USER MANUAL

AUTO REFKERATOMETER

UM AKR750 EN
V5 – Avr 2016

INTRODUCTION

Le manuel utilisateur complet est disponible sur un espace web. Pour y accéder veuillez scanner le QR code ci-dessous à l'aide d'une application dédiée.

El manual de uso completo está disponible en la web. Para acceder, escanee el código QR que se encuentra a continuación con la ayuda de una aplicación.

This manual contains information on correct handling and operational procedures as well as safety consideration pertinent to AKR750. This device (AKR750) can objectively measure the refractive power of the eye.
Before carrying out measurement and/or adjustment, read the instructions thoroughly so that effective operation is ensured. As this constitutes an important reference and user guide, keep it on hand at all times.

(1) The information contained in this manual is subject to change without notice.
(2) While reasonable efforts have been made in the preparation of this document to ensure its accuracy, you should contact your local distributor immediately if any quarries arise due to editorial errors or omissions etc.
(3) If you find any imperfect collating or missing pages, contact your local distributor for replacement.

SAFETY CONSIDERATION

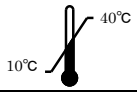
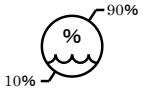
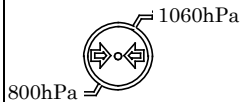
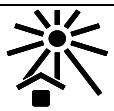
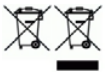
AKR750 is a Class I, Type B medical Device.
This device complies with Medical Device Directive 93/42/EEC as amended by Directive 2007/47/EC.

A great deal of consideration has gone into the design and manufacturing of this device with regard to its operational ease, the patient's safety and well-being as well as to the reliability of the product.
For safer and more effective use, however, follow the points described in this manual.

This device is designed for professional use.

～General Definitions of Safety Symbols in This Manual～

WARNING	This symbol indicates that mishandling as a result of failure to comply with the indications can result in "personal death or serious injury".
	Denotes general ban or prohibition.

	General mandatory action.
	Additional information which is important to the text or useful/convenient to know.
	Symbol for “MANUFACTURER”.
EC REP	Symbol for “AUTHORISED REPRESENTATIVE IN THE EUROPEAN COMMUNITY”.
	Refer to operation manual.
	The number on the left is the lower limit and the one on the right is the upper limit of the temperature.
	The number on the left is the lower limit and the one on the right is the upper limit of the humidity.
	The number of the left indicates the lower limit and on the right indicates the upper limit of the atmospheric pressure.
	Avoid direct sunlight.
	This is the type B equipment.
	Special collection for this type of electrical and electronic device
	This way up.
	Manufacturing date (year)

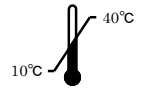
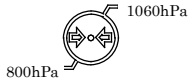
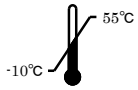
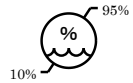
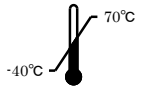
 **WARNING**

- Always take great care when operating AKR750. Malfunction or damage to the device could occur.
- Cut the power immediately if malfunction occurs during operation. Damage to the equipment or personal injury will result. Consult your dealer, if repair work needs to be carried out.

- At no time attempt to remodel or disassemble AKR750. Damage to the device or personal injury will result.
- As AKR750 is a precision optical device, operations must be carried out at all times by experienced, authorized personnel. Damage to the equipment or personal injury will result.

- Electromagnetic wave generated by TV, radio, mobile phone, radio transceiver, etc. may cause malfunction of this device. This device may also generate noise in the TV, radio, mobile phone, radio transceiver, etc.
  Avoid introducing or installing devices which may have adverse influence to the circumstance.
- Avoid use this device adjacent to other devices or stacked in plies. Failure or malfunction of the device may occur.
- Avoid installation near TV or radio. The reception can be disturbed by electrical noise.
  Follow the manual for the proper installation.
- Never remove the plug from the outlet if your hands are wet. Electric shock or personal injury could result.
- Make sure the power cord is not damaged. Fire or electric shock may occur.
- Do not touch the optical parts. Measurement accuracy will be adversely affected.

- The power cord must be firmly connected to an electrical ground (safety ground) at the power outlet.
  Personal injury may result from electric shock, etc.
- If the device fails to work properly, you should not try to repair the fault. Consult your dealer immediately.
- The instruction in this manual ensures correct operations.
- Observe the following environmental conditions for used and storage. Avoid dew condensation at all time.

	Temperature	Humidity	Atmospheric pressure.
Use			
Storage			
Transportation			

Avoid the following conditions for storage and use of the device.

- Where noxious gases or air pollutants are present.
- Where dust and grit may occur.
- Where oil fumes or greasy substances are emitted.
- Where there are atmospheric concentrations of salt.
- Near gas generation areas and places where dust accumulates.
- Keep in a secure, stable situation. Do not expose to strong vibrations (areas of seismic activity) and sudden shocks (this includes transportation) etc.
- Where there is an inclination of more than 10 degrees.
- Where voltage from the power sources rises or falls sharply during loading.
- Where fluctuations in the voltage of the power source occurs.
- Direct contact with sunlight.

If the instructions above are not followed, damage to the equipment or personal injury will ensue.

Electromagnetic Compatibility

This product conforms to the EMC Standard (IEC 60601-1-2 Ed. 3.0: 2007).

a) This product needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this manual.

b) Portable and mobile RF communications equipment can affect medical electrical equipment.

c) The use of accessories, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the equipment or system as replacement parts for internal components, may result in increased emissions or decreased immunity of the equipment or system.

d) The equipment or system should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the equipment or system should be observed to verify normal operation in the configuration in which it will be used.

e) The use of the accessory, transducer or cable with equipment and systems other than those specified may result in increased emission or decreased immunity o the equipment or system.

<table>
<tr><th colspan="3">Guidance and manufacturer's declaration – electromagnetic emissions</th></tr>
<tr><td colspan="3">AKR750 is intended for use in the electromagnetic environment specified below.
The customer or the user of AKR750 should assure that it is used in such an environment.</td></tr>
<tr><th>Emissions test</th><th>Compliance</th><th>Electromagnetic environment – guidance</th></tr>
<tr><td>RF emissions
CISPR 11</td><td>Group 1</td><td>AKR750 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td></tr>
<tr><td>RF emissions
CISPR 11</td><td>Class A</td><td rowspan="5">AKR750 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td></tr>
<tr><td>Harmonic emissions
IEC 61000-3-2</td><td>Class A</td></tr>
<tr><td>Voltage fluctuations/
flicker emissions
IEC 61000-3-3</td><td rowspan="3">Complies</td></tr>
<tr><td>RF emissions
CISPR 14-1</td></tr>
<tr><td>RF emissions
CISPR 15</td></tr>
</table>

Guidance and manufacturer's declaration – electromagnetic immunity			
AKR750 is intended for use in the electromagnetic environment specified below. The customer or the user of AKR750 should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0.5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	<5 % U_T (>95 % dip in U_T) for 0.5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of AKR750 Image Intensifier requires continued operation during power mains interruptions, it is recommended that AKR750 Image Intensifier be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	If image distortion occurs, it may be necessary to position AKR750 further from sources of power frequency magnetic fields or to install magnetic shielding. The power frequency magnetic field should be measured in the intended installation location to assure that it is sufficiently low.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity			
AKR750 is intended for use in the electromagnetic environment specified below. The customer or the user of AKR750 should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 Vrms 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of AKR750, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, [a] should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which AKR750 is used exceeds the applicable RF compliance level above, AKR750 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating AKR750. [b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Recommended separation distance between portable and mobile RF communication equipment and AKR750

AKR750 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of AKR750 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and AKR750 are recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150kHz to 80MHz $d = 1.2\sqrt{P}$	80MHz to 800MHz $d = 1.2\sqrt{P}$	800MHz to 2.5GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

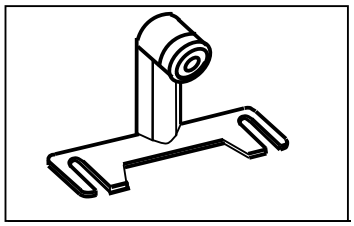
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

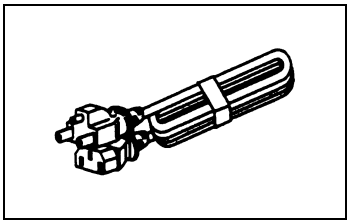
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Contents

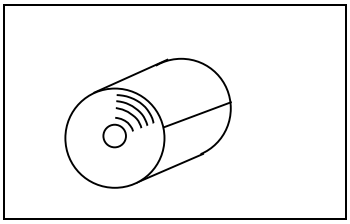
Accessories



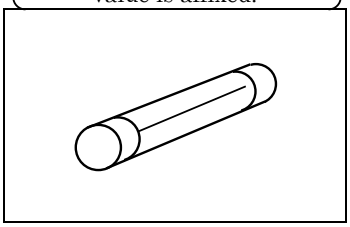
Model Eye: 1
With a contact lens holder
A sticker indicates the diopter value is affixed.



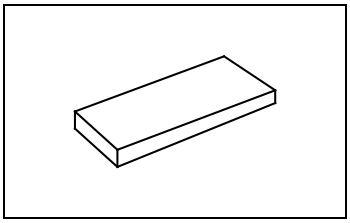
Power Cord: 1
(2.5m)



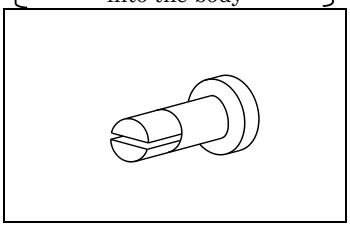
Printer Paper: 3
(Width57mm)
2 packed and one installed into the body



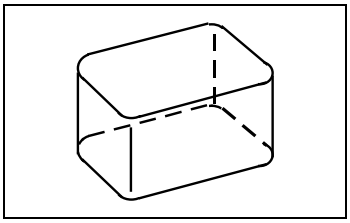
Fuse: 2
(T2A L 250V)



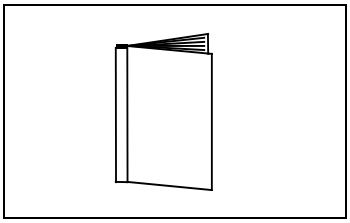
Pack of Chin Rest Liners: 1
(1,000sheets)



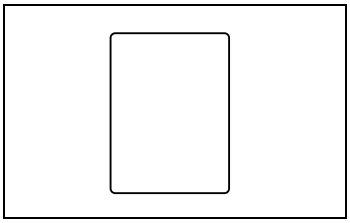
Chin Rest Liner Pin: 2



Dustproof Cover: 1



Operation Manual: 1



Simple Manual: 1

Cable to be used

Name	Model No.	Length
Power cord	KP4819YKS31A	2.5m

- Use accessories specified by us to avoid any malfunction or failure.
- Use of accessory (power cord) other than specified below may adversely affect other instruments and/or cause malfunction of the device. Always use the accessory specified by us.

- Extra care should be taken for storage of a mode eye. Avoid where the lens of the model eye may be damaged as well as any dusty or humid/steamy environments.
- Avoid direct sunlight, humidity and high temperature when storing printer paper which is a thermal paper.

1. Description of Device

1.1 General Description of Product

Auto refkeratometer, AKR750, aims to objectively measure the refractive power of the eye using the light that is projected to and reflected from the eyeground. It also aims to measure the radius of corneal curvature by the light that is projected to and reflected from the cornea.

As its feature in appearance, the LCD can be tilted and the angle is adjusted so that the examiner can see the LCD easily.

As for safety consideration, see "4.Safeguard Summary" of this manual.

1.2 Intended Use Defined

Auto refkeratometer, AKR750, aims to objectively measure the refractive power of the eye using the light that is projected to and reflected from the eyeground. It also aims to measure the radius of corneal curvature by the light that is projected to and reflected from the cornea.

1.3 Classification Defined, Rule Given

This product is the active device which does not belong to the category of the invasive/ non-invasive device and does not intend the performances below.
Supply of energy / observation of physiological process/ irradiation of ionization radiation/ medication of medicines etc.
Therefore, this is a class I medical device with a measuring function based on the rule 12 of MDD Annex IX.

