
Reserve for
use

Tabletop Refraction System

ETR-770

Instruction Manual

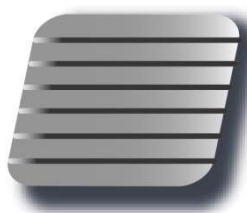


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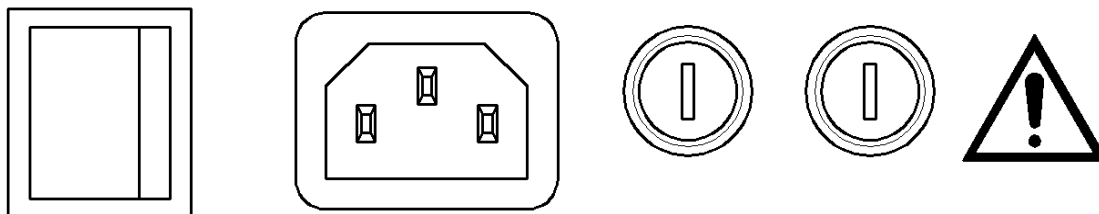
1 Safety Precautions

1.1 For safe use

This instrument is manufactured in accordance with GB9706.1 General Requirements for Safety of Medical Electrical Equipment, and must be reliably grounded. In order to ensure the safe use of the product and prevent injury to the operator and other people, or damage to other facilities, warning marks can be seen on the product and in the manual. Please pay attention and carefully consult the accompanying documents. If the warning sign is missing, please contact us at the address on the manual. Thank you for your cooperation.

Mark	meaning
	If this mark is ignored or ignored, it may cause injury to the human body or damage to the equipment.
Injuries include damage, burns, clicks, etc. Equipment damage refers to damage to buildings, equipment and furnishings.	

There is a warning sign on the front of the instrument: Do not put your face close to the support rod



of the visual acuity chart to prevent injury.

There is also a warning sign on the back of the power box: Do not disassemble the power box and replace the fuse according to the specifications.

1.2 Transportation and storage conditions

1. Shock, severe vibration and moisture shall be prevented during transportation. Transportation requirements shall be subject to the order contract.

2. Transportation and storage conditions: The packaged optical head shall be stored in a well-ventilated room with relative humidity not exceeding 93% and without corrosive gas.

1.3 Safety precautions

This product is developed and validated in accordance with national and international safety standards and specifications to ensure a high degree of product safety. The law stipulates that the manufacturer has the obligation to fully explain the relevant safety matters of the product to the user. For the safe operation of the product, correct operation is necessary. Therefore, the user should fully understand the instructions before using the product. For other more detailed information, please contact our customer service department or our distributor.

1. This instrument cannot be used in places with flammable, explosive and volatile solvents.
2. The instrument cannot be stored and installed in a high humidity environment. The ideal working humidity is not more than 80%. The instrument cannot be exposed to rain, water or placed in a foggy place.
3. The instrument must be operated by trained and qualified personnel or under their guidance.
4. The instrument must be adjusted by the technical service personnel or other authorized personnel of US Ophthalmic.
5. The customer's maintenance of the instrument is limited to the contents in the instruction manual and service manual, and other maintenance can only be carried out by the technical service personnel or other authorized personnel of US Ophthalmic.
6. The manufacturer shall be responsible for the safety, reliability and performance of the products that meet the following conditions:
 - I. When installing according to the requirements of the operating instructions
 - II. When using and maintaining according to the requirements of the instruction manual and service manual
7. The manufacturer is not responsible for any problems caused by unauthorized changes to the instrument, and the instrument after such changes will not be within the scope of service promised by the manufacturer.

8. The accessories used in this instrument are provided by US Ophthalmic., and the accessories of other manufacturers can be used by the customer only after their safety is verified and confirmed by US Ophthalmic.

9. Only properly trained personnel can install, operate and maintain the instrument.

10. The instruction manual and service manual shall be placed in a place easily accessible to the personnel operating and servicing the product.

11. Do not apply excessive pressure to the power cord connection. If the power cord cannot be connected, the first thing to check is whether the plug and socket match. If the plug or socket is damaged, only a qualified service technician can repair it.

Other considerations

- Do not place heavy objects on the control box tray, do not sit on it, and do not support it with your hands.
- Instruct the patient not to touch the head handpiece (head), control box panel, or master device while the patient is sitting or standing.

- Avoid the following environmental conditions when storing equipment.

Do not store the equipment in an area where it will be exposed to rain, moisture, harmful gases, dust, direct sunlight, or high temperature and humidity.

- Maintain the following environmental conditions during transportation and storage of the equipment in packaged condition.

For environmental conditions during storage, see "Environmental conditions (during storage, unpackaged)"

- When transporting the equipment, use special packing materials to prevent the equipment from being impacted by dropping or the like.

Excessive vibration or shock may cause equipment failure.

- When cleaning the measuring window, visual target window or LCD, use an air brush to remove dust and gently wipe with a soft cloth.

- Do not use a cloth dampened with detergent or the like to clean measuring window, the sight mark window or the LCD.

Otherwise, wiping marks may be left or the surface coating may be damaged.

- Do not use organic solvents such as paint thinners to clean equipment.

Otherwise, the surface of the equipment may be damaged.

- Do not continue to use the equipment after the end of its useful life.

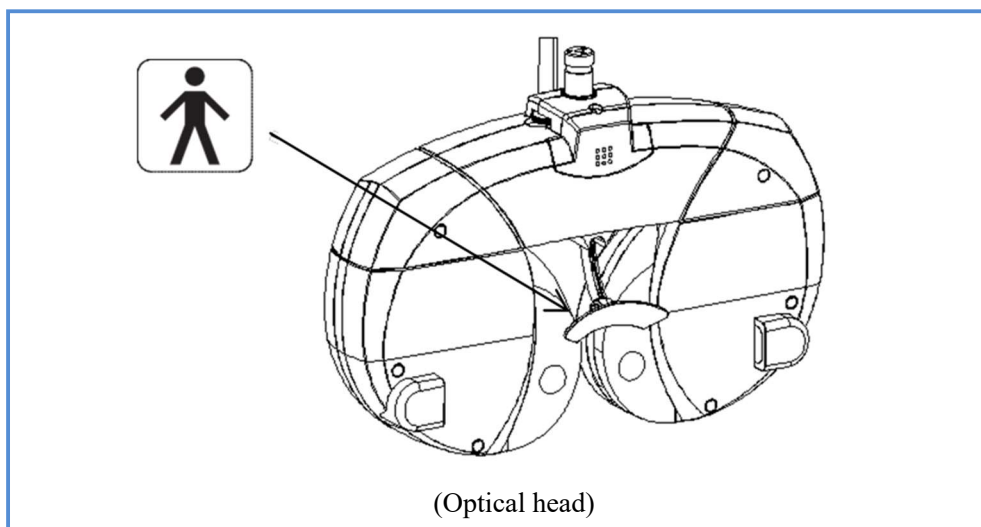
Even with proper maintenance and inspection, the reliability or safety of the equipment is likely to decline beyond the service life and the target value will not be achieved.

1.4 Labels and Symbols

There are labels and instructions attached to this equipment to draw the attention of the user. If the label falls off, the characters fade or become blurred, please contact CJO or your local authorized dealer.

	This symbol indicates that the operator is advised to refer to the relevant instructions in the instruction manual. This symbol is affixed to the same label.
	This symbol indicates that the equipment is a Type B application according to the degree of protection against electric shock. The application part is a forehead support.
	This symbol indicates the status of the power switch. If the switch is placed in the position marked with this symbol, it will not energize the device.
	This symbol indicates the status of the power switch. If the switch is placed in the position marked with this symbol, it will not energize the device.
	This symbol indicates that the device can only be powered by AC power.

◆ Symbol details



The symbols displayed on the touch screen of the control box are the same as the symbols and names defined in (Ophthalmic Instruments-Eye Instrument Handpiece), as shown in the table below.

Auxiliary Lens	Symbol		
	Control box touch screen	YY 0674	
Horizontal/Vertical Malpighian Rod	 or 	MR	Malpighian Rod
2 mm hole diameter pinhole plate		PH or 	Pinhole
Shade plate		BL or 	Shade plate
PD checks the lenses		CL or 	Cross line
Red Filter		RF	Red Filter
Green filter		GF	Green filter
Polarizer (not used)	 / 	pF	Polarizer
Flat Lens		OA	Flat Lens
Retinoscope, spherical lens		RL	Retinal Lens



2 Before use

2.1 Equipment Overview

The ETR-770 is a space-saving automatic optometry system with a combination optometry head and control box.

- Equipped with a precision LCD, it measures 5 m vision and 40 cm near vision with the same accuracy as standard optometry using actual distance.
- The objective data measured by the autorefractor and the data measured by the focimeter can be imported and used in this device.

◆ Scope of application

- For subjective measurement of the refractive state of the human eye

◆ How it works

This device does not require a large optometric distance and displays the optotype on an LCD at a distance equal to 5 m through its internal concave lens. The head contains a trial lens. The operator displays the optotype to the patient through the measurement window to measure the subjective optometry of the patient while switching the trial lens in the optometry head.

- About the button operation and left and right directions in this manual

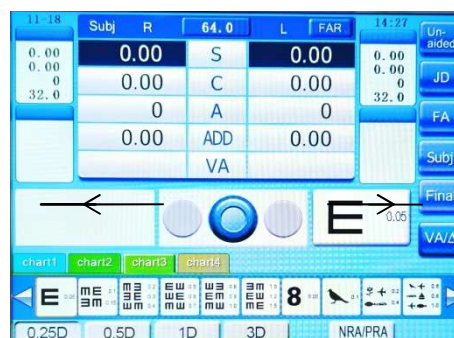
Notes

- On the touch screen, right and left are mapped with the value of the right eye side (R) displayed on the left and the value of the left eye side (L) displayed on the right.

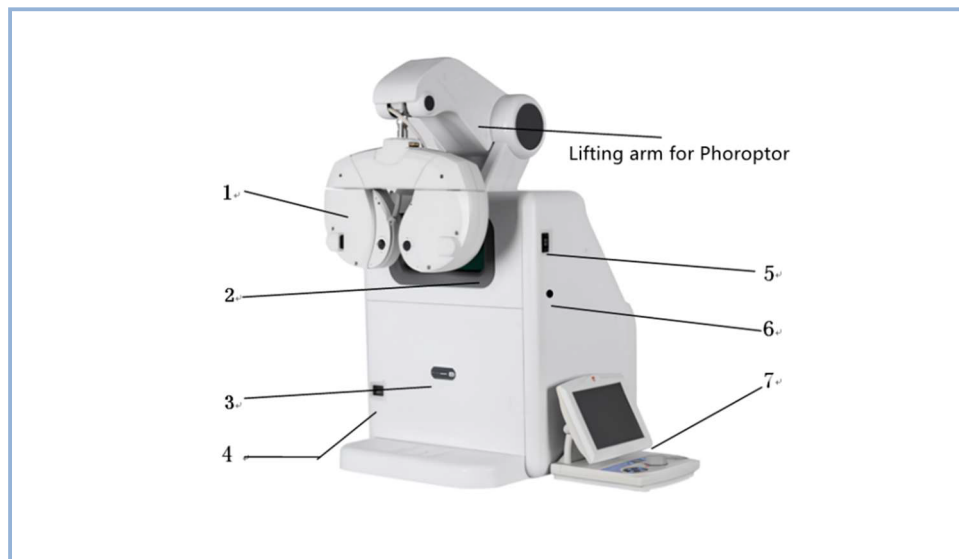
(This is the alignment of the patient's eyes as seen by the operator viewing the patient from the front).

- The control panel buttons on the control box are indicated by Shift, dial buttons, etc.

- **Shift** + — means press — while holding Shift.
- **Shift** + — means press — while holding Shift.



2.2 Equipment configuration



1. Optical Phoropter

2. Visual target window

Display the visual target.

3. Indicator

Illuminates when the power switch is on. The indicator flashes slowly in standby mode.

4. Power switch

Used to turn on (I) or turn off (O) the entire system.

5. Up and down movement switch of the phoropter (one on the left and one on the right)

An up and down motion unit for move that head. Press the up arrow. → Move up.

Press the down button. → Move down.

