

USER MANUAL

Auto-phoropter





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.



INTRODUCTION

This instrument is to inspect the refractive error of the eyes subjectively.

ABOUT THIS MANUAL

This manual contains information on correct handling and operational procedures as well as safety consideration pertinent to AUTO PHOROPTER APH550.

Connectable chart display unit: CP550, CSPOLA600, CS550

This instrument complies with IEC60601-1.

Before carrying out measurement and/or adjustment, read the instructions thoroughly so that effective operation is ensured.

- (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

APH550 is a Class I, Type B medical Instrument.






This instrument complies with Medical Device Directive 93/42/EEC, respectively, as amended by Directive 2007/47/EC.

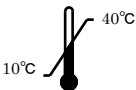




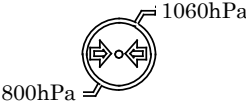


A great deal of consideration has gone into the design and manufacturing of this instrument with regard to its operational ease, the patient's safety and well-being as well as to the reliability of the product.

For safer and more effective use, however, follow the points described in this manual.

This instrument is designed for professional use.

~General Definitions of Safety Symbols in This Manual~

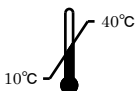

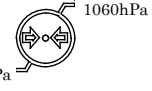
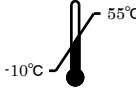
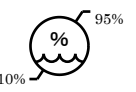
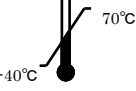
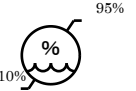
 Caution	Personal death or serious injury could occur if disregarding this information and performing a wrong operation.
	Denotes general ban or prohibition.
	General mandatory action.
	Recommended references to read.
 NOTE	Additional information which is important to the text or useful/convenient to know.


	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.
	This is the type B equipment.
	Symbol for “MANUFACTURER”.
	Symbol for Compliant with CE marking i.e. with applicable European directives.
	The number of the left indicates the lower limit and on the right indicates the upper limit of the atmospheric pressure.
	This way up.
	Manufacturing date (year)
	Special collection for this type of electrical and electronic device

Caution

General Caution

- If fingerprints or dust are on the optical parts such as a measuring window, it affects on accuracy of the measurement. Do not touch them with fingers and avoid dust.
- If fingerprints or dust are on the optical parts, wipe them gently with a soft cloth.
- Observe the following environmental conditions for use and storage.

	Temperature	Humidity	Atmospheric pressure.
Use			
Storage			
Transportation			

 No dew condensation

- Do not install the instrument adjacent to the wireless applications such as TV and radio etc. The instrument may generate noise in the TV and radio.
- If spilling liquid on the instrument or getting foreign substances into the instrument, remove the plug from the outlet and consult your dealer.
- If the abnormalities (noise, smoke etc.) happened, remove the plug from the outlet and consult your dealer. Fire or personal injury could result if keep using it.
- At no time, attempt to disassemble the instrument. Malfunction or fire could result.

If the instrument fails to work properly, do not touch inside. Remove the plug from the outlet and consult your dealer.

Power Source

- Make sure to use the earth cable of the power cord with connecting to the earth terminal.
- Do not damage the power cord (folding it extremely small, pulling it or putting a heavy object on it etc.). Also do not remodel it. If the power cord is damaged (disconnection, damages of the covering), replace it with a new one. Electric shock or fire could result if keep using it.
- Make sure that the power cord is all the way seated in the outlet and the instrument. If it is not all the way seated, fire or electric shock could result.
- Always clean the power cord to avoid dust or oil etc. Malfunction or fire could result if the terminal unit is dirty.
- If the power cord becomes hot after using the instrument, check dirt of the terminal unit. If no dirt is found, replace the power cord with a new one. Fire or malfunction could result if keep using it.
- Use the instrument with the appropriate power-supply voltage. Malfunction or fire could result if keep using it with the power-supply voltage which is over the rating.
- Hold the plug part when inserting the power cord in/out.
- Do not touch the power plug when hands are wet. Electric shock could result.
- Remove the plug from the outlet when not using the instrument for a long time.


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 of the equipment or system.

Guidance and manufacturer’s declaration – electromagnetic emissions		
APH550 is intended for use in the electromagnetic environment specified below. The customer or the user of APH550 should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	APH550 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.
RF emissions CISPR 11	Class A	APH550 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.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	
RF emissions CISPR 14-1		
RF emissions CISPR 15		

Guidance and manufacturer's declaration – electromagnetic immunity			
APH550 Image Intensifier is intended for use in the electromagnetic environment specified below. The customer or the user of APH550 Image Intensifier 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 APH550 Image Intensifier requires continued operation during power mains interruptions, it is recommended that APH550 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	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity			
APH550 is intended for use in the electromagnetic environment specified below. The customer or the user of APH550 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	3 Vrms 150 kHz to 80 MHz	3 Vrms	<p>Portable and mobile RF communications equipment should be used no closer to any part of APH550, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2.3\sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$ <p>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).</p>
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	<p>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</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
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 APH550 is used exceeds the applicable RF compliance level above, APH550 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating APH550.			
^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

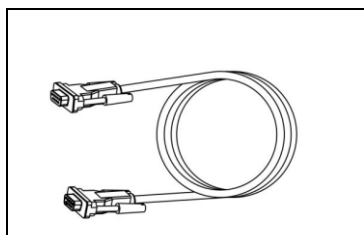
Recommended separation distance between portable and mobile RF communication equipment and APH550			
APH550 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of APH550 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and APH550 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	80MHz to 800MHz	800MHz to 2.5GHz
	$d = 1.2\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
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

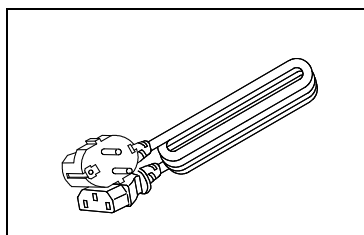
INTRODUCTION	1
ABOUT THIS MANUAL	1
SAFETY CONSIDERATION.....	1
Caution	2
Electromagnetic Compatibility	4
Contents.....	8
Accessories	10
1. Instrument.....	12
1.1 General description of instrument	12
1.2 Intended use defined	12
1.3 Classification of Device.....	12
1.4 Mode of Operation.....	13
1.5 Connection of the instrument	13
1.6 Identification of each unit of the head	14
1.7 Identification of each unit of the controller	16
1.8 Identification of each unit of the relay box	17
2. Conveyance.....	18
3. Installation	18
4. Instructions and Directions for Use.....	19
5. Operation Procedures.....	20
5.1 Operation list	20
5.2 Measurement preparation	22
5.3 Operation screen	23
5.4 Basic operation.....	24
5.5 Setting of the chart	28
5.5.1 Operation of the chart selection area	28
5.5.2 Operation at the time of selecting the chart for vision measurement	29
5.5.3 Operation at the time of selecting the dots chart	32
5.5.4 Operation at the time of selecting the other charts	33
5.5.5 Operation at the time of selecting the near point chart.....	33
5.6 Other operations	34
5.6.1 Operation at the time of cross cylinder mode	34
5.6.2 Setting of the auxiliary lens.....	35
5.7 Input of the external data	37
5.7.1 Data input from the auto refractometer	37
5.7.2 Data input from the lensmeter	38
5.7.3 Data input from PC	38
5.7.4 Manual input to the “External data” area	39
5.8 Operation of the menu area	40
5.8.1 Switch of performance at the time of selecting chart.....	40
5.8.2 Save and calling up of the measurement data.....	40
5.8.3 Output of the measurement values	42

5.8.4	Selection of the measurement program	43
5.8.5	Selection of fogging.....	43
5.8.6	Selection of working distance.....	44
5.8.7	Setup.....	44
5.9	Edit of the chart and measurement program	54
5.9.1	Edit of the chart selection area.....	54
5.9.2	Edit of the measurement program	57
6.	Measurement Procedures.....	60
6.1	Astigmatism measurement.....	60
6.1.1	Clock dial chart	60
6.1.2	Dots chart.....	61
6.2	Red/ green Test	61
6.3	Binocular balance test	62
6.4	Phoria test	62
6.5	Aniseikonia test	63
6.6	Worth 4 dots test.....	63
6.7	Maddox test.....	64
7.	Cautions at the Time of the Measurement	65
8.	Error Display.....	66
9.	Major Troubles and Provisions	67
10.	Maintenance and Storage	68
10.1	Replacement of the printer paper.....	68
10.2	Replacement of the fuse	69
10.3	Storage of the instrument	69
10.4	Cleaning.....	70
10.5	Periodical inspection and maintenance	71
10.6	Disposal	71
11.	Specifications.....	72

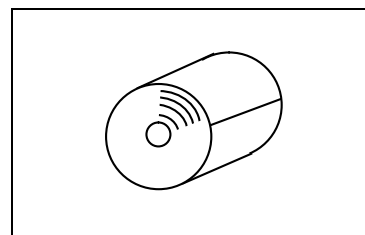
Accessories



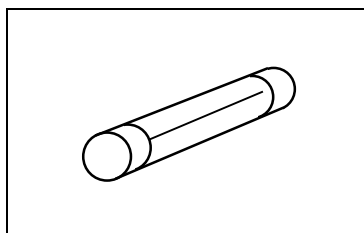
Communication cable: 2
(6m)



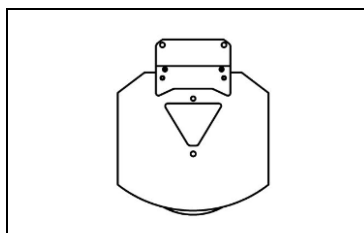
Power cord: 1
(2.5m)



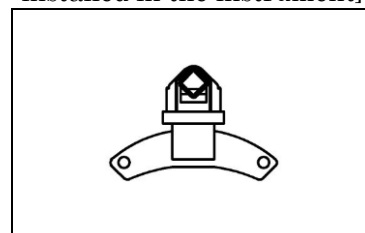
Printer paper: 3
(width 57mm)
[two packed and one
installed in the instrument]



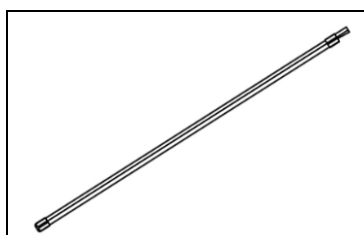
Fuse: 2
(EWM AC250V 2A)



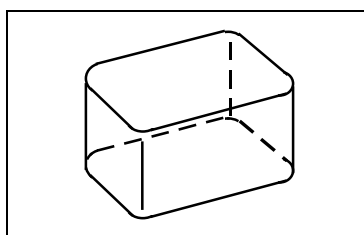
Near point chart: 1



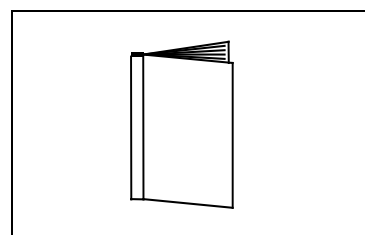
Near point holder: 1



Near point chart bar: 1



Dust cover: 1



Operation 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 one may adversely affect other instruments and/or cause malfunction of the instrument. Always use the accessory specified by us.



- Avoid direct sunlight, high humidity and temperature when storing printer paper which is a thermal paper.

1. Instrument

1.1 General description of instrument

This instrument (APH550) is to examine the eyes subjectively by placing the lenses in front of the examinee's eye. For the subjective eye examination, there are two types of examinations: monocular vision and binocular visions. This instrument enables both examinations. Refer to "4. Instructions and Directions for Use" about the precautions for use about this instrument.

1.2 Intended use defined

The purpose of this instrument (APH550) is to examine the refraction subjectively. The subjective refraction examination is to perform the examination of the visual function by placing the chart and switching the corrective lenses incorporated.

1.3 Classification of Device

According to European directive on medical device, the APH550 is a class I medical device. It is marked **CE** . Date of first marking February 2016. The expected lifetime is 7 years

Type of protection against electrical shock: Class I Equipment

Class 1 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 with 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.

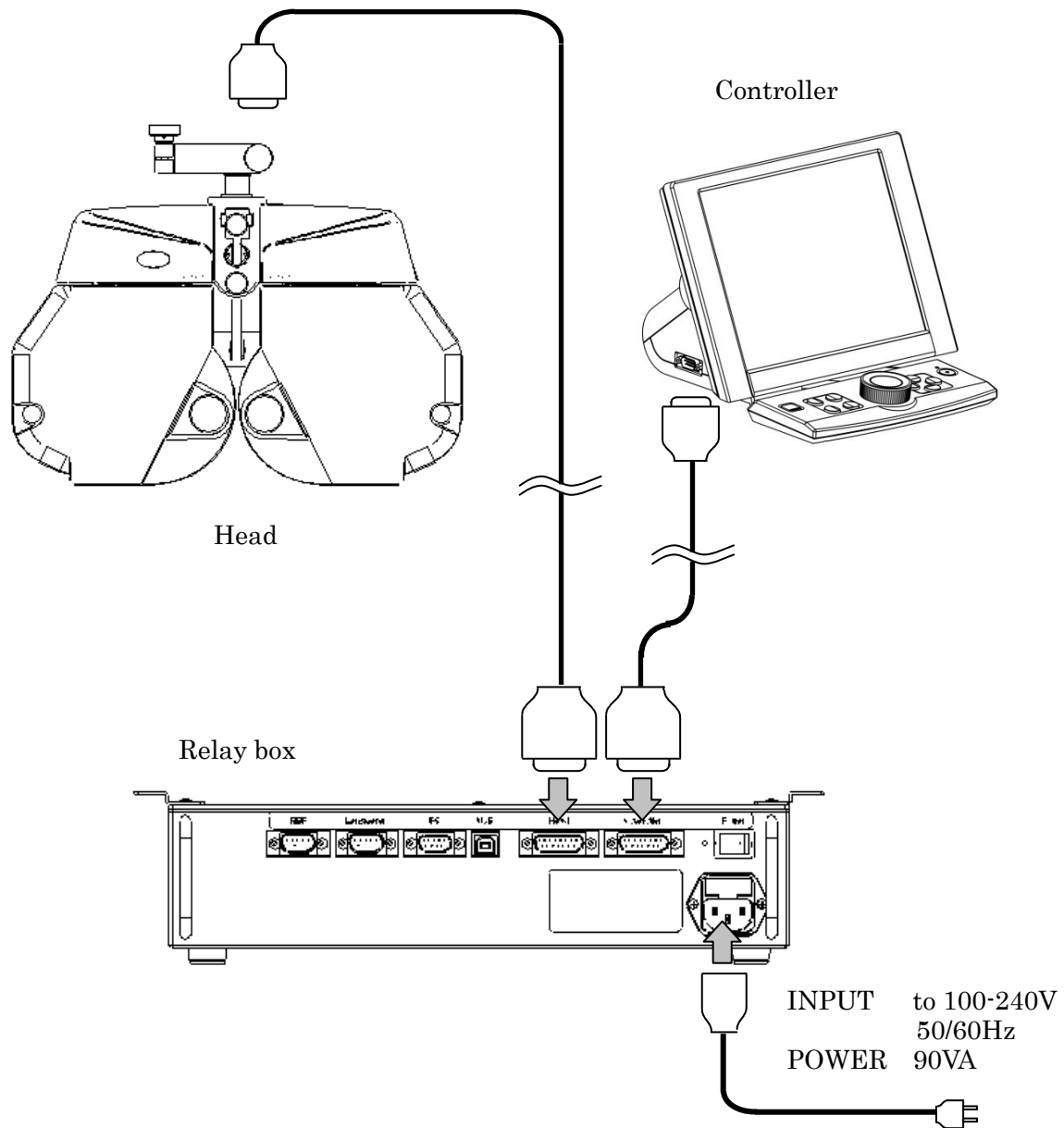
Classification by operation mode: Continuous operation with short-time loading.