1.4 Classification of Device

Type of protection against electrical shock: Class I Equipment

Class I equipment is equipment in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that means are provided for the connection of the equipment to a protective earth conductor in the fixed wiring of the installation in which a way which accessible metal parts cannot become live in the event of a failure of the basic insulation.

Degree of protection against electrical shock: Type B Equipment

Type B equipment provides an adequate degree of protection against electrical shock, particularly regarding allowable leakage currents and reliability of the protective earth connection.

Degree of protection against harmful intrusion of water (IEC 60529): IPX0
This product does not provide protection against intrusion of water.
(The degree of protection against harmful ingress of water defined in IEC 60529 is IPX0.)

Classification by safety of use in air/ flammable anesthetic gas, oxygen or nitrous oxide/ flammable anesthetic gas atmosphere:

- Equipment not suited for use in air/flammable anesthetic gas, oxygen or nitrous oxide/flammable anesthetic gas atmosphere.
- This product should be used in an environment free of flammable anesthetic gas and other flammable gases.

Classification by operation mode: Continuous operation with short-time loading.

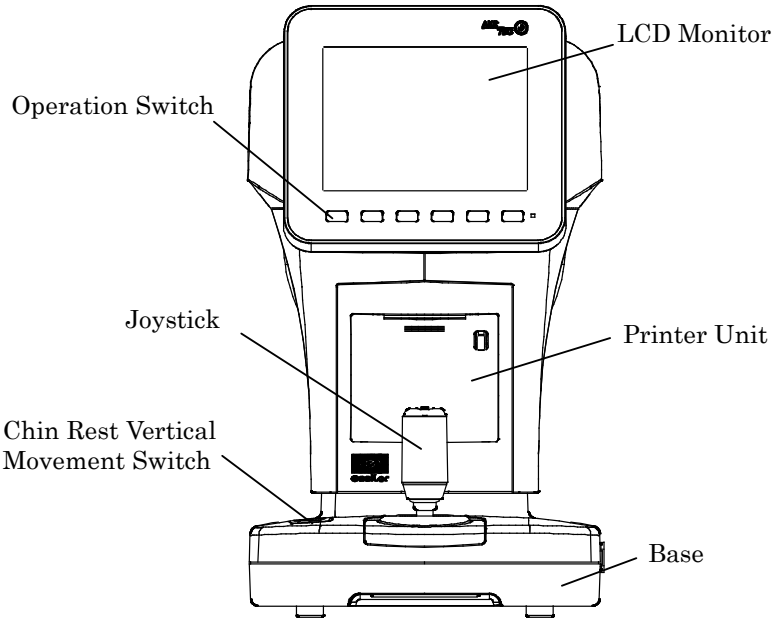
1.5 Usage of Product

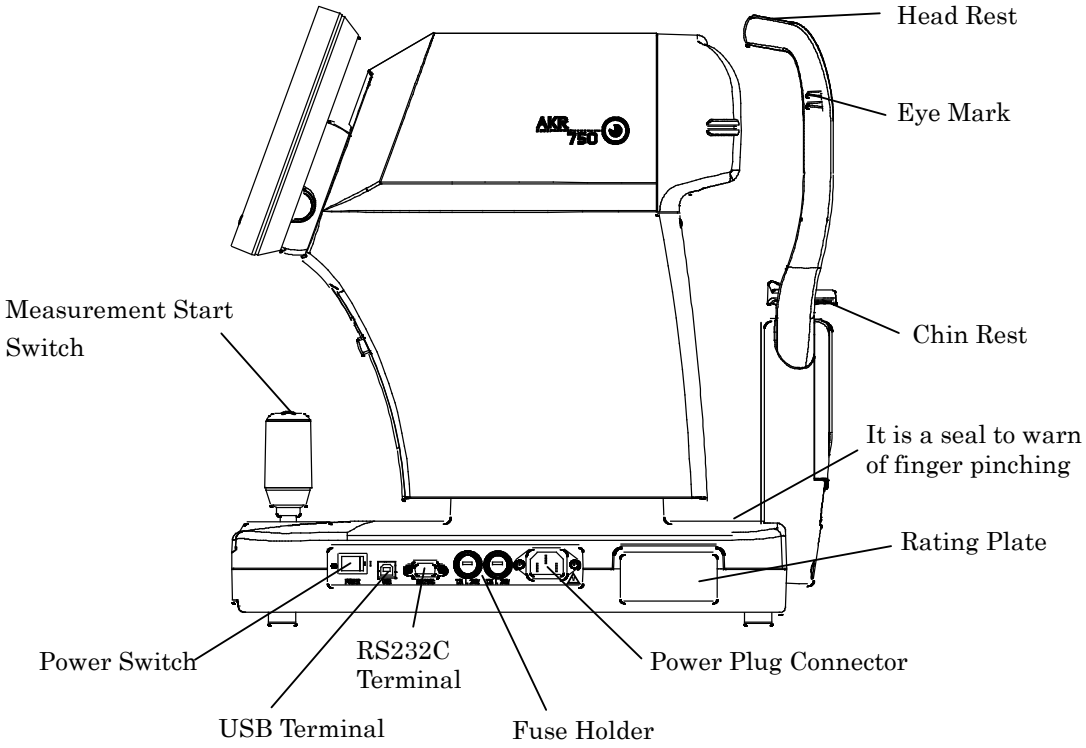
This product is for medical use which must be used under instructions of a doctor.

1.6 Mode of Operation

This product is for continuous operation. It takes approx. 2 sec. for each measurement.

1.7 Parts Identification





NOTE There is the parts list separated from this manual. Also there is the another parts list related to the safety.

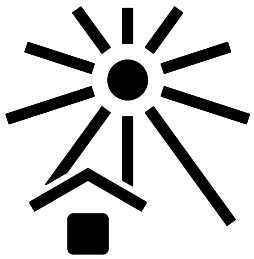
2. Conveyance

Make sure to set as package mode when transporting the device.
The device is set as package mode when pressing **Clear** and **Print** switches together on the main unit in measurement standby mode after turning power on.

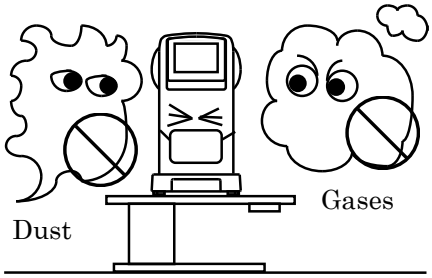
3. Installation Environment

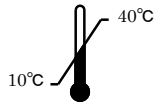
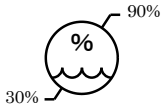
1) Do not expose view window of the device directly to the sunlight or bright lighting from other sources.

> NOTE
> Great care should be taken because the measurement cannot be carried out if the examinee is exposed to strong light or glare during the measurement and his/her pupil contracts too small.



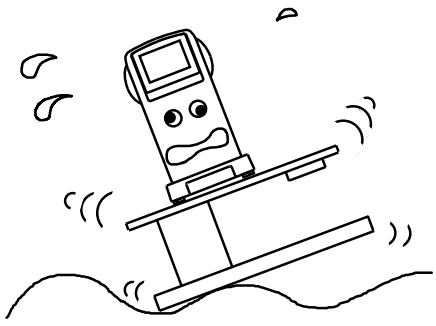
2) Do not operate at places where either dusty or grabby place. Environment with extremes in heat and humidity should also be avoided. Always follow the environmental requirements below for installation.



Environmental Conditions for Use	
	

3) Keep away from the space for storage of chemical or the place that gas is emitted.

4) Avoid installing where dew condensation may accumulate. Also, avoid where the radical temperature changes may occur.



5) Keep away from sites that may experience strong vibrations or sudden shocks.

6) Malfunction is likely to occur if the device is improperly stabilized or accidentally overturns. Also it is very dangerous if the device falls off on body or foot. Do not store in high, 'out of reach' places.

4. Safeguard Summary

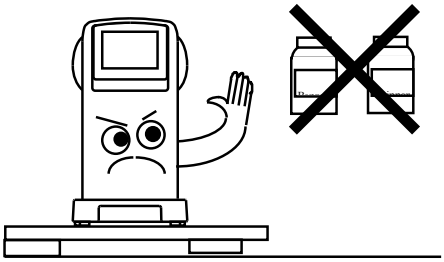
1. This device is a precision optical device. Always handle with care and avoid dropping it accidentally.

2. Ensure that the device is properly grounded when connected to the power source.

3. Do not touch the optical parts such as a viewing window with fingers and be sure to avoid dust, as their measuring accuracy could be adversely affected and incorrect values may result.

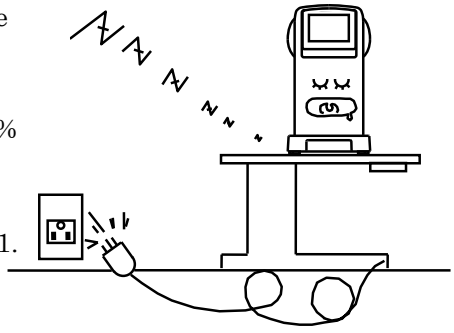
> When dust or fingerprints appear on the optical part, use a soft cloth to wipe them off gently. Take great care when cleaning these parts as they are particularly sensitive and fragile.

4. If the measuring unit cover, the main unit cover, and the operation panel are dirty, gently wipe with a dry cloth. For stubborn stains, a little water or neutral cleanser is recommended.



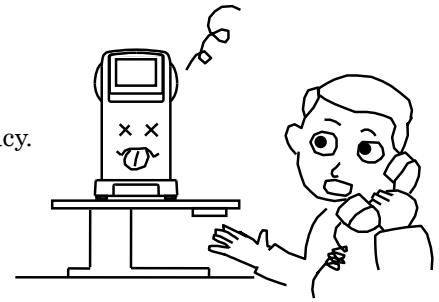
> Avoid using organic solvents that will dissolve the water based paint on surface of the device.

5. Clean the chin rest and head rest with the neutral cleanser. For disinfecting the parts especially where the examinee may contact such as the chinrest and headrest, use the ethanol for disinfection.
   ※ Ethanol for disinfection contains 76.9 to 81.4vol% of ethanol (C_2H_6O) at 15℃ (specific gravity).
   Basically, it is not necessary to replace the chinrest and headrest rubber. They comply with ISO 10993-1.



6. If the device is not used for a long time, remove the power cord from the outlet.

7. When not in use, protect the device with a supplied dustproof cover.
   If dust is adhered, it affects its measurement accuracy.



8. When the device fails to function properly, never attempt to fix inside of the device.
   Contact the nearest registered agent, distributor or retail outlet.

5. Disposal

Dispose this device according to the regulations of each local government.

Follow the disposal procedures of each local government when disposing the lithium batteries used in this device. Check the procedures before disposal.
The lithium battery is used for the control board to store the information about the date and time. Basically it is not necessary to replace it because it is rechargeable.

Separate the packaging materials and accessories according to the instructions of each local government.

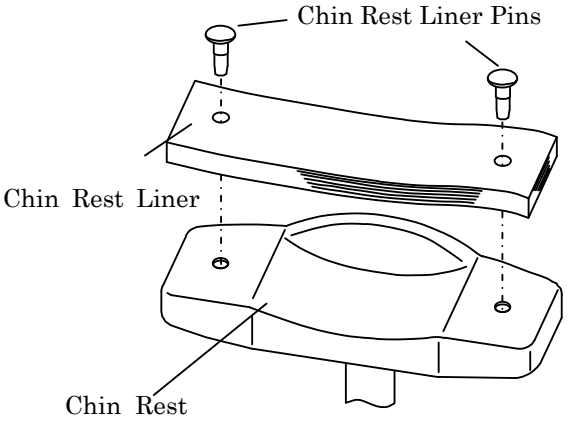
6. Preparation for Measurement

6.1 Setting

(1) Set a roll of printer paper in the printer. Refer to '12.1 Reloading Printer Paper' for the procedure.

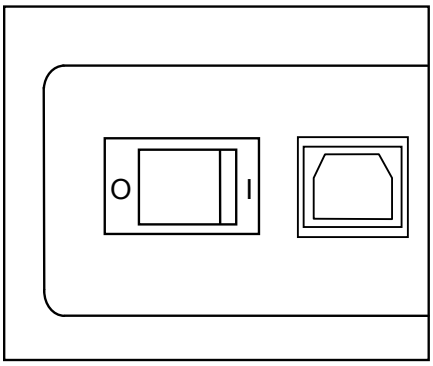
(2) Set and fix the chin rest liners with the chin rest liner pins on the chin rest.
Refer to the figure on the right.

