.



(4-5) Preparing PRM-100αfor Data Reception

①Select "4. Conc" on the SET UP mode, using the ↑ ↓ keys (Fig. 11-20).

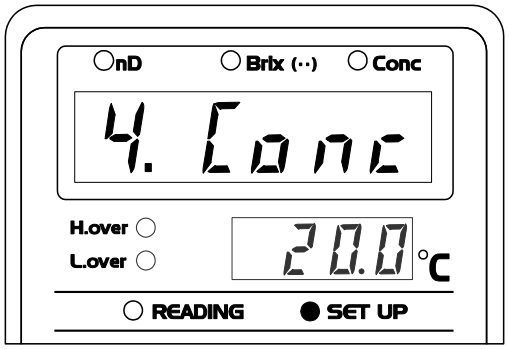


Fig. 11-19

②Press the ENTER key to confirm the selection.
The screen is ready for Conc1 to 5.
(Fig. 11-20).

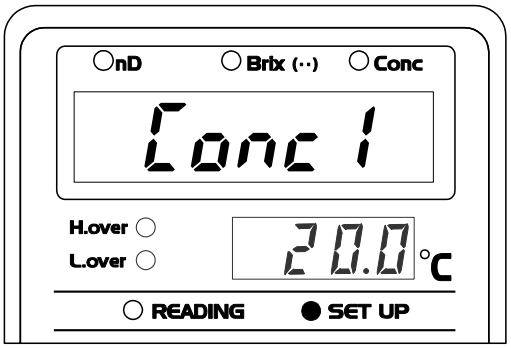


Fig. 11-20

③Press the ENTER key to confirm the selection.
The screen is ready for Conc input.
"dAtA" appears on the measurement result display (Fig. 11-21).

※Press the SCALE key to return to the previous " Conc1" screen.

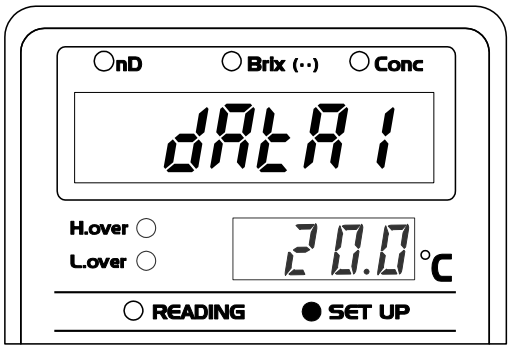
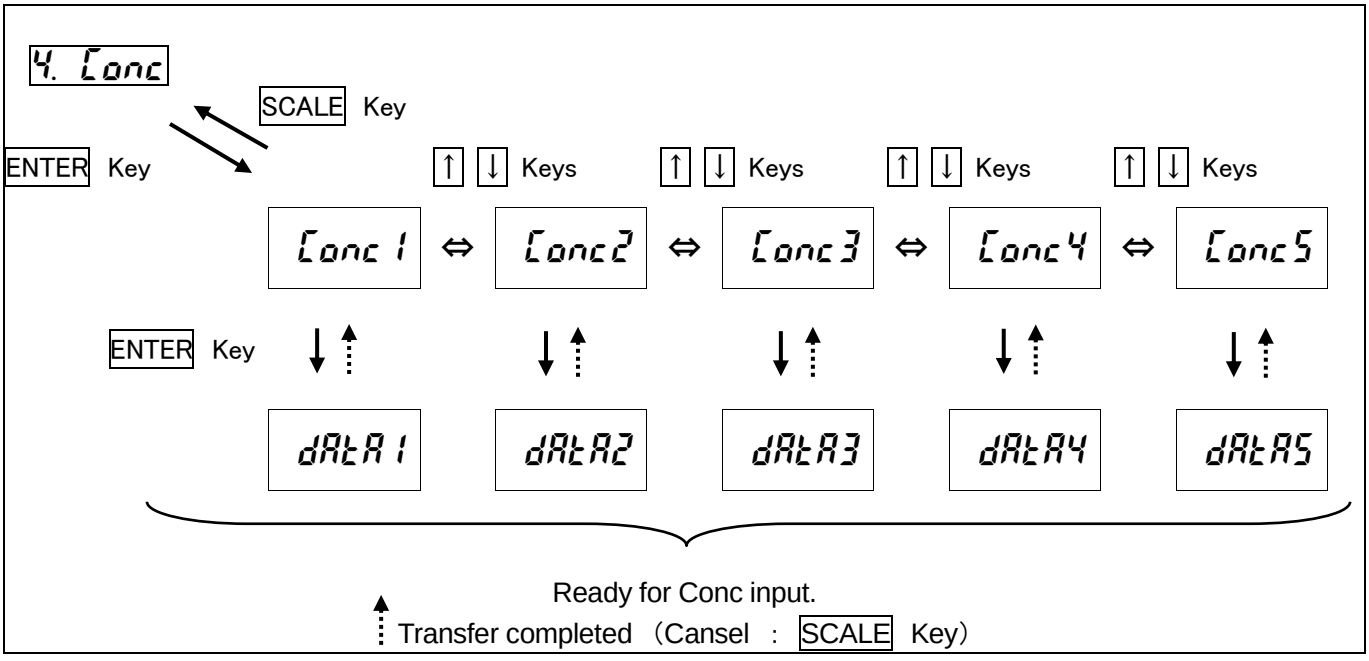


Fig. 11-21



(4-6) Transferring Data

When preparations for sending (computer side) and preparations for receiving (PRM-100αside) are completed, send the created text file (NaOH solution) according to the following steps.