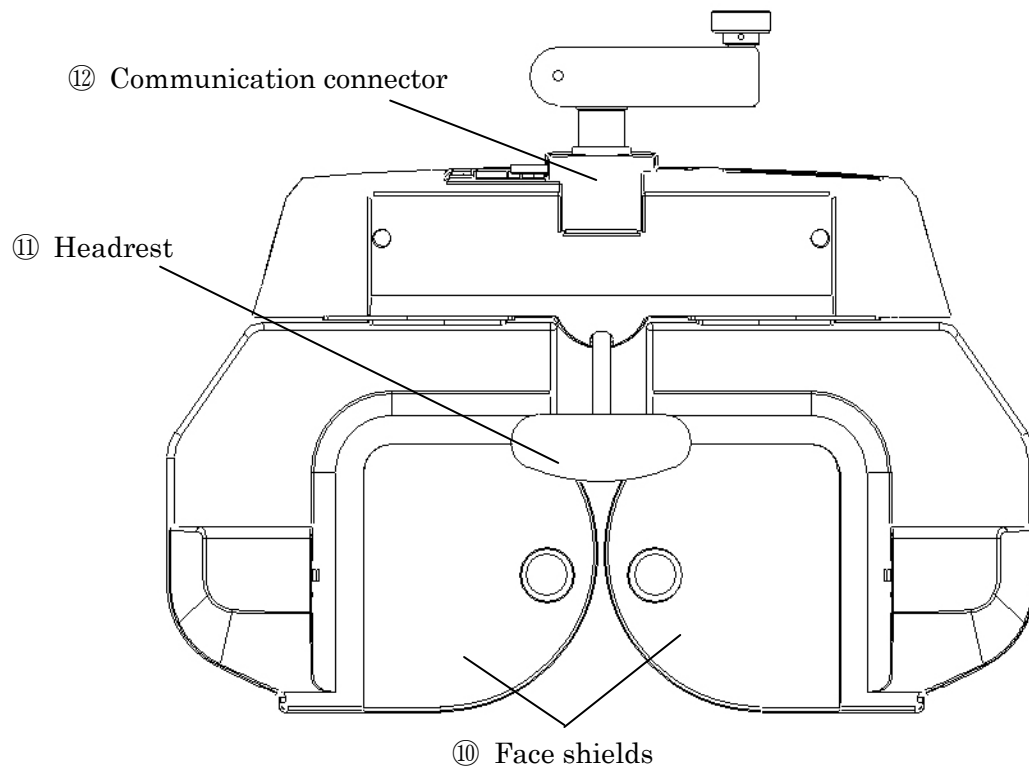
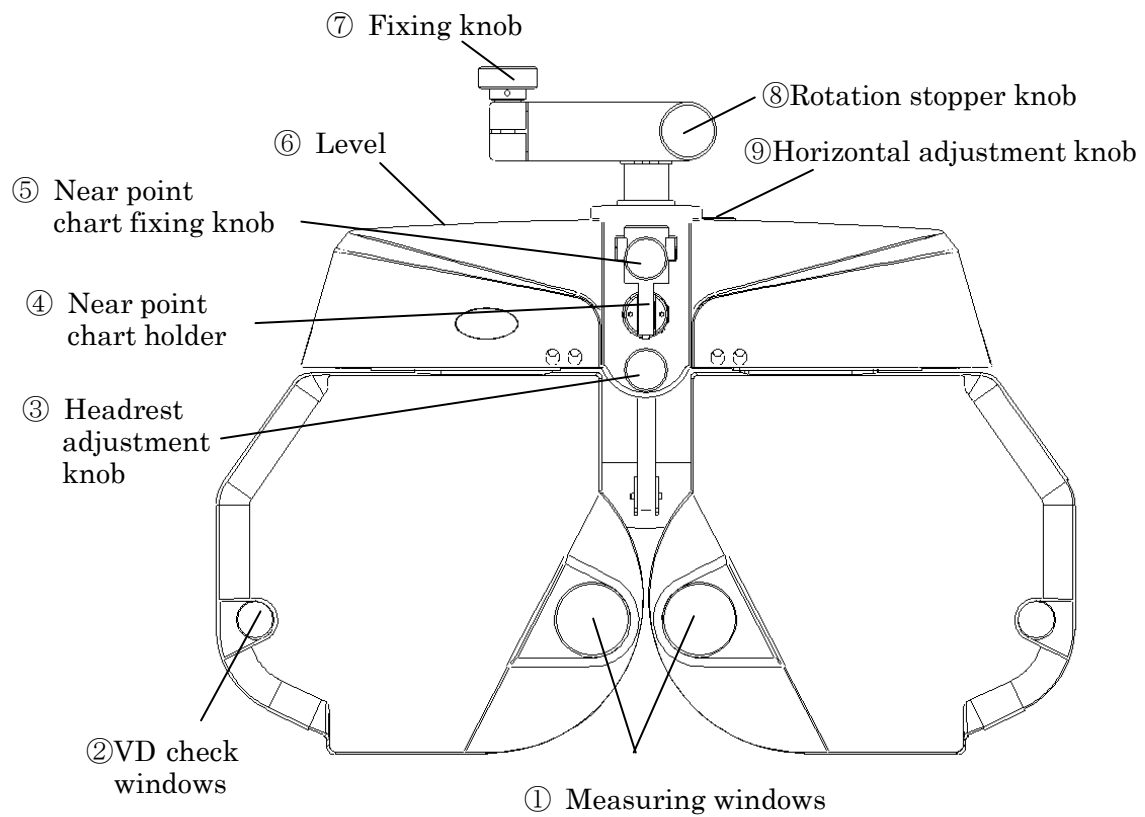
1.4 Mode of Operation

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

1.5 Connection of the instrument



1.6 Identification of each unit of the head



① **Measuring window**

The window which the examinee looks at the chart

② **VD check window**

It can check VD of the examinee.
Refer to “5.4 Basic operation – VD adjustment” for usage.

③ **Head rest adjustment knob**

The knob to adjust VD. The head rest moves back and forth by rotating this knob.

④ **Near point chart holder**

Fix the near point chart bar at the time of using the near point chart.

⑤ **Near point chart fixing knob**

The knob to fix the near point chart bar after inserting it into the near point chart holder.

⑥ **Level**

Use this to confirm that the head is horizontal.

⑦ **Fixing knob**

Use this to place the head on the arm of the measurement table etc.
(When fixing it on the measurement table, secure it with the screw underneath of the arm of the head.)

⑧ **Rotation stopper knob**

The knob to stop rotation of the head unit.

⑨ **Horizontal adjustment knob**

The knob to adjust the head unit horizontally.
Adjust it with checking the level.

⑩ **Face shields**

The parts which the cheeks of the examinee touch to during the measurements.
Always clean the parts because they contact with skin directly.
Refer to “10.4 Cleaning”.

⑪ **Head rest**

The place which the examinee puts his/her forehead on at the time of the measurement.
Always clean the parts because they contact with skin directly.
Refer to “10.4 Cleaning”.

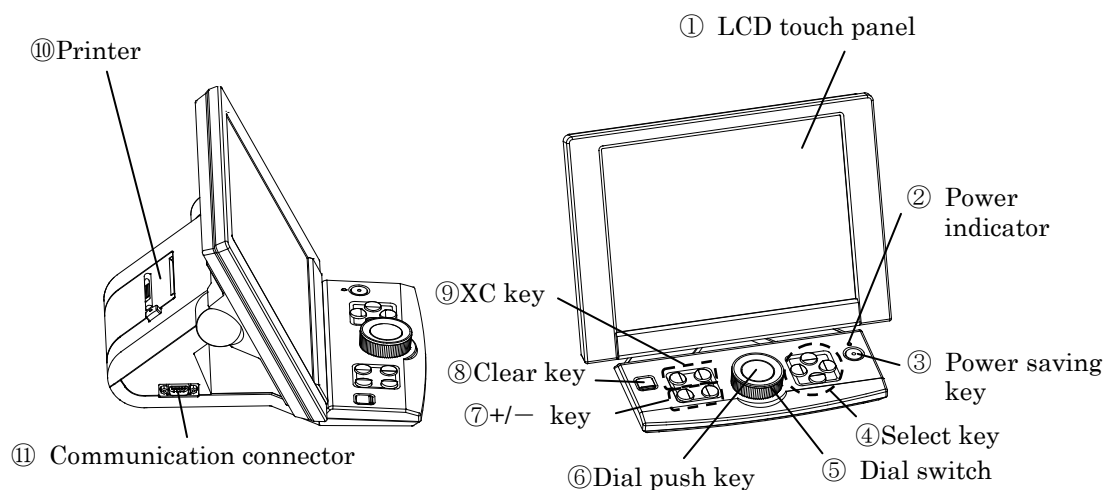
⑫ **Communication connector**

The connector to communicate with the relay box.
Plug the communication cable here.



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

1.7 Identification of each unit of the controller



① LCD touch panel

Display the conditions of the measurement data and the chart.
It is operated by touching the LCD.

② Power indicator

The light is on when the power is on and the light is off when the power is off.

③ Power save key

The button to switch ON/OFF of the standby mode.

④ Selection key

This is to switch the chart or the setting.

⑤ Dial switch

This is to change the measurement value.

Turn to the left: change to + side

Turn to the right: change to - side

The cross cylinder lens is switchable at the time of XC mode*¹.

⑥ Dial push key

At the time of normal mode: switch PD/S/C/A/ADD/prism.

At the time of XC mode*¹: the lens is switched appropriately when the examinee selects the clearer one and the examiner presses the button.

⑦ +/− key

This is to change the power and angle of the lens. It is switchable by 1 step.

⑧ Clear key

Initialize the measurement values and memorized data.

⑨ XC key*¹

This is to switch the cross cylinder lens.

⑩ Printer

Print the measurement results out.

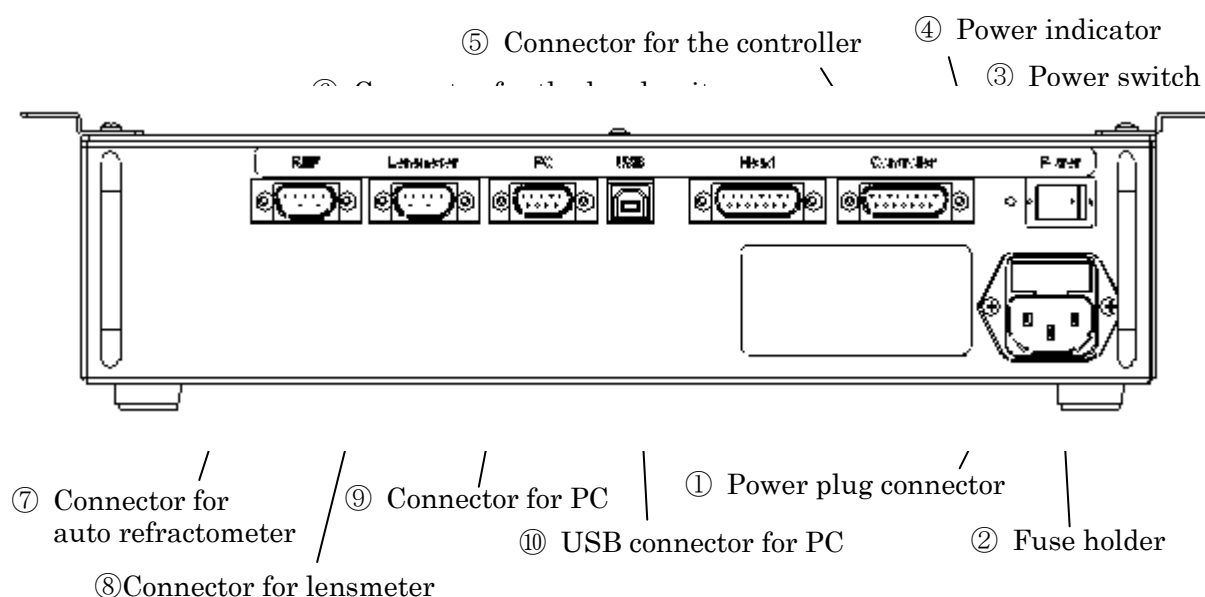
⑪ Communication connector

The connector to communicate with the relay box. Plug the communication cable here.



*¹ Refer to “5.5.3 Operation at the time of selecting the dots chart” about the operation procedures at the time of XC mode and of the XC mode.

1.8 Identification of each unit of the relay box



① Power plug connector

The outlet of the power cord.

② Fuse holder

There is a fuse (EWM AC250V 2A) in here.

Refer to “10.2 Replacement of the fuse” about the replacement procedures.

③ Power switch

The switch to turn on/off the power.

④ Power indicator

The light is on when the power is on and the light is off when the power is off.

⑤ Connector for the controller

The connector to communicate with the controller.

Insert the communication cable here.

⑥ Connector for the head unit

The connector to communicate with the head unit.

Insert the communication cable here.

⑦ Connector for the auto refractometer

The connector to communicate with the auto refractometer.

⑧ Connector for the lensmeter

The connector to communicate with the lensmeter.

⑨ Connector for PC

The connector to communicate with PC.

⑩ USB connector for PC

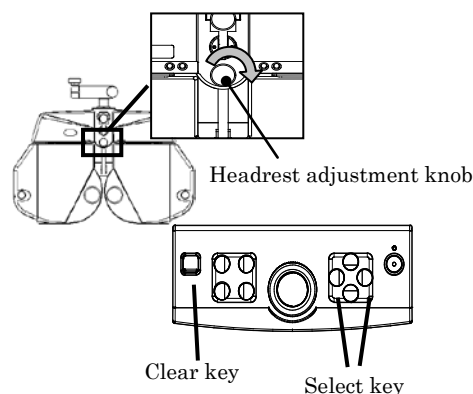
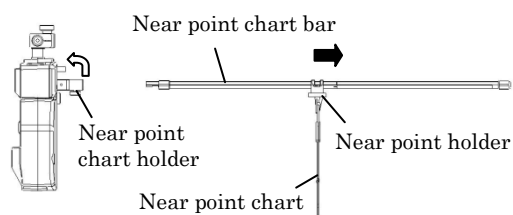
The connector to communicate with PC.

2. Conveyance



Set the device as below at the time of conveyance.

- Remove the near point chart, the near point holder and the near point chart bar from the head.
- Place the headrest at the closest position to the head side.
- Press and hold the clear key on the controller and, ◀ and ▶ of the selection key at the same time.
The head moves as it can be packed.



3. Installation

Installation procedures

- 1) Place the head on the arm of the measurement table and fix it with the fix knob.
Also, to prevent drop, secure it with the screw underneath of the arm of the head.
- 2) Set the printer paper in the printer.
Refer to “10.1 Replacement of the printer paper” about the setting procedures.
- 3) Connect the each instrument. Refer to “1.5 Connection of the instrument” for the details.
- 4) Make sure that the head is not inclined by checking it with the level.
If it is inclined, adjust the head to be horizontal with the horizontal adjustment knob.

Precautions at the time of installation

Observe precautions below at the time of installation.



- Do not install the device at the places where dust or rubbish accumulates. Environment with extremes in heat and humidity should also be avoided.
- Keep away from inflammable or explosive gases as well as storage areas housing medical supplies and chemicals.
- Keep the device away from the places that may experience strong vibrations or sudden shocks.
- Do not drop the device because malfunction could result. Also it is very dangerous if it is dropped on your body or foot. Do not install the device at the unstable places.

4. Instructions and Directions for Use

1. This is a precision optical instrument. Always handle with care and avoid dropping it accidentally.
2. Make sure to use the earth cable with connecting to the earth terminal.
3. Do not touch the optical parts such as a measuring window with fingers and be sure to avoid dust, as their measurement accuracy could be adversely affected and incorrect values may result.



When dust or fingerprints are on the optical parts, use a soft cloth to wipe the buildup off. At that time, handle the instrument carefully not to scratch it.

4. If the cover is dirty, gently wipe it with a dry cloth. For hard to remove stains, wipe it off with a little water or using neutral detergent.



Avoid using organic solvents such as thinner because it will damage the water based paint finish of the instrument.

Clean the chinrest and headrest with the neutral cleaner. For disinfecting them where the examinee may contact, use the ethanol for disinfection.

※ Ethanol for disinfection contains 76.9 to 81.4vol% of ethanol (C_2H_6O : 46.07) at 15°C (specific gravity).

5. When cleaning the LCD panel, use the absorbent cotton or soft cloth etc.
6. If the instrument is not used for a long time, remove the plug from the outlet.
7. When the instrument is not in use, protect it with a supplied dustproof cover.
8. Do not attempt to repair or remodel the instrument.
Never attempt to perform the internal service when the instrument fails to function properly. Contact us or your dealer.

5. Operation Procedures

5.1 Operation list

5.2 Measurement preparation (P.22)

5.3 Operation screen (P.23)

5.4 Basic operation (P.24)

- Setting of the near point chart (P.24)
- PD input (P.25)
- VD adjustment (P.25)
- Each type of input mode (P.26)
“Switch of the eye to be measured, S, C and A etc.” “Input of the values”
- Lock of the input value (P.27)
- Switch of the step (P.27)
- Switch of the masking (P.27)

5.5 Setting of the chart (P.28)

5.5.1 Operation of the chart selection area (P.28)

- Selection of the chart (P.28)
- Page switch of the chart (P.28)

5.5.2 Operation at the time of selecting the chart for vision measurement (P.29)

- Switch of chart auxiliary function (P.29)
- Masking of the chart (P.29)
- Random function (P.30)
- R/G button (P.30)
- Contrast button (P.31)
- Inversion button (P.31)
- Memory of the vision (P.31)

5.5.3 Operation at the time of selecting the dots chart (P.32)

- Operation of the custom area (P.32)
- Operation of the cross cylinder lens (P.32)

5.5.4 Operation at the time of selecting the other charts (P.33)

- Operation of the memory button area (P.33)
- Operation of the custom area (P.33)

5.5.5 Operation at the time of selecting the near point chart (P.33)

5.6 Other operations (P.34)

5.6.1 Operation at the time of cross cylinder mode (P.34)

- Entering procedures of the cross cylinder mode (P.34)
- Operation of the cross cylinder lens (P.34)

5.6.2 Setting of the auxiliary lens (P.35)

- Setting procedures of the auxiliary lens (P.35)
- The list of the auxiliary lens (P.36)

5.7 Input of the external data (P.37)

5.7.1 Data input from the auto refractometer (P.37)

5.7.2 Data input from the lensmeter (P.38)

5.7.3 Data input from PC (P.38)

5.7.4 Manual input to the External data area (P.39)

5.8 Operation of the menu area (P.40)

5.8.1 Switch of performance at the time of selecting chart (P.40)

5.8.2 Save and calling up of the measurement data (P.40)

5.8.3 Output of the measurement values (P.42)

5.8.4 Selection of the measurement program (P.43)

5.8.5 Selection of fogging (P.43)

5.8.6 Selection of working distance (P.44)

5.8.7 Setup (P.44)

- Operation in the setup mode (P.44)
- Setting of the parameter (P.45)

5.9 Edit of the chart and measurement program (P.54)

5.9.1 Edit of the chart selection area (P.54)

- Sorting of the chart (P.55)
- Edit of the measurement mode (P.56)

5.9.2 Edit of the measurement program (P.57)

5.2 Measurement preparation

- (1) Insert the power cord in the power plug connector of the relay box after confirming that the power switch of the relay box is OFF (○). Then, insert the power plug in the outlet.