NOTE For sanitary reasons, dispose the top chinrest liner after every patient.

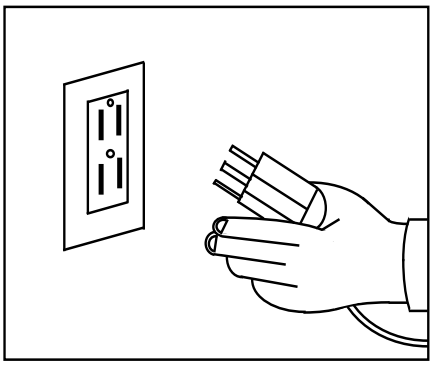


- Keep strictly the matters above for the chin rest.
- For sanitary reasons, disinfect the chinrest with the ethanol for disinfection.
  ※ Ethanol for disinfection contains 76.9 to 81.4vol% of ethanol (C_2H_6O) at 15℃ (specific gravity).

6.2 Applying Power



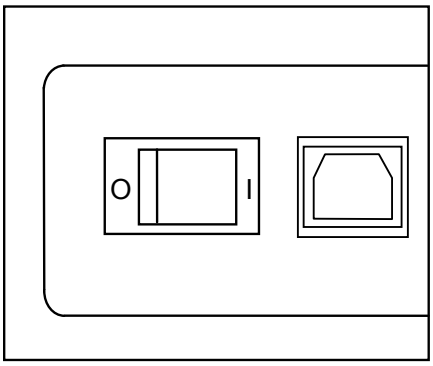
(1) Confirm that the power is 'OFF' (○).



(2) Insert the power cord into the plug connector of the device and insert the plug into an outlet.

Always make sure that the cable is grounded.

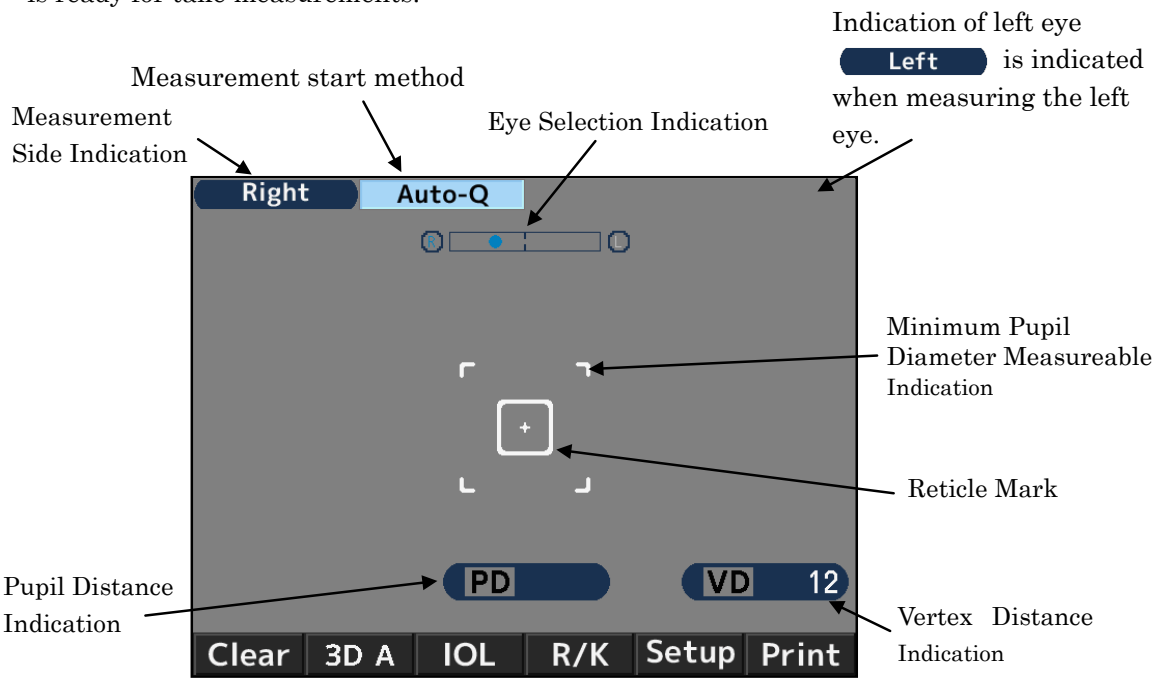
Do not use an additional power strip or an extension cord.



(3) Turn the power switch 'ON' (|).

6.3 Standby

When the power is turned on, the screen as shown below appears on the LCD monitor, which is ready for take measurements.

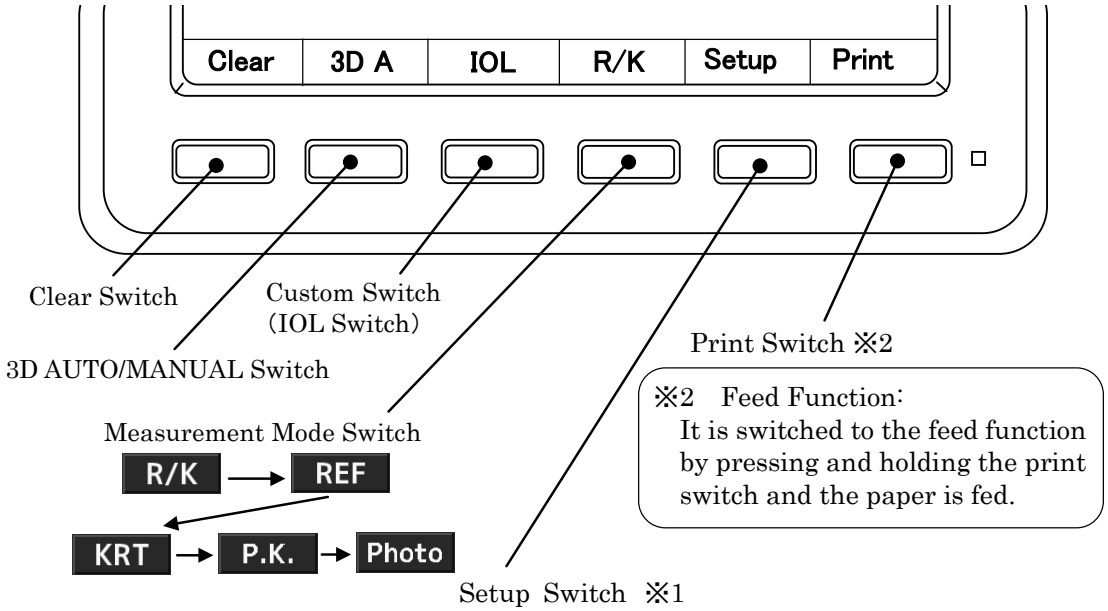


Icon Description (Normal Measurement)

Icon	Description
Right / Left	Indicate the eye (right or left) in process of measurement.
Auto / Auto-Q	Indicate the measurement start method.
VD 12	Indicate the vertex distance. It can be switched between 0, 10, 12, 13.5 and 15mm.
Clear	Clear the measurement results (values).
3D A	Switch the auto-alignment operation.
IOL	IOL measurement mode indication
R/K	Select the measurement mode: refractive & keratometry continuous measurement, refractive measurement, keratometry measurement, peripheral kerato measurement, and anterior eye color shooting.
Setup	Switch to the setup screen. The screen will be changed to the start mode selecting display (Auto-Quick, Auto, and Manual) without switching to the setting screen after pressing the menu switch for a while.
Print	Display the measurement result on the screen and prints it out.

6.4 Switch Function

The operating switches under the monitor correspond to the icons displayed on the bottom of the monitor.
For usual measurement, the operating switches correspond to the icons shown as below.



※2 Feed Function:
It is switched to the feed function by pressing and holding the print switch and the paper is fed.

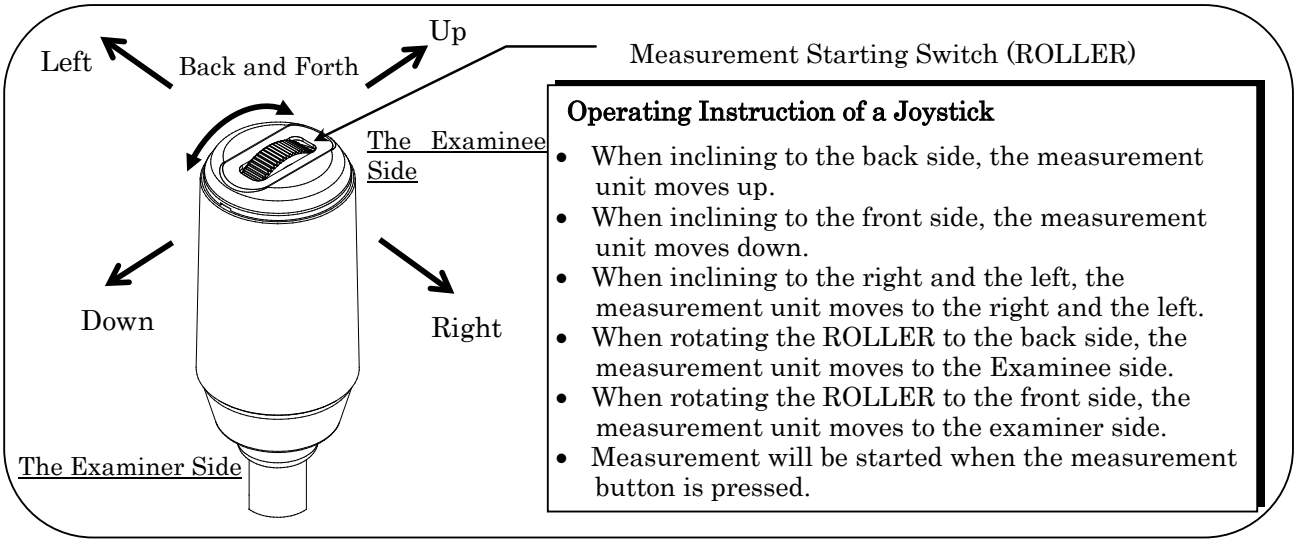
※1 Start method switching function:
The start method (START items on the setup screen: Auto-Quick/Auto/Manual) can be switched on the measurement screen by pressing and holding the setup switch.

6.5 Operating Instruction of Joystick

There are 2 ways (TYPE A and TYPE B) to operate a joystick and they can be switched on the Joystick of the setup screen. (Refer to '7.7 Setup Screen Setting' for the details.)

> NOTE The operation of back and forth and up and down will be opposite between TYPE A and TYPE B.

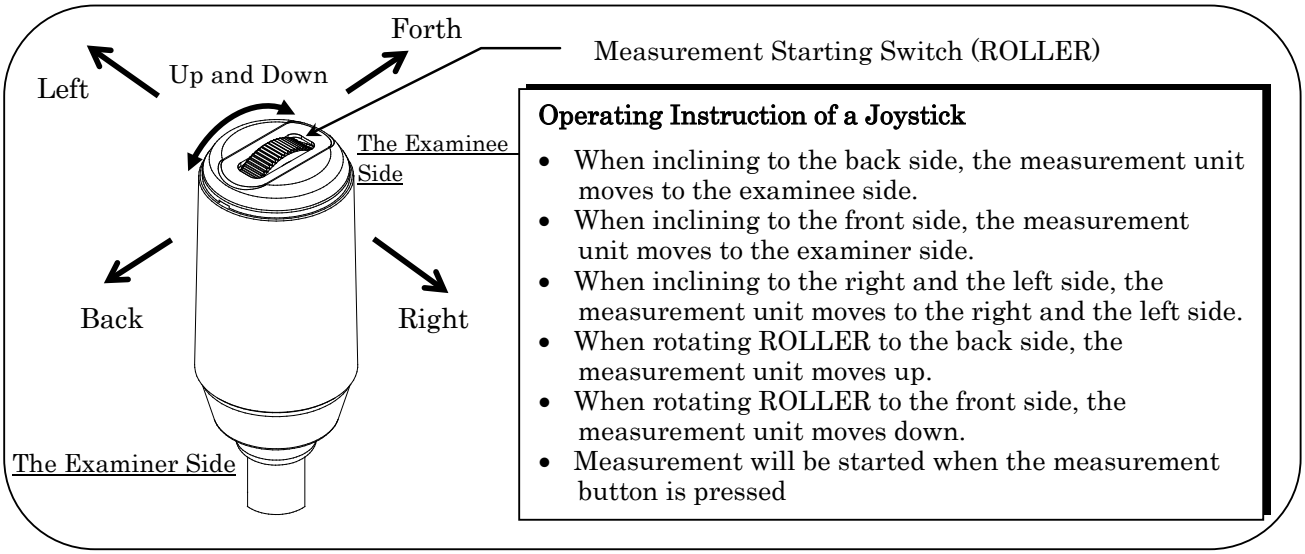
TYPE A



Operating Instruction of a Joystick

- When inclining to the back side, the measurement unit moves up.
- When inclining to the front side, the measurement unit moves down.
- When inclining to the right and the left, the measurement unit moves to the right and the left.
- When rotating the ROLLER to the back side, the measurement unit moves to the Examinee side.
- When rotating the ROLLER to the front side, the measurement unit moves to the examiner side.
- Measurement will be started when the measurement button is pressed.