Saving received data to a local file:
Click “File” and “Log…” and a “Tera Term: Log” window will appear. Save with a desired file name.

①Window for Tera Tarm comes out on the screen.
Select File and click on Send File... (Fig. 11-22).

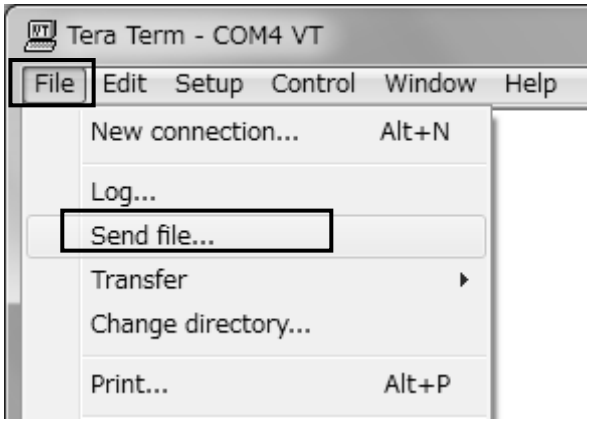


Fig. 11-22

②Click on ▼ next to [Look in:] to select the hard disk drive storing a created user scale file (Fig. 11-23).

A. Move the cursor to ▼ and click on it with the left button of your mouse.

B. As a menu screen like this opens, specify the hard disk drive storing the user scale created earlier with Notepad.

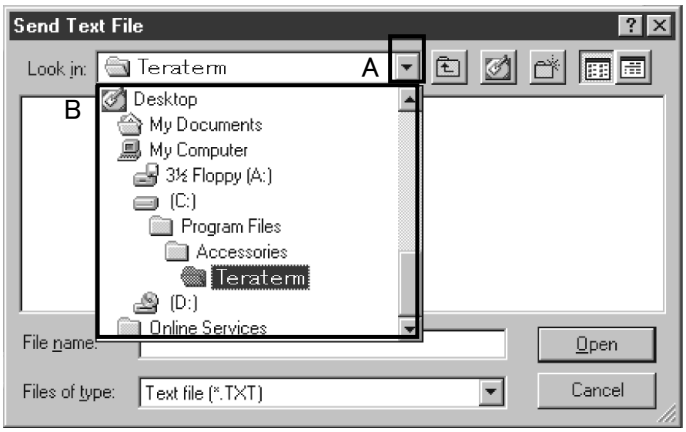


Fig. 11-23

③If you select the hard disk drive, the Fig. 11-24screen appears.

Specify the folder storing the user scale created with Notepad.

Repeat the operation 3) until the file storing a created user scale is updated like Fig. 11-25.

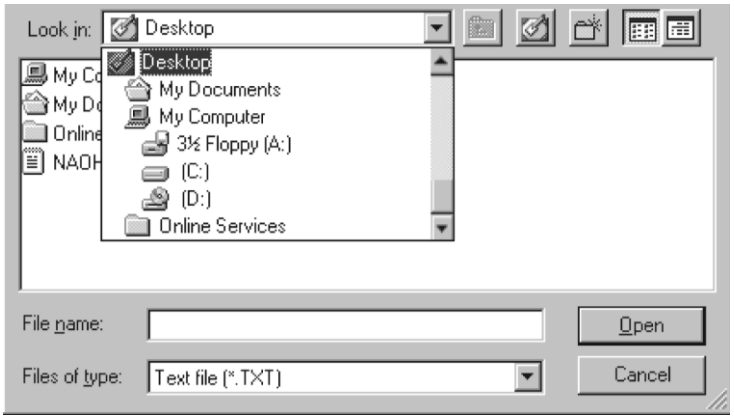


Fig. 11-24

④Next, enter the file name of the created user scale in the blank next to File name.

A. Move the cursor to the user scale name and click on it with the left button of your mouse.

B. The user scale name will be automatically entered in the blank next to File name.

C. If the user scale name is entered next to File name, move the cursor to Open and click on it with the left button of your mouse. Data transfer starts

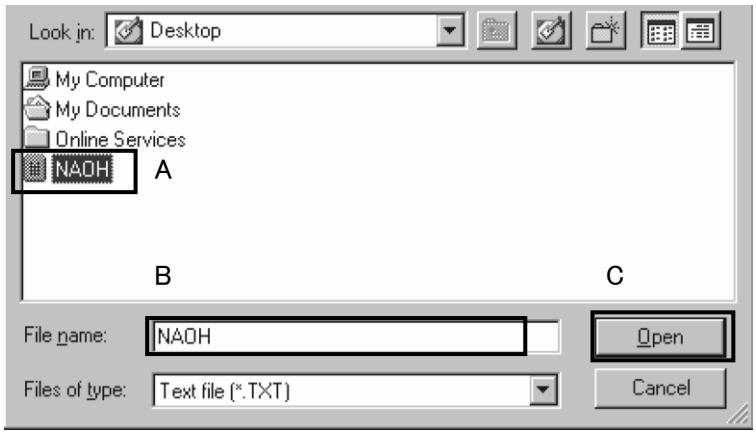


Fig. 11-25

⑤Click Open in Fig. 11-25 to start the data transfer.