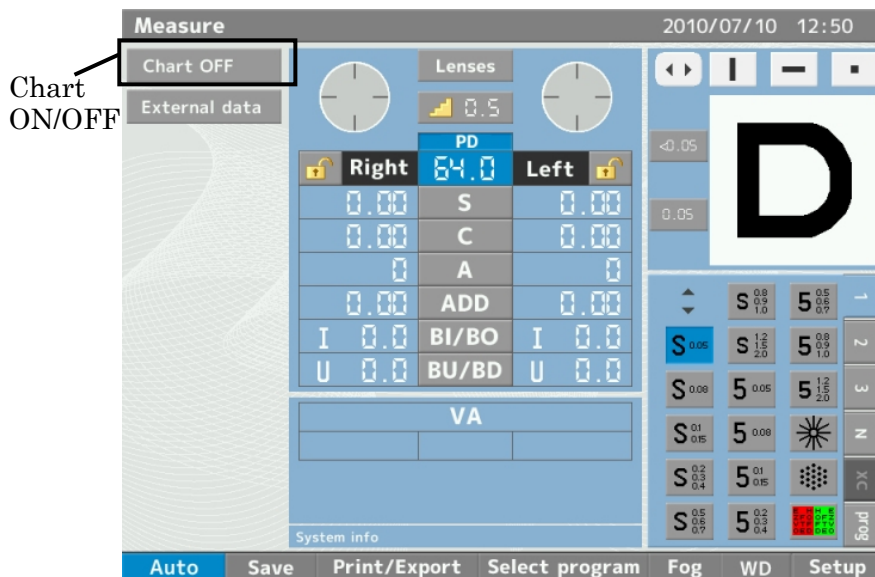


Always make sure that the cable is grounded.



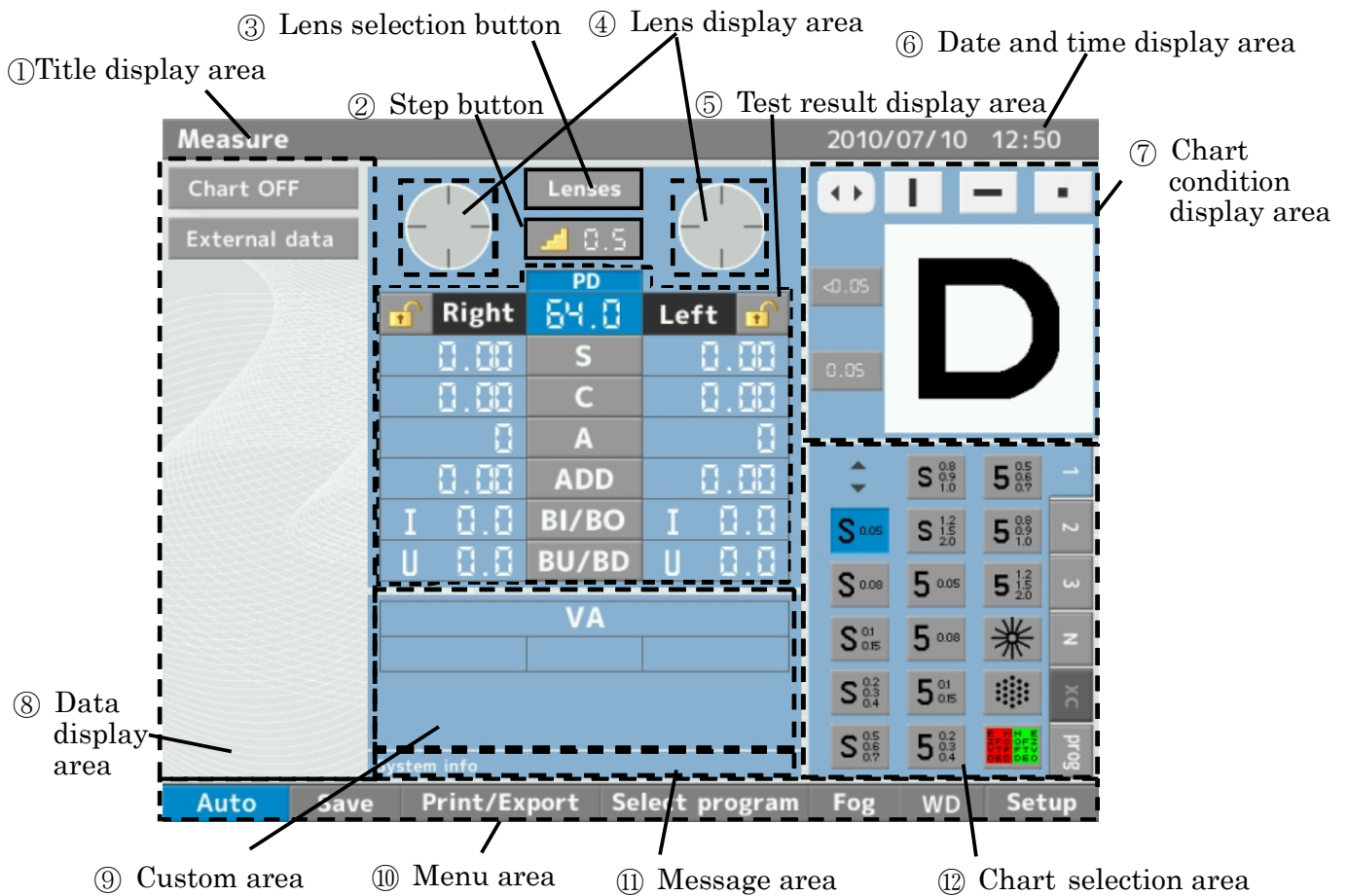
Do not use an additional power strip or an extension cord.

- (2) Turn on the power switch (|) of the relay box.
The screen below appears on the LCD of the controller.



- (3) Turn on the power of CSPOLA600, CS550.
- (4) When the chart type is displayed on the bottom of the screen of CSPOLA600, CS550, touch the “Chart ON/OFF button” on the screen of the controller.
If the display of the “Chart ON/OFF button” is already set as “Chart ON”, set it as “Chart OFF” once and set it back as “Chart ON” again.
The chart can be selected by the controller when the charts are displayed on the screen of CSPOLA600, CS550.
- (5) Make sure that the head is not inclined by checking it with the level.
If it is inclined, adjust the head to be horizontal with the horizontal adjustment knob.

5.3 Operation screen



① Title display area

Display the current condition.

② Step button

Switch the step of the each measurement value.

③ Lens selection button

Select the arbitrary lens.

④ Lens display area

Display the auxiliary lens which is set on the measuring window.

⑤ Measurement result display area

Display current condition of the lens.

⑥ Date and time display area

Display the current date and time.

⑦ Chart condition display area

Display the condition of the displayed chart.

⑧ Data display area

Display the data input from external and memorized data.

⑨ Custom area

Display the auxiliary function such as angle switch of the astigma lens.

⑩ Menu area

Display the menu.

⑪ Message area

Display the error message.

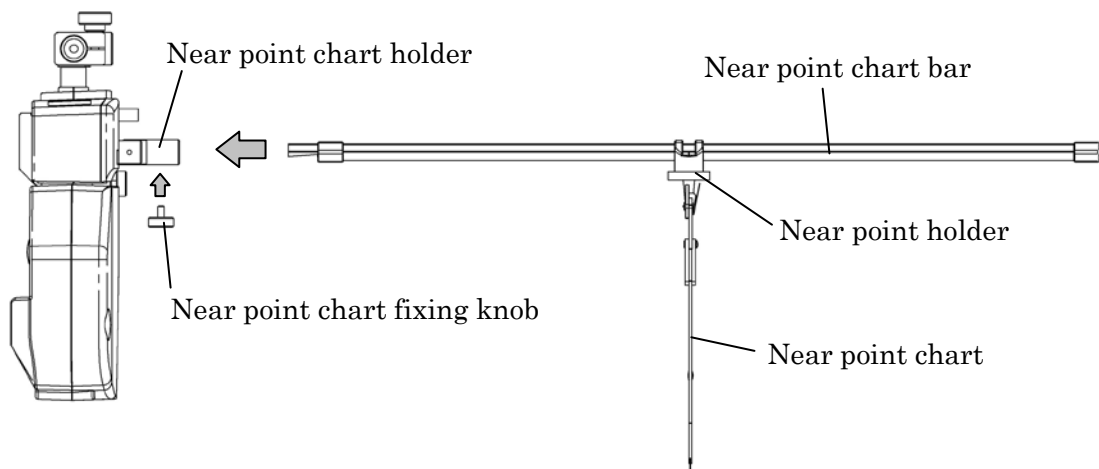
⑫ Chart selection area

Select the chart to display from the ones in this area.

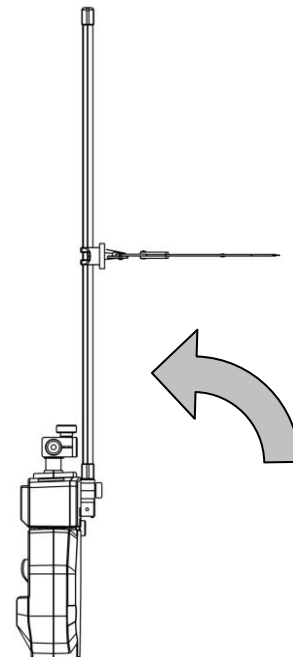
5.4 Basic operation

• Setting of the near point chart

- (1) Attach the near point chart to the near point holder.
- (2) Fix (1) on the near point chart bar.
- (3) Insert (2) into the near point chart holder and secure it with the near point chart fixing knob.



If not using the near point chart, it can be hold as shown on the right.

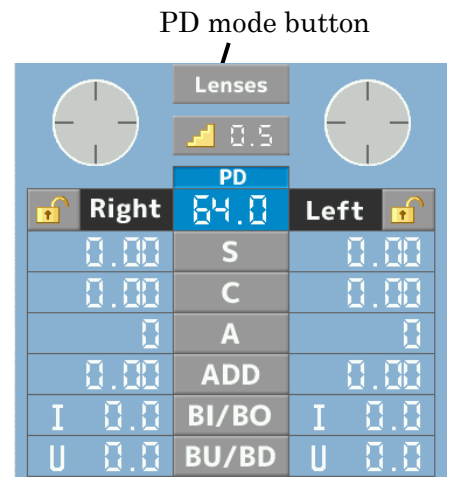


• PD input

- (1) Touch the “PD mode button” on the measurement result display area.
PD input mode is started up.

When turning on the power switch (|), it is started up with PD input mode.

- (2) Turn the “Dial switch” or press “+/-” key.
PD value is increased or decreased by 1 step.

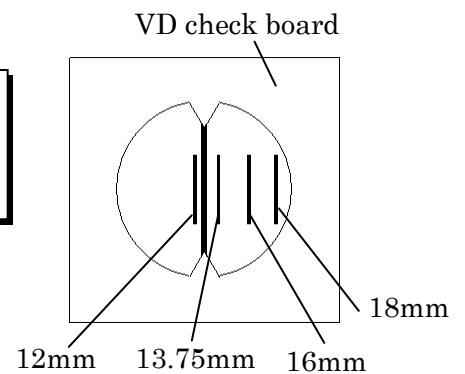


• VD adjustment

- (1) Look through the VD check windows.

Look through the windows as matching the longest line with the ∇ part of the VD check board.

- (2) Position the apex of cornea of the examinee at the arbitrary position. It can be adjusted with the headrest adjustment knob.



5.4 Basic operation

• Each type of input mode

(1) Press “S value mode button”.

The eye to be measured can be selected by touching the area below

Right eye: display area of S input value of the right eye

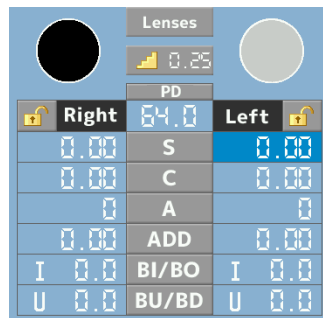
Left eye: display area of S input value of the left eye

Both eyes: “S”

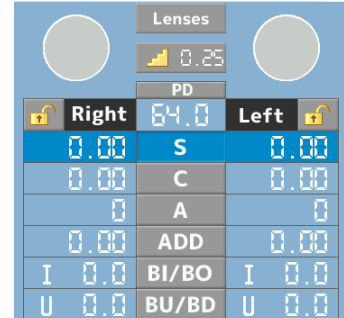
S value mode button



When you wish to select S value of the right eye



When you wish to select S value of the left eye



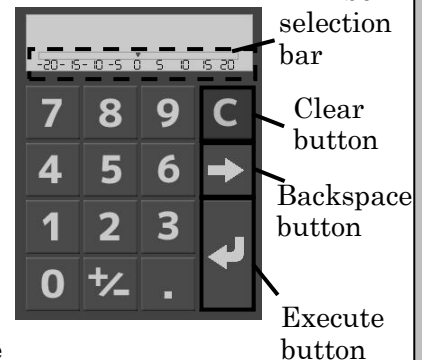
When you wish to select S values of both eyes

(2) Turn the “Dial switch” or press the “+/- key”. It can increase or decrease S value by 1 step.

Input with the numerical keypad

- (1) If touching the currently selected “S value mode button” again, the numerical keypad is displayed.
- (2) Input the values with the numerical keypad.
- (3) The lens is set by touching the “Execute button”.
- (4) When erasing all of the values, press the “Clear button” and erasing one value, press the “Backspace button”.

When canceling it, touch the area other than the numerical keypad.



Input with the number selection bar

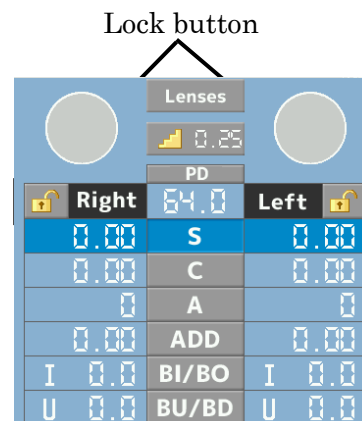
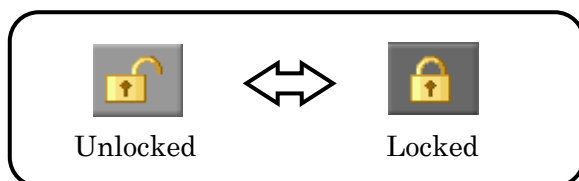
- (1) If touching the currently selected “S value mode button” again, the numerical keypad is displayed.
 - (2) By touching the number selection bar, the selected value is displayed.
 - (3) When touching the execute button, the lens is set.
- When canceling it, touch the area other than the numerical keypad.

The input values for “C”, “A”, “ADD”, “BI/BO” and “BU/BD” can be changed by operating in the same manner.

• Lock of the input value

This function is to prevent the measurement value from being changed by incorrect operation. If it is locked, the measurement value cannot be changed.

It is locked by pressing the “lock button”.
It is unlocked by pressing it again.

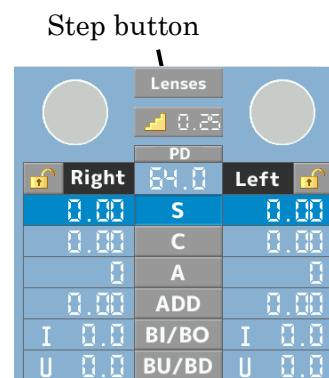


• Switch of the step

If touching the “Step button”, the range of the each step is switched.

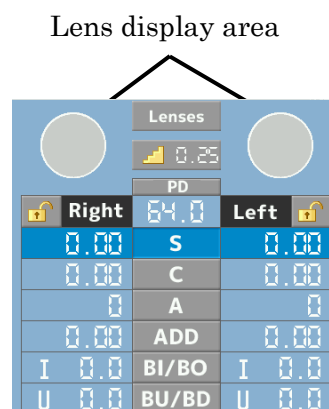
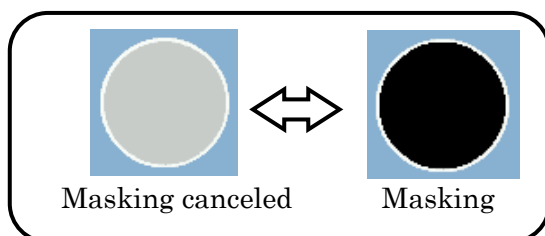
The step of each mode can be changed as shown below.

※ When selecting PD	:0.5cm/1.0cm
※ When selecting S	:0.12D/0.25D/0.50D/1.00D
※ When selecting C	:0.25D/0.50D
※ When selecting A	:1°/5°
※ When selecting ADD	:12D/0.25D/0.50D/1.00D
※ When selecting BI/BO, BU/BD, P	:0.1Δ/0.5Δ/1.0Δ
※ When selecting THETA	:1°/5°



• Switch of the masking

It is masked if touching “Lens display area”. It is canceled when touching it again.



If the fog is set, it is fogged.
Refer to “4) Sub menu” of “5.8.7 Setup” about the fogging procedures.

5.5 Setting of the chart

5.5.1 Operation of the chart selection area

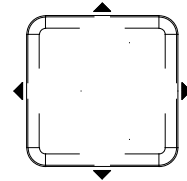
• Selection of the chart

The intended chart is displayed when touching the chart displayed on the “Chart selection area”.

At the same time, the selected chart is displayed on the “Chart condition display area” and it is entered into the measurement mode according to the chart.