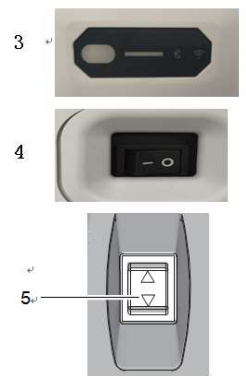
6. Packing lock distance/proximity switching part fixing screw

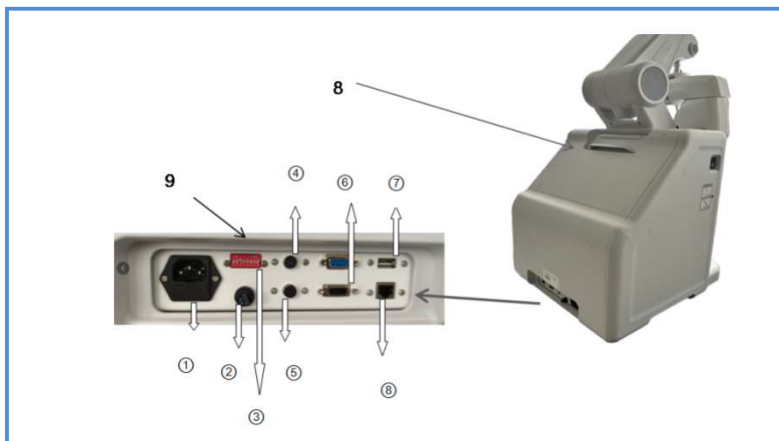
Turn on the machine/lock the machine and remove the cap. The internal hexagonal wrench is used to open counterclockwise and tighten clockwise. It is used to fix the long-distance/short-distance switching component.

7. Control panel

8. Pupil position confirmation window

When checking the position of the pupil, open the cover by hand. Close the cover without checking the pupil position.



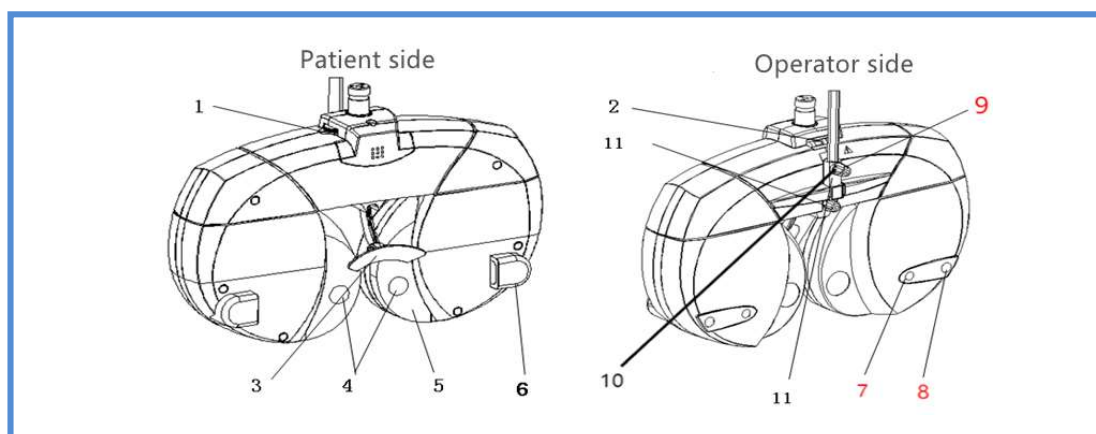


9 Rear socket connector

① Power interface ② Fuse holder ③ Dial switch ④ Focimeter interface ⑤ Computer optometer interface

⑥ Operation panel interface ⑦ USB interface ⑧ Network interface

◆ Optical phoropter



1.Horizontal adjustment knob

Adjust the instrument level.

2. Level

Displays the instrument level.

3. Forehead support

The client's forehead rests on the forehead support during the eye exam.

4.Measurement window

The patient views the optotype through this window.

5. Face support

The facial stipules are fixed here by magnetic force.

6 Corneal VD measurement window

Used to measure the distance between the apex of the cornea and the lens.

7. Proximity lighting

The light is on in the near vision test mode and off in the far vision test mode.

Corneal alignment window

Observe the distance between the customer's lens and the eye.

9. Fixing screw of near vision test rod

Fix the near vision test rod.

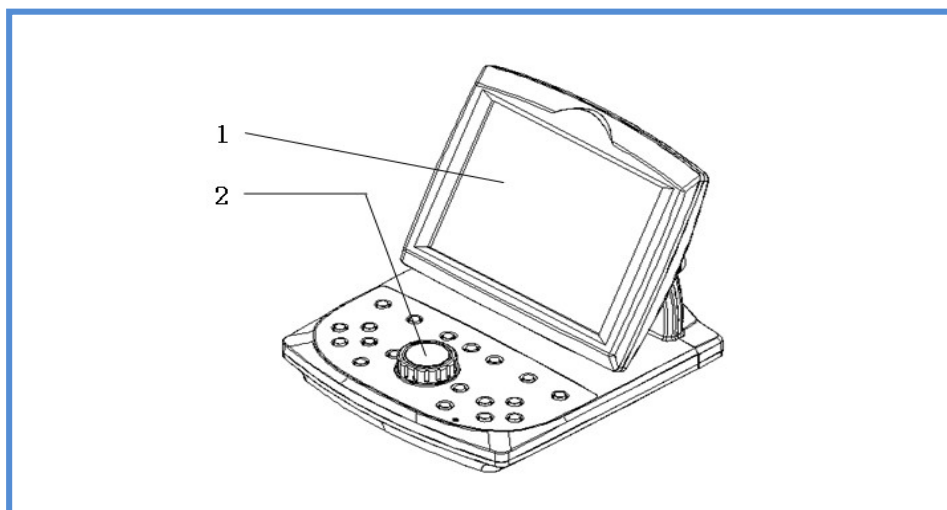
10. Near vision test rod holder

A near vision detect rod is inserted and fix therein.

11. Adjustment knob for forehead support

Used to move the forehead rest forward and backward to adjust the eyeglass distance.

◆ Operation panel



1 Touch screen

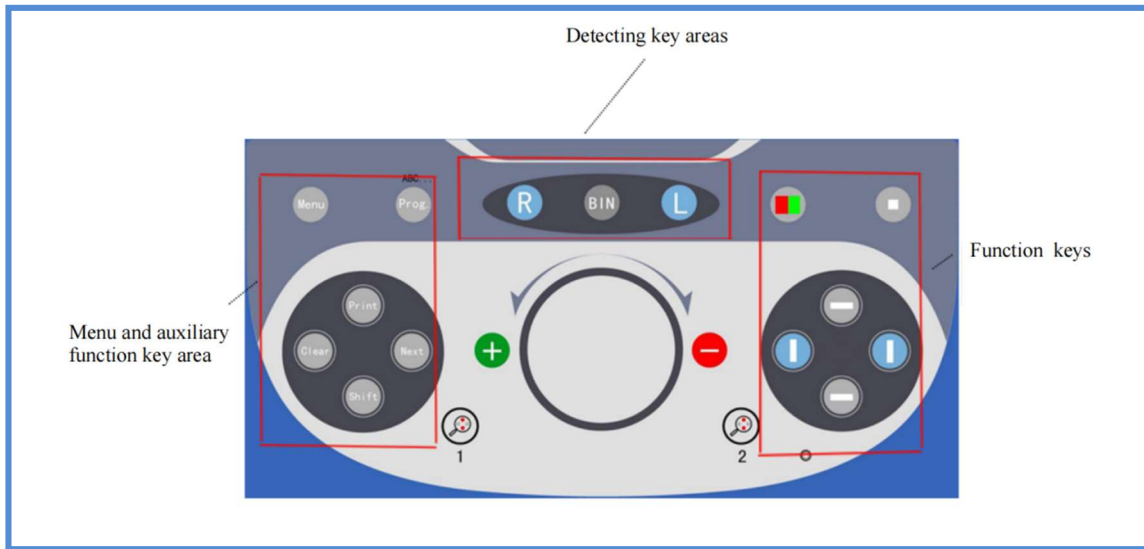
This is an LCD touch screen. The operation button, data and visual target are displayed.

2 Control dial

Used to change the measured value.

The scale spirals	Measured values
Turn left (counterclockwise)	Increase the value.
Turn Right (Clockwise)	Decrease the value.

◆ Control panel



The key area of the control panel is functionally divided into three key areas: menu and auxiliary function key area, detection related key area and visual target related key area. Wherein the menu and the shift key in the auxiliary function key area are used as a combination key to realize the second function of part of the keys. The description of the display will be expanded in the next section.

1 Menu and accessibility keypad

Menu: when the current is the main detection interface, enter the main menu selection interface.

Prog.: Click this button to bring up and hide preset program options.

Print: refers to the print function key. This is valid when the current interface is a test interface, and the print content details are determined by the print settings in the environment variable.

Clear: When the current interface is the main detection interface, clear the status of the operation panel and the optical head quickly.

Next: Automatically perform the next step in the standard program or custom program state.

Shift key: Used as a key combination.

The Shift + Next key can automatically return to the previous step in the standard program or custom program state.

The Shift + Menu key enters the screen calibration program. After calibration, the device is automatically restarted.

2 Detect the relevant key area

Use to select the right eye, both eyes (both eyes), or the left eye.   

Button	Function
	The right eye is open and the left eye is blocked. Only the right eye value can be entered.
	Open your eyes. You can enter values for both eyes.
	The left eye is open and the right eye is blocked. Only left eye values can be entered.

3 Numeric input button

Button	Function
	Increases the value of the current test item.
	Decrease the value of the current test item.

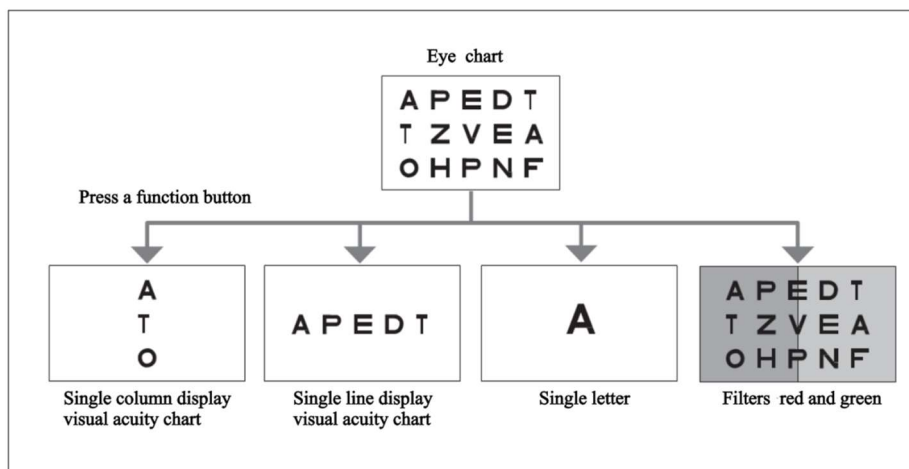
4 Cross cylinder switching button

Place crossed cylinder 1 or 2.



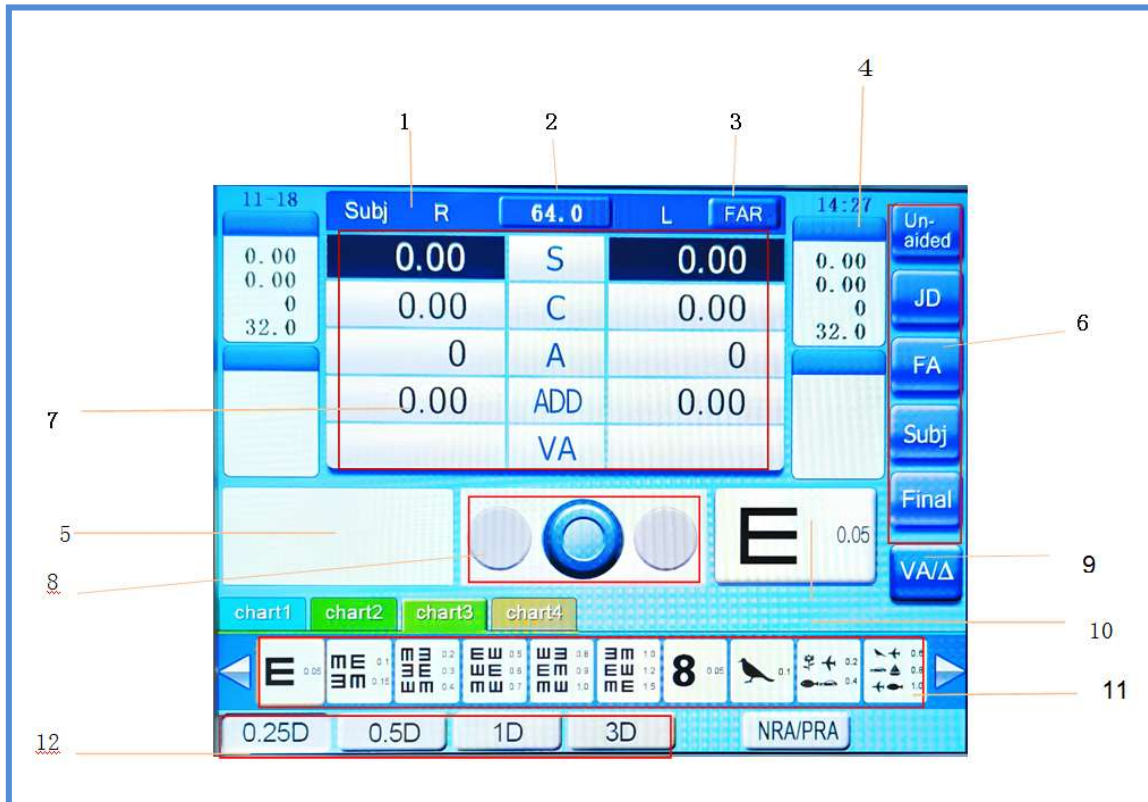
5 Function keys

Use to select an eye chart.