TYPE B



Operating Instruction of a Joystick

- When inclining to the back side, the measurement unit moves to the examinee side.
- When inclining to the front side, the measurement unit moves to the examiner side.
- When inclining to the right and the left side, the measurement unit moves to the right and the left side.
- When rotating ROLLER to the back side, the measurement unit moves up.
- When rotating ROLLER to the front side, the measurement unit moves down.
- Measurement will be started when the measurement button is pressed

7. Measurement

7.1 Measurement Flow

(1) Have the examinee place his/her chin on the chin rest and his/her forehead against the head rest. Then have him/her see a target.

> NOTE
> Uncomfortable posture may fatigue the examinee during the measurement. Adjust the height of the optical table or the chair to avoid it.

(2) Check from the side and adjust the chin rest so that the examinee's eye level is in line with the eye mark.

(3) When the target eye appears on LCD monitor, conduct alignment for correct measurement.

> NOTE
> Refer to '7.2 Alignment' for the detail of alignment.

(4) When the alignment mark overlaps with the center of the reticle mark, press measurement start switch and start measurement.

> NOTE
> This device has the high speed continuous measurement function. Continuous measurement can be done by pressing and holding the starting switch during measurement.

7.2 Alignment

This device has 2 kinds of alignment modes (3D_MANUAL, 3D_AUTO).
The alignment mode can be switched with 3D AUTO/MANUAL switch.

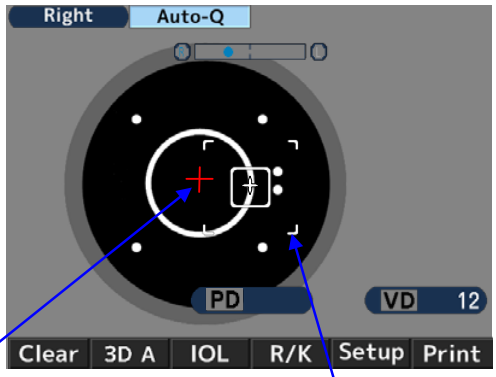
- **In Case of 3D_AUTO Mode**

Operate a joystick and if the subject eye comes to center of the monitor, it is aligned automatically.

(1) "+" (alignment mark) will appear when operating a joystick and the monitor catch the subject eye.

NOTE

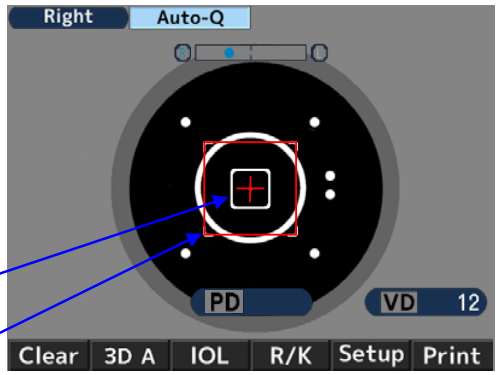
If the eyelid is over the minimum pupil diameter measureable indication, urge the examinee to open the eye bigger.



Alignment Mark

Minimum Pupil Diameter Measureable Indication

(2) After "+" (alignment mark) appears, the main unit moves automatically to overlap the center of the reticle mark with the alignment mark. When the alignment mark overlaps with the center of the reticle mark, the focus indicator (red square) appears.



Reticle Mark

Focus Indicator (Red Square)

(3) Once the focus indicator appears, the main unit moves automatically to focus on the object eye.
When the focus indicator changes to green, press measurement button and start measurement.

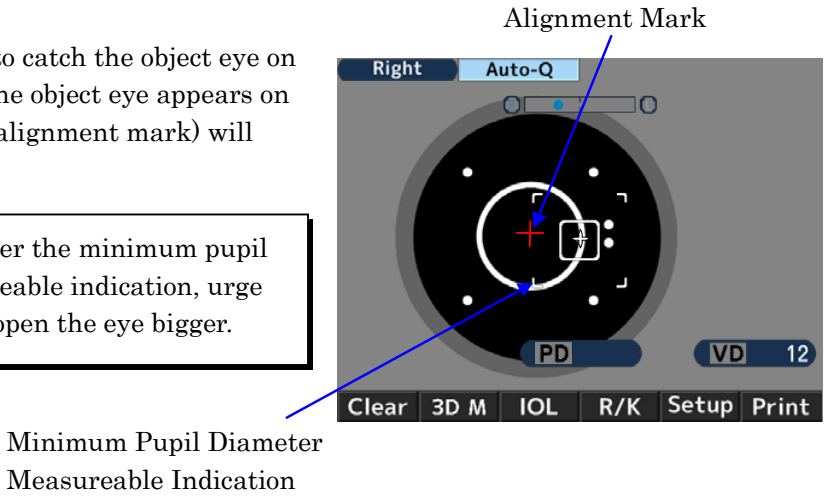
NOTE

When the setting of start is Auto-Quick or Auto, it conducts alignment and starts measurement automatically after finishing measurement of one eye and changing the side of the object eye.

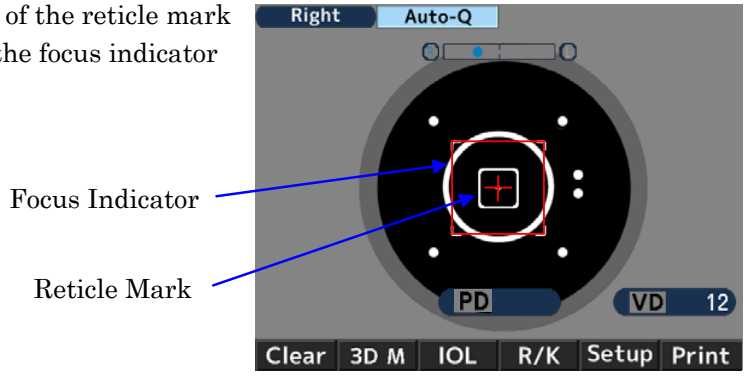
- **In Case of 3D_MANUAL Mode**

(1) Operate a joystick to catch the object eye on the monitor. When the object eye appears on the monitor, " + " (alignment mark) will appear.

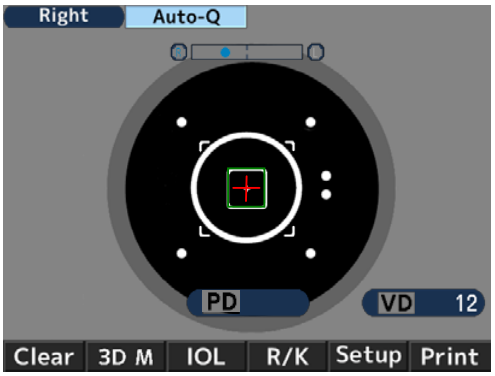
> NOTE
> If the eyelid is over the minimum pupil diameter measureable indication, urge the examinee to open the eye bigger.



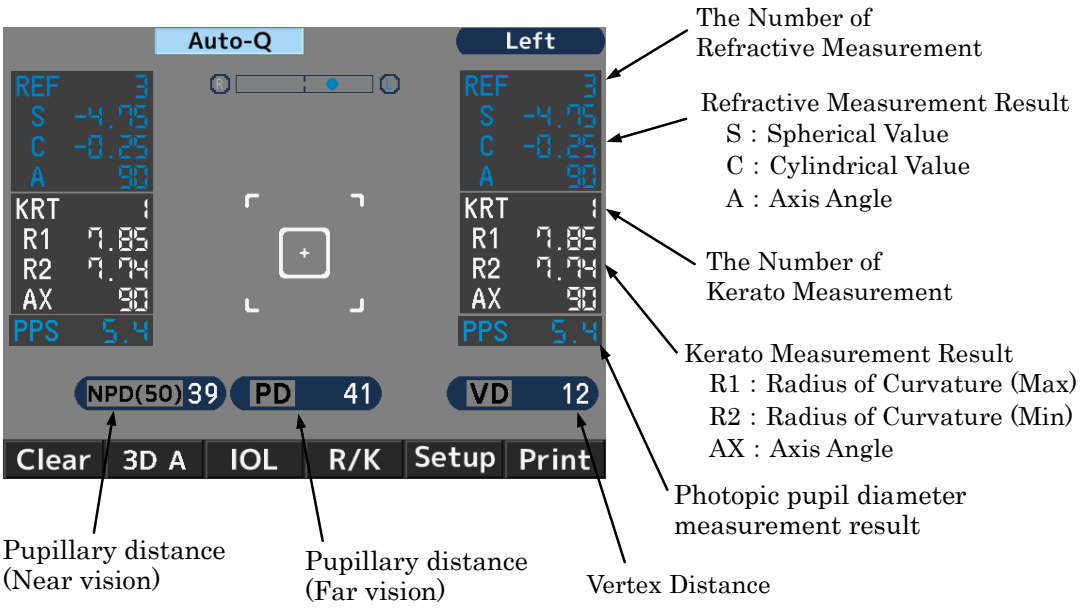
(2) When overlapping center of the reticle mark and the alignment mark, the focus indicator (red square) will appear.



(3) With adjusting the alignment mark to the center of the reticle mark, focus on the subject eye and press the measurement button. The place that the indicator changes to green is the in-focus place.



7.3 Measurement Result



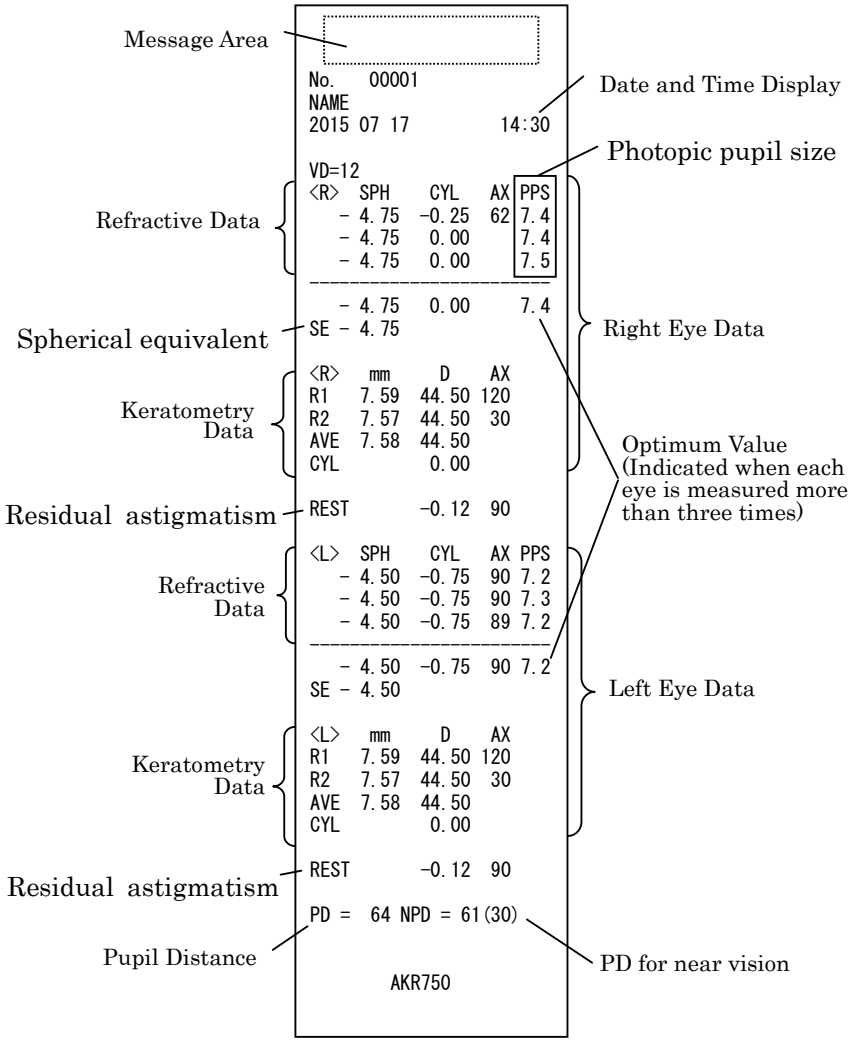
※ The PD value is indicated after the refractive power of both right and left eyes are measured. The order of the eye to be measured is not important.
The NPD value is indicated only if the number of "W-D (cm)" on the Setup screen is set.
The PPS value is indicated only if the number of "Pupil Size" on the Setup screen is set.