Also, the chart can be selected by operating with the “Selection key”.

If pressing ▼ or ►, the selected chart cursor moves down and pressing ◀ or ▲, the selected chart cursor moves up.



Selection key

• Page switch of the chart

The page can be switched by pressing the “Page switch tab”.

“XC” can be operated only at the time of the XC mode. Refer to “5.6.1 Operation at the time of cross cylinder mode” about entering the XC mode.



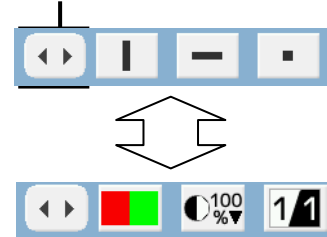
Page switch tab

5.5.2 Operation at the time of selecting the chart for vision measurement

- **Switch of chart auxiliary function**

When pressing the “chart auxiliary function button”, the buttons are changed as shown on the right.

Chart auxiliary function button



- **Masking of the chart**

- In case of masking vertically**

It is masked vertically if touching the “Vertical mask button”.

It is canceled when touching the button again.

Vertical mask button



“Selection key” ⇒ The vertical mask moves to up and down, and right and left.

When the mask is on the extreme left:

By pressing ◀, the mask moves to the extreme right of the chart which is one above of the currently selected chart on the “Chart selection area”.

When the mask is on the extreme right:

By pressing ▶, the mask moves to the extreme left of the chart which is one below of the currently selected chart on the “Chart selection area”.

- In case of masking horizontally**

It is masked horizontally if touching the “Horizontal mask button”.

It is canceled when touching the button again.

Horizontal mask button



“Selection key” ⇒ The horizontal mask moves to up and down.

When the mask is on the lower end:

By pressing ▼ or ▶, the mask moves to the upper end of the chart which is one below of the currently selected chart on the “Chart selection area”.

When the mask is on the upper end:

By pressing ▲ or ◀, the mask moves to the lower end of the chart which is one above of the currently selected chart on the “Chart selection area”.

5.5 Setting of the chart

In case of masking one chart

Only one chart is masked if touching the “One chart mask button”.

It is canceled when touching the button again.

“Selection key” ⇒ The one chart mask button moves to up and down, and right and left.

When the mask is on the extreme left:

By pressing ◀, the mouse moves to the extreme right of the column one above.

When the mask is on the extreme right:

By pressing ▶, the mouse moves to the extreme left of the column one below.

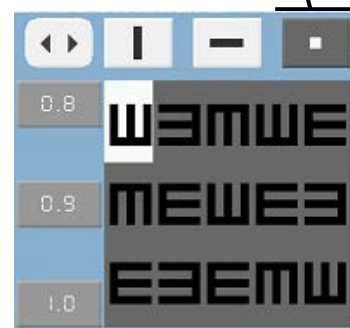
When the mask is on the lower end:

By pressing ▼, the mask moves to the chart which is one below of the currently selected “Chart selection area”.

When the mask is on the upper end:

By pressing ▲, the mask moves to the chart which is one above of the currently selected “Chart selection area”.

One chart mask button



The chart which is set the one chart mask

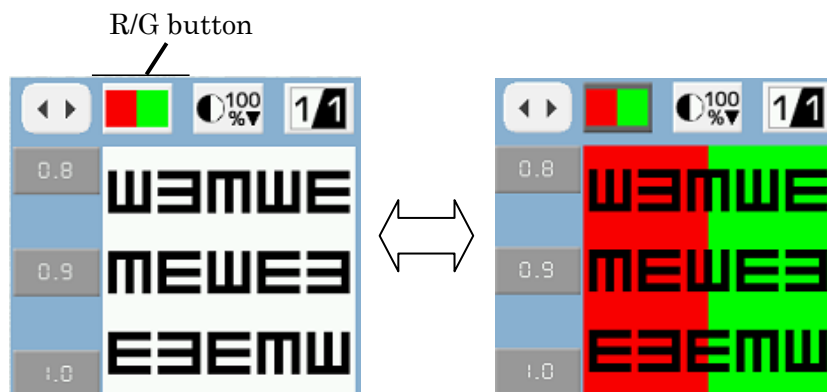
• Random function

The masked chart is randomly switched if touching the chart again which is set the one chart mask.



• R/G button

The color of the currently displayed chart is changed if touching the “R/G button”. The right half is changed to green and the left half is changed to red. It returns to the original when touching it again.

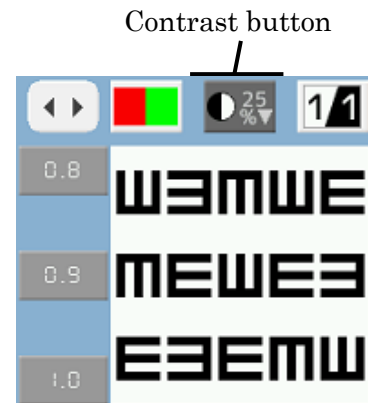


• Contrast button

The contrast of the currently displayed chart is changed in the following order when touching the “Contrast button”.

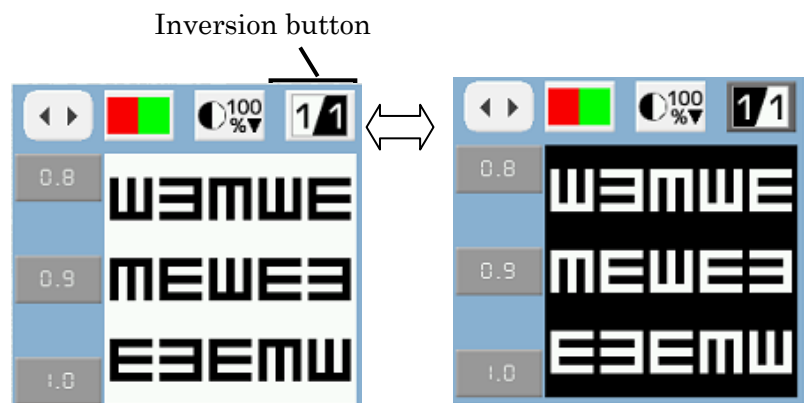
100%→25%→12%→6%

The number indicated in the “Contrast button” is the contrast intensity of the currently displayed chart.



• Inversion button

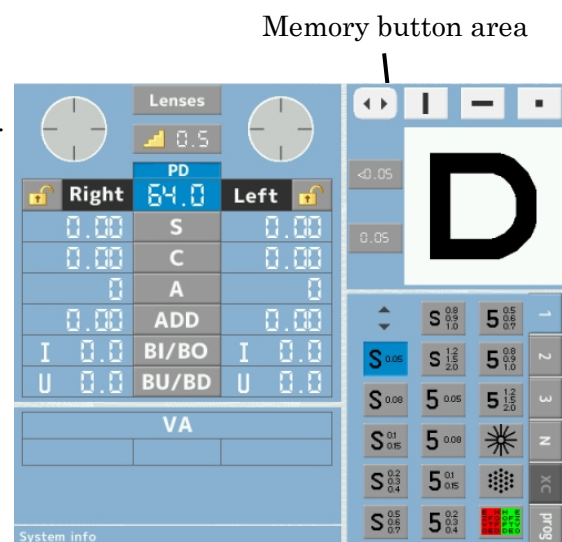
The colors of black and white of the currently displayed target are inverted when touching the “Inversion button”. It returns to the original if touching the button again.



• Memory of the vision

By touching the value displayed on the “Memory button area”, the value is memorized as the vision. The memorized vision is displayed on the “Vision display area”.

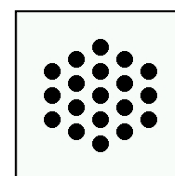
When measuring the right eye:
memorize the vision of the right eye
When measuring the left eye: memorize
the vision of the left eye
When measuring both eyes: memorize
the vision of the both eyes



Vision display area

5.5.3 Operation at the time of selecting the dots chart

The operation procedures at the time of selecting the dots chart (right figure) are described below.



Dots chart

• Operation of the custom area

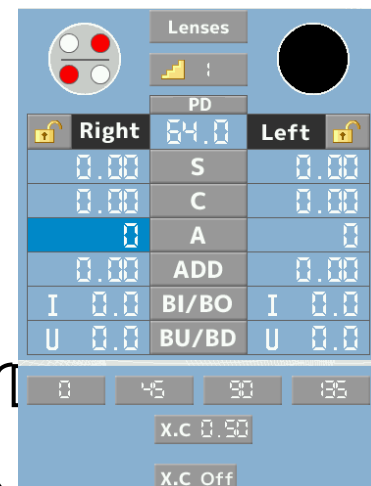
When touching the one of the “Angle switch button”, it is changed to the selected angle.

The cross cylinder lens is switched as

“0.50D→AUTO→0.25D” every time touching the “XC



lens switch button”.



Custom area

XC lens switch button

Angle switch button

• Operation of the cross cylinder lens

In case of the cross cylinder lens of 0.25D or 0.50D

Ask the examinee which is clearer to see, when pressing the “XC1 key” or when pressing the “XC2 key”.

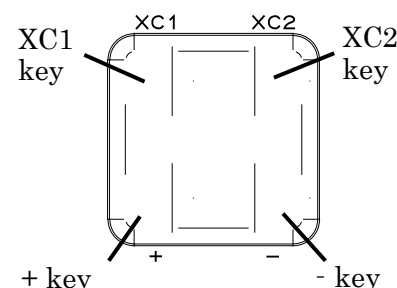
Press the “+ key” or “- key” depending on the answer.

In case that it is clearer when pressing the “XC1 key”

⇒ press “+key”

In case that it is clearer when pressing the “XC2 key”

⇒ press “- key”



Repeat it until the both can be seen equally.

In case of the auto cross cylinder lens

When the auto cross cylinder lens is set, the examinee can see two charts.

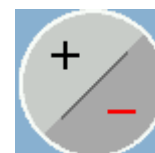
Ask the examinee which is clearer to see and press either the “+ key” or the “- key” depending on the answer.

In case that “+” is clearer to see

⇒ press “+ key”

In case that “-” is clearer to see

⇒ press “- key”



Repeat it until the both can be seen equally.

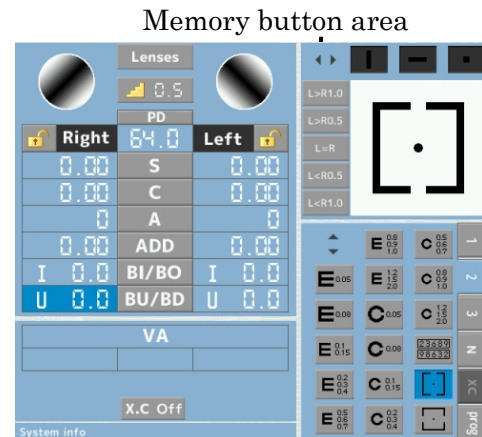
5.5.4 Operation at the time of selecting the other charts

• Operation of the memory button area

The memory button area is displayed for each measurement if needed.

Touch one of the items on the memory button area depending on the answer from the examinee.

It is memorized in the memory and these data is output when printing out.

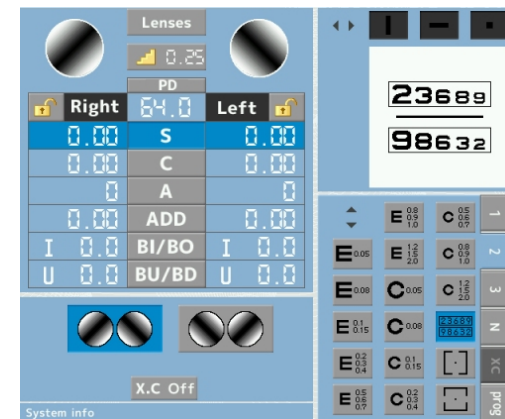


• Operation of the custom area

Switch of the polarized filter.

It is not displayed on all of the measurements using the polarized filter. It is displayed only on some measurements.

The angle of the polarized filter can be changed by touching the “Polarized filter switch button”.

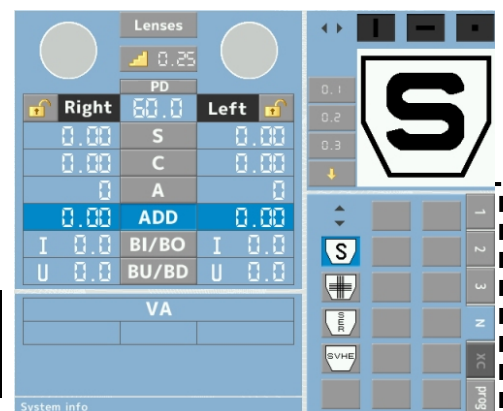


Polarized filter switch button Custom area

5.5.5 Operation at the time of selecting the near point chart

- (1) The list of the near chart is displayed by selecting “N” of the “Page switch tab”.
- (2) The measurement mode is started by selecting the chart to be measured.

Be careful because the head moves when selecting the near point chart.



Page switch tab

5.6 Other operations

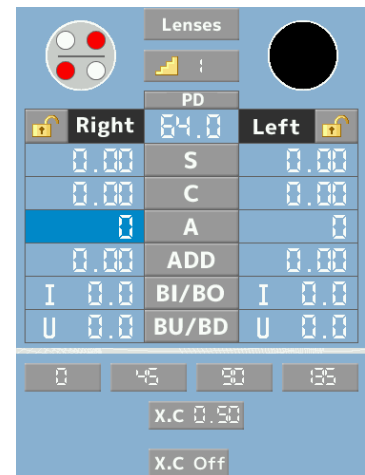
5.6.1 Operation at the time of cross cylinder mode

- **Entering procedures of the cross cylinder mode**

It is entered into the cross cylinder mode by touching the “XC mode button”.

When touching it again, it returns to the normal mode.

The cross cylinder lens set is remained set even though changing the chart in the cross cylinder mode.



- **Operation of the cross cylinder lens**

Operation with XC1 key or XC2 key

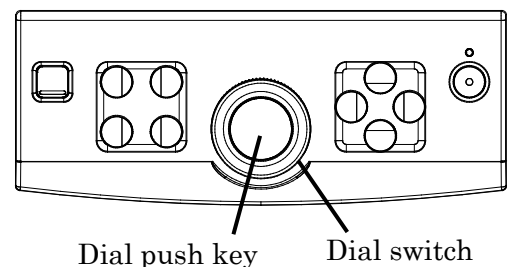
Refer to “5.5.3 Operation at the time of selecting the dots chart”

Operation with the dial switch

In case of the cross cylinder lens of 0.25D or 0.50D

- (1) Ask the examinee which is clearer to see, when rotating the dial switch to the right or when rotating it to the left.

(Ask the examinee which target is clearer to see the horizontal direction when selecting S and ADD.)



- (2) In case that it is clearer to see when rotating to the right, press the dial push key with the dial switch being turned to the right.
In case that it is clearer to see when rotating to the left, press the dial push key with the dial switch being turned to the left.
- (3) Repeat it until the both can be seen equally.

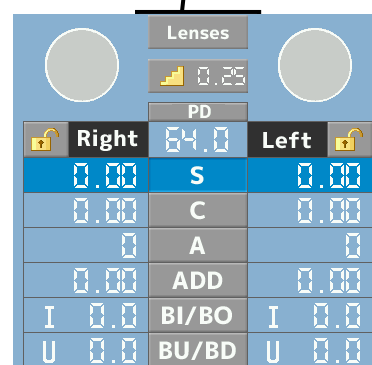
In case of auto cross cylinder lens

- (1) Ask the examinee which is clearer to see between 2 charts which can be seen through the auto cross cylinder lens.
(Ask the examinee which target is clearer to see the horizontal direction when selecting S and ADD.)
- (2) When “+” is clearer to see, turn the dial switch to the left and press the dial push key.
When “-” is clearer to see, turn the dial switch to the right and press the dial push key.
- (3) Repeat it until the both can be seen equally.

5.6.2 Setting of the auxiliary lens**• Setting procedures of the auxiliary lens**

- (1) The list of the auxiliary lens is displayed by touching the “Lens selection button”.

Lens selection button

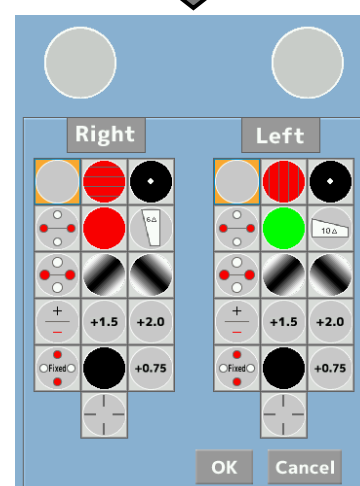


- (2) The auxiliary lenses are set on the right and left measuring windows by selecting the lens for right and left and pressing the “OK button”.

- (3) Press the “Cancel button” when canceling it.

**NOTE**

Refer to the list of the auxiliary lens on the next page about the auxiliary lens.



















OK button

Cancel button

5.6 Other operations

• The list of the auxiliary lens

The list of the auxiliary lens

	Occluder		Polarized filter		Pinhole (φ1)
	Red Maddox		Red filter		Green filter
	Cross cylinder (±0.25D)		Cross cylinder (±0.50D)		Fixed cross cylinder
	Auto cross cylinder		Lens for retinoscope (+1.5D)		Lens for retinoscope (+2.0D)
	Lens for retinoscope (+0.75D)		Dispersing prism (6ΔBU)		Dispersing prism (10ΔBI)
	Lens for checking PD				

5.7 Input of the external data

APH550 can input the data from an auto refractometer, a lensmeter and PC. There are 2 kinds of setting for data input from the auto refractometer, the lensmeter and PC, and it can be switched in the “Setup”.