Button	Function
	Adds a red/green background effect to the current sight.
	Enter the single display mode of the optotype.
	Switch up/down the size of visual target.
Shift+ 	Enter the single-line display mode of the optotype.
	In the single column/single optotype display mode, the optotype size is switched left/right.
Shift+ 	Enter single column display mode.

◆ Measurement screen



1. Mode indication

Current data source display.

2. PD button 64.0

PD value display and PD detection key.

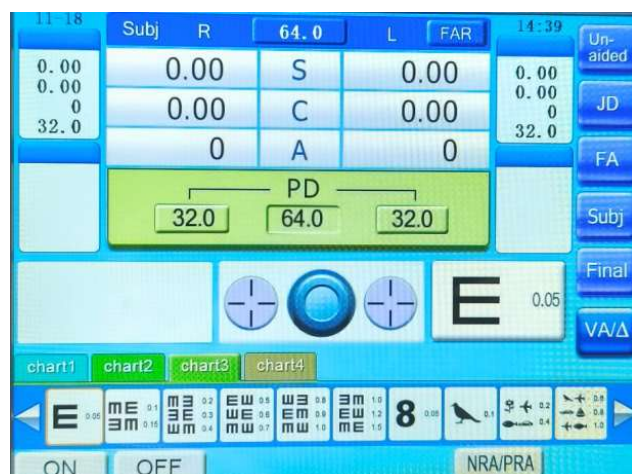
Click the PD detection button to enter the interface, and adjust the interpupillary distance through the knob or the + and - keys on the keypad.

- When inputting monocular PD (1/2 PD)

In PD mode, press the R or L sidebar and turn the dial to change the monocular PD.



(In PD mode, press R or L to change monocular PD)



3. Far/near button

FAR

Press this button to toggle between distance mode and near mode. Remote mode is activated when the device is turned on or the data is erased. The near mode is used to perform a near vision test. The Add (ADD) function is not available in proximity mode.

4. Auxiliary data area

Data display area of focimeter and computer refractometer.

5. Help information area

Displays and toggles help information.

6. Prescription data selection key area

Select measurement mode.

The measured value is displayed in the center of the touch screen.

Button	Function
Un-aided	None
JD	Call out the input data of the lensmeter
FA	Calling out the input data of the refractometer
Subj	Subjective optometry key. Press this key to insert the lensmeter or refractometer's power degree into the phoropter
Final	None

7. Measurement data display area

The core area of the entire basic detection interface.

Subj	R	64.0	L	FAR
① 0.00	② S	③ 0.00		
④ 0.00	⑤ C	⑥ 0.00		
⑦ 0	⑧ A	⑨ 0		
⑩ BI 0.0	⑪ H	⑫ BI 0.0		
⑬ BD 0.0	⑭ V	⑮ BU 0.0		

The core area of the whole basic interface mainly has two States: display state of spherical lens, cylindrical lens axis and prism.

1, 3: right (left) sphere lens degree display area and right (left) sphere lens degree detection mode selection button.

2: Double sphere lens degree detection mode selection button.

4, 6: Right (left) eye cylinder degree display area and right (left) eye cylinder degree detection mode selection button.

5: Binocular cylindrical lens degree detection mode selection button.

7, 9: Right (left) eye axial degree display area and right (left) eye axial degree detection mode selection button.

8: Binocular axial position detection mode selection button

10, 12: right (left) eye horizontal prism degree display area/modular value display area in polar coordinate mode. (XY mode and polar mode are switched by the auxiliary function key)

11: Binocular horizontal prism degree detection mode selection/binocular polar mode lower mode detection mode selection.

13, 15: right (left) eye vertical prism degree display area/modular value display area in polar coordinate mode. (XY mode and polar mode are switched by the auxiliary function key)

14: Binocular vertical prism degree detection mode selection/binocular polar mode lower mode detection mode selection.

16,18: right (left) eye ADD degree display area.

17: Binocular ADD detection mode selection. (Called out by prism and VA switch key)

19, 20, 21: Invalid

Subj	R	64.0	L	FAR
	0.00	S		0.00
	-0.00	C		-0.00
	0	A		0
16	0.00	17 ADD	18	0.00
19		20 VA	21	

8. Prism and VA switching

Switch the main test area to display VA + ADD items and prism item status

9. Current visual target

Displays the current optotype and the occlusion coverage status of the optotype.

10. Auxiliary lenses for left and right eyes

Display the current left and right auxiliary lenses. Click the left auxiliary lens button to call out the left auxiliary lens selection interface; click the right auxiliary lens button to call out the right auxiliary lens selection interface.

11. Visual target selection key area

Select the type and size of the optotype.

12. Function buttons

Additional function button. The buttons displayed vary depending on the optotype displayed or the number column selected.

Spherical inspection mode:



keystrokes	Operation content
0.50D	Set the spherical step size to 0.50 D
1.00D	Set the spherical step size to 1.00D
3.00D	Set the spherical step size to 3.00D
Do not display	Operation content

Cylindrical detection mode



keystrokes	Operation content
-/+	Toggle +/- display mode for cylinder power

Cylindrical axial position detection mode



keystrokes	Operation content
0°	Set the axial position of the cylindrical lens to 0 °
45°	Set the axial position of the cylindrical lens to 45 °
90°	Set the axial position of the cylindrical lens to 90 °
135°	Set the axial position of the cylindrical lens to 135 °
1/5	Set the step of 1 ° or 5 ° for switching the axis of the cylindrical lens.

ADD detection mode



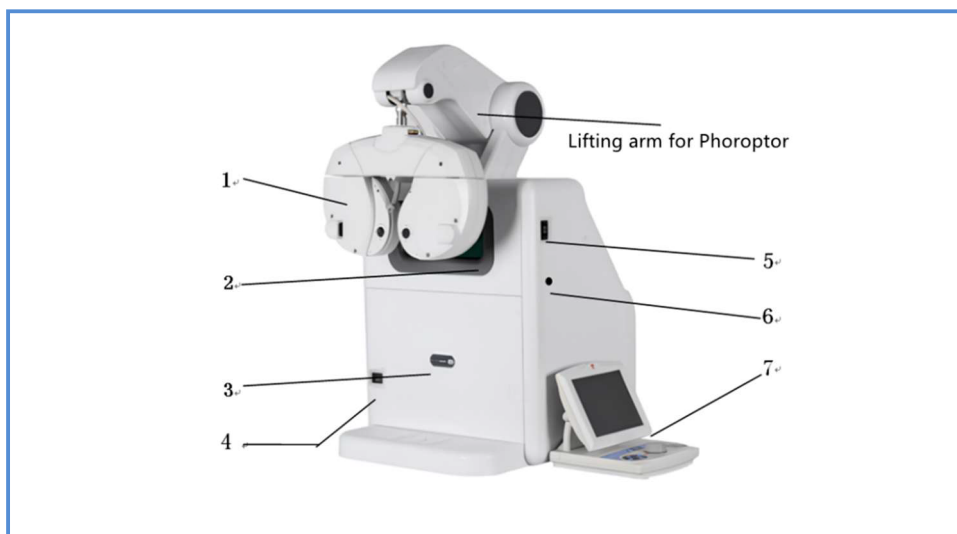
keystrokes	Operation content
0.25D	Set the spherical step size to 0.25 D
0.50D	Set the spherical step size to 0.50 D
1.00D	Set the spherical step size to 1.00D
3.00D	Set the spherical step size to 3.00D

Prism detection mode:

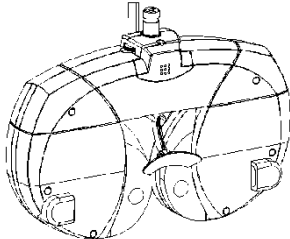


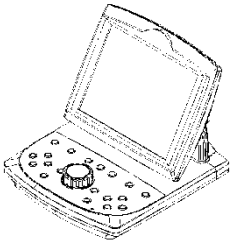
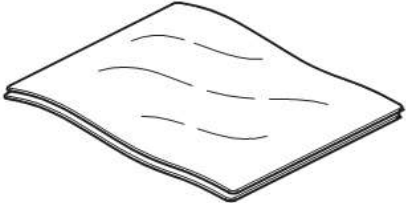
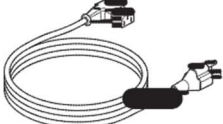
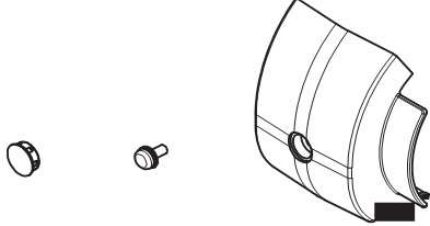
keystrokes	Operation content
0.1	Set the prism step to 0.1Δ
0.5	Set the prism step to 0.5Δ
XY/Rθ	Toggle between XY and polar model
CLEAR	Clear prism data

2.3 Package contents



Unpack the contents from the shipping container and verify that everything is complete.

Part name	Quantity	Appearance
ETR-770 Mirror chart	1	
Lifting arm	1	
ETR-770 Phoropter	1	

Control panel	1	
Forehead support	1	
Face support (with head handpiece (Provided together with the phoropter))	1 pair	
Dust cover	1	
Power cord	1	
Cover plate, cap, screw	1 each	
One hexagonal wrench M3 and one M4 each	2	
Screwdriver	1	
Instruction manual	1	

2.4 Before first use

◆ Before first use or after removal

- The installation of the equipment on the workbench is taken as an example for description.



- The table on which the device is mounted must have a means of elevation in order to achieve high alignment of the head (window) with the patient's eye.

⚠ Notice

- Use two or more people to carry the equipment, lifting from both the front and rear.

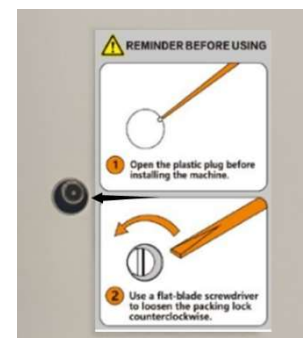
1. Arrange two or more people to put their hands on the right and left parts of the main machine and lift them, and then place the equipment on the workbench. Make sure the workbench is level and there is no rattling.



Worktable

2 Loosen the distance/proximity switching part set screw (packing lock).

- 1) Turn the set screw counterclockwise with an M4 hex wrench to loosen it.
- 2) Install the cap.



⚠ Notice

- Do not turn on the device before loosening the set screw of the distance/proximity switching unit.

Otherwise, a malfunction may occur.



3 Operating procedures

3.1 Equipment startup and shutdown

3.1.1 Inspection before use and equipment startup

1 Be sure to check the stability of packing lock, power plug, connecting wires and lifting platform before starting the equipment.

2 Turn on (I) the power switch of the device.

A few seconds after the device is powered on, the startup screen in the window appears, and then the screen switches to the measurement screen.



The phoroptor enters the self-inspection state and enters the inspection interface.

3.1.2 Equipment shutdown and post-use inspection

1. Turn off (O) the power switch.

2. Clean as necessary.

3. Perform a post-use inspection.

It is recommended to create a checklist and fill in the results.

- Power is cut off.
- Face support and forehead support are clean.
- The equipment is clean and in good condition.

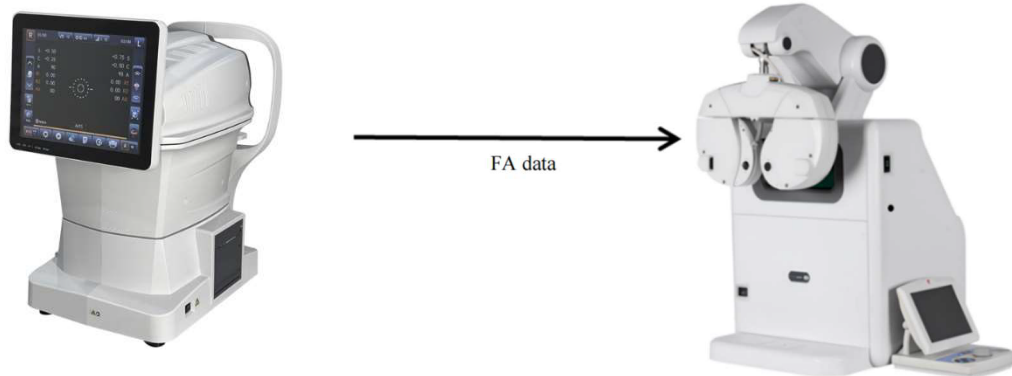
4. Put a dust cover on the equipment.