The instrument will beep once the transfer is completed, and then, the data as programmed in the PRM-100αwill be displayed on the screen, below the original data.

Compare the two sets of data and make sure that the programming has been executed accurately (Fig. 11-26).

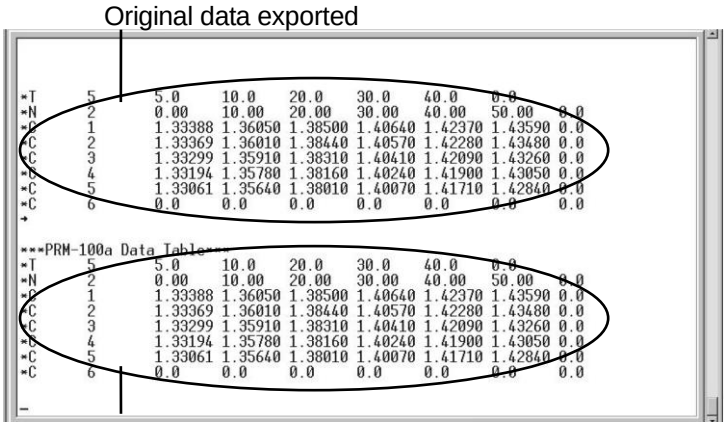


Fig. 11-26

(4-7) Confirming Data

Take measurements after the Conc data are programmed to confirm that the data have been transferred successfully.

Take reset the Conc's "bIAS" after the Conc data are programmed.

(5) Setting Decimal Place

① Press the START/STOP key to pause the measurement.

②Press the SCALE key three times.
The SET UP light will then blink, and "SEt" will be displayed on the measurement value display.

③Press the ENTER key and the SET UP light comes on.
Using the ↑ ↓ keys, select "5. dp" (Fig. 11-27).

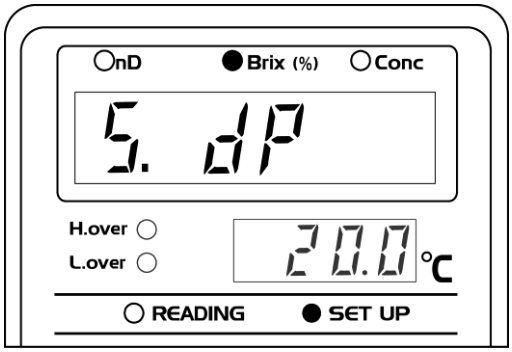


Fig. 11-27

④Press the ENTER key to enter the Decimal Place setting screen.
Press the ENTER key to confirm the selection.
"5" will appear under the LED light for nD and "2" under the LED light for Brix (Fig. 11-28).
This means that the nD is displayed to the fifth decimal place, and the Brix is to the second decimal place.

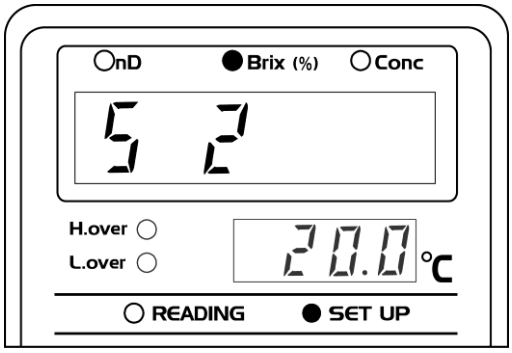


Fig. 11-28

⑤Press the ↑ ↓ keys, and "4" will appear under the LED light for nD and "1" under the LED light for Brix (Fig. 11-29).
This means that the nD is displayed to the fourth decimal place, and the Brix is to the first decimal place.

⑥"5" for nD and "2" for Brix are displayed when ↑ key is pressed.
"4" for nD and "1" for Brix are displayed when ↓ key is pressed.

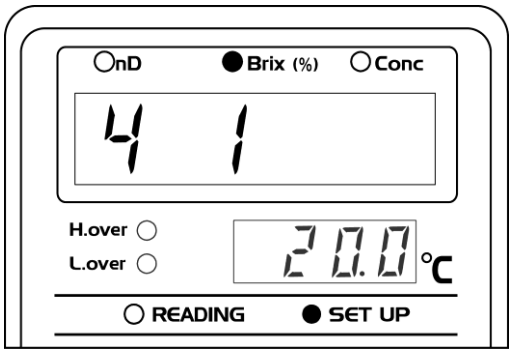


Fig. 11-29

※Press the SCALE key to abort the operation and return to "5. dP."

⑦Select either of the decimal place combinations and press the ENTER key to confirm the selection and return to the "5. dP" screen.

※Set the number of digits in Conc mode at the time of Conc data entry.

(6) Scale ON/OFF Set-Up

This setting is for displaying only the particular scale(s) used on a regular basis.

For example, to display only "Brix" and "Conc1 (concentration)" : select "ON" for the 2 aforementioned scales and "OFF" for all other scales.
Press the SCALE key again to display only "Brix," "Conc1 (concentration)" and "Set."

① Press the START/STOP key to pause the measurement.

② Press the SCALE key .
The SET UP light will then blink, and "SEt" will be displayed on the measurement value display (Fig. 11-1).