*The connection cables for the auto refractometer, the lensmeter and PC are not included.

5.7.1 Data input from the auto refractometer

- In case that the communication setting is auto

- (1) Match the Baudrate of the auto refractometer and this instrument.



Refer to “Setting of the parameter” of “5.8.7 Setup” about the setting procedures of Baudrate.

- (2) Press the print button of the auto refractometer.

The data is loaded in the column of the “External data” and is input in the measurement result display area, and the lens is changed at the same time.

- In case that the communication setting is manual

- (1) Match the Baudrate of the auto refractometer and this instrument.

- (2) Select the “REF button” after touching the “External data” on the data display area.

Select the “REF button”.

- (3) Press “Import button” after pressing the print button of the auto refractometer.

The data is loaded in the column of the “External data”.

- (4) The data is input in the measurement result display area and the lens is switched by pressing the “Set button”.

REF button

Import button

Set button

5.7 Input of the external data

5.7.2 Data input from the lensmeter

- **In case that the communication setting is auto**

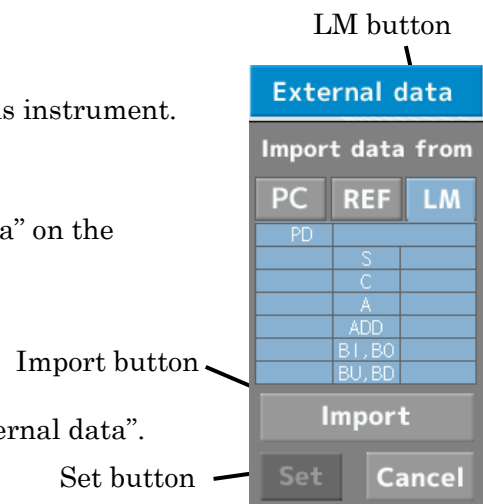
(1) Match the Baudrate of the lensmeter and this instrument.

(2) Select “LM” after touching the “External data” on the data display area.

(3) Press the print button of the lensmeter.

The data is loaded in the column of the “External data”.

(4) The data is input in the measurement result display area and the lens is switched by pressing the “Set button”.



- **In case that the communication setting is manual**

(1) Match the Baudrate of the lensmeter and this instrument.

(2) Press the “Import button” after pressing the print button of the lensmeter.
The data is loaded in the column of the “External data”.

(3) Press the “OK button”.

The data is input and the lens is switched.



Consult your dealer about the details of the connection procedures or the output data.

Connectable auto refractometer: ARK070, AKR550, AKR750

Connectable auto lensmeter: CLE60, CLE070, ALM500, ALM700

5.7.3 Data input from PC

- **In case that the communication setting is auto**

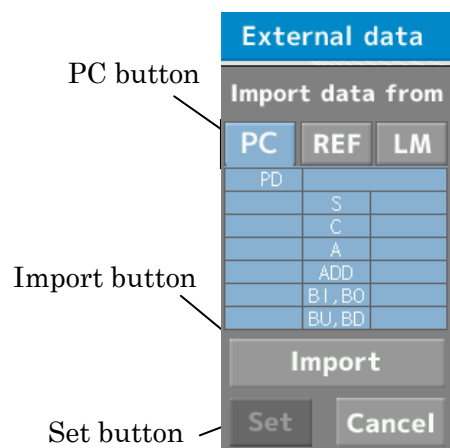
(1) Match the Baudrate of PC and this instrument.

(2) Select “PC” after touching the “External data” on the data display area.

(3) Press the print button of the lensmeter.

The data is imported to the “External data” area.

(4) The data is input to the inspection result display area and the lens is switched by pressing the “Set button”

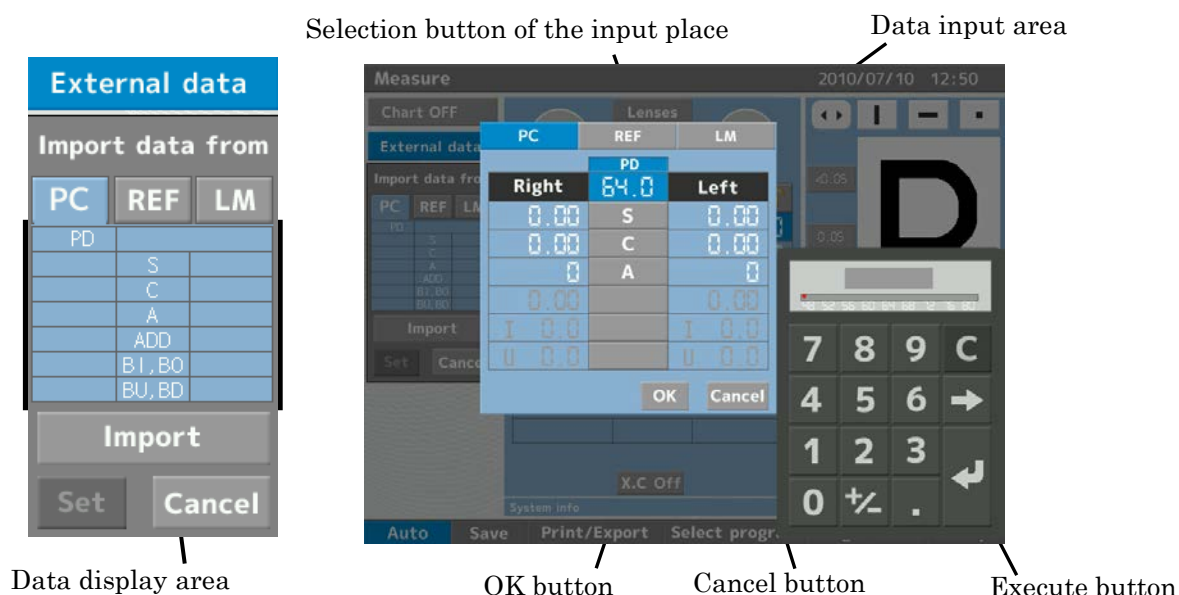


• **In case that the communication setting is manual**

- (1) Match the Baudrate of PC and this instrument.
- (2) Press the “Import” button after pressing the print button of PC.
The data is input to the “External data” area.
- (3) Press the “Set” button.
The data is input and the lens is switched.

5.7.4 Manual input to the “External data” area

- (1) The screen is changed to the one as shown below by touching the “External data” firstly and then, the “data display area” (refer to the figure on the left below).



- (2) Select the place to be input to by touching the “Selection button of the input place”.
- (3) Select the item to be input (PD, S, C, A, ...) from the “Data input area”.
- (4) The data is input to the “Date input area” by inputting it with the numerical keypad and pressing the “Execute button”. (It can be input with the dial switch or the +/- key.)
- (5) The data is input to the “External data” area by touching the “OK button” after inputting all of the values.



Refer to “Each type of input mode” of “5.4 Basic operation”.

5.8 Operation of the menu area

5.8.1 Switch of performance at the time of selecting chart

Set whether switching the auxiliary lens and the eye to be measured etc. automatically or not at the same time with switching the chart.

The performance at the time of selecting the chart is switched by touching the “Auto/Manual” switch button.

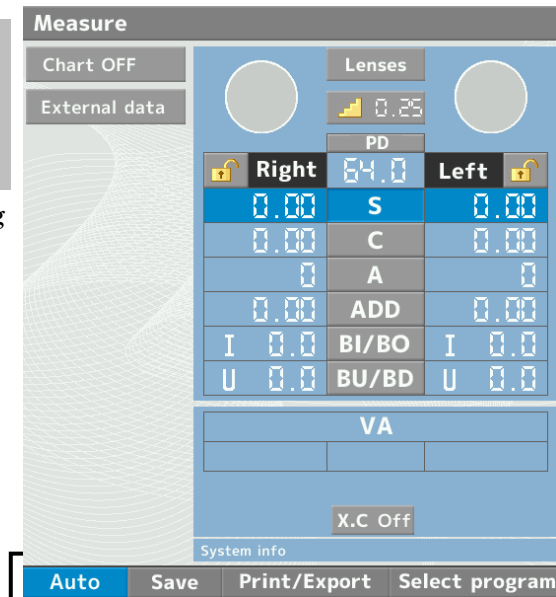
Auto: operate in according to the set contents of the mode editing the chart.

※ Refer to "5.9.1 Edit of the chart selection area".

Manual: only chart is switched



Refer to “5.9.1 Edit of the chart selection area” about the editing procedure of the charts.



“Auto/Manual” switch button

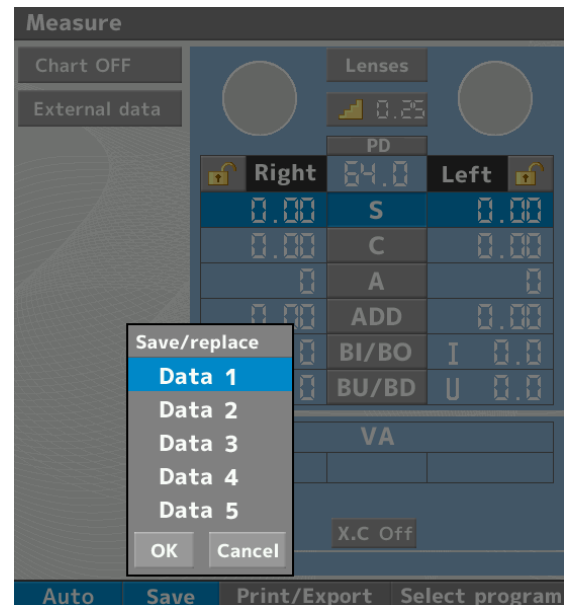
5.8.2 Save and calling up of the measurement data

The saved data is called up at one touch of a button and the examinee can compare the data.

(1) Touch the “Save button”

(2) Select where to save and touch the “OK button”.

The destination file which has data in is indicated in orange.
If saving the data in the destination file which already has another data, the data is overwritten.



Save button

- (3) Touch the “Cancel button” when canceling it.

When data is saved, the “Data button” appears on the “Data display area”.

- (4) The saved data is called up and the lens is switched by touching the “Data button”.

Data button

All of the saved data are deleted if pressing the “Clear key”.

Measure

Chart OFF

External data

Lenses

0.25

PD

Right		Left
0.00	S	0.00
0.00	C	0.00
0	A	0
0.00	ADD	0.00
I 0.0	BI/BO	I 0.0
U 0.0	BU/BD	U 0.0

Data 1

VA

X.C Off

System info

Auto Save Print/Export Select program

5.8 Operation of the menu area

5.8.3 Output of the measurement values

The measurement result can be printed out by pressing the “Print/Export button” after completing the measurement.



It can be redirected in the “Setup”.
Refer to “9) Other” of “5.8.7 Setup”.

Print/Export button

Example of the printout

Message	ABCDEFGHIJKLMN O PQRSTU V WXYZabcdefghijklmnopqr	
ID No.	No.	00000
Date	NAME	2010 07 10 12:50
VD value	VD	= 12.00
Working distance	WD	= 40 cm
	<PRESCRIPTION DATA>	
	<VA>	
Far vision	<R>	 <L>
Near vision	F 0.63	0.8 0.5
	N 0.5	0.7 0.6
Prescription	<R>	<L>
	-3.50 S	-3.00
	0.00 C	-0.50
	0 A	179
	0.00 ADD	0.00
	F I 7.0	BI/BO O 3.0
	F U 0.0	BU/BD U 1.0
Near prism	N I 0.5	BI/BO I 0.0
	N U 0.0	BU/BD U 1.0
Interpupillary distance	F PD	= 64.0
Near interpupillary distance	N PD	= 60.0

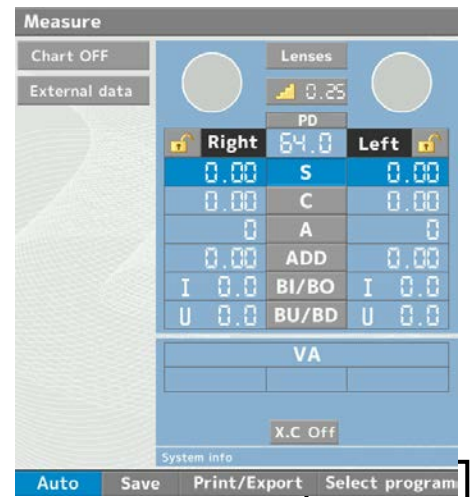
BINOCULAR TEST	
<CONVERGENCE>	
F 10.0/14.0/ 7.0	} Convergence power
N 9.0/12.0/ 5.0	
<DIVERGENCE>	
F 6.0/ 4.0	} Divergence power
N 5.0/ 3.5	
<VERTICAL DIVERGENCE>	
F BD 3.0/ 1.0	} Vertical divergence power
F BU 2.5/ 1.0	
N BD 3.5/ 1.5	
N BU 3.0/ 1.5	
<WORTH 4 DOTS>	
4 DOTS	Worth 4 dots
<ANISEIKONIA-H>	
LEFT=RIGHT	Aniseikonia
<ANISEIKONIA-V>	
LEFT=RIGHT	
<STEREO>	
13'12	Stereoscopic
<PRECISION STEREO>	
4'	Precision Stereoscopic
<N-PRECISION STEREO>	
40'	N-Precision Stereoscopic
<RELATIVE ACCOMODATION>	
NEG_ -1.00	} Relative Accommodation
POS_ +0.75	
<ACCOMODATION>	
<R> 6.50	} Accommodation
<L> 7.00	
APH550	

5.8.4 Selection of the measurement program

- (1) Press the “Select program” button.
- (2) Select the program and touch the “OK button”.
- (3) Touch the “Cancel button” if canceling the change.

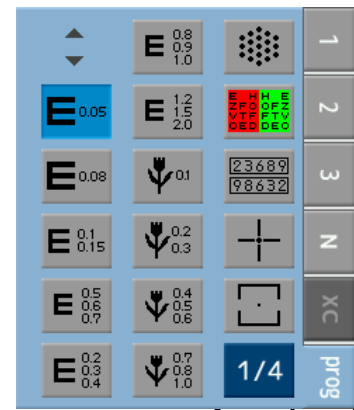


Refer to “5.9.2 Edit of the measurement program” about the setting of the measurement program.



Select program button

- (4) It is entered into the measurement program by touching the “Prog button” and touching the chart on the upper left.
- (5) The next measurement is started by pressing either ▼ or ►. It goes back to the prior measurement by pressing either ▲ or ◀. The chart can be selected by the touch panel.
- (6) It is switched to the next page by touching the “Page button”.

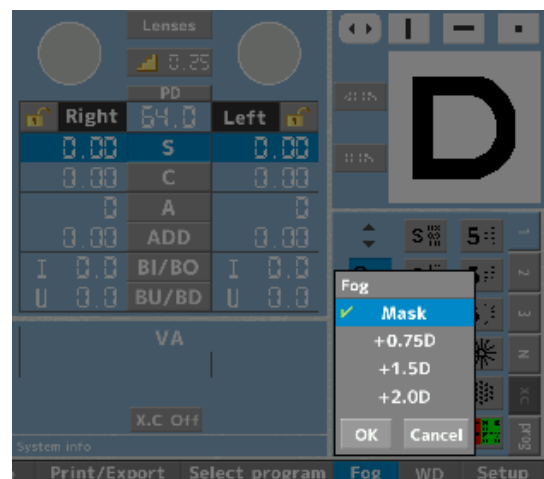


Page button

Prog button

5.8.5 Selection of fogging

- (1) Press the “Fog button”.
- (2) Select the intended fogging from “Mask/+0.75D/+1.5D/+2.0D” and press the “OK button”.
- (3) Touch the “Cancel button” when canceling the change.



Fog button

5.8 Operation of the menu area

5.8.6 Selection of working distance

- (1) Touch the “WD button”.
- (2) Select the intended working distance and touch the “OK button”.
- (3) Touch the “Cancel button” if canceling the change.

When changing the working distance, the head is converged. Be careful about pinching your fingers or hairs.

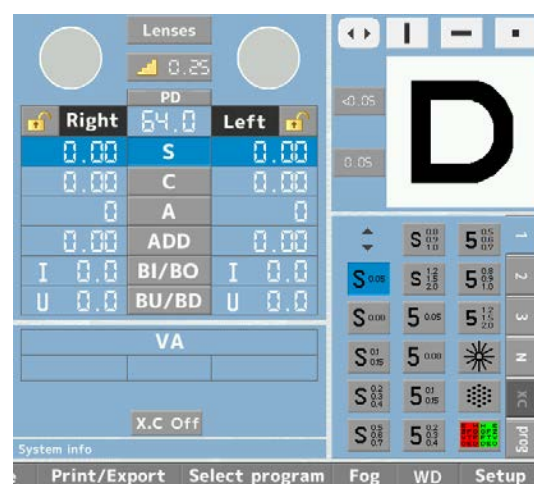


WD button

5.8.7 Setup

• Operation in the setup mode

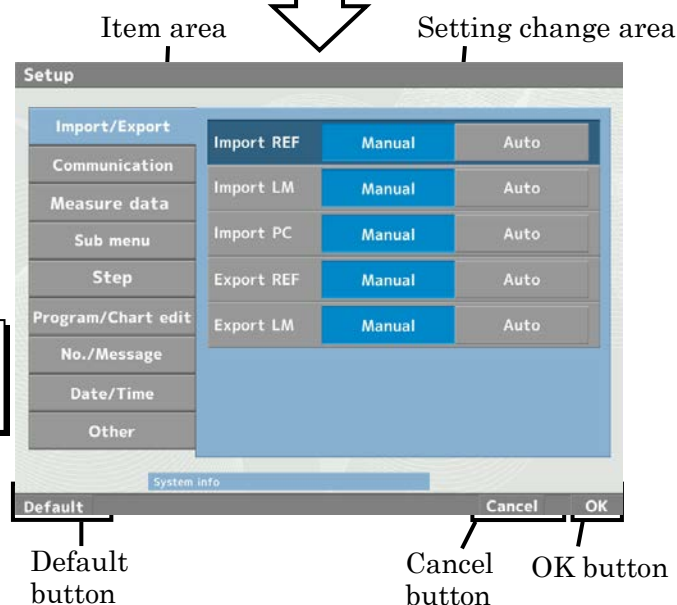
- (1) Touch the “Setup button” on the menu area.
It is entered into the setup mode.