3.2 Import data before optometry

3.2.1 Importing Data from Auto Refractometer

This section describes how to import objective (FA) data from an auto refractor. Please refer to the user manual for the operating instructions of the auto refractor.

Auto Refractometer	ERK-770
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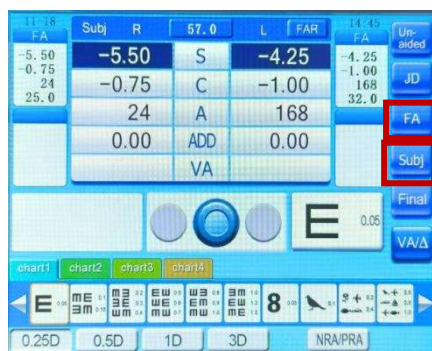


1. Measure the patient's eyes with auto refractor.

2. When the measurement is complete, press the print button on the auto refractor.

When printing, the measured values are automatically transferred to the memory of the mirror chart (only one set of measurement results can be stored.)

3 Press the FA key and the data will be displayed in the windows on the left and right sides of the operating panel. Then press the Subj key and the data will be uploaded to the phoropter. The degree will be automatically placed in the window.



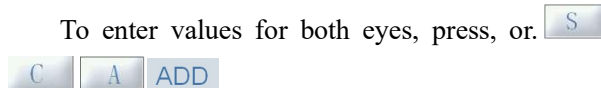
3.2.2 Manual Data Entry

1. Data measured by the auto refractor or the lensmeter can be entered using the control panel (manual operation). For the operating instructions of the autorefractometer or lensmeter, refer to the instruction manual.

2. Press the desired number column.

Press a number bar to highlight it in dark blue to indicate that the value is changeable.

To enter values for both eyes, press, or.



Press (Pd) to allow PD) to allow entry of PD values. 64.0

3. Turn the rotary button on the operating panel to input the measurement of the auto refractor or lensmeter.



3.3 Input Prism Value

3.3.1 Specifying the Prism Value Display

Format

1. Set the device to Prism mode.

Press. 



2. Press 

3. Enter the prism degree along the base (up/down) direction.

The prism value can be changed by turning the rotary disk in increments of 0.5 Δ .

- Turn left eye clockwise to base down and right eye clockwise to base up
- Turn left eye counterclockwise to base up



Right eye to base down, instead of rotating the rotating disk, or, the prism value can be changed in increments of 0.1 Δ .  Also, press and hold this button to continuously change the prism value. 

3.3.2 Input Polar Coordinates (θ)

1. Press. 

2. Enter the absolute value of the prism.

By turning the rotating disk, the prism value can be changed in increments of 0.5 Δ .

Instead of turning the dial, or changes the prism value in increments of 0.1 Δ .  



In addition, press and hold or to continuously change the prism value.  

- 3 Press. 

- 4 Enter values in the direction of the prism base.

Turn the rotary disc to change the angle in 1 $^\circ$ increments.

3.4 Display of visual target

This section describes optotype selection and chart display (E-chart, single-column chart, single-row chart, single-letter chart, or red-green filter).

3.4.1 Selection of visual target

1 By optotype area



2 Press the button of the target to be displayed. The selected optotype is displayed in the window. The displayed optotype can be returned to the measurement screen by selecting an optotype in the optotype display column at the bottom left of the screen.

3.4.2 Selection of visual acuity chart

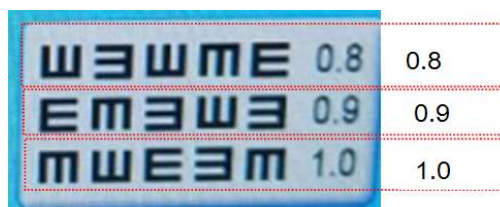
Press the button of the optotype to be displayed.

The E chart or the selected chart is displayed.



Notice

- E-chart displays multiple charts in order of visual acuity. The optotypes surrounded by dotted lines in the figure below represent the same visual acuity value.



◆ Occlusion chart

Using the function buttons, the E chart can be changed to a single column chart, a single row chart, a single letter chart, or a red-green filter.

◆ Display the upper or lower row

Button	Function
	Displays the upper row of the displayed eye chart.
	Displays the lower row of the displayed eye chart.

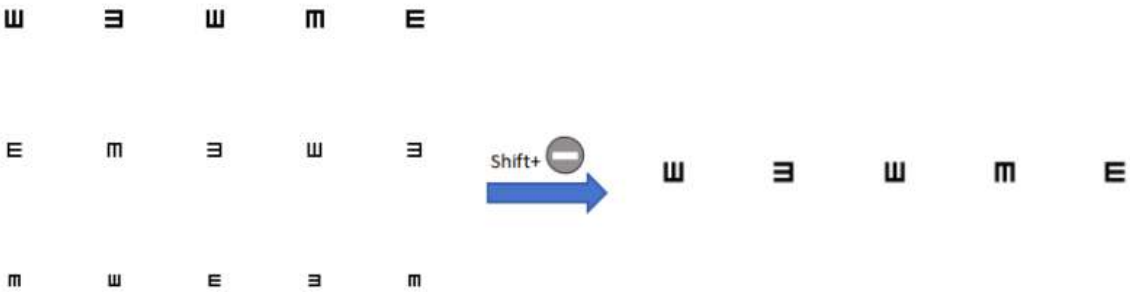


◆ Display Single Line Display Visual Acuity Chart

Press to display the E visual acuity chart at the same time, and the middle single column will be displayed. 

Button	Function
Shift + 	• Display a single row of an E-chart.

• Function button operation and single line display process (visual acuity value is not displayed to the patient 0.8 0.9 1.0)



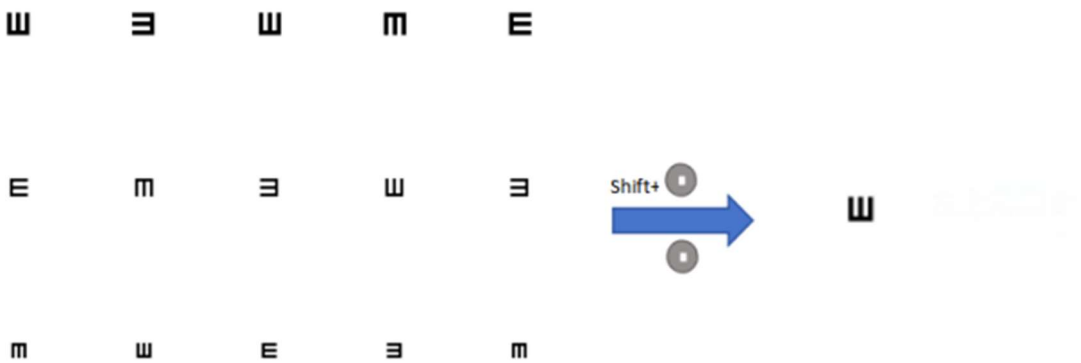
◆ Display single letter chart

Press or Shift + to display a single letter when the E chart is displayed.  

Button	Function
Shift + 	A single letter that displays an E chart.
	A single letter that displays an E chart.

- Function button operation and single letter display process

(Visual acuity values are not displayed to the patient 0.8 0.9 1.0)

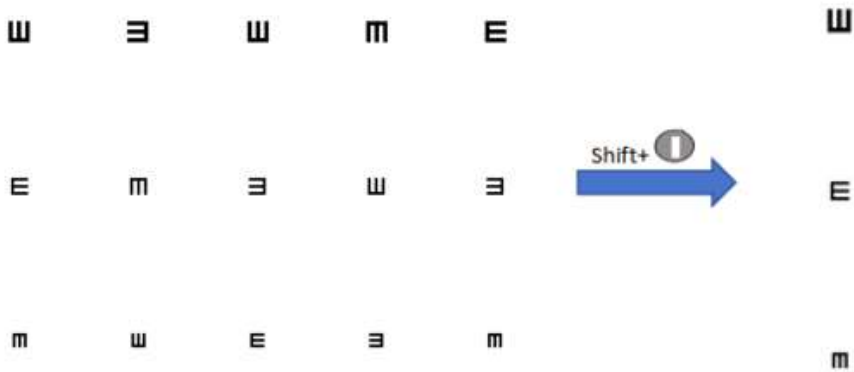


Display a single-column visual acuity chart

Press Shift + to display a single-column visual acuity chart when the E chart is displayed. 

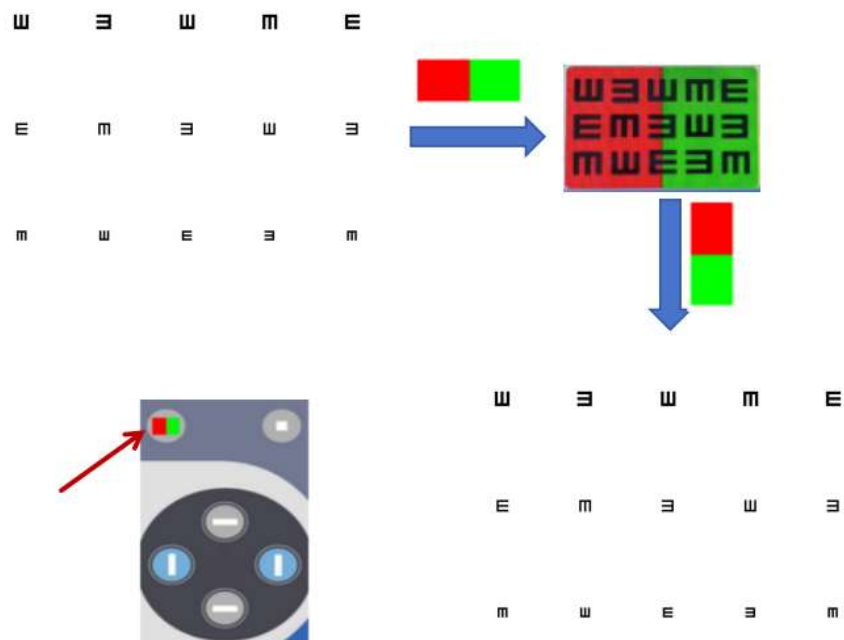
Button	Function
Shift + 	• Display the left-most column of the E-chart to display the chart.

- Function button operation and single column display process (visual acuity value is not displayed to the patient 0.8 0.9 1.0)



◆ Apply red-green filtration

- Function button operation and red-green filtering



◆ Remove the red and green filter

Press the red and green button on the screen of the operation panel to release the red and green filtering.

3.5 Measurement of distance or near vision

3.5.1 Measurement of distance vision

1. If NEAR is displayed on the measurement screen, press this button to change it to FAR

Remote mode is activated. After the phoropter has been moved, optometry is started with the patient's forehead resting on the forehead rest.

2. Press the optotype display icon to select the optotype.

The operation screen of the selected visual target is displayed.

Change the visual target as needed to achieve the best visual acuity.

3. Test visual function visual target

Press  to select the required visual target, or press the key



to select.

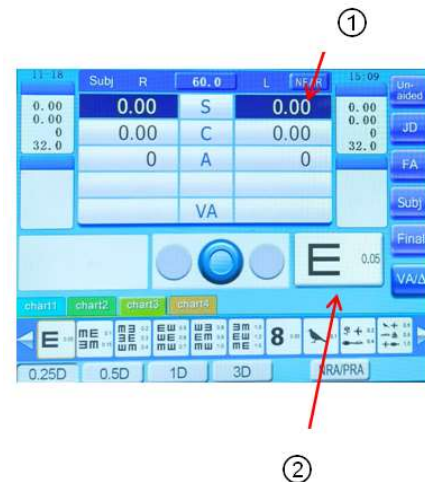
3.5.2 Measurement of near vision

1. If FAR is displayed on the measurement screen, press this button to change it to NEAR.

Proximity mode is activated. After the phoropter has been moved, optometry is started with the patient's forehead resting on the forehead rest.

2. Press optotype to display the icon. All kinds of visual targets can be selected.

The selected visual target is displayed in the window, and the visual target operation screen is displayed.





4 Optometry

Notice

- Clean equipment before optometry.
- Advise the patient not to touch the test head, control box panel, or main unit before sitting or standing for the test.
- When moving the head up or down, ask the patient to place their hands on their knees and keep a distance of 20 cm or more between the head and the patient.