③ Press the ENTER key and the SET UP light comes on.Using the ⇑⇓ keys, select "6. CH" (Fig.11-30).

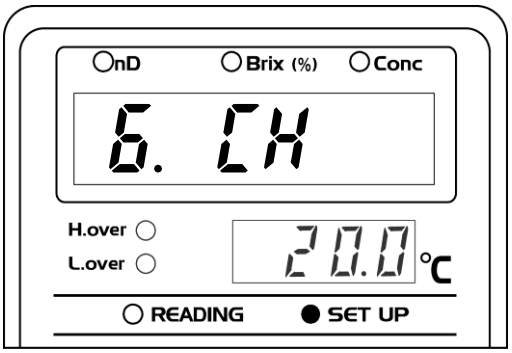
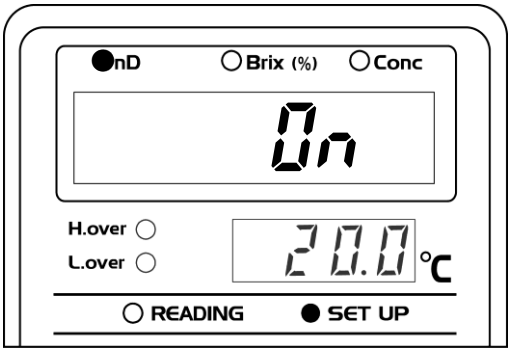


Fig.11-30

④ Press the ENTER key to display the nD ON OFF setting screen.
The nD LED will light up.
Use the ↑ ↓ keys to select ON or OFF (ON: nD will be displayed on the measurement results display screen, OFF: results will not be displayed)（
↑⇓ keys



⇑⇓ keys

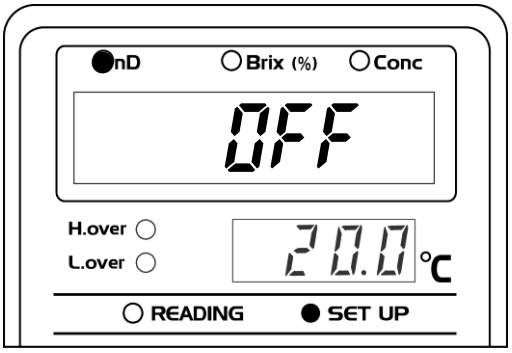
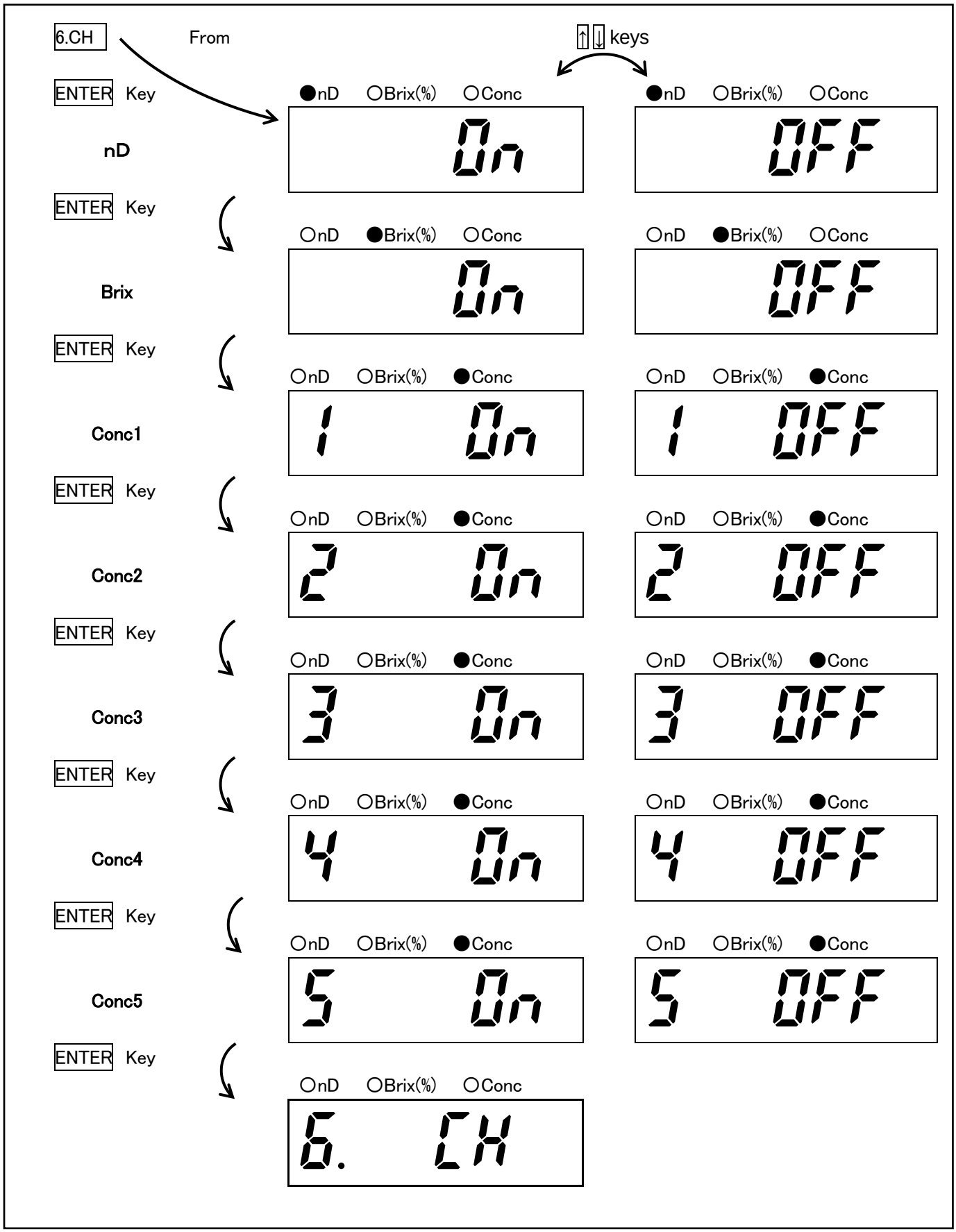