Setup button

- (2) Select the item to be changed from the “Item area”.
- (3) Select the item to be changed from the “Setting change area”.

When changing it back to the default, touch the “Default button”.



Default button

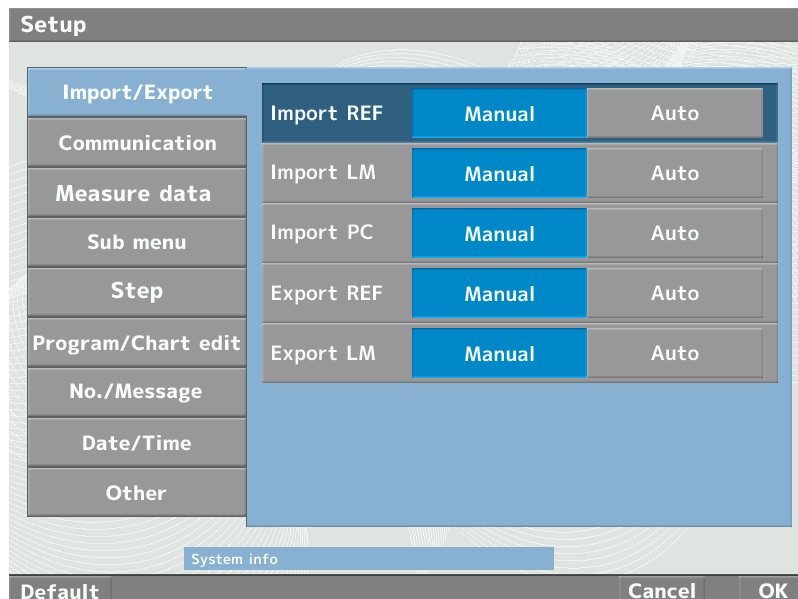
Cancel button

OK button

- (4) Touch the “OK button” after completing the setting change.
Touch the “Cancel button” if exiting without changing the setting.

- **Setting of the parameter**

- 1) **Import/ Export**



- **Import REF**

Set the communication with the auto refractometer.

Switch auto ⇔ manual of the input data of “5.7.1 Data input from the auto refractometer”.

- **Import LM**

Set the communication with the lensmeter.

Switch auto ⇔ manual of the input data of “5.7.2 Data input from the lensmeter”.

- **Import PC**

Set the input from PC.

Switch auto ⇔ manual of the input data of “5.7.3 Data input from PC”.

- **Export REF/Export LM**

Set the output of the input data which is output to PC from the auto refractometer or the lensmeter.

Manual : The data of the auto refractometer or the lensmeter is output together with the one of APH550 when pressing the print button.
 Auto : The data is output to PC at the same time when the data of the auto refractometer or the lensmeter is output to the “External data” area.



“Export REF”/“Export LM” may not be displayed.

5.8 Operation of the menu area

2) Communication

The screenshot shows a 'Setup' window with a sidebar on the left containing menu items: Import/Export, Communication (highlighted), Measure data, Sub menu, Step, Program/Chart edit, No./Message, Date/Time, and Other. The main area displays settings for the 'Communication' section:

Setting	Current Value	Available Values
Import ADD	disable	disable, enable
Import P	disable	disable, enable
Baudrate PC	9600	9600, 115200
Baudrate REF	9600	9600, 115200
Baudrate LM	9600	9600, 115200

At the bottom of the main area is a 'System info' button. The footer of the window contains 'Default', 'Cancel', and 'OK' buttons.

• Import ADD

Set if loading the data of the addition or not if the addition is included in the data input from the outside.

Disable: do not load the data of the addition
Enable: load the data of the addition

• Import P

Set if loading the data of the prism or not if the prism is included in the data input from the outside.

Disable: do not load the data of the prism
Enable: load the data of the prism

• Baudrate PC/ Baudrate REF/Baudrate LM

Set Baudrate at the time of communicating with the outside. It can be set for each of PC/REF/LM.

Set the same Baudrate with the one communicating with.



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

3) Measure data

Setup				
Import/Export	C to S	Off	On	Only Point
Communication	S to ADD	Off	On	
Measure data	Minus ADD	OK	Error	
Sub menu	C Sign	-	+	+/-
Step	P Format	BI/BO,BU/BD	r,Theta	
Program/Chart edit	S Display	Far Point	Near Point	
No./Message	VA Format	1.0	20/20	6/6
Date/Time				
Other				
System info				
Default		Cancel		OK

• **C to S**

Set if switching the spherical diopter power (S value) or not by interlocking with the Cylinder power (C value).

Off : do not interlock at any time
 On: interlock at all times
 Only Point: Interlock only when selecting the point group chart

• **S to ADD**

Set if switching the addition (ADD) or not by interlocking with the spherical diopter power (S value).

If setting as "On", the addition is changed in conjunction with the change of the spherical diopter power after inputting the addition.

• **Minus ADD**

Set if permitting the addition in the minus range or not.

If selecting "Error", the addition in the minus range cannot be set.

• **C Sign**

Set the sign of the Cylinder power (C value).

• **P Format**

Set the display format of the prism.

BI/BO,BU/BD: X-Y coordinate representation
 r,Theta : polar representation

• **S Display**

Set the display of S value at the time of selecting the addition (ADD).

Far Point : display S value of far point
 Near Point :display S value of near point

• **VA Format**

Set the display procedure of the vision.

5.8 Operation of the menu area

4) Sub menu

Setup						
Import/Export	VD	12	13.75	16	18	
Communication	XC Power	0.25	0.50	Auto		
Measure data	WD	30	40	50	60	70
Sub menu	WD unit	cm	Inch	Diopter		
Step	Mask Type	Mask	+0.75D	+1.5D	+2.0D	
Program/Chart edit	XC Mask	Off	On			
No./Message	Prism Mask	Off	On			
Date/Time						
Other						
System info						
Default		Cancel			OK	

- **VD**
Set the VD.
- **XC Power**
Select the type of the cross cylinder which is set first when setting the cross cylinder lens.
- **WD**
Set the position to set the near point chart.
- **WD unit**
Select the unit of the near point chart at the time of indicating the position.
- **Mask Type**
When masking the eye which is not tested, "Masking/Fogging" can be selected.

Mask: masking
+0.75D: fogging with +0.75D
+1.5D : fogging with +1.5D
+2.0D : fogging with +2.0D
- **XC Mask**
Set if masking or not at the time of operating the cross cylinder.
- **Prism Mask**
Set if masking or not at the time of operating the prism.

5) Step

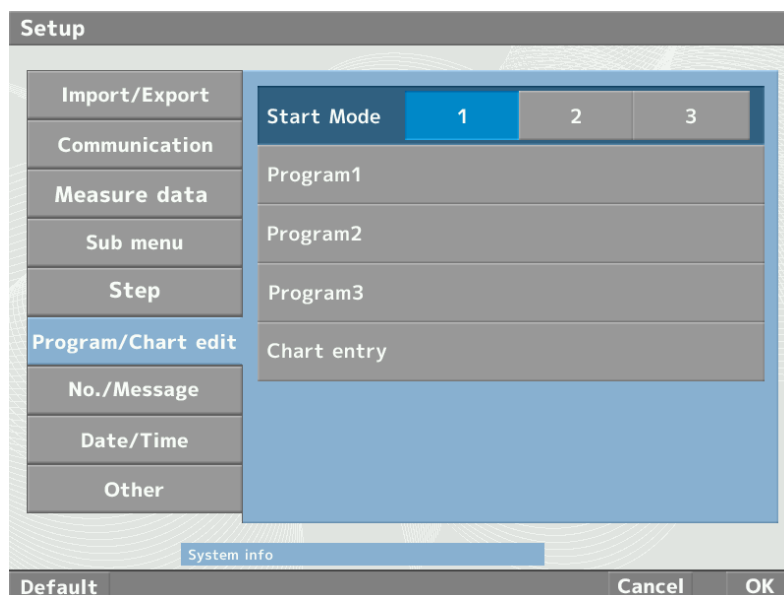
Menu Item	Value 1	Value 2	Value 3	Value 4
S Step	0.12	0.25	0.5	1.0
C Step	0.25	0.5		
A Step	1	5		
P Step	0.1	0.5	1	
Theta Step	1	5		
PD Step	0.5	1		

System info

Default Cancel OK

- **S Step**
Set the initial step at the time of S value adjustment.
- **C Step**
Set the initial step at the time of C value adjustment.
- **A Step**
Set the initial step at the time of Axis adjustment.
- **P Step**
Set the initial step at the time of prism value.
- **Theta Step**
Set the initial step at the time of prism angle.
- **PD Step**
Set the initial step at the time of PD.

6) Program/Chart edit

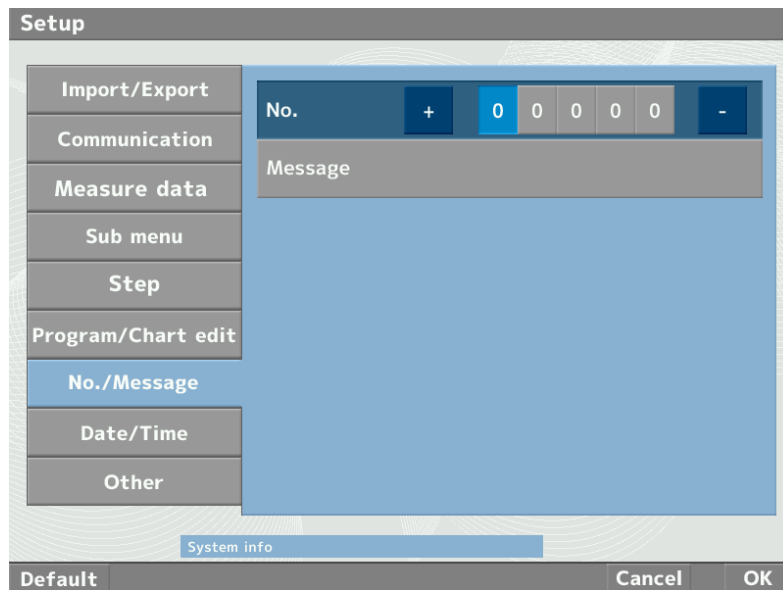


- **Start Mode**
Set the initial measurement program.
- **Program1**
Enter into the mode to edit the measurement program “Program 1”.
- **Program2**
Enter into the mode to edit the measurement program “Program 2”.
- **Program3**
Enter into the mode to edit the measurement program “Program 3”.
- **Chart**
Enter into the mode to edit the chart which is displayed on the chart selection area.



Refer to “5.9 Edit of the chart and measurement program” about edit of the measurement program and the chart selection area.

7) No./Message



- **No.**

Select the digit to be changed with the touch panel, or ◀/ ▶key and set the ID by touching the “+/- button” or pressing the “+/- key”.

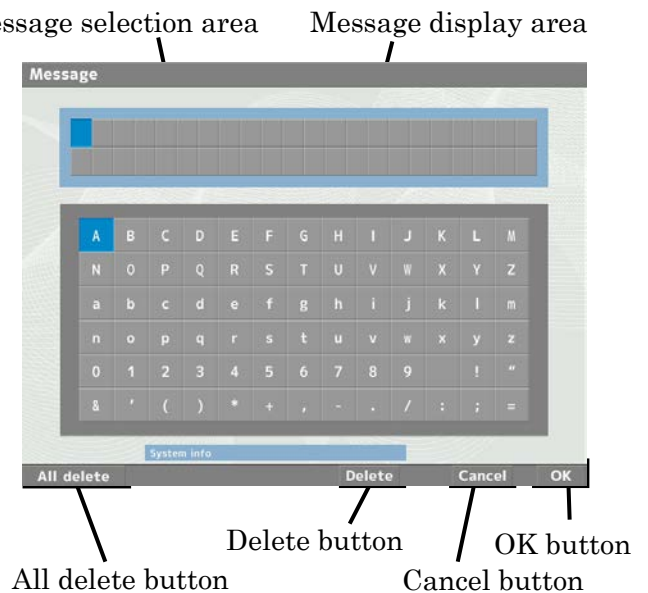
It is displayed at the time of data output.

- **Message**

When selecting it, the screen is changed to the Message edit screen.

It is displayed at the time of data output.

- (1) When selecting the characters on the message selection area, it is input on the message display area.
- (2) If deleting one character, touch the “Delete button” and deleting all of the characters, touch the “All delete button”.
- (3) After completing input, touch the “OK button”.
Press the “Cancel button” when exiting without changes.

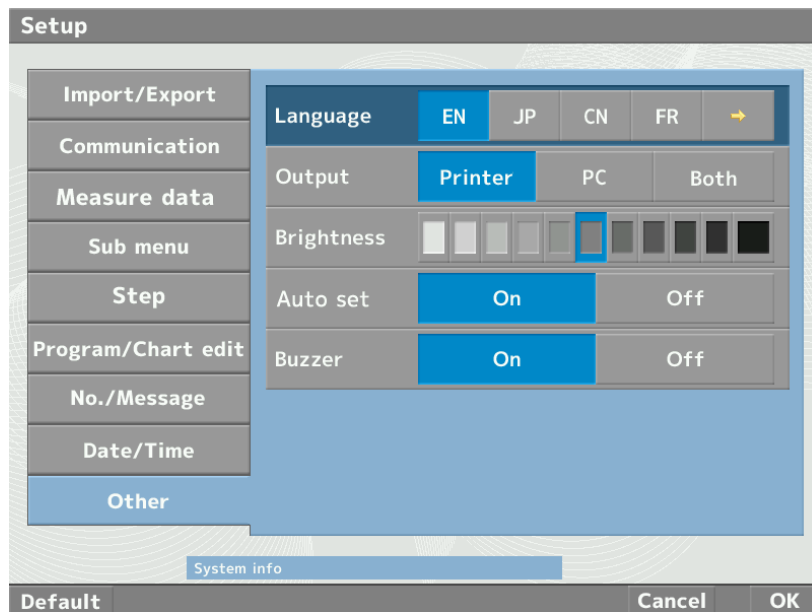


8) Date/Time

Setup	
Import/Export	Date Display: Yes / No
Communication	Date Format: YMD / MDY / DMY
Measure data	Time Format: 24hr / AM/PM
Sub menu	Date: + 2010 / 07 / 10 -
Step	Time: + 12 : 50 : 00 -
Program/Chart edit	
No./Message	
Date/Time	
Other	
System info	
Default	Cancel OK

- **Date Display**
Set if displaying the date or not.
- **Date Format**
Set the order of year, month and day.
- **Time Format**
Switch the time format between “24 hr” and “AM/PM”.
- **Date**
Set the date.
Set the date right by touching the area to be changed or selecting the area with ◀ or ▶ key and touching the “+/- button” or pressing the “+/- key”.
- **Time**
Set the time.
Set the time right following the same procedures of the date.

9) Other



- **Language**

Select the language.

- **Output**

Set where the measurement result is output to.

Printer	: print out from the printer
PC	: output to PC
Both	: output to both of the printer and PC


- **Brightness**

Adjust the brightness of the screen.

Select the intended brightness by touching the gauge and selecting by ◀ or ▶ key.

- **Auto set**

Set the performance at the time of selecting the chart.

 NOTE	Refer to “5.8.1 Switch of performance at the time of selecting chart” about the details.
--	--

- **Buzzer**

Set ON/OFF of the buzzer beeped at the time of operation and detecting the errors.