The patient may be struck in the face during the movement of the head, or the hands may be caught in the armrest. If both hands are caught in the armrest, immediately release the head up and down movement switch to stop movement.

- Advise the patient not to push their forehead toward the forehead support during the optometry and not to move away from the forehead support. Otherwise, the optometry may not be performed correctly.

- When the head is switched between the distance and near vision tests, the head moves to diverge or converge. Before performing the near vision test, remind the patient to keep their face 20 cm or more away from the test head. When the movement is complete, optometry begins with the patient's forehead touching the forehead support.

4.1 Preparation before optometry

Before optometry, the purpose and method of optometry should be fully explained to patients.

The position adjustment of the phoropter, the corneal apex distance adjustment, and the interpupillary distance adjustment are described below.

4.1.1 Adjust the position of the phoropter

1. Remind the patient to remove their glasses or contact lenses and sit in the chair.

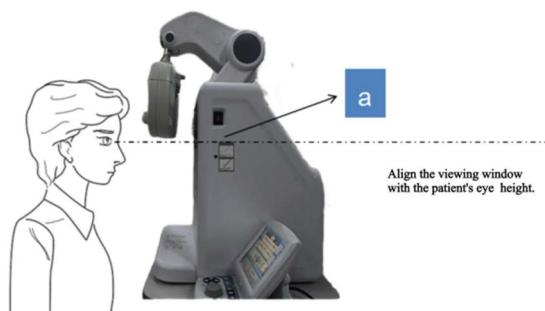
Remind the patient to keep their face away from the phoropter.

2. Press the up and down switch to lower the phoropter to the bottom.

3. Align the viewing window with the patient's eye height.

1) Remind the patient to move his or her face toward the phoropter, taking care not to touch it.

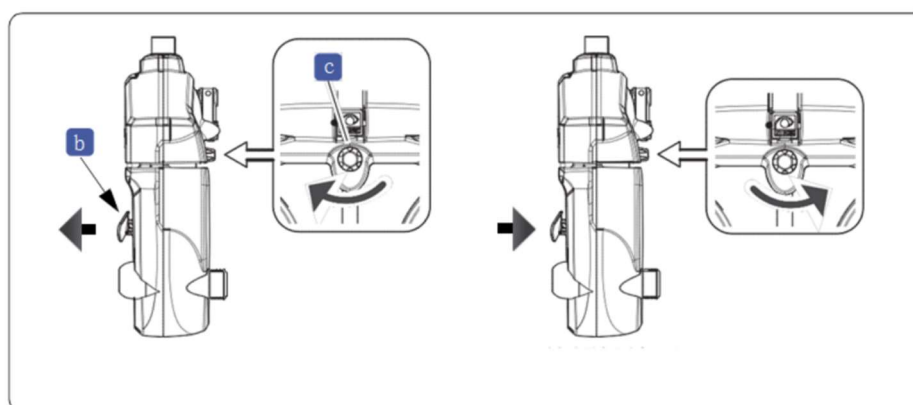
2) Press the up and down switch on the table to roughly align the eye height mark a with the patient's eye height.



4 Adjust the longitudinal position of the forehead support.

1) Remind the patient to look through the measurement window and lean on the forehead rest B.

2) Turn the forehead support adjusting knob C clockwise or counterclockwise to adjust the longitudinal position of the forehead support.

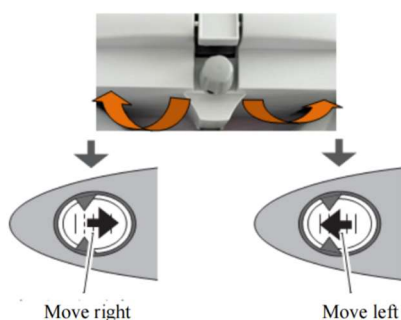


4.1.2 If it is necessary to adjust the corneal apex distance.

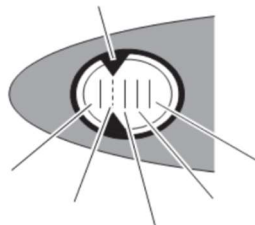
This section describes how to adjust the corneal vertex distance (VD) for the patient's right eye. The following is described starting from a state in which the positioning of the head has been completed.

1. Check adapter a. By looking at VD on the left side from the operator's side.
2. Check the corneal apex distance of the patient's right eye.
3. Align the apex of the patient's cornea with the desired VD mark using the forehead rest adjustment knob B.
4. Adjust the PD distance.

Turn the adjustment knob counterclockwise and clockwise



VD confirmation



This section describes how to adjust the pupillary distance (PD).

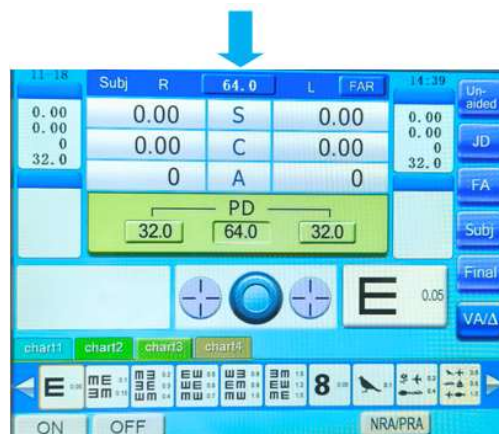
1. Open the outer cover a of the pupil position confirmation window by hand and observe through the pupil position confirmation window B from the back and front.

- When one eye is offset up or down

2. If the patient's eyes are not centered on the right and left sides of the PD exam lens, adjust the patient's interpupillary distance.

- Place the PD exam lens to illuminate the patient's eye.

- 3 Press again** **(PD) to exit PD mode.**



4.2 Visual acuity test

This section describes the test methods for uncorrected and corrected visual acuity.

4.2.1 Measurement of naked eye vision

Purpose	Measure the uncorrected visual acuity of the right eye, left eye, or both eyes.	
Use the optotype	Letters, numbers, E visual chart, children's visual target	
Measurement method	Evaluate the minimum visual acuity at which the patient is able to see the target.	

1 Press to measure the uncorrected visual acuity of the right eye. R

Patients were assessed for best visual acuity when they were able to see the smallest target.

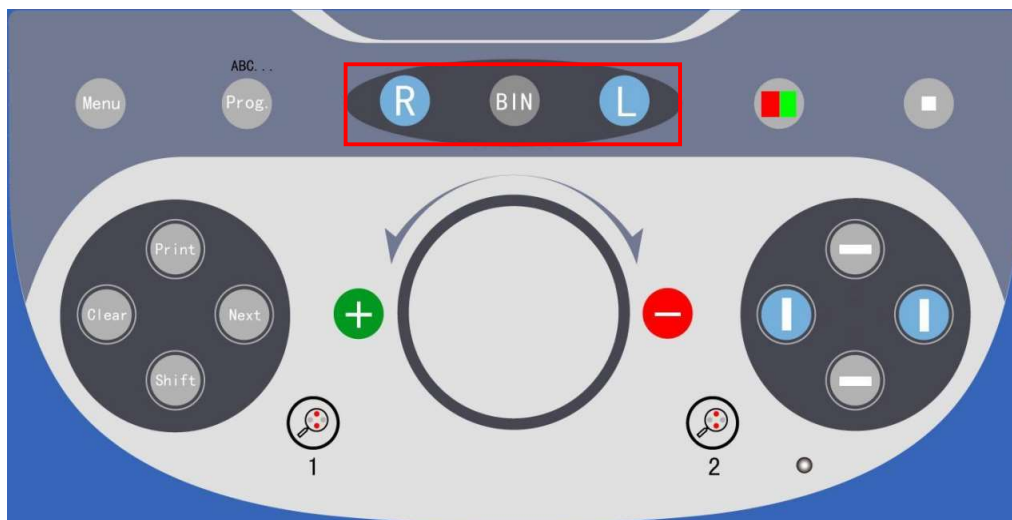
2 Press to measure the uncorrected visual acuity of the left eye. L

Follow the same procedure as step 1.

3 Press to measure the uncorrected visual acuity of both eyes. BIN

Open your eyes.

Follow the same procedure as step 1.



4.2.2 Measure the corrected visual acuity.

Corrected visual acuity can be measured when JD data is imported.

Purpose	Corrected visual acuity was measured in the right, left, or both eyes.	
Use the optotype	Letters, numbers, E visual chart, children's visual target	
Measurement method	Evaluate the minimum visual acuity at which the patient is able to see the target.	

1. Press. **JD**

JD measurement mode is activated.

The corrective lens data is placed in the measurement window according to the JD data.

2. Press to measure the corrected visual acuity of the right eye. **R**

Press the + or – control dial to change the vision value.

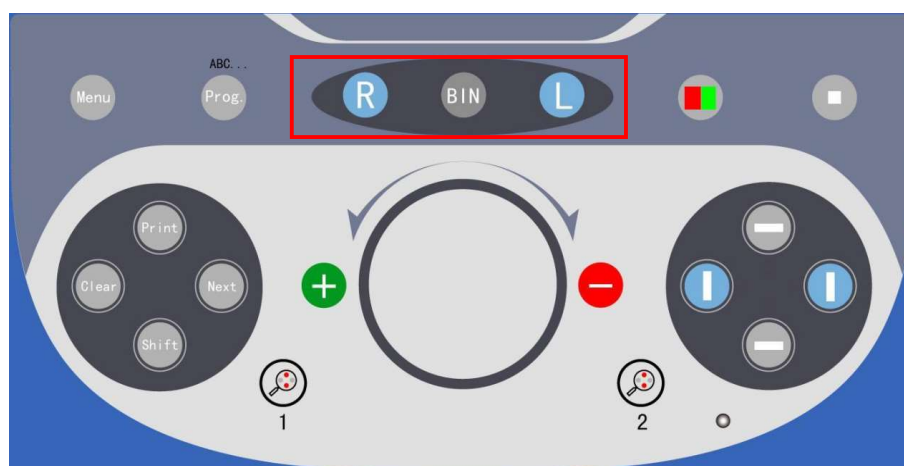
3. Press to measure the corrected visual acuity of the left eye. **L**

Follow the same procedure as step 2.

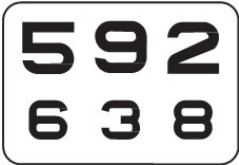
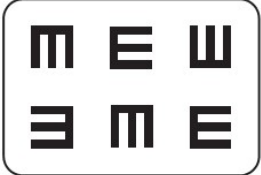
Measure the corrected visual acuity of both eyes. **BIN**

Open your eyes.

Follow the same procedure as step 2.



♦ Distance vision chart and near vision

Name	example
Letter	
Number	
E visual acuity chart	
Children's visual acuity chart	

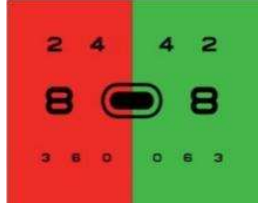
♦ Visual acuity 5-minute record conversion table

For visual acuity values, refer to the following 5-minute record conversion table.

Decimal vision	5-minute recording	Line width viewing angle (minutes)
0.04	3.6	25.119
0.05	3.7	19.953
0.06	3.8	15.849
0.08	3.9	12.589
0.1	4.0	10.000
0.12	4.1	7.943
0.15	4.2	6.310
0.2	4.3	5.012
0.25	4.4	3.981
0.3	4.5	3.162
0.4	4.6	2.512
0.5	4.7	1.995
0.6	4.8	1.585
0.8	4.9	1.259
1.0	5.0	1.000
1.2	5.1	0.794
1.5	5.2	0.631
2.0	5.3	0.501

4.3 Spherical mirror correction

4.3.1 Red-green test

Purpose	Correct the spherical power in the red and green test.	
Use the optotype	Red and green visual targets	
Ideal appearance	The letters on the red side and the green side look equally clear.	

1. Press **R** or **L** to select the eye to be measured.

2 Correct the spherical power in the red and green test.

1) Click the red and green test visual target.

2) Close the left eye window. The right eye is placed in the sphere + 1.0 D.

(Turn the knob counterclockwise by 4 divisions)

3. Turn the knob to reduce the fog until the letters on the red side and the green side look equally clear.

Ask the patient, "Which is clearer, the red or the green?" "

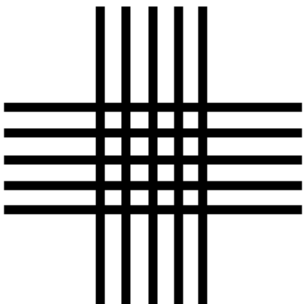
Until the red and green are as clear (almost clear).

Adjust as required as follows.