7.4 Print Out

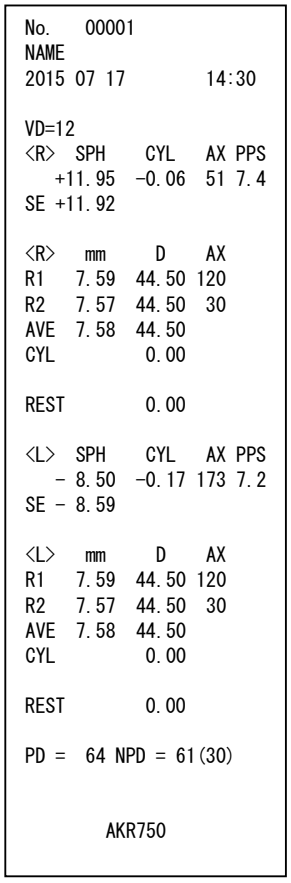
Normally you can print the measurement result out after measurement. For refractive measurement, a maximum of ten data for each eye can be saved and the most reliable value among them is indicated as optimum value. The optimum value is printed out only when more than three times of measurement is made for each eye. The format of the output (All, All/Eco, Eco or Off) can be set on Print REF/KRT on the setup screen.

※ All	:Print out a maximum of ten data of the refractive measurement and Kerato measurement for each eye.
※ All/Eco	:Print out a maximum of ten data of the refractive measurement for each eye. Print out only the optimum values for the Kerato measurement.
※ Eco	:Print out only the optimum values for all of the measurement.
※ Off	:Print out no data

Sample Print Out
when Print REF/KRT is set to All/Eco



Sample Print Out
when Print REF/KRT is set to Eco



※Message Area

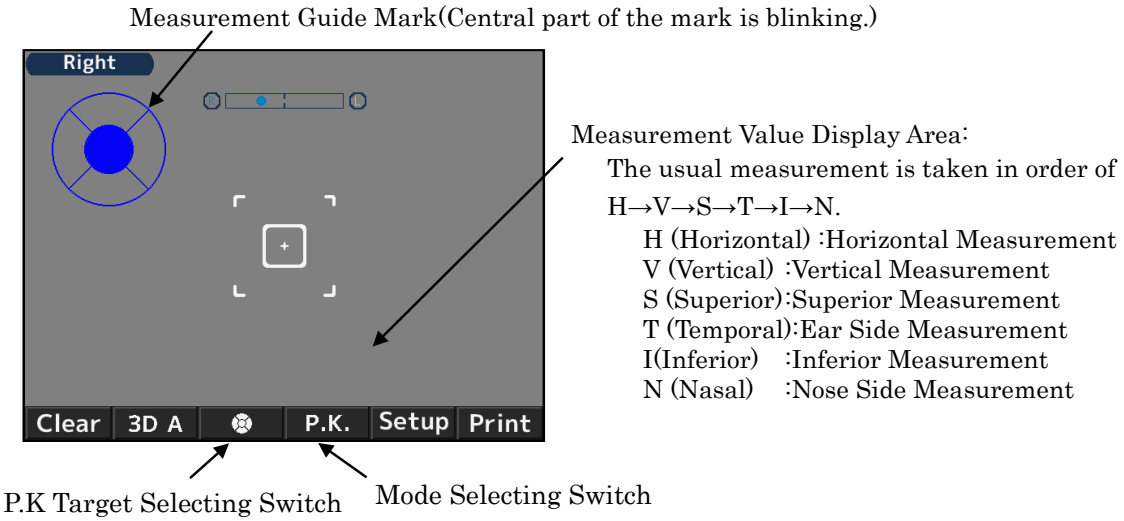
Printing out can be done of the registered characters in the range of 22 characters/line× 2 lines in the message area. For registering characters, refer to '7.7 Setup Screen Setting 【Message】'.

7.5 Peripheral Kerato Measurement Function (P.K. Measurement)

This device has the measurement function of not only a center of the cornea but also peripheral Kerato.

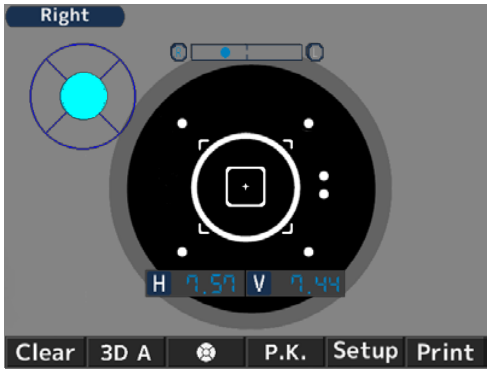
Operation Manual

(1) Press the mode selection button and switch to P.K. measurement mode.
After switching to the P.K. measurement screen, the measurement guide mark will appear on the screen.



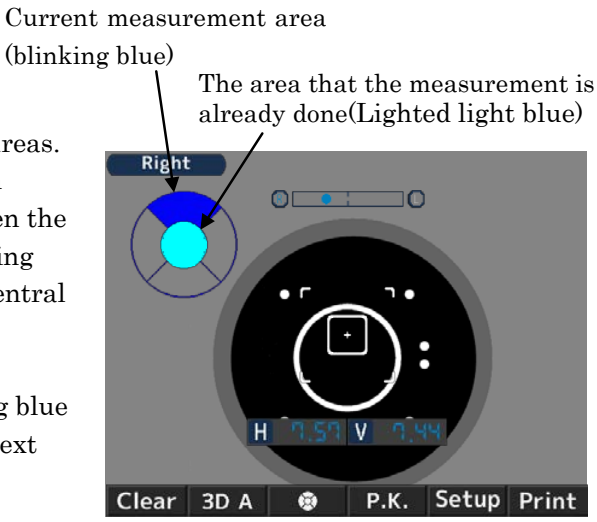
Measurement Guide Mark
The measurement guide mark indicates the area of the measurement and the end of the measurement by colors and conditions. In the measurement, the display of the mark changes as below.
No color・・・・・・・・The area that the measurement is not conducted.
Blinking blue・・・・・The area that is about to start the measurement.
Lighted light blue・・・・・The area that the measurement is finished.
Blinking yellow and blue・・The area that the measurement is taken one more time.

(2) Adjust the reticle mark to the center of the pupil and start measurement by pressing the measurement switch.
After finishing measurement, the color of the central measurement guide mark changes from blinking blue to lighted light blue and next measurement area (superior) starts blinking.



Make sure to conduct the measurement of the central area first but if the measurement is already done in the R/K mode or K mode, measurement of the central part is not necessary.

(3) Start measurement of the peripheral areas. Have the examinee look at the fixation target and conduct measurement. When the area of measurement changes to blinking blue as same as measurement of the central part, conduct alignment and press the measurement switch.
When finishing measurement, blinking blue changes to lighted light blue and the next measurement area starts blinking.

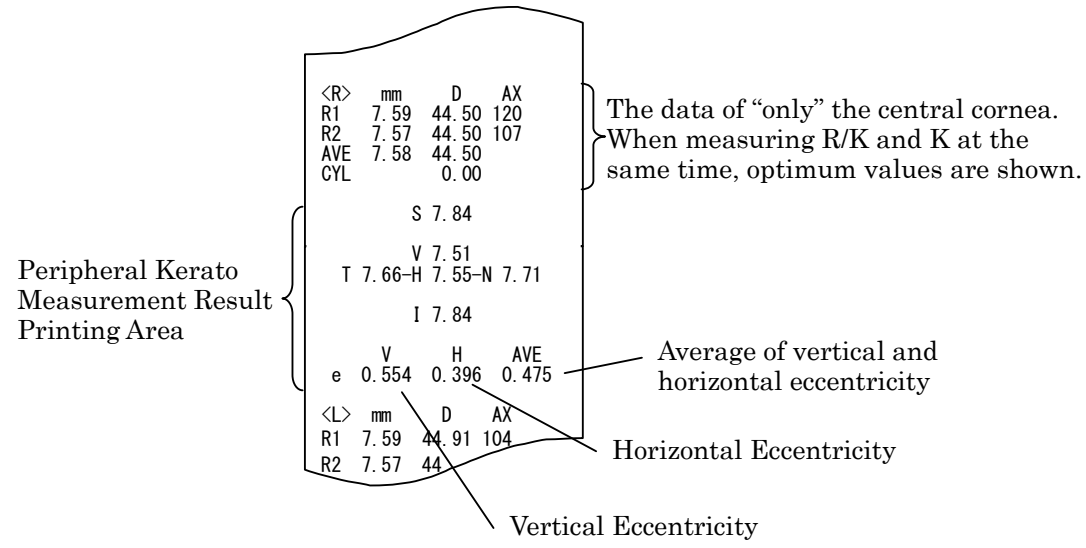


(4) Conduct measurement for all of the measurement parts as well. When all of the areas in the measurement guide mark Light blue, measurement is done.
Conduct measurement of the other eye as well.

NOTE

- When trying the measurement again, operate the P.K. target selection switch and move the blinking area of the measurement guide mark to where trying the measurement again.
- If the data cannot be taken or not all of the data is necessary, press the P.K target selection switch and skip measurement.
  In this case, the results of only the measured areas are displayed.
  However, measurement of the central area is always certainly necessary.

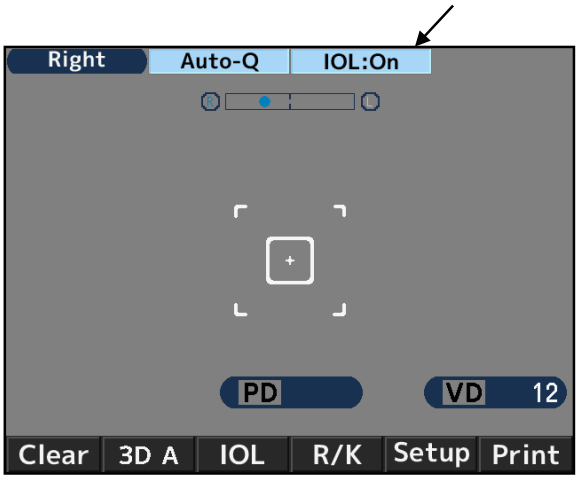
Print Out of P.K. Measurement



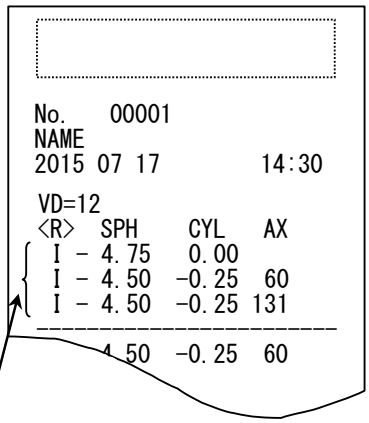
7.6 IOL Measurement Function

When measuring the IOL (intraocular lens) implanted eye, the eye with a cataract, or the eye with scratches on corner, the measurement errors may occur and hard to complete the measurement with REF measurement. In this case, it is easier to measure if moving the device closer to the examinee. Also these can be measured with IOL mode.
Press the IOL switch on the front panel of the body and turn the IOL function on.
At this time, the IOL measurement mark will appear in the upper right of the monitor.