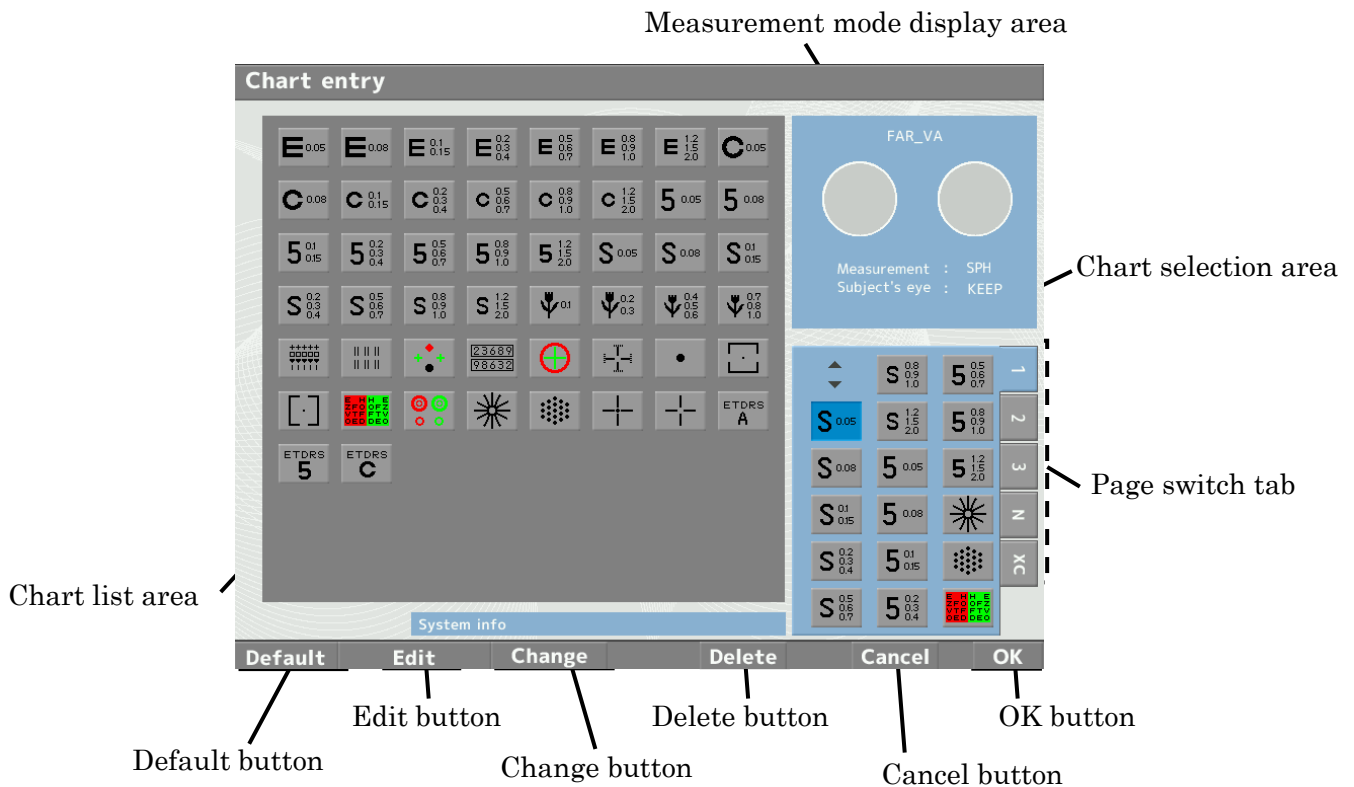
5.9 Edit of the chart and measurement program

5.9.1 Edit of the chart selection area

The screen is switched to the one below when entering into the chart edit mode.



Refer to “6) Program/Chart edit” of “Parameter setting” of “5.8.7 Setup” about entering procedure of the chart edit mode.



• **Sorting of the chart**

- (1) Select the page which has the chart to be changed with “Page switch tab”.

“Page switch tab”
 “1” “2” “3” : Far point chart
 “N” : Near point chart
 “XC” : The chart at the time of XC mode

- (2) Select the area to add a new chart from the “chart selection area” with the touch panel or the “selection key”.

Move to down with ▼ or ► , and move up with ▲ or ◀ key.

- (3) Select the chart to add from the “Chart list area”.

For the procedure (2), if the area selected to add the new chart already has the chart, the new chart is added on the selected area and the chart which was already at the area is moved to the next area.

- (4) Touch the “Delete button” after selecting the chart when deleting the chart on the “Chart selection area”.

- (5) Change it back to the default when touching the “Default button”.

When switching the position of the chart
 (1) Select one chart to be switched.
 (2) Touch the “Change button”.
 (3) Select the other chart to be switched.

5.9 Edit of the chart and measurement program

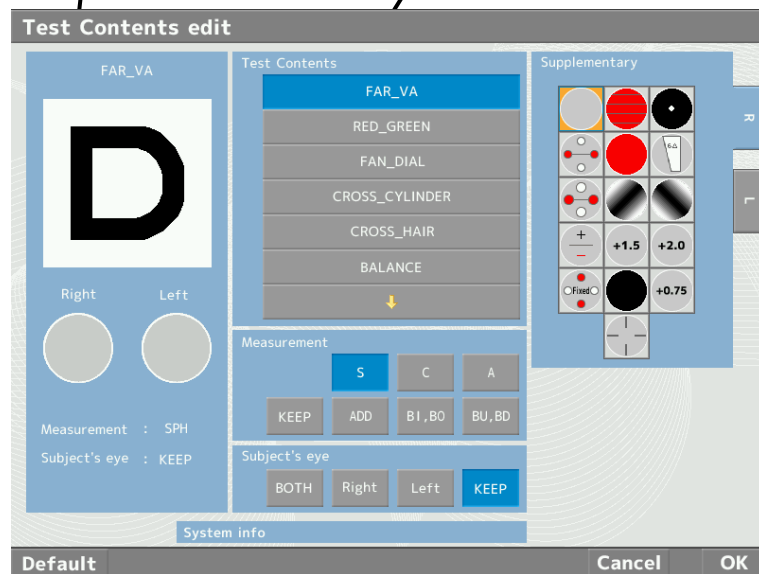
- **Edit of the measurement mode**

The performance at the time of selecting the chart “the eye/eyes to be measured (right eye, left eye or both eyes)/ the lens to be measured (spherical lens (SPH), cylindrical lens (CYL) etc.)/ the auxiliary lens to use for the measurement” can be set freely by editing the measurement mode.

The measurement mode at the time of selecting the chart can be edit by touching the “Edit button” after selecting the chart to be edit.

Measurement mode display area

Test name selection area



Auxiliary lens selection area

Selection area of the eye to be measured

Lens selection area

- **Measurement mode display area**

Display the currently set measurement mode.

- **Test name selection area**

Switch to the measurement mode corresponding to the test name by selecting it.

- **Lens selection area**

Set the lens to be measured.

If pressing “KEEP”, the conditions of the last measurement are taken over.

- **Selection area of the eye to be measured**

Select the eye to be measured.

If pressing “KEEP”, the conditions of the last measurement are taken over.

- **Auxiliary lens selection area**

Select the auxiliary lens.

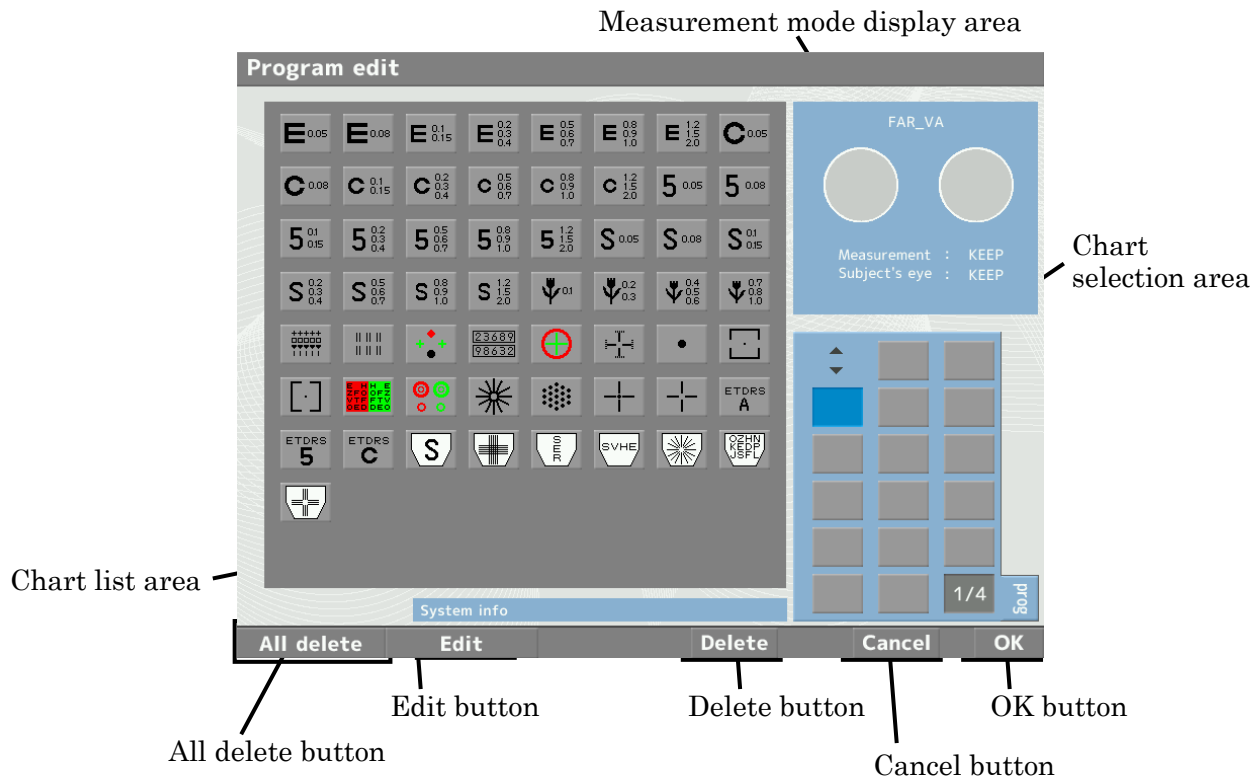
Select the right eye or left eye with the “RIGHT” or “LEFT” tab.

5.9.2 Edit of the measurement program

The screen is switched to the one below when entering into the edit mode of the measurement program.



Refer to “6) Program/ Chart edit” of “5.8.7 Setup” about the entering procedures of the measurement program edit mode.



- (1) Select the charts to add from the “Chart list area” in order.

The cursor displayed on the “chart selection area” can be moved in the range which the chart is set.

It is moved with the touch panel or the “selection key”.

if the area selected to add the new chart already has the chart, the new chart is added on the selected area and all of the charts after it move over by one.

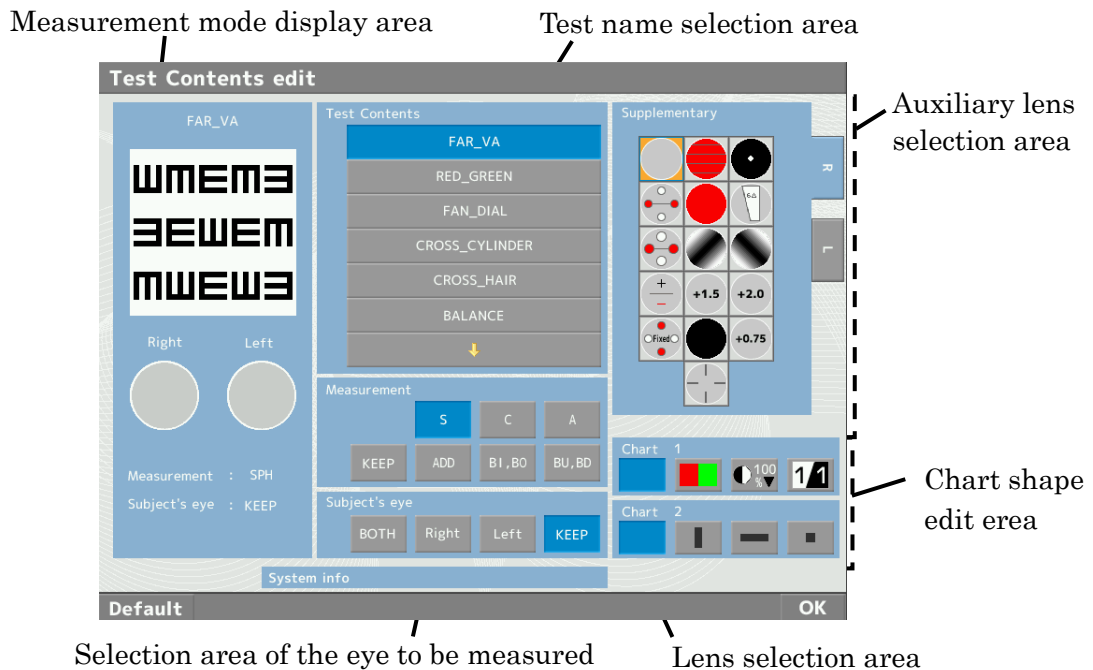
- (2) Press the “Delete button” when deleting the chart set in the measurement program and press the “All delete button” when deleting all of the charts.
- (3) The measurement mode can be edit by touching the “Edit button”.
The chart selected with the cursor on the chart selection area can be edited.
It is not switched to the edit screen if the area other than the chart is selected with the cursor.

5.9 Edit of the chart and measurement program

- **Edit of the measurement mode**

The performance at the time of selecting the chart “the eye/eyes to be measured (right eye, left eye or both eyes)/ the lens to be measured (spherical lens (SPH), cylindrical lens (CYL) etc.)/ the auxiliary lens to use for the measurement/the shape of the chart” can be set freely by editing the

The measurement mode at the time of selecting the chart can be edit by touching the “Edit button” after selecting the chart to be edit.



- **Measurement mode display area**

Display the currently set measurement mode.

- **Test name selection area**

Switch to the measurement mode corresponding to the test name by selecting it.

- **Lens selection area**

Set the lens to be measured.

If pressing “KEEP”, the conditions of the last measurement are taken over.

- **Selection area of the eye to be measured**

Select the eye to be measured.

If pressing “KEEP”, the conditions of the last measurement are taken over.

- **Auxiliary lens selection area**

Select the auxiliary lens.

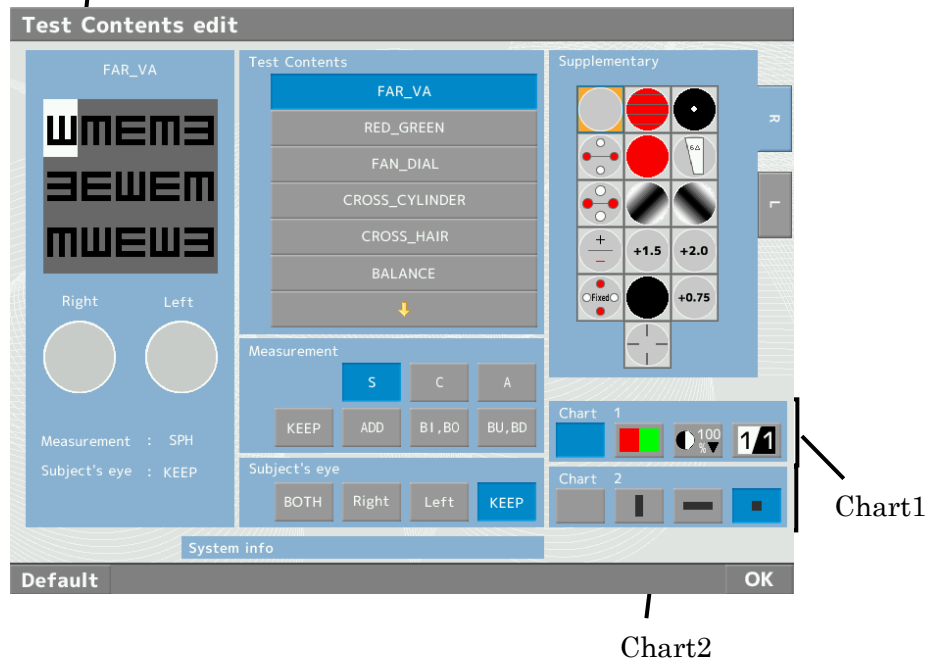
Select the right eye or left eye with the “RIGHT” or “LEFT” tab.

- **Chart shape edit area**

R/G, contrast or inversion can be set on Chart1.

Vertical masking, Horizontal masking or 1 letter masking can be set on Chart2.
It can select the area to be masked by touching the chart in the measurement mode display area.

Measurement mode display area




6. Measurement Procedures

The measurement procedures below are for the case of using CSPOLA600 (LCD chart).
The displayed chart and the set auxiliary lens might be different for CP550, CS550.

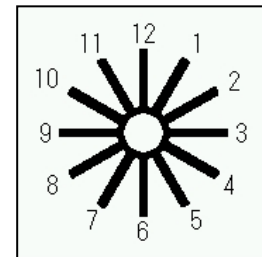
6.1 Astigmatism measurement

6.1.1 Clock dial chart

Measurement procedures

1. Select the clock dial chart .

The chart on the right is displayed.



2. Select the eye to be measured.
3. Add the spherical diopter power up to the point which can only just see the visual acuity chart of 0.7.
4. Ask the examinee “Are there any lines of the clock dial chart which are especially darker?”
 - If he/she said “No”
Show him/her the charts which are $\pm 0.25D$ from the current spherical diopter power. If he/she says there are no darker lines, he/she does not have an astigmatism. Therefore finish the measurement.
 - If he/she said “Yes”
Ask him/her the directions of the darker lines and set the axis to the direction which multiplies the smaller number by 30.

Ex) In case that the directions of 3-9 are darker
 $3 \times 30 = 90^\circ$ (The direction of the Axis)

5. Add the cylindrical lens by $-0.25D$ until all of the lines become same depth.
 - In case that all of the lines become same depth:
Correction of the astigmatism is completed.
 - In case that the darker lines are inverted 90° :
Cylinder is added too much.
Set back by $+0.25D$ until all of the lines looks same depth.
 - In case that the darker lines are inverted:
The direction of the Axis is not right so correct it as follows.

- ① In case that it moves in a counterclockwise direction: correct it in a clockwise direction


- ② In case that it moves in a clockwise direction: correct it in a counterclockwise direction

Ex) First, set the Axis to the direction of 180° because the directions of 12-6 were darker but the directions of 1-7 become darker as adding cylinder lenses.

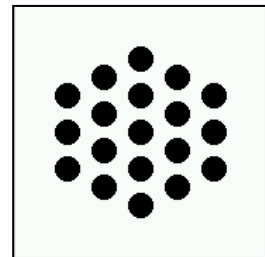
Correct the Axis in a counterclockwise direction (the direction of 10°) because the darker lines move in a clockwise direction.