The letters on the red side and the green side look equally clear.	The operating procedure is now complete.
The letters on the red side look clearer.	Turn the knob clockwise.
The letters on the green side look clearer.	Turn the knob counterclockwise.
The letters on the red side and the green side look equally clear.	The green side should look slightly clearer.



4.3.2 Cross grid test

Purpose	The spherical power is corrected in the cross grid test.	
Use the optotype	Cross grid optotype	
Ideal appearance	The rows and columns appear equally clear.	

1. Press **R** or **L** to select the eye to be measured.

2. Correct the spherical power in the cross grid test.

Click  to display the cross grid optotype.

The measurement picture is displayed, and the ± 0.50 D cross cylinder lens is placed.

3. Turn the **S** knob until the rows and columns look equally clear.

- 1) According to the eye to be measured.
- 2) Ask the patient, "Which is clearer, horizontal or vertical?" Or is it almost as clear? "

3) Turn the knobs one by one until they look equally clear.

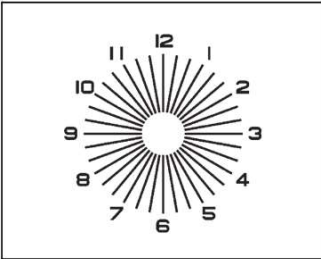


Adjust as required as follows.

The rows and columns appear equally clear.	The operating procedure is now complete.
It seems clearer to run wild.	Turn the knob counterclockwise.
A single-column visual acuity chart appears to be clearer.	Turn the knob clockwise.
The rows and columns do not seem to be equally clear.	A single-column chart should appear to be clearer than a single-column chart.

4.4 Astigmatism test

4.4.1 Measurement of astigmatism with an astigmatism chart

Purpose	Measurement and Correction of Cylindrical Axial Angle with Astigmatism Chart	
Use the optotype	Astigmatism chart	
Ideal appearance	All the lines seem equally clear.	

1. Press  or  to select the eye to be measured.

2. Display the astigmatism chart.

Click the  visual target, the measurement screen is displayed, and the cylindrical lens mode is activated.

3. Fog visual acuity, until the visual acuity to about 0.1.

1) If the cylinder value is not 0, change it to 0.

2) Press the S number column of the eye to be measured to enter the spherical power mode.

3) Turn the dial counterclockwise to add positive degrees.

4 .Turn the dial clockwise to reduce the fog until the visual acuity becomes about 0.5.

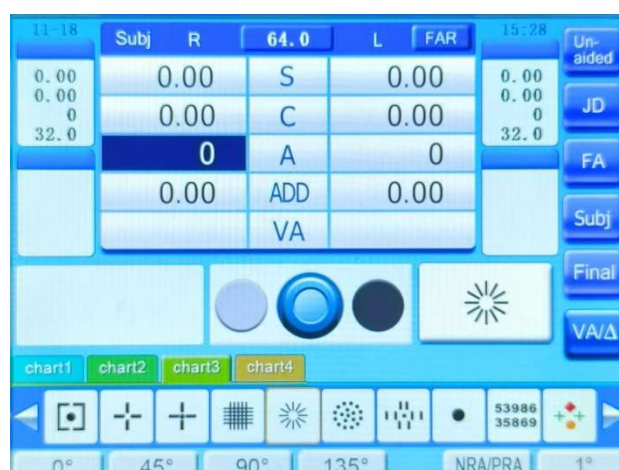
The number next to the line (1-12) has the clearest line.

Ask the patient, "What time is the clearest line?" "Adjust as needed as follows."

Measure the direction of the negative cylindrical axis angle by multiplying the smaller number (1 to 6) next to the sharper line by 30 °.

For example, when the line at 2 o'clock or 8 o'clock is clear: $2 \times 30^\circ = 60^\circ$, the axial position is 60° .

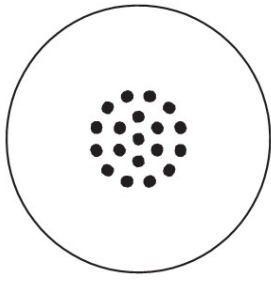
5. Press the number column of the eye to be measured and turn the knob to set the cylindrical lens axis at 60 °.



6. Click C to enter Cylindrical Degree mode, adding negative cylindricals in 0.25 D increments until all lines appear equally sharp.

The sharper lines move in a counterclockwise direction.	Decrease the axis value
The clearer lines move clockwise.	Increase the axis value

4.4.2 Correction of astigmatism axis and astigmatism degree with cross cylinder

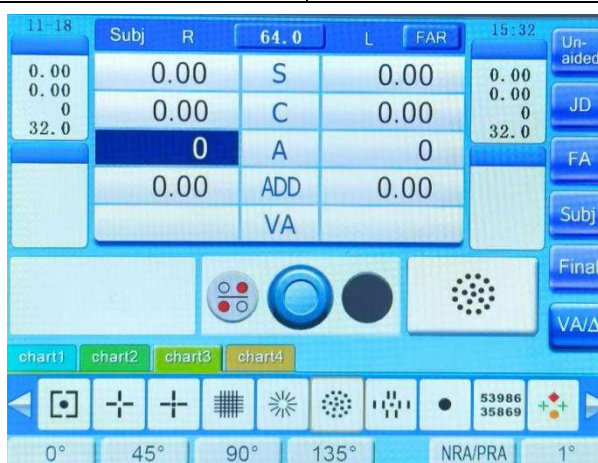
Purpose	Measurement and correction of cylinder axis and cylinder power using crossed cylinder lenses	
Use the optotype	Dot group optotype	
Auxiliary Lens	Cross cylinder lens	
Ideal appearance	The first and second sides of the cross cylinder are equally clear.	

1. Set the phoropter according to the FA data, and press A  or A  to select the eye to be measured.

Displays the dot group optotype. Click on the  icon and the right eye will be directly inserted into the cross cylinder.

2. Precise astigmatic axis until optotype 1 and optotype 2 appear equally clear.

Precise astigmatism axis: Press  or  change the two sides of the cross cylinder and ask the tester which side is clearer. If the  is more clear, press the + key on the top; if the  is more clear, press the - key on the top. At the same time, the phoropter will automatically adjust the astigmatism axis. Repeatedly press the  /  key and the +/- key alternately until the tester thinks that both sides are equally clear, and the main interface shows the accurate axis of astigmatism.

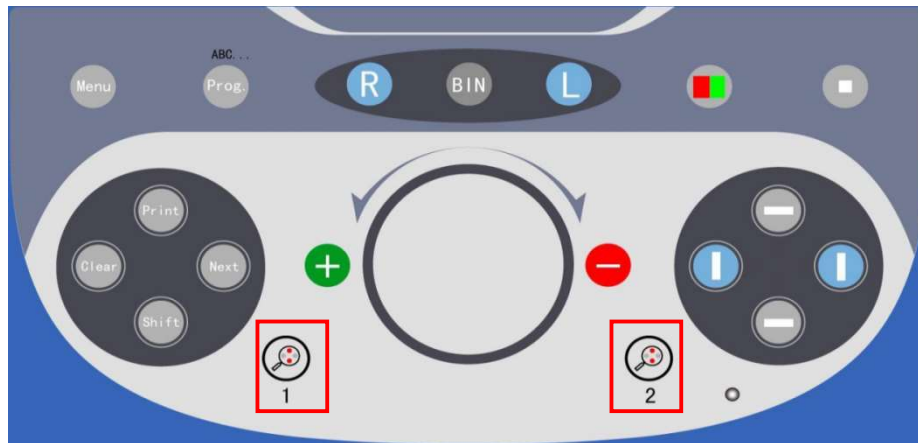


3. Accurate degree of astigmatism

After accurate astigmatism axis, click C to set the astigmatism degree to the current test status.

Press  /  to change the two sides of the cross cylinder and ask the tester which side is clearer. If the  side is clearer, press the + on the top of the key; if the  side is clearer, press the - on the top of the key. At the same time, the optical head will automatically adjust the astigmatism degree.

Repeatedly press the  /  key and the +/- key alternately until the tester considers that both sides are equally clear, and the main interface displays the accurate degree of astigmatism.



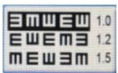
4.5 Binocular visual function test

4.5.1 Binocular balance test

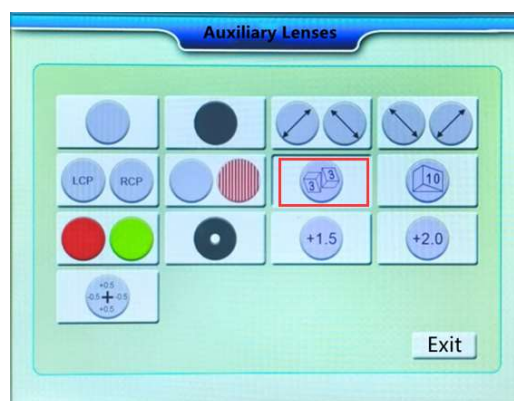
Purpose	Both eyes achieve the same appearance.	
Use the optotype	Binocular balance visual target (far visual target can also be used near)	
Auxiliary Lens	3 Δ BD prism for the right eye and 3 Δ BU prism for the left eye	
Ideal appearance	The letters in the upper and lower lines appear equally clear.	

Appearance		
Right eye 	Left eye 	Ideal appearance 

1. Display the binocular balance optotype.

Click the single line of  (click Shift +  on the operation panel), and then click the auxiliary lens in the red box. Select the 3 prisms in the red box to insert the measurement screen, and the spherical lens mode is activated.

The 3 Δ BD prism is placed in the right measurement window and the 3 Δ BU prism is placed in the left measurement window.



Until the upper and lower E target look equally legible.

Ask the patient, "Which is clearer, the upper or the lower?" Adjust the spherical lenses of the left and right eyes to make the upper and lower eyes look equally clear.

4.5.2 Heterophoria test

Purpose	Detection and correction of horizontal and vertical heterophoria.	
Use the optotype	Cross oblique visual target	
Auxiliary Lens	A red filter for the right eye, a green filter for the left eye, and a rotating prism for both eyes.	
Ideal appearance	See a cross.	

Appearance		
Right eye 	Left eye 	Ideal appearance of both eyes (orthotropic eyes) 

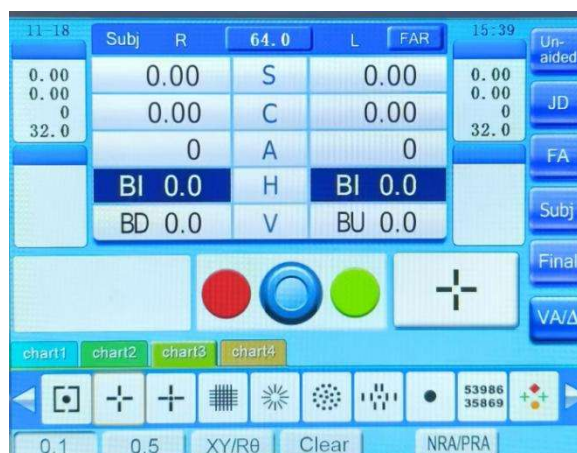
1. Display cross oblique optotype.

Click , the measurement screen is displayed and the prism mode is activated. The red filter is placed in the rear measurement window and the green filter is placed in the left measurement window.

Ask the patient if you can see the vertical and horizontal lines forming a cross in the center?

Yes > No heterophoria

No > Have heterophoria



4.5.3 Cross Oblique with Fixation Test

Purpose	Heterophoria is detected and corrected by providing a fusion stimulus dot.	
Use the optotype	Cross oblique optotype with fixation	
Auxiliary Lens	A red filter for the right eye, a green filter for the left eye, and a rotating prism for both eyes.	
Ideal appearance	See a cross.	

Appearance		
Right eye 	Left eye 	Ideal appearance of both eyes (orthotopic eyes) 

1. Display cross oblique optotype with fixation.

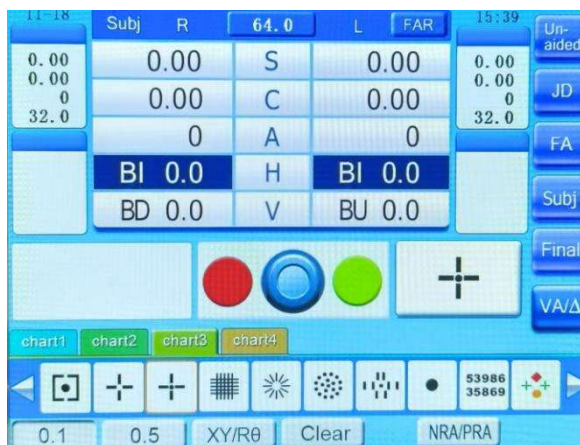
Click , the measurement screen is displayed and the prism mode is activated.

The red filter is placed in the right measurement window and the green filter is placed in the left measurement window.