IOL Measurement Mode Indicator



【Measurement screen when IOL mode is set】



【Print Out Sample】

Measurement results of the IOL measurement mode have 'I' marks on the left side of each data.

IOL measurement mode will be cancelled:

① when the IOL switch is pressed again
② when the mode is changed to keratometry measurement
③ when pressing the print switch
④ when turning the power off

【When the measurement cannot be completed because of the errors with IOL mode】
There is a possibility that the measurement of the IOL (intraocular lens) implanted eye cannot be completed because of the influence of the implanted IOL.
In this case, move the device closer to the examinee with keeping the alignment in-focus. It might help curbing the influence and the measurement can be done.

NOTE

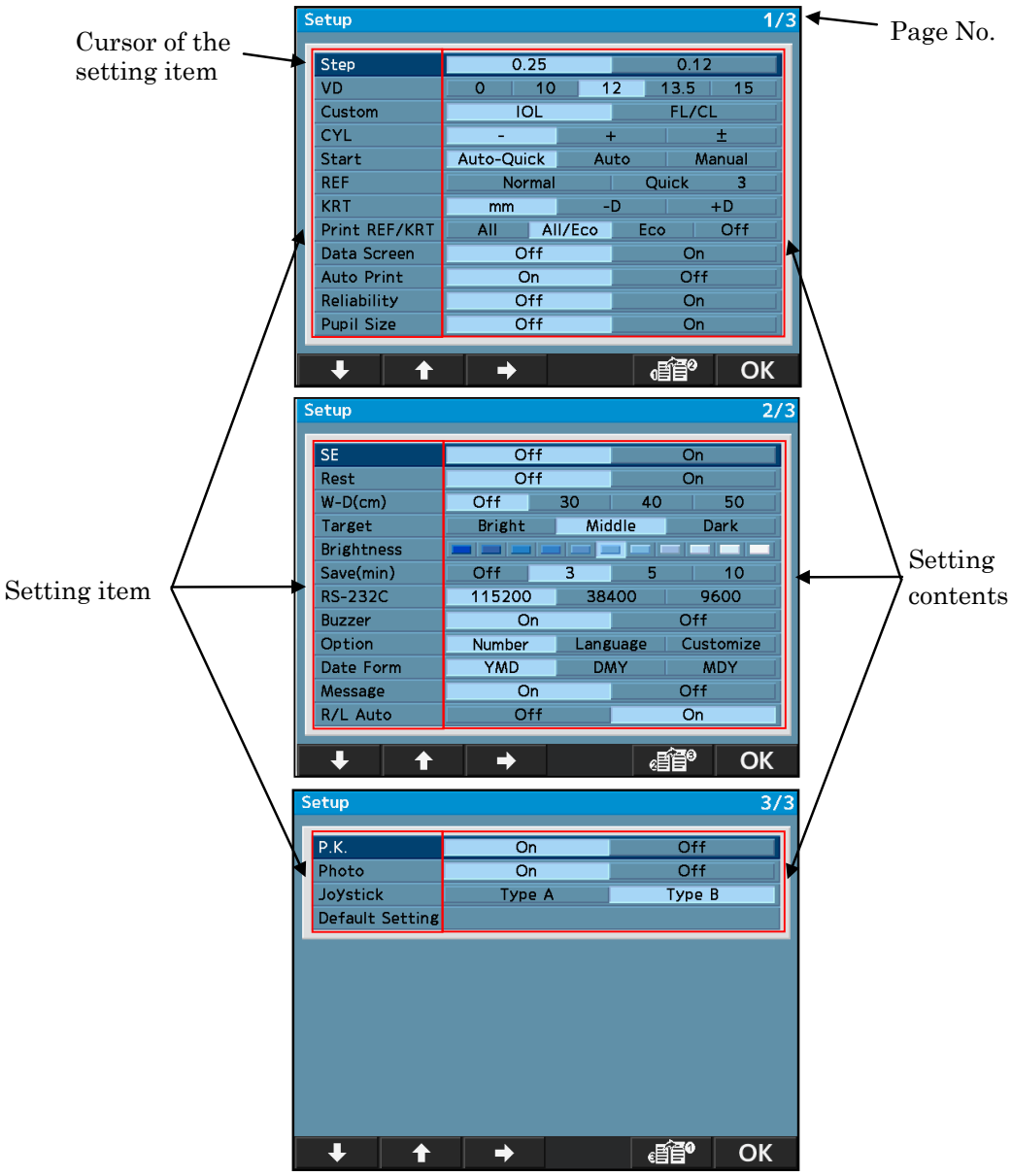
The image of the eyeground is displayed if pressing and holding IOL or FL/CL switch for seconds.

7.7 Setup Screen Setting

The standard measurement mode is preset to be ready for use. However, altering the setting can be done easily if necessary.

Press **Setup** switch under the LCD monitor and display the setup screen.

【Setup Screen】



There are 28 setting items on the setup screen.

Select the item to be changed by pressing ↓ or ↑ and change it by pressing → .

After changing it, return to the measurement screen by pressing **OK** .

There are 3 setup screens. By pressing 2 , screen goes to page 2, by pressing 1 , screen goes to page 3 and screen goes to page 1 by pressing 3 .

Details of Each Setting Item

【Screen 1】

■ Step — Select the step for refractive measurement.

■ VD — Select the corneal vertex distance.

■ Custom — Select the function of the operation switch.
- IOL : Switch to the mode to measure IOL.
- FL/CL : Switch the corneal vertex distance (frame value/ contact value)

■ CYL — Select the sign of cylindrical value.

■ Start — Select the measurement start method.
- Auto-Quick:
  It starts measurement when the alignment is achieved. Take 1 time of Kerato measurement and 3 times of refractive measurements continuously for each eye.
  The result is printed out automatically when "Auto Print" is set as ON. (For the refractive measurement, only one time of the fog control is done at the beginning.)
- Auto:
  Take 3 times of Kerato measurements and refractive measurements continuously for each eye.
  The result is printed out automatically when "Auto Print" is set as ON. (For the refractive measurement, the fog control is done every time.)
- Manual:
  Measurements are taken every time the measurement switch is pressed.

■ REF — Select the refractive measurement method. The setting is valid only when the measurement start method is set as Manual.
- Normal:
  A measurement is taken one time by pressing the measurement start switch.
- Quick:
  Continuous measurement is started as much as it is set by pressing the measurement start switch one time. (Maximum of 10 times.) (For the refractive measurement, only one time of the fog control is done at the beginning.)

■ KRT — Select the sign of Kerato measurement result.
- mm : Corneal Curvature radius
- −D : corneal astigmatism (−)
- +D : corneal astigmatism (+)

■ Print REF/KRT — Select the format of print-out.
- All : Print out all of the measurement data.
  (Maximum of 10 times for each eye.)
- All/Eco: Print out all of the REF measurement.
  (Maximum of 10 times for each eye.)
  Print out only the optimum values for the Kerato measurement.
- Eco: Print out only the optimum values.
- Off : No measurement result is printed out.

■ Data Screen　Display the stored measurement results.
・Off：Display no measurement result on the screen.
・On：Display the measurement results on the screen.

■ Auto Print　Select the print-out method. This function is valid only when the setting of Start is either Auto-Quick or Auto.
・On：Activate the auto print function.
・Off：Invalidate the auto print function.

■ Reliability　Select if displaying the low reliability mark on the measurement values or not.
・Off: No low reliability mark is displayed.
・On: If it is judged that the measurement value possesses low reliability, display the low reliability mark "*" on it.

■ Pupil Size　Select the output of pupil diameter measurement.
・Off：Pupil diameter measurement is not printed out.
・On：Pupil diameter measurement is printed out.

【Screen 2】

■ SE　Set the output of SE value
・On：Output the representative value of SE on print-out, data screen and communication output (XML format only)
・Off：No output of SE value

■ Rest　Select the output of residual astigmatism.
・Off： Residual astigmatism is not printed out.
・On： Residual astigmatism is printed out.

■ W-D(cm)　Set the work distance.
The near pupil distance is automatically computed after the measurement and displayed on the screen.

■ Target　Select the brightness of the target.
・Bright　：Brighten the target
・Middle　：Normal setting
・Dark　：Darken the target

■ Brightness　Adjust/ change the brightness of the LCD monitor.

■ Save(min)　Select the switchover time to activate the power saving function (unit is min.).

■ RS-232C　Select the baud rate when sending the measurement data to the exterior computer.

■ Buzzer　Set the buzzer sound when pressing each switch.
・On： Buzzer is activated.
・Off： Only buzzer at the time of transition to power saving mode is OFF.

■ Option

It is switched to each option screen when selecting the item to be set on the option of the setup screen.

【The screen of each option and the details】

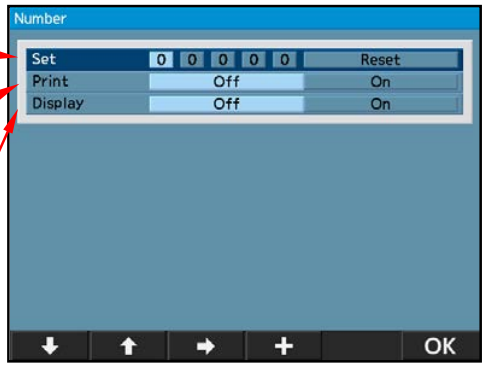
1. Number

This function can set or change the number of the examinee, and select if displaying the number on the monitor and the printout.

Set/change the number of the examinee. (Maximum of 5 digits can be input.)

Select if printing out the number of the examinee or not.
- Off : The number is not printed out.
- On : The number is printed out.

Select if displaying the number of the examinee on the screen or not.
- Off : The number is not displayed.
- On : The number is displayed.



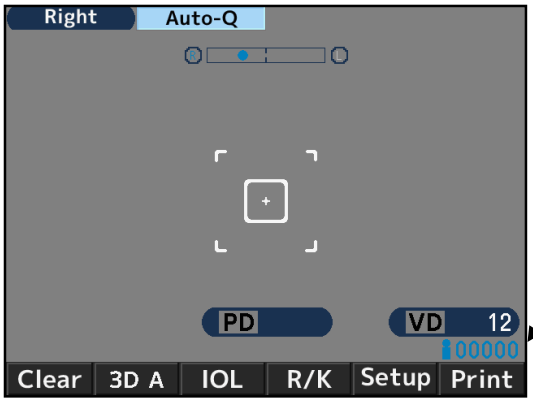
NOTE

Reset of the number of the examinee
If moving the cursor to "Reset" on "Set", the "+" switch on the bottom is changed to "Reset". Press the "Reset" switch to reset the number.

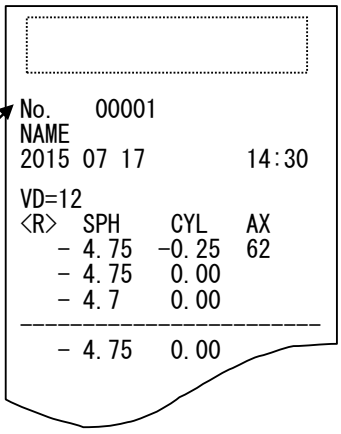
(1) Move the cursor to the item to be set or changed by pressing ↓ or ↑ and change it by pressing → or +.

(2) Go back to the setup screen by pressing OK after the setting or the change.

【Screen when Display is set to On】



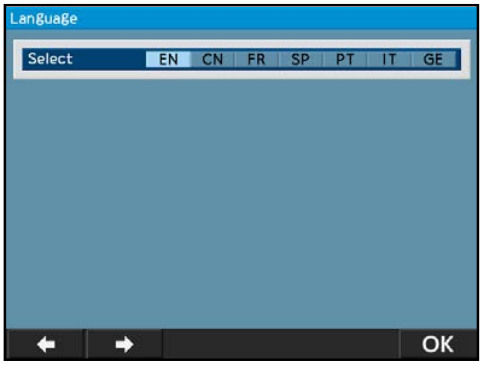
【Print out when Print is set to On】



Number of Examinee

2. Language

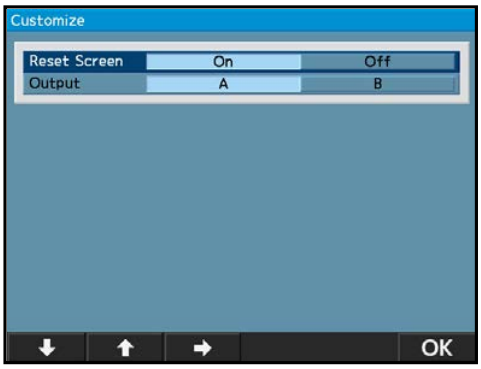
This function can select the language displayed on the screen.
Selectable language: EN (English), CN (Chinese), FR (French), SP (Spanish), PT (Portuguese), IT (Italian), GE (German)



(1) Move the cursor to the item to be set by pressing → and execute it by pressing OK.