Fig.11-31）.
Press the ENTER key to confirm the selection.

Fig.11-31

※Press the SCALE key to cancel setting procedures.


6.CH
From
keys
ENTER Key
●nD ○Brix(%) ○Conc
On
●nD ○Brix(%) ○Conc
OFF
nD
ENTER Key
○nD ●Brix(%) ○Conc
On
○nD ●Brix(%) ○Conc
OFF
Brix
ENTER Key
○nD ○Brix(%) ●Conc
1 On
○nD ○Brix(%) ●Conc
1 OFF
Conc1
ENTER Key
○nD ○Brix(%) ●Conc
2 On
○nD ○Brix(%) ●Conc
2 OFF
Conc2
ENTER Key
○nD ○Brix(%) ●Conc
3 On
○nD ○Brix(%) ●Conc
3 OFF
Conc3
ENTER Key
○nD ○Brix(%) ●Conc
4 On
○nD ○Brix(%) ●Conc
4 OFF
Conc4
ENTER Key
○nD ○Brix(%) ●Conc
5 On
○nD ○Brix(%) ●Conc
5 OFF
Conc5
ENTER Key
○nD ○Brix(%) ○Conc
6. CH

12. Measurement Procedure

⚠ WARNING	◇Should the unit begin to smell abnormally, become overheated or begin to smoke, turn it off immediately and unplug from the AC outlet. Continued use could increase the risk of fire or failure. Contact your ATAGO distributor for servicing information. ◇Avoid unauthorized repairs or modifications, as these could increase the likelihood of fire, electrical shock or burning hazards. ◇If the unit is dropped or suffers some other heavy impact, please contact your ATAGO distributor for troubleshooting information. Continued use of an instrument which has been dropped could increase fire or smoking hazards.

⚠ CAUTION	◇Avoid measurement of samples that could corrode the prism or sample inlet unit. ◇Cleaning liquids up to 160˚C can be used for CIP or SIP. The momentary difference between the sample liquid temperature and the cleaning liquid temperature must be no more than 80˚C. When using cleaning liquids at temperatures over 160˚C, the power switch must be turned off. ◇If a sample residue has built up on the prism, clean it immediately as instructed on Page 48 "13Cleaning the Prism."

①Verify the following points:

- Proper mounting of the detection section (sample inlet unit) on the piping (See Page 12 "5.Mounting the Detection Section").
- Mounting of the calculation display section (See Page 15 "6.Mounting the Display Section").
- Connection between the detection section and the calculation display section (See Page 17 "7.Connecting the Detection Section to the Display Section").
- Appropriate external output cable connection to RS-232C, recorder output and alarm output ports (See Page 19 "8.External Output").

②Turn on the unit as instructed in 8. "9 Turning On the Power" (see page 22).
In addition, turn on and set external output devices, such as recorders.

③The unit will display 0.0 (or 0.0000 in nD mode) for about 5 seconds when first powered on.

※If the unit is powered on without sample in contact with the prism, the error message LLLL.LL (or L.LLLLL in nD mode) will display, following 0.0 (or 0.0000 in nD mode).

④Set measurement value display modes (Refractive index (nD), Brix, or Concentration(Conc1 to 5)) (See Page 23 "10.Setting Measurement Value Display Modes").

⑤Perform reference (zero) level adjustment as needed (see page 26 "11.Setting Measurement SET UP Mode").

13. Cleaning the Prism

⚠ WARNING	◇Handle all harmful substances with extreme caution. Fully understand a sample's properties before applying to this instrument. Ensure no harmful sample substances are present when dismantling.

⚠ CAUTION	Temperature of the cleaning liquid ◇Cleaning liquids up to 160˚C can be used for CIP or SIP. The momentary difference between the sample liquid temperature and the cleaning liquid temperature must be no more than 80˚C. When using cleaning liquids at temperatures over 160˚C, the power switch must be turned off.