Ask the patient if you can see the vertical and horizontal lines forming a cross in the center?

Yes > No heterophoria

No > Have heterophoria



4.5.4 Maddox rod test (eye position test)

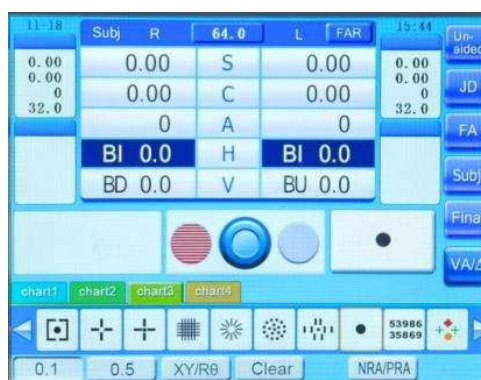
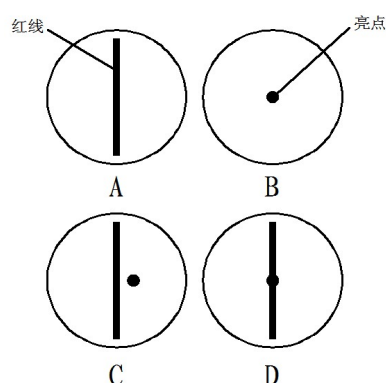
Purpose	Detection and correction of horizontal cruciate oblique position.	
Use the optotype	Fixation point	
Auxiliary Lens	The right eye is a horizontal maddox rod and the left eye is a rotating prism.	
Ideal appearance	The white dot is on the line.	

Appearance		
Right eye 	Left eye 	Ideal appearance of both eyes (orthotopic eyes) 

1. Display fixed point optotypes.

Horizontal heterophoria is first tested by selecting the binocular mode, using the right eye lens selection button, and applying the red maddox rod to the right eye while projecting the projection point icon. The patient will see a red vertical line in the right eye (Figure A) and an illumination point in the left eye (Figure B). The binocular fusion image is shown in Figure C or Figure D. If the lighting point is on the red vertical line (Figure D), no prism adjustment is required.

Or click  to display the test screen, and place the horizontal maddox rod in the right window. The measurement screen is displayed and the horizontal prism mode is activated.



2. Adjust until the white point is on the line.

Ask the patient, "Does the white dot shift to the right or left of the red bar?"

If there is a horizontal shift in the white spot, adjust as follows.

Phoria	Appearance	Operating procedures
Esophoria (white spot deviates to the left.)		Press  Turn the knob clockwise to add the BI prism value until the white point appears to be completely on the red bar.
Exophoria (white spot deviates to the right.)		Press  Turn the knob counterclockwise to add the BO prism value until the white spot appears to be completely on the red bar.

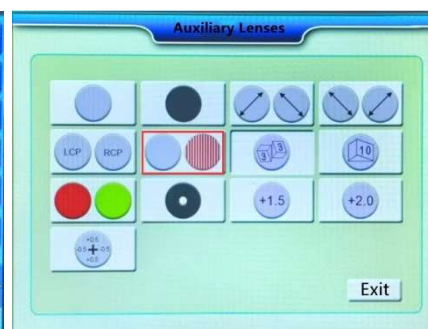
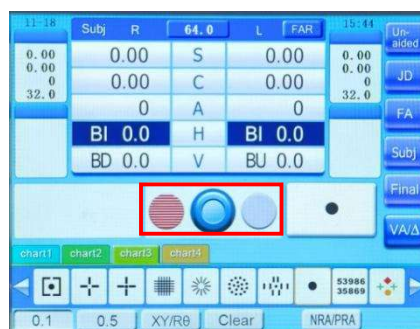
4.5.5 Maddox (Vertical Cross Oblique) Test

Purpose	Detect and correct vertical cross slanting.	
Use the optotype	Fixation point visual target	
Auxiliary Lens	The right eye is a rotating prism and the left eye is a vertical Malpighian rod	
Ideal appearance	The white dot is on the line.	

Appearance		
Right eye 	Left eye 	Ideal appearance of both eyes 

1. Display fixed point optotypes.

Click  to display the test screen, and place the horizontal maddox rod in the right window. The measurement screen is displayed and the horizontal prism mode is activated.



2. Switch auxiliary lens

1) Select the lens in the red box in the auxiliary lens.

The measurement screen is displayed with the horizontal bar removed from the right measurement window and the vertical bar placed in the left measurement window. The vertical prism mode is activated.



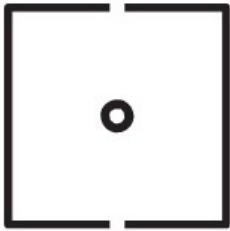
3. Adjust until the white dot overlaps the line.

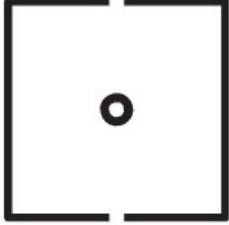
Ask the patient, “Does the white spot shift up or down? Or is the white spot on the red pole?”

If there is a vertical shift in the white spot, adjust as follows.

Phoria	Appearance	Operating procedures
Superior heterophoria of left eye (upward shift of white spot).		Press  . Turn dial clockwise to add the BU prism value until the white spot appears to be completely within the red bar.
Superior heterophoria of the right eye (white spot shifted downward).		Press  . Turn the dial counterclockwise to add the BD prism value until the white spot appears to be completely within the red bar.

4.5.6 Aniseikonia (vertical cross oblique position) test

Purpose	Aniseikonia is detected	
Use the optotype	Vertical aniseikonia visual acuity chart	
Auxiliary Lens	Red filter for right eye and green filter for left eye	
Ideal appearance	- The right and left frames appear to be the same size. - The right and left frames appear to be vertically aligned.	

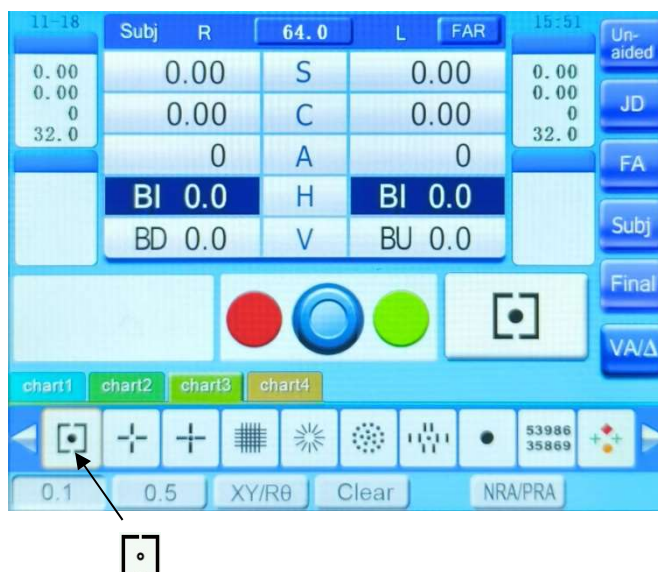
Appearance		
Right eye 	Left eye 	Ideal appearance of both eyes 

♦ Aniseikonia detection

1. Display the vertical coincidence chart.

Click  to display the measurement screen. The red filter is placed in the measurement window on the right, and the green filter is placed in the measurement window on the left.

Ask the patient, "Can you see the box with a dot in the center? Whether the right frame and the left frame have the same size."



Same size → orthotopic eye

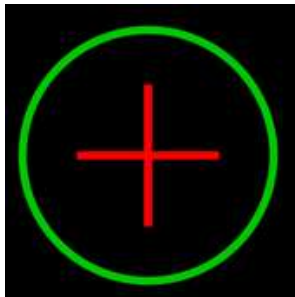
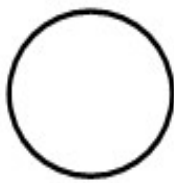
Different size → Aniseikonia

For example) 3.5% aniseikonia

The linewidth corresponds to 3.5% of the aniseikonia.

- When anisometropia (the difference in refractive power between the right and left eye is 2.00D or more), the spectacle lens prescription is for axial anisometropia and the contact lens prescription is for refractive anisometropia.

4.5.7 Schober Test

Purpose	Correction of heterophoria.		
Use the optotype	Schober's visual target		
Auxiliary Lens	A red filter for the right eye, a green filter for the left eye, and a rotating prism for both eyes.		
Ideal appearance	I saw a cross in the center of the garden.		
Appearance			
Right eye	Left eye	Ideal appearance of both eyes (orthotopic eyes)	
			

4.5.9 Four-point visual target test

Purpose	Fusion or suppression is detected.	
Use the optotype	Four-point visual target	
Auxiliary Lens	Red filter for right eye and green filter for left eye	
Ideal appearance	 See red,  green  and pink or red/green.	

Appearance		
Right eye	Left eye	Ideal appearance of both eyes (orthotopic eyes)
  Red  , red 	  Green  , green 	 See red  , green  and pink or red/green 

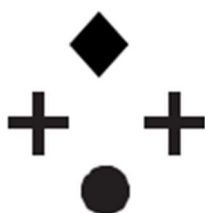
1. Display four-point optotype

Click  to display the measurement screen.

The red filter is placed in the measurement window on the right, and the green filter is placed in the measurement window on the left.

2 Adjust until you see red , green , pink, or red/green. 

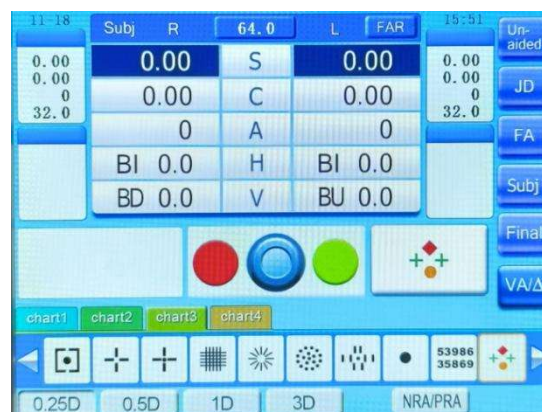
Ask the patient, "How many bright spots can you see?"



What colors are they?

Normal (fused): 4 optotypes, red , green , pink, or red/green. 

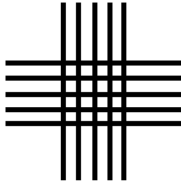
Others are abnormal fusion images.



4.6 ADD test

This section describes how to measure the prescription power of near vision glasses after the distance vision has been corrected, and the required power testing and corrected vision.

◆ Add degree measurement

Purpose	Measure the degree of near addition in the right, left, or both eyes.	
Use the optotype	Cross grid optotype	
Auxiliary Lens	Cross lenticular lens	
Ideal appearance	Columns and rows seem equally clear.	

1. Press **R** or **L** to select the eye to be measured.

2. Select the cross grid optotype.

Click **ADD**  to display the measurement screen, and the cross grid visual target is displayed.

3. Remind the patient to keep his face away from the head.

The optical head move to converge when switching to that join measurement mode.



4. Add degrees via operating panel knob.

- 1) Change the degree of joining as needed.
- 2) Ask the patient, "Which is clearer, horizontal or vertical? Or is it almost as clear?"
- 3) Turn the knobs clockwise or counterclockwise one by one until they look equally clear.

Adjust as required as follow

The rows and columns appear equally clear.	The operating procedure is now complete.
It seems clearer to run wild.	Turn the dial counterclockwise.
Columns appear to be clearer.	Turn the dial clockwise.
The rows and columns do not seem to be equally clear.	The horizontal lines should seem clearer than vertical lines.