(2) Go back to the setup screen by pressing OK after finishing the setting.

3. Customize



・ Reset Screen

This function can delete the measurement values on the screen after printout.

On : Delete the measurement values on the screen after printout.

Off : Leave the measurement values on the screen after printout.

・ Output

This function can select the output procedure of the measurement data

・A : Standard

・B : Output data common spec. of ophthalmic testing device

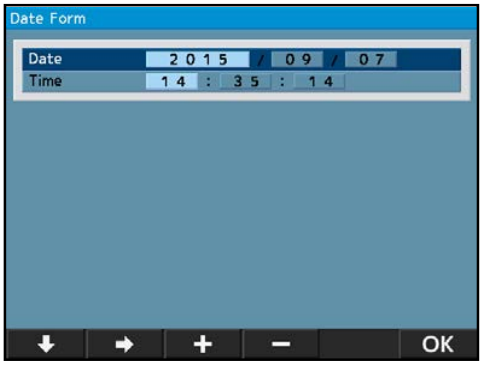
■ Date Form

Select the display format of the date from the followings.

YMD : Display the date as year/ month/day.

DMY : Display the date as day/month/year.

MDY : Display the date as month/day/year.



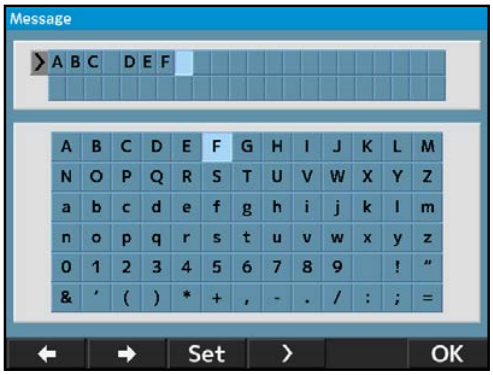
The screen on the left appears when selecting "YMD" and pressing Enter.

(1) Move the cursor to the item to be changed by pressing ↓ or → and input the date by pressing + or −.

(2) Go back to the setup screen by pressing OK after finishing the setting.

■ Message

This function is to input the message in the range of 22 characters/line × 2 lines and output it.

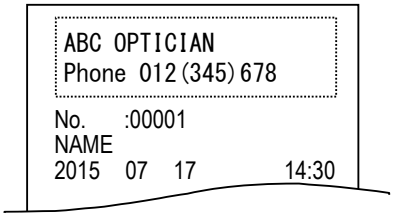


The message input screen on the left appears by selecting "On" and pressing Enter .

(1) Select the characters by pressing ← or → and input them by pressing Set .
A space can be input by pressing › .

(2) At the same time, the input cursor moves to the next input area to be ready for the next input.

(3) Go back to the setup screen by pressing OK after finishing the setting.



〔Print Out Sample〕

NOTE When changing the characters already inputted, press › switch and move the input cursor to the character to write over.

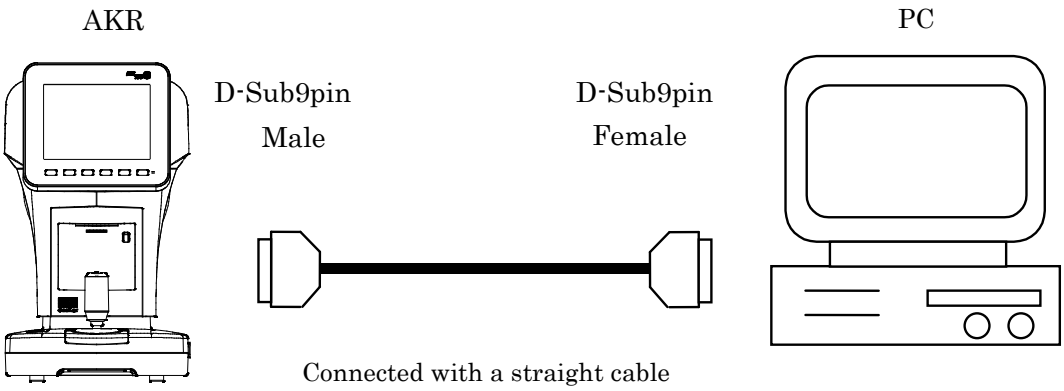
■ R/L Auto	Selects whether to switch between right and left eyes automatically. ・OFF: Cancel the auto-switching function of right and left eyes. ・ON: Activate the auto-switching function of right and left eyes.

【Screen 3】

■ P.K.	Select the selecting corneal-peripheral curvature radius measurement.
■ Photo	Select the anterior eye color shooting.
■ Joystick	Change the operating direction of joystick. ・Type A: With the rotating operation of the roller, move the measurement unit back and forth, and with back and forth operation of the joystick, move the measurement unit up and down. ・Type B: With the rotating operation of the roller, move the measurement unit up and down, and with back and forth operation of the joystick, move the measurement unit back and forth.
■ Default Setting	Reset the settings to the factory setting.

7.8 Output

【Connection: RS-232C】



【Connecting Diagram: RS-232C】

D-Sub9pin			D-Sub9pin	
RXD	2	———	2	RXD
TXD	3	———	3	TXD
GND	5	———	5	GND

NOTE Use the shielded line to protect the output data from noise.

※ Contact your local distributor about the details of the operation, the connection, the output data.

Do not connect to other than PC.

In case of connecting the device to other devices using RS-232C connector and USB, it should be connected with devices complying with IEC60601-1 or IEC60950.

【COM Port Output Setting】

-In case of using RS-232C-
When deciding the transmission speed, select BAUDRATE and select one from the list below for RS-232C.

Selectable BAUDRATE	Standard Setting
115200bps	○
38400bps	
9600bps	

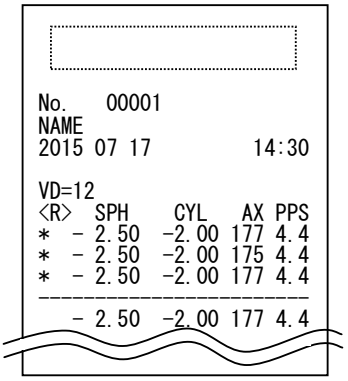
NOTE
For RS-232C, CHARACTER (bit number), PARITY (check of the forwarded data), STOPBIT (finish code) cannot be changed from initialization number, CHARACTER (8), PARITY (NONE), STOP BIT (1).

-In case of using USB-
When using USB, the output mode cannot be changed.
(Initial setting is BAUDRATE (921600), CHARACTER (8), PARITY (NONE), STOP BIT (1))

NOTE
When using USB, need a specific devise driver.
Contact your local distributor about the specific devise driver.

7.9 Low Reliability Mark Display Function

This device has the low reliability mark display function. The low reliability mark is displayed on the measurement result which reliability is low when taking the refractive measurement with this function activated. Consider the refractive measurement value with the low reliability mark as reference.

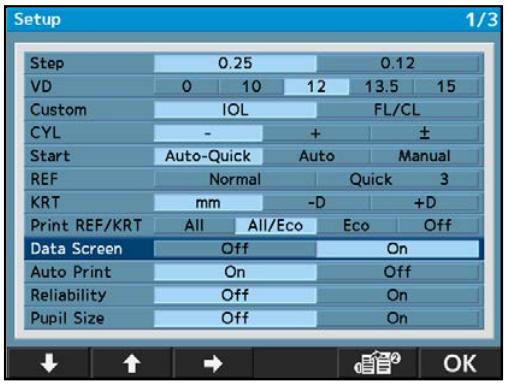


【Example of printout】

7.10 Data Screen Function

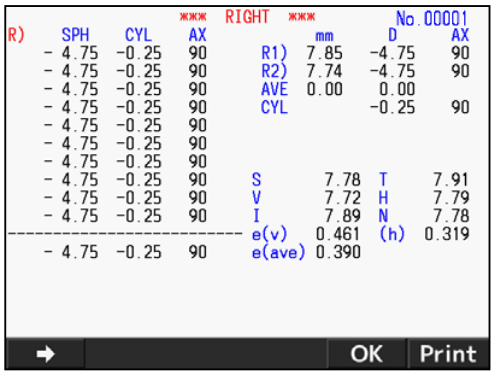
Measurement result that is saved in the memory can be displayed on the monitor and checked easily by using the data screen function.

When displaying measurement data on the screen



(1) Set the 'Date Screen' on of the setup screen.

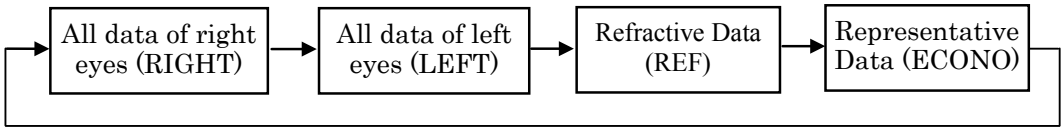
> **NOTE** In case that the setting of "Data Screen" is "On", the measurement data of the right eye is displayed regardless of the settings of "Print REF/ KRT".



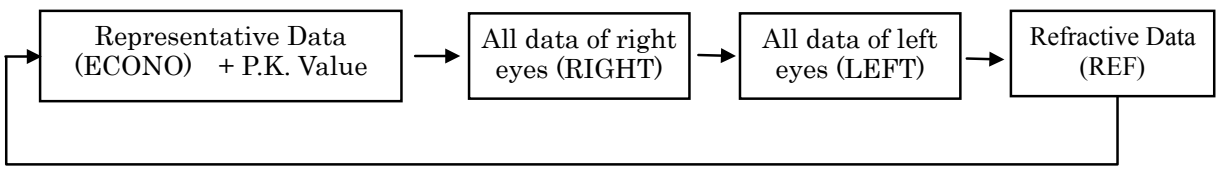
(2) It is displayed as shown on the left by pressing the print switch after the measurement.

> **NOTE** When the measurement is made with the IOL measurement mode, 'I' is indicated on the left side of the measurement value.
>
> Ex) : SPH CYL AX
> I - 4.75 -0.25 62

(3) If pressing → with the data display is on the screen, the display screen will be changed as below.



—When measuring P.K.—



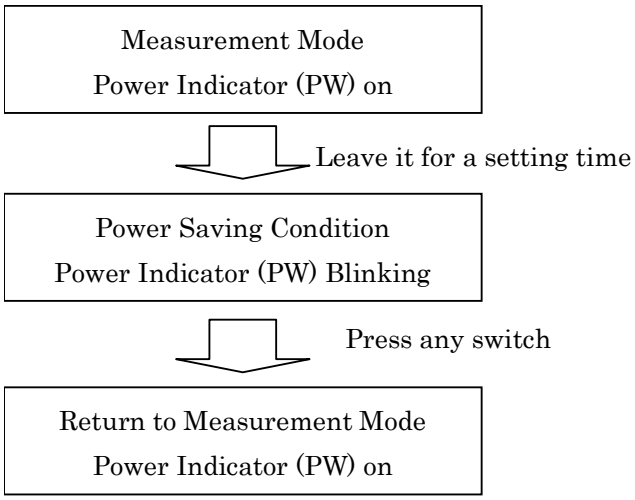
(4) When printing the data on the screen out again, press Print one more time.

(5) Press OK to return to the measurement screen.

7.11 Power Saving Function

The power saving function will start operating when switch operation is suspended with the power on.
(Refer to '7.7 Setup Screen Setting【Save(min)】' for details of the switchover time to power saving function.)

To return to the measurement mode, press any switch (any switch on the front panel or the measurement start switch).



8. Tip for Effective Measurement

(1) Do not allow external light to directly penetrate the room.