When samples flow through the sample inlet for a long period of time, it is possible that solids or oils adhere to the surface of the prism, and this build-up can affect readings.
Cleaning by hot water or alkaline liquid, called CIP cleaning, is recommended for removal of prism build-up. The PRM-100α is designed for cleaning with solutions up to 160˚C.
When cleaning with solutions hotter than 160˚C, the instrument must be powered off.
Additionally, the difference in temperature between the sample and the cleaning solution can be no greater than 80˚C.
If a greater difference is necessary, run a warmer solution through the sample inlet for a few minutes before applying the cleaning liquid.
If matter adhering to the surface of the prism cannot be removed by such cleaning, it is necessary to clean the surface of the prism directly. Follow these steps:

①Detach the detection section from the sample inlet unit.
②Clean the surface of the prism using soft tissue paper moistened in lukewarm water or ethyl alcohol.
For a liquid containing oils and fats, wipe out with soft tissue paper moistened in ethyl alcohol.
Never scrub the surface of the prism with a hard object, otherwise flaws will develop.
③Remount the sample inlet unit in its original position.

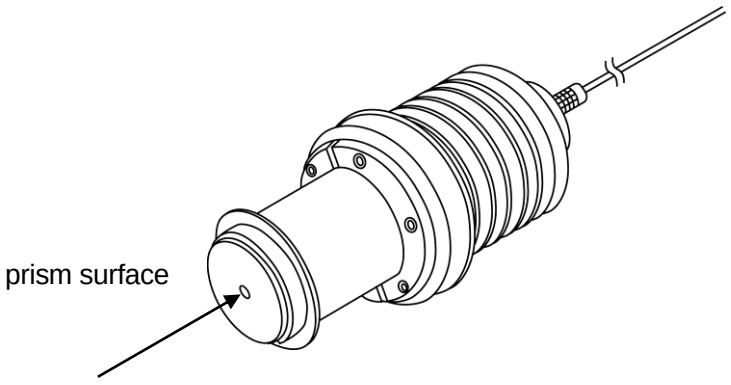


Fig. 13-1

14. Definitions of Error Messages

Measurement value display

Error message	Explanation	Action
L.LLLLL	In Refractive index (nD) mode, the sample measured below the lower limit of the measuring range, or measurement was made with air contacting the prism.	Measure a sample within the measuring range.
LLLL.LL	In Brix mode, the sample measured below the lower limit of the measuring range, or measurement was made with air contacting the prism.	Measure a sample within the measuring range.
LLLLLL	In Concentration mode, the sample measured below the lower limit of the measuring range, or measurement was made with air contacting the prism.	Measure a sample within the specified concentration and temperature range.
H.HHHHH	In Refractive index (nD) mode, the sample measured above the upper measurement limit.	Measure a sample within the measuring range.
HHHH.HH	In Brix mode, the sample measured above the upper measurement limit.	Measure a sample within the measuring range.
HHHHHH	In Concentration mode, the sample measured above the upper measurement limit.	Measure a sample within the specified concentration and temperature range.
H.over	The alarm setting LED light comes on when the sample measured is above the upper limit.	Measure samples within the upper limit.
L.over	The alarm setting LED light comes on when the sample measured is below the lower limit.	Measure samples within the lower limit.
E.EEEEE	The LED light source has been depleted (in refractive index (nD) mode).	————————
EEEE.EE	The LED light source has been depleted (in Brix mode).	————————
EEEEEE	The LED light source has been depleted (in concentration mode).	————————
E-8002	An error is present in the connection between the detection and display sections.	Check the connection of each section. Turn on the power switch again. Clean the prism.
d Err	The sample temperature measured in the Conc mode is above the programmed range.	Measure a sample within the specified concentration and temperature range.

※ - - - - - - is displayed during the time a measurement is being taken.

Temperature display

Error message	Explanation	Action
LLLL	The sample temperature is -5.1˚C or lower.	Measure a sample within the measuring range.
HHHH	The sample temperature is 160.1˚C or higher.	Measure a sample within the measuring range.
Flashing temperature value	The prism temperature is below 5˚C or above 100˚C. In this case, the displayed Brix(%) value is not properly corrected for temperature.	————————

15. Availability of Parts

The table below lists the customer-serviceable and expendable parts for this unit.
For their availability, contact your ATAGO distributor.

Part name	Part number	Summary
RS-232C output cable	RE-65301	4-pin connector, D-Sub connector on one end, standard 10mm.
Alarm output cable	RE-65305	6-pin connector, crimp terminal on one end, standard 10mm.
O-ring (Silicon)	RE-68100	O-ring attached between the detection section and sample inlet unit.
O-ring (EPDM)	RE-68115	
O-ring (Viton)	RE-68002	

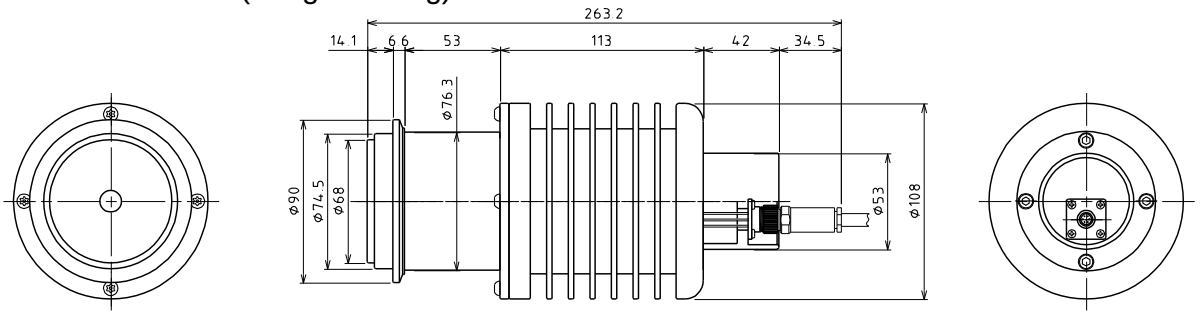
16. Specifications

The standard specifications of this product are summarized below.