6.1.2 Dots chart

Measurement procedures

1. Select the dots chart .


The chart on the right is displayed and the cross cylinder lens is set at the same time.



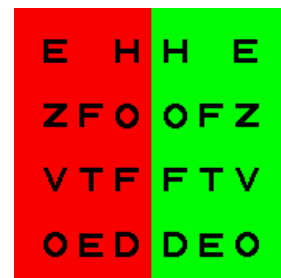
2. Select the eye to be measured.
3. Measurement the Axis by comparing the two of the cross cylinder lens.
Refer to “5.5.3 Operation at the time of selecting the dots chart” about the operation procedures.
4. Measurement the cylinder by comparing the two of the cross cylinder lens.
Refer to “5.5.3 Operation at the time of selecting the dots chart”.

6.2 Red/ green Test

Measurement procedures

1. Select the red/ green chart .

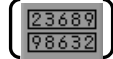
The chart as shown on the right is displayed.



2. Select the eye to be measured.
3. Switch the S value as the fogging is approximately +0.50D or +0.75D.
4. Ask the examinee “which letters are clearer, the letters in red area or in green area?”
Repeat the procedure below until both colors look same.
In case that the letters in red area are clearer: add +0.25D to the current spherical diopter power.
In case that the letters in green area are clearer: add -0.25D to the current spherical diopter power.

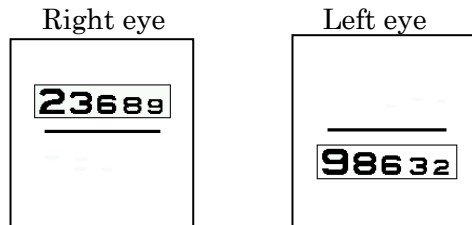
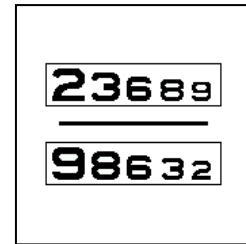
6.3 Binocular balance test

Measurement procedures

1. Select the binocular balance chart .

The chart as shown on the right displayed and the polarized filter is set on.


The examinee can see the chart with one eye as below.



2. Switch the S value as the fogging is approximately +0.50D or +0.75D for the both eye at the same time.
3. Ask the examinee “which is clearer, the chart on the top or on the bottom?”
Repeat the procedure below until the chart on the top and the on the bottom look same.
 - In case that the chart on the top is clearer: add +0.25D on the S value of the current left eye
 - In case that the chart on the bottom is clearer: add +0.25D on the S value of the current right eye
4. Cancel fogging.

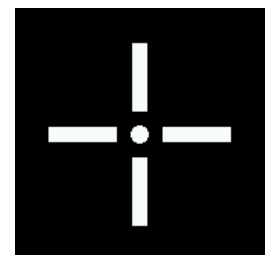
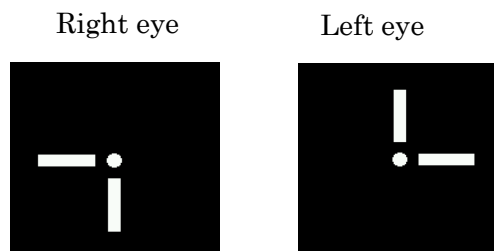
6.4 Phoria test

Measurement procedures

1. Select the phoria chart .

The chart as shown on the right is displayed, and the polarized filter is set on.


The examinee can see the chart with one eye as below.



2. Ask the examinee how he/she can see the chart.
 - In case that he/she can see the chart as a cross
It is orthophoria. It is not necessary to prescribe the prism.
 - In case that the cross is deviated horizontally
He/she has horizontal phoria. Prescribe it with BI/BO to be a cross.
 - In case that the cross is deviated vertically
He/she has vertical phoria. Prescribe it with BU/BD to be a cross.

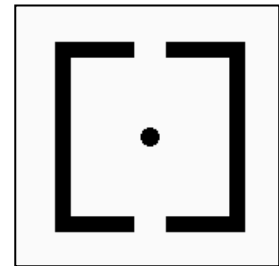
6.5 Aniseikonia test

Measurement procedures

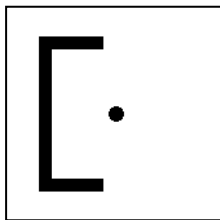
1. Select the vertical coincidence chart .

The chart as shown on the right is displayed, and the polarized filter is set on.

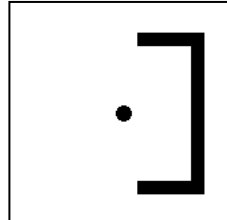
The examinee can see the chart with one eye as below.



Right eye



Left eye

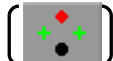


2. Ask the examinee how he/she can see the chart.

- In case that the size of the frames on the right and on the left are same
It is normal.
Select the “L=R” on the memory button area.
- In case that the size of the frames on the right and on the left are different
It is anisometropia.
Select the appropriate item on the memory button area.

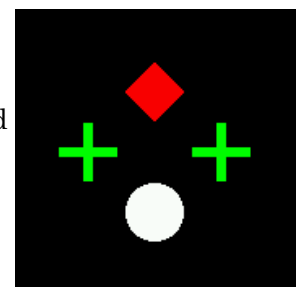
6.6 Worth 4 dots test

Measurement procedures

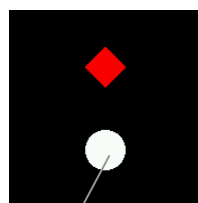
1. Select the worth 4 dots chart .

The chart as shown on the right is displayed, and the red filter is set on the right eye and the green filter is set on the left eye at the same time.

The examinee can see the chart with one eye as below.

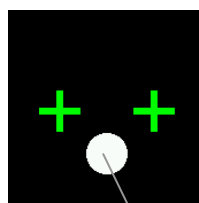


Right eye



Red

Left eye




Green

2. Ask the examinee how he/she can see the chart.

Select the item on the memory area depending on the visibility.

6.7 Maddox test

Measurement procedures

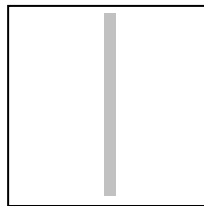
1. Select the fixation point chart .

The chart shown on the right is displayed, and the red Maddox (horizon) is set on the right eye and the rotary prism is set on the left eye at the same time.

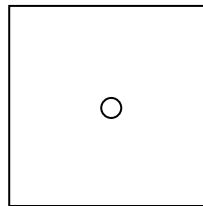
The examinee can see the chart with one eye as below.



Right eye



Left eye

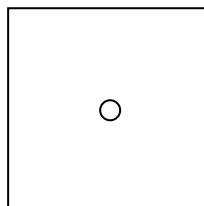


2. Ask the examinee how he/she can see the chart.
 - In case that the vertical line and the fixation point match
He/she does not have horizontal phoria. It is not necessary to prescribe the prism to the horizontal direction.
 - In case that the vertical line and the fixation point does not match
He/she has horizontal phoria. Prescribe the prism to match.
3. Select the BU/BD of the right eye.

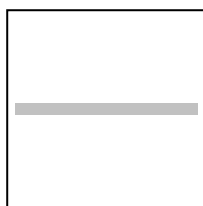
The rotary prism is set on the right eye and the red Maddox (vertical) is set on the left eye.

The examinee can see the chart with one eye as below.

Right eye



Left eye



4. Ask the examinee how he/she can see the chart.
 - In case that the horizontal line and the fixation point match
He/she does not have vertical phoria. It is not necessary to prescribe the prism to the vertical direction.
 - In case that the horizontal line and the fixation point does not match
He/she has vertical phoria. Prescribe the prism to match.

7. Cautions at the Time of the Measurement

Cautions at the Time of the Measurement

- (1) Start the measurement in the dark room.
- (2) Talk to the examinee in a relaxed and friendly manner and prevent him/her from inspiring a feeling of nervousness.
- (3) Inappropriate height of the head or the chair will cause the examinee fatigue. Adjust the height of the optical mount (option) to establish the most comfortable and convenient position for him/her.
- (4) If the examinee's head is inclined, it will affect on the values of AXIS and prism. Ask the examinee to maintain good posture during the measurement.
- (5) Adjust the PD and the VD before the measurement.
If they are not adjusted, it will affect on the measurement result.


8. Error Display

The error messages are displayed at the time that there is a defect in the performance of the instrument.

Message	Cause	Procedure
Error***	It is displayed when there is a defect in the system.	Turn the power off and restart it. If the message is still displayed, consult your dealer. Do not attempt to repair it by yourself.
The cable is not connected.	It is displayed when the communication cable between the head and the relay box is disconnected.	Insert the cable securely.
The printer is overheated.	It is displayed when the printer is superheated.	Turn the power off and leave it for a while. If the message is still displayed, consult your dealer. Do not attempt to repair it by yourself.
Printer cutter error	It is displayed when the printer paper is stuck in the cutter unit or the cutter unit does not move because of some defects.	Turn the power off and make sure that the paper is not stuck in the cutter unit. If the message is displayed even though the paper is not stuck, consult your dealer. Do not attempt to repair it by yourself.

9. Major Troubles and Provisions

If any malfunction found, refer to the table below.

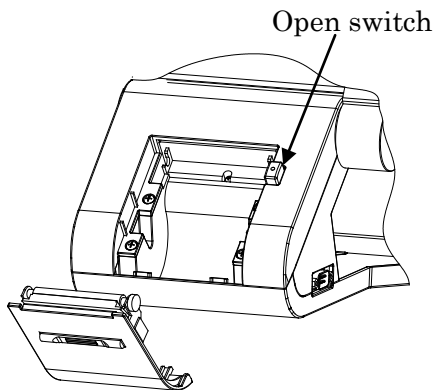
 Caution	Never disassemble, modify or repair the instrument. Personal injury may result from electric shock.
--	--

Symptom	Cause and Measures
The power indicator of the relay box is not turned on.	<ul style="list-style-type: none">• The power cord may not be properly connected. Make sure to connect it securely.• The fuse may be blown. If so, replace it to the new one after turning the power off.
The monitor and the power indicator of the controller are not turned on even though the power indicator of the relay box is turned on.	<ul style="list-style-type: none">• The communication cable between the controller and the relay box may not be connected. Connect it securely after turning the power off.
The controller is operated but the head is not operated.	<ul style="list-style-type: none">• The communication cable between the head and the relay box may not be connected. Connect it securely after turning the power off.
The fuse is blown when the power switch is turned on.	<ul style="list-style-type: none">• Remove the plug from the outlet immediately and consult your dealer.
The monitor display suddenly disappears.	<ul style="list-style-type: none">• The saving function may be activated. Press any switch to deactivate the saving function.
The instrument does not print out.	<ul style="list-style-type: none">• The Output in the Setup may be set as PC. Change the setting.
The printer papers come out but no printing.	<ul style="list-style-type: none">• The printer paper may be set in a wrong direction. Set the paper properly.

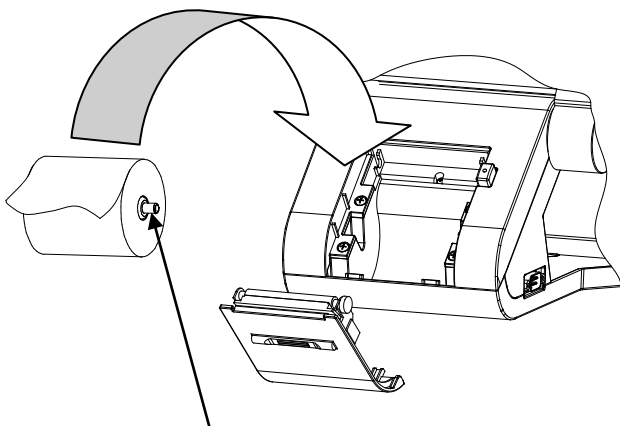
Contact your dealer immediately if the situation is not improved even after the measures mentioned above are taken.

10. Maintenance and Storage

10.1 Replacement of the printer paper



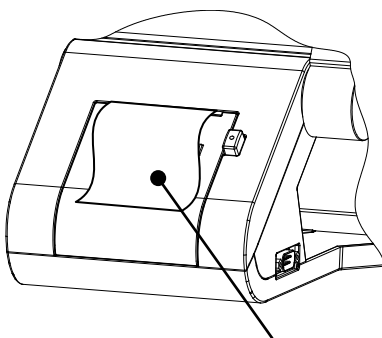
- 1) Open the cover by pressing the open switch.



Make sure to set the core of the printer paper.

- 2) Set a roll of the printer paper, paying attention to the direction of the paper rolled.

Note) The loose end of the paper should be inserted topside and drawn forward.



Set the paper as it comes out from the printer a little bit

- 3) Close the printer cover until it clicks. If it is not closed completely, the error message appears and print out cannot be conducted.

10.2 Replacement of the fuse



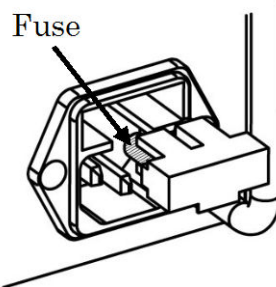
Caution

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 a fuse is blown, remove a fuse holder of the power plug connector and replace it. It is removed from the instrument if pulling the fuse holder out.



Always use the specified fuse (EWM AC250V 2A).



10.3 Storage of the instrument

(1) The dots to be checked for long-term storage

- Turn the power switch OFF.
- Remove the plug from the outlet.
- Put a dustproof cover on the head.

(2) Notes on the 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.
- Where chemicals are stored or gas is generated.



Always check above whenever storing or do not use the device for a long time.

When reusing the device after long-term storage, operate it according to “5.2 Measurement preparation”.

10.4 Cleaning



Caution

Make sure to fix the head securely before cleaning.
It may result in injury if the head is fallen.

- **Cleaning of the measuring window**

If the measuring windows or VD check windows have stains, wipe lightly with the soft cloth. In this case, handle it carefully and do not scratch it.

- **Cleaning of the cover**

If the cover has stains, wipe it with a dry cloth.

If it has heavy stains, wipe it by using a little amount of water or neutral detergent



Do not use organic solvent such as thinner
because it damages the surface of the device.

- **Cleaning of the LCD touch panel**

Use the absorbent cotton or soft cloth when the LCD touch panel has stains.

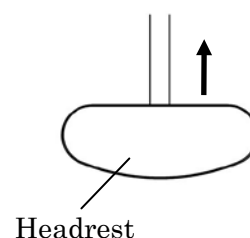
- **Cleaning of the headrest**

1) Remove the headrest (refer to the figure on the right).

2) Wipe it with the clean cloth.

If it has heavy stains, wipe it with a diluted neutral detergent solution. For disinfecting it where the examinee may contact, use the ethanol for disinfection.

※ Ethanol for disinfection contains 76.9 to 81.4vol% of ethanol (C_2H_6O : 46.07) at 15°C (specific gravity).



3) Put the headrest back together.

- **Cleaning of the face shields**

1) Remove the face shields.

It can be easily detached since they are fixed by magnets.

2) Wipe it with the clean cloth.

If it has heavy stains, wipe it with a diluted neutral detergent solution. For disinfecting it where the examinee may contact, use the ethanol for disinfection.

※ Ethanol for disinfection contains 76.9 to 81.4vol% of ethanol (C_2H_6O : 46.07) at 15°C (specific gravity).

3) Put the face shield back together.

Basically, it is not necessary to replace the headrest and the face shields. They comply with ISO 10993-1.

10.5 Periodical inspection and maintenance

To prevent malfunction and accidents and maintain the 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.

10.6 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.

11. Specifications

Spherical power	Measurement range	-28.75D to +27.25D
	Measurement unit	0.12D, 0.25D, 0.50D, 1.00D
Cylindrical power	Measurement range	0D to $\pm 6.00D$
	Measurement unit	0.25D, 1.00D
Axis	Measurement range	0° to 180°
	Measurement unit	1°, 5°
Interpupillary distance	Measurement range	48.0mm to 80.0mm
	Measurement unit	0.5mm, 1mm
Prism degree	Measurement range	0 Δ to 20 Δ
	Measurement unit	0.1 Δ , 0.5 Δ , 1 Δ
Prism angle	Measurement range	0° to 360°
	Measurement unit	1°, 5°
Vertex distance	12, 13.75, 16, 18mm	
Cross cylinder	Auto cross cylinder ($\pm 0.25D$) $\pm 0.25D$ cross cylinder $\pm 0.50D$ cross cylinder	
Auxiliary lens	P.D, occluder, foraminous board ($\phi 1mm$), polarization filter(45°/135°), Red Maddox (right eye: horizon, left eye: vertical), R/G filter (right eye: red filter, left eye: green filter), dispersing prism (right eye: 6 Δ BU, left eye: 10 Δ BI), lenses for retinoscope (+0.75D/+1.50D/+2.00D)	
External dimensions	Head	(Width) 385-417mm (Depth) 112mm (Height) 308mm
	Controller	(Width) 272mm (Depth) 272mm (Height) 204mm
	Relay box	(Width) 364mm (Depth) 119mm (Height) 121mm
Weight	Head	Approximately 5.3kg
	Controller	Approximately 2.5kg
	Relay box	Approximately 2.5kg
Rated supply	AC100 to 240V 50/60Hz	
Power consumption	90VA	



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

Essilor Instruments USA

8600 W. Catalpa Avenue, Suite 703

Chicago, IL 60656

Phone: 855.393.4647

Email: info@essilorinstrumentsusa.com

www.essilorinstrumentsusa.com