(2) Fluctuation of values during measurement may occur if the examinee looks something other than the target. Urge the examinee to concentrate on the target set in front.

(3) Talk to the examinee in a relaxed and friendly manner, so as to allay any fear or doubt they may have.

(4) Inappropriate height of a chin rest or a chair will cause the examinee fatigue. Adjust the (optional) instrumental table to establish the most comfortable and convenient position for the examinee.

(5) When the eyelash or eyelid interfere measurement, an error will occur in the measurement. Urge the examinee to keep his/her eye open wider.

(6) Tear residue or eye mucus, etc. trapped on the corneal surface may cause measurement errors. Check the surface with LCD monitor, and if you see something moving when the examinee blinks, remove it before measurement.

(7) When the pupil of the target eye is smaller than the minimum pupil diameter measurable, correcting measurement will be impossible. When the pupil is too small to take correct measurement, make the surroundings (room) or the target darker to allow the pupil to dilate as much as possible.

(8) If the examinee moves his/her head during measurement, AXIS value will be adversely affected. Ask him/her to maintain correct posture.

9. Error Messages

This device automatically evaluates measurement condition or result and indicates error messages if it is invalid. An error messages also appear when abnormality is detected in its operational system.
When any error messages appear, always check the system with a supplied model eye. If it appears when no abnormality in system is detected, check the measured eye for eye diseases or problems.

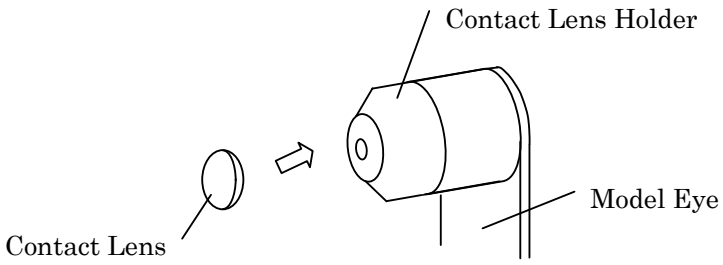
Message	Cause	Corrective Action
RETRY	Failed to capture eye image because the examinee blinks or moves during measurement or the examined eye has eye diseases.	Try alignment precisely and conduct measurement again. Consult your dealer immediately if the message appears again. **Do not try to repair by yourself.**
SPH OVER	Exceeded spherical measurement range (-25 to +25D). (In case of VD=0, contact value)	
CYL OVER	Exceeded cylindrical measurement range (0 to ±10D).	
Target motor fault	Detected abnormality in motor control system.	Cut the power and turn it back on. Consult your dealer immediately if the message appears again. **Do not try to repair by yourself.**
Focus Motor fault.		
EEPROM fault	Failed to initialize.	
Printer cover opened.	It is indicated when the printer cover is opened.	Close the printer cover.
Printer Overheated.	Printer head is overheating.	Cut the power and stop using until the head cools off. Consult your dealer immediately if the message appears again. **Do not try to repair by yourself**
Paper Empty	No printer paper.	Set the printer paper. Refer to '12.1 Reloading Printer Paper.'
Please reset the paper	The printer cover is not closed properly.	Close the printer cover properly until the ejection button comes out toward.

10. Contact Lens: Base Curve Measurement

This device can measure base curve of hard a contact lens.
To do so, attach a contact lens onto a contact lens holder of the model eye as below.

(1) Put a small amount of water on the concave side of the contact lens holder.

(2) Place the contact lens so that its convex side faces the holder.



(3) Confirm the contact lens is firmly adhered to the holder with water and does not slip down, set the model eye unit to measure.

11. Main troubles and troubleshooting

If there is malfunction found, refer to the table below to tale appropriate measures.

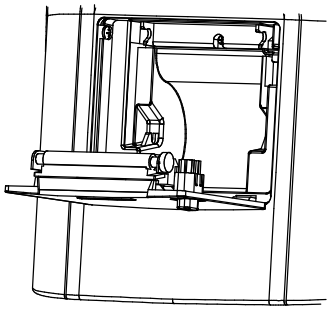
 WARNING	Never disassemble, modify or repair the device. Personal injury may result from electric shock.

Symptoms	Causes and Measures
The monitor and power indicator are not turned on.	・The power cord may not be properly connected. Make sure to connect it securely. Fuse may be blown. If so, replace it with the new one.
Fuse is blown when the power switch is turned on.	・Contact your local distributor immediately.
The monitor display suddenly disappears.	・The saving function may be activated. Press any switch to deactivate the saving function.
The moving parts such as a joystick are not moving appropriately.	・Do not move the part forcibly. Contact your local distributor or service person.
The apparatus does not print out.	・Check if the papers are set. Reload them if the papers are out. ・The printer cover may not be closed properly. Close it properly until the ejection button comes out toward. ・Print REF/KRT on the setup screen may be set as Off. Change the setting.
The printer paper comes out but no printing.	The printer paper may be set in a wrong direction. Set the paper properly.
The date setting becomes inaccurate.	The battery inside the apparatus may dead. Keep the power on for 24 hours to recharge it.

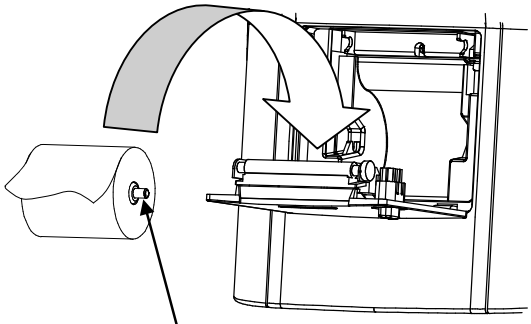
Contact your local distributor immediately if the situation does not improve even when the measures mentioned above are taken.

12. Storage and Maintenance

12.1 Reloading Printer Paper



1) Remove a printer cover and take a printer paper shaft out.

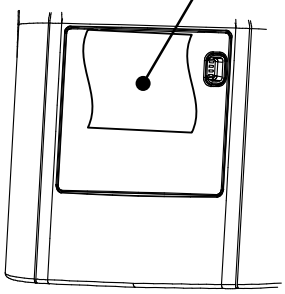


Make sure to set the shaft of the printer paper.

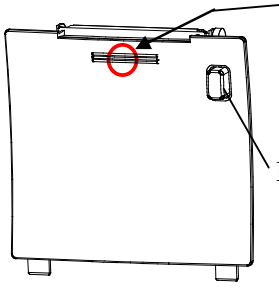
2) Pay attention to direction of the paper rolled up and set a roll of printer paper.

Note) Set the paper to come out toward the front from upside.

Set this as a small amount of paper ejected.



3) Close the printer cover. If the cover is not closed properly, the error message appears and it cannot print out the data.



Close the printer cover until it clicks (until the ejection button comes out toward) by pressing the middle of the pressing mark.

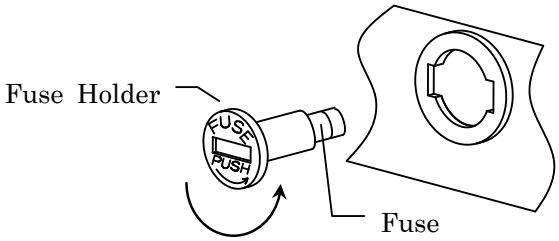
Ejection button

12.2 Fuse Replacement

WARNING	When replacing a fuse, unplug the power cord from the unit before removing the fuse holder. You may be in danger of electric shock if you remove the fuse holder without unplugging the power cord.

When the fuse is blown, remove a fuse holder at the side of a main unit for replacement. Pushing the fuse holder, rotate it in the direction of the arrow below and you can remove it.

Always use the specified fuse (T2A L 250V).



Rotate the holder counterclockwise.

12.3 Storage

(1) Points to check for long-term storage

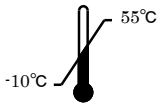
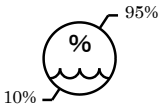
- Turn the power switch OFF.
- Remove the power cord from the outlet.
- Turn the power on and press Clear switch and Print switch in the measurement standby mode and set the device as the package mode.
- Put the dustproof cover on the optical unit.

(2) Notes on storage environment

Avoid storage under the following conditions.

- Where dust accumulates.
- Where water may get on the unit.
- Where temperature and humidity are high.
- Where sunlight directly contacts.
- Unstable and /or high place

Always follow the environment conditions below for storage.

Environmental Conditions for Storage	
	

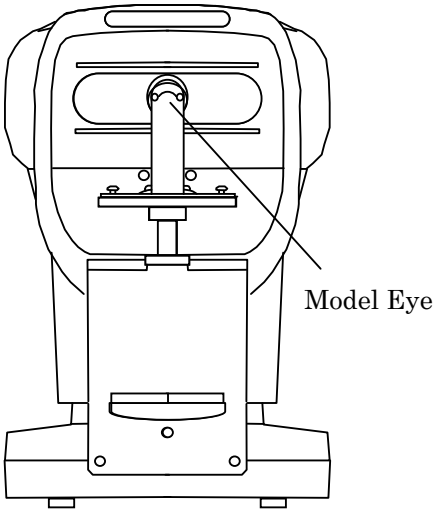
Check the items above in case that the device is not used or is stored for a long time. When you reuse the device after long-term storage, operate according to instruction in '6. Preparation for Measurement '.

12.4 Confirmation of Measurement Accuracy

It is extremely important to check operation and accuracy of the device using a supplied model eye. We recommend checking accuracy periodically.
When the measurement result of the model eye falls anywhere within the tolerance listed below, measurement should be considered reliable and accurate. When the result exceeds the tolerance, contact your dealer immediately.

Mode Eye Data		
SPH	CYL	R
Indicated value ±0.25	0±0.25	Indicated value ±0.03

※ Precise value of the supplied model eye is indicated on the model eye stand (VD=12).



Note for setting of mode eye

- Remove the contact lens holder and set the model eye carefully not to incline back and forth and around.
  Cannot take the CYL value data if the model eye inclines.
- Set the model eye at the position where an alignment mark is located at the center of the reticle mark and the model eye comes into focus.
- All of the conditions above are met, start the measurement.

12.5 Periodical Inspection and Maintenance

To prevent malfunction and accidents and maintain to performance and reliability of the product, it is recommended to request your distributor for the periodical inspection and maintenance once a year.
The periodical inspection and maintenance include inspection of the function and performance of the product, and cleaning, adjustment and replacement of consumable parts if necessary.
It is recommended for the distributors to perform the cleaning of each part, performance check and accuracy check at least once in a year.
Cleaning of each part： exterior parts and optical system
Performance check：main unit and each switch
Accuracy check：measurement function of refractive power and corneal curvature radius

13. Specification

Refractive Measurement Range	Sphere (S)	-30D to +22D (In case of VD=12) (step: 0.12/0.25D)
	Cylinder (C)	0 to ±10D (step: 0.12/0.25D)
	Axis (A)	0 to 180° (1°unit)
Corneal Curvature Radius Measurement	Corneal Curvature Radius	5.0 to 10.0mm (step: 0.01mmun)
	Corneal Refractivity	33.75 to 67.5D (However, Corneal Refractive n=1.3375) (step: 0.12/0.25D)
	Degree of Corneal Astigmatism	0 to ±10D (step: 0.12/0.25D)
	Axis Angle	0 to 180° (step:1°)
	Peripheral Measurement	ϕ 7.0mm
Vertex Distance	0, 10, 12, 13.5, 15mm	
Minimum Pupil Diameter	ϕ 2.2 mm	
PD Measurement	Measurement Range	85mm (step: 1mm)
Measurement Time	Refractive Measurement Corneal Curvature Radius	approx. 0.07sec. approx.0.07sec.
Printer	The Thermal Line Printer with auto-cutter (paper width57mm)	
Internal Monitor	7.5inches color LCD monitor (TFT)	
Shifting Range of the Sliding Body	back/forth±16mm right/left±43mm up/down±12 mm	
Vertical Adj. Range of Chin Rest	±30mm	
Dimensions	(W) 260mm (D) 442mm (H)452mm	
Weight	Approx.16kg	
Data Output	RS-232C interface USB	
Power Source	100 to 240V 50/60Hz	
Consumption	90VA	
Power Saving Function	OFF, 3, 5, 10mins (switchable)	

The circuit diagram, parts lists, and description and instructions for calibration and testing are available separated from this manual.

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