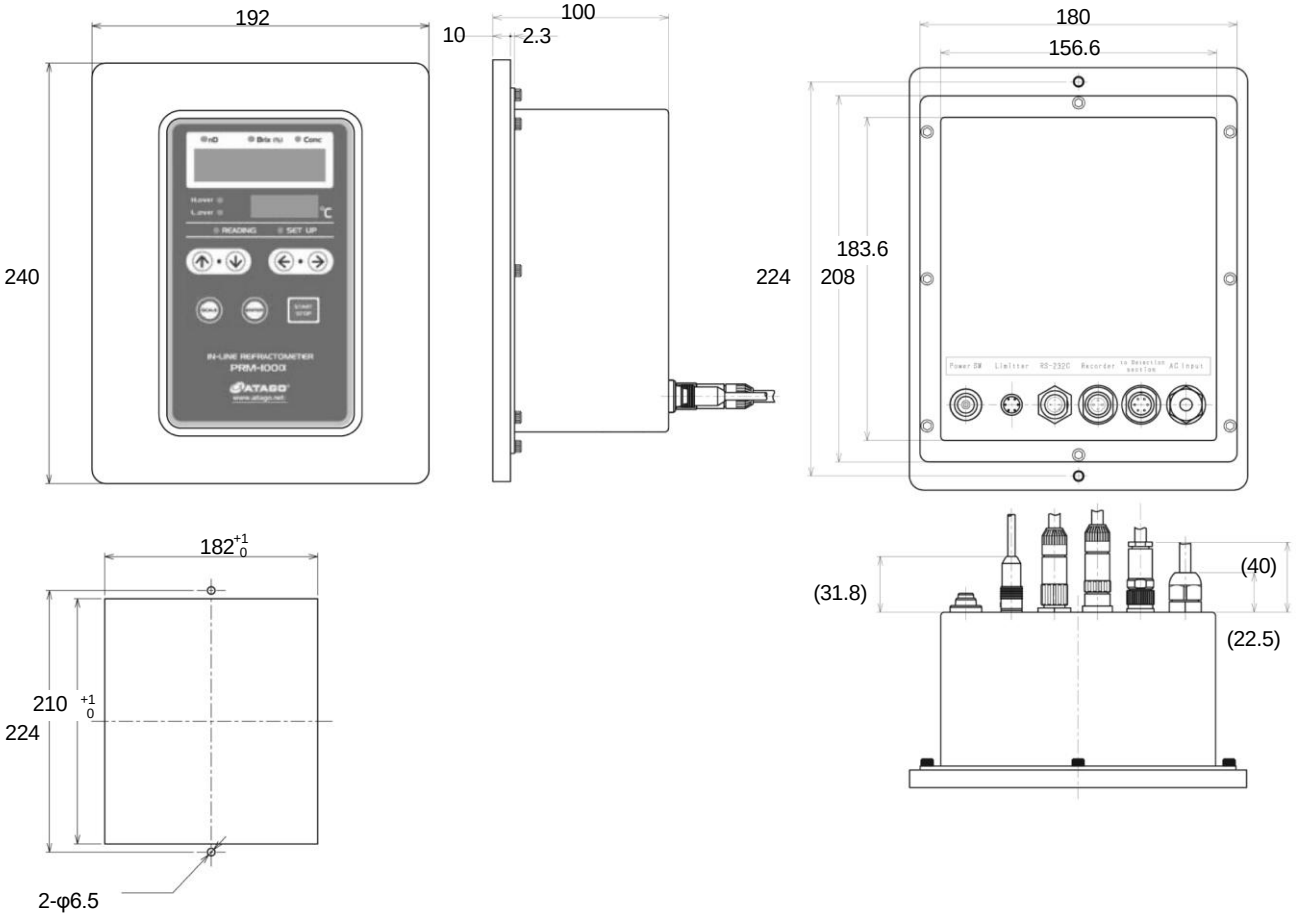
Measurement items	One of Refractive Index (nD), Brix (temperature compensation according to sucrose solution),and concentration (%)1to5 (temperature compensation according to samples). Temperature
Measuring range	Refractive Index (nD) 1.32000 to 1.55700, Brix 0.00 to 100.00%
Minimum indication	Refractive Index (nD) 0.0001 or 0.00001, Brix 0.1% or Brix 0.01% (by selection)
Measurement accuracy	Refractive Index (nD) ±0.0001, Brix±0.05%
Measurement temperature	-5.0 to 160.0˚C
High- and low- limit settings	High and low control limits can be set with keys.
Display items	Refractive Index, Brix, concentration (Conc1 to 5), temperature (˚C).
Display method	Seven-segment LED
Output items	Refractive Index (nD), Brix, concentration (%), temperature (˚C)
Output method	DC4 to 20mA, RS-232C
Alarm output	Open-collector output for high- and low-limit settings (alarm output).
Connecting cables	Detection section - Display section (power supply 12V and RS-485) Length: standard 15m (maximum up to 200m)
Light source	LED (D line approximation)
Material	Prism : Sapphire, Prism stage : SUS316L
Waterproof protection class	Detection section : IP67, Display section : IP67
Power supply	AC 100 to 240V, 50/60Hz
Input rating	30VA
Pressure resistance	1.0MPa (Detection section)
Enviromental conditions	Use this instrument at an ambient temperature between 5 to 40˚C. Use this instrument under the condition of a relative humidity that the humidity of 80% at a temperature of 30˚C or lower falls linearity to 50% at 40˚C. The pollution degree is 2 (according to IEC60664). Altitude (above sea level): Up to 2,000m.

17. Dimensions

Detection section (Weight : 3.2kg)



Display section (Weight : 3.3kg)



18. Repair Service and Warranty Period

The In-line refractometer PRM-100α is a complicated precision instrument consisting of optical (prism and objective lens) and electronic parts.
Since it basically functions by interactions of the optical and electronic components, it is very difficult to detect the cause of problems if there is something wrong in the refractometer.
Therefore, the PRM-100α requires special knowledge of not only optics and electricity but also the PRM-100α itself for adjusting and repairing it.
Do not disassemble or perform any repair on the unit other than the basic inspection and replacement of parts described in this operation manual.
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 warraty 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 a possible inspection fee. ATAGO does not warrant malfunctions resulting from user's actions, regardless of the warranty period.
Any abuse, or use outside of the normal operations for this device will void this warranty.

●Replacement Part Information

Please note that ATAGO cannot guarantee that replacement parts will be available after a unit has been discontinued. ATAGO will make every effort to secure replacement parts for a period of at least seven years after discontinuation of any product.

●Periodic inspection service (charged)

We recommend having your PRM-100α inspected periodically (once in two years, or so) to ensure years of dependable and accurate use.
Ask your ATAGO distributor for more information and pricing for periodic maintenance.

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

ATAGO CO., LTD.

When contacting your preferred distributor regarding repairs or troubleshooting, please inform them of the serial number of the unit.

19. ATAGO CO.,LTD. Service Centers

ATAGO has Authorized Service Centers around the world. Below is the list of countries where you can find an ATAGO Authorized Service Center. If your ATAGO instrument requires servicing please contact ATAGO at the following e-mail address.

overseas@atago.net

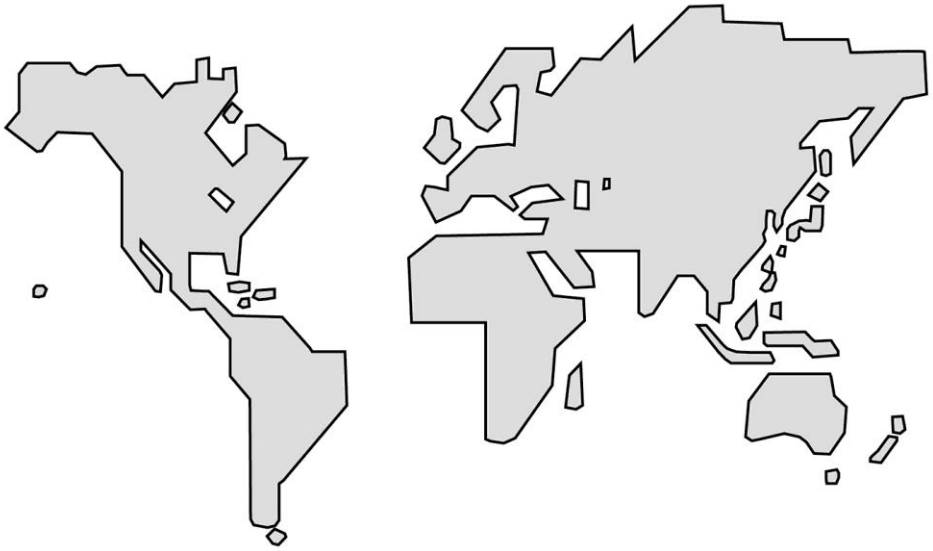
Please provide your company name, address and telephone number so that we can direct your inquiry to the Authorized Service Center nearest you. The Authorized Service Center in your area will contact you within 1 to 2 business days.

North America

Canada
U.S.A.
Mexico

Europe

Netherlands
Italy
Germany
France
Spain
U.K.
Belgium
Poland
Greece
Russia
Belarus
Ukraine
Serbia
Croatia
Romania



Central America

Costa Rica
El Salvador
Guatemala

South America

Argentina
Bolivia
Brazil
Colombia
Chile
Ecuador
Paraguay
Peru
Uruguay

Middle East / Africa

Iran
Turkey
Saudi Arabia
Israel
Lebanon
South Africa
Egypt

Asia / Oceania

Australia
China
India
Thailand
Korea
Taiwan
Indonesia
Malaysia
Singapore
Philippines
Bangladesh
Pakistan
Vietnam

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ATAGO INDIA Instruments Pvt. Ltd.

TEL: 91-22-28544915 / 40713232 customerservice@atago-india.com

ATAGO THAILAND Co.,Ltd.

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ATAGO ITALIA s.r.l.

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ATAGO CHINA Guangzhou Co.,Ltd.

TEL: 86-20-38108256 info@atago-china.com

ATAGO RUSSIA Ltd.

TEL: 7-812-777-96-96 info@atago-russia.com

ATAGO NIGERIA Scientific Co.,Ltd.

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