▲ Near vision measurement

	2.5	1.1	1	1	1.1	1.3	
--	-----	-----	---	---	-----	-----	--

1. Measure the patient's distance vision correction on the distance vision measurement screen.

- When switching to the near-vision test, the head of the test head converges

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- Proximity mode is activated. After that convergence movement of the head is completed, the

4. Press to measure the near vision of the

- Patients were assessed for best visual acuity

Press or to change the vision value

- Follow the same procedure as step 4

- ## Open your eyes

Follow the same procedure as step 4

4.8 Placement of auxiliary lenses

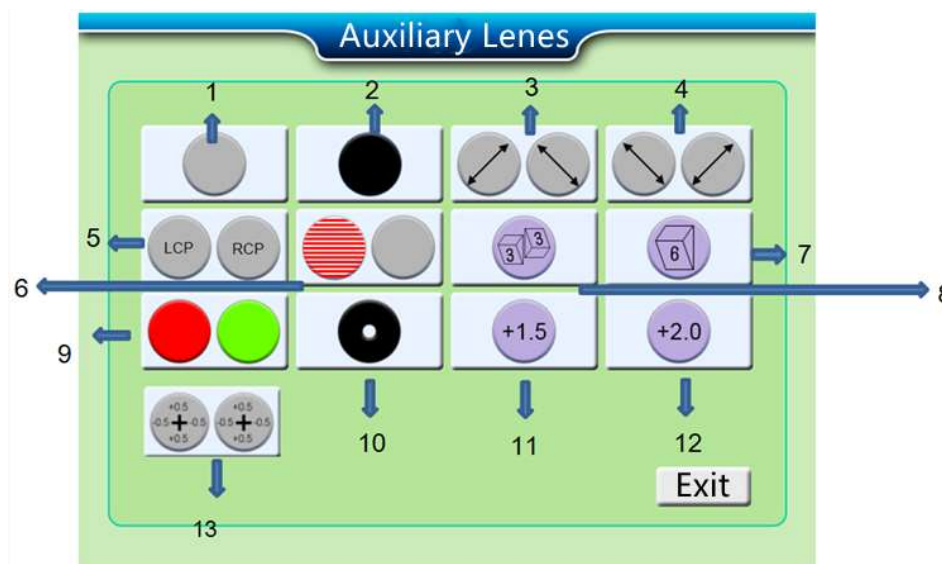
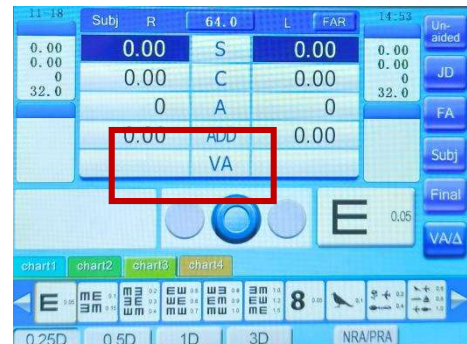
This section describes how to place the secondary lenses.

1. The Auxiliary Lens window is displayed.

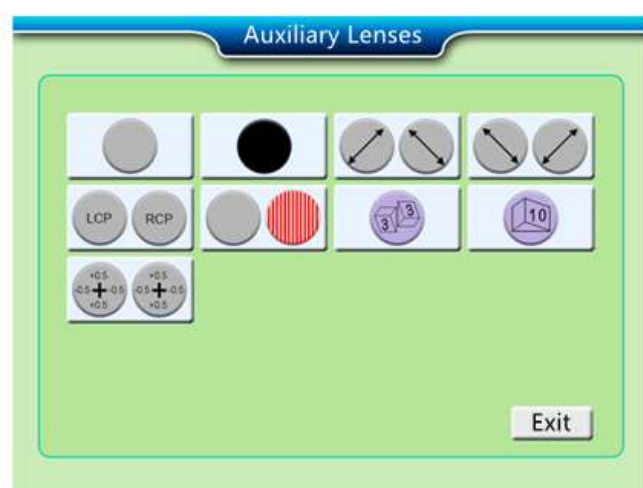
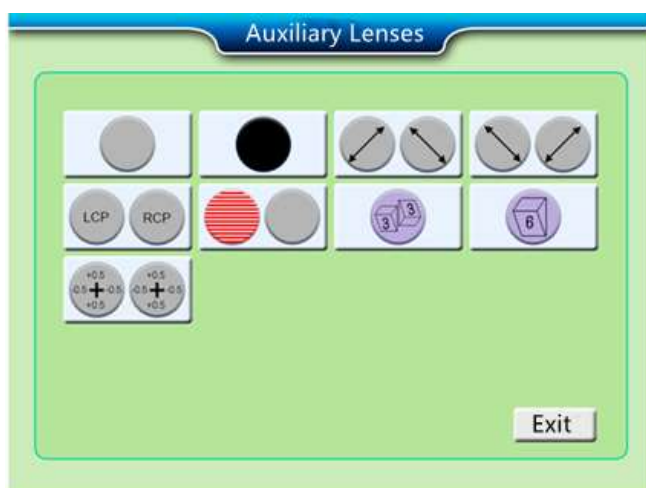
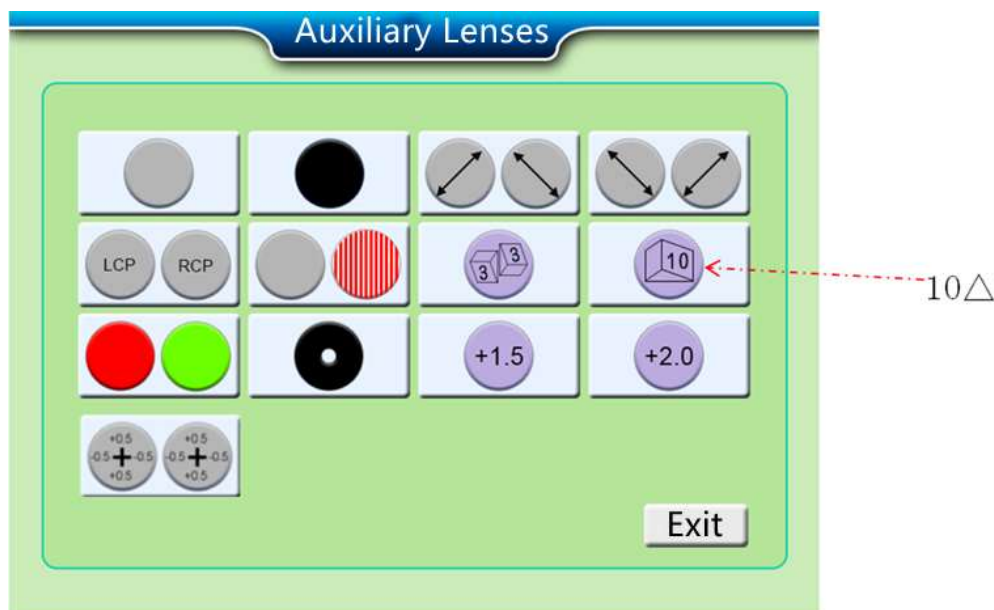
Clicking the red square area in the figure will bring up the auxiliary lens interface.

2. Press the desired auxiliary lens button.

The measurement screen is displayed, and the selected auxiliary lens is placed.



- | | |
|--|--|
| 1. Open the right eye | 7.6 Δ prism |
| 2. Close right eye | 8. Left eye 3 Δ BU, right eye 3 Δ BD |
| 3. Polarizing filter (45 ° left and 135 ° right) | 9. Add red and green lenses |
| 4. Polarizing filter (left 135 ° right 45 °) | 10. Pinhole plate |
| 5. Circular polarization | 11. Retinoscope + 1.5D |
| 6. Malpighian rod | 12. Retinoscope + 2D |
| | 13. $\pm 0.5D$ crossed cylinder |



Near right eye auxiliary lens selection interface Near left eye auxiliary lens selection interface

Compared with the far right eye, the Malpighian rod auxiliary lens is different, and the 6 Δ prism becomes the 10 Δ prism.



5 Maintenance

5.1 Troubleshooting

If the equipment is not working properly, please try to correct the problem according to the following table, and then contact US Ophthalmic or your local authorized dealer.

Fault phenomenon	Remedial measures
The device cannot be activated even if the power switch is turned on.	• Make sure the power plug is properly connected to the power outlet.
The touch screen and visual target of the control box suddenly disappear.	• The device may have entered automatic light off mode. Press any button to exit the automatic light off mode.
The button does not work.	• Turn the power switch off and on.
The touch screen reacts poorly or in a misaligned position.	• Adjust the detection position of the touch screen.
The display of distant or near visual targets is blurred.	• Clean measuring window of the head (head). • Clean sight mark window. • If the display does not become clear even after cleaning as described above, internal cleaning is required. Please contact US Ophthalmic or your local authorized dealer.

If the above remedial measures still fail to correct the fault, please contact US Ophthalmic or your local authorized dealer.

5.2 Cleaning

This section describes how to clean main unit, the optotype window, the pupil position confirmation window, the forehead rest, the face support, the measurement window,

5.2.1 Clean host machine

Notice

- Do not use paint thinners or organic solvents for alcohol lamps to clean machine.
- Do not use sponges or cloths that have been soaked in water.

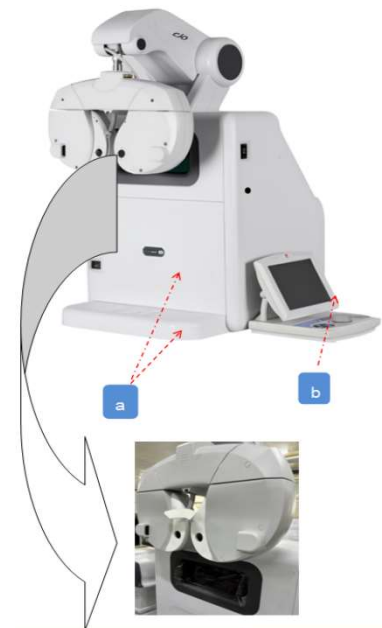
1. Press the up arrow on the up and down switch to raise the phorotor all the way to the top, then turn off the power switch.

2 . Wipe the main unit with a soft cloth.

For stubborn stains, soak a soft cloth in a mild detergent, wring it out, and wipe it.

3.Wipe the front cover part a frequently, especially because it is prone to becoming dirty due to the inspection reaction.

4 .Gently wipe the control box touch screen B with a soft cloth.



5.2.2 Clean visual target window and pupil position confirmation window.

- If the optotype window or the pupillary position confirmation window becomes dirty, an accurate vision measurement cannot be performed. Be sure to check each window before optometry. Clean them if necessary.
- Before cleaning the sight mark window or the pupil position confirmation window, remove the dust on the window with an air brush.
- Do not clean with a cloth dampened with detergent or similar.
Wipe marks may be left or the surface coating may be damaged.

◆ Visual target window

1. Press the up arrow on the up and down switch to raise the phoropter all the way to the top, then turn off the power switch.

2. Blow off the dust on the sight mark window a with a blowing brush.

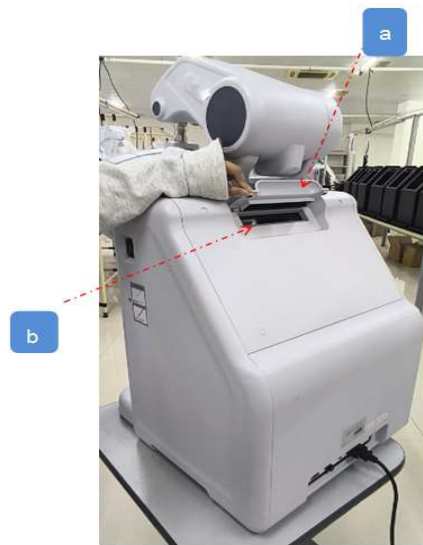
3. Gently wipe off the dust with a dry, soft cloth.

◆ Pupil position confirmation window

1. Open the cover a of the pupil position confirmation window by hand.

2. Blow off the dust on the pupil position confirmation window B with a blowing brush.

3. Gently wipe off the dust with a dry, soft cloth.



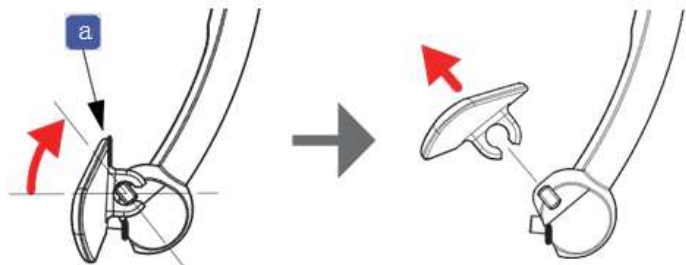
5.2.3 Cleaning the forehead support

⚠ Notice

- Use a cloth dampened with disinfecting alcohol to clean forehead support before optometry.

1. Remove forehead support a

- 1) Tilt the forehead support upward.
- 2) Pull the forehead support at an angle to remove it.



2 For stubborn stains, soak a soft cloth in a mild detergent, wring it out, and wipe it

3. Before optometry, clean forehead support with a cloth dipped in disinfectant alcohol.

4. Press the forehead support at an angle from above to return it to its original position.

5.2.4 Clean face support

Notice

- Use a cloth dampened with disinfecting alcohol to clean facial support before the optometry.
- Do not wipe the inside of the face support with a neutral cleaner.
If the interior becomes damp, it may rust.

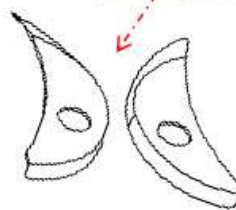
1. Remove the two face supports.

The face support can be magnetically fixed to the phoropter.

2. For stubborn stains, soak a soft cloth in a mild detergent, wring it out, and wipe it.

3. Before optometry, use a cloth dipped in disinfectant alcohol to clean facial support.

4. Reinstall the face support



5.2.5 Clean measuring window.

Notice

- Before cleaning the measurement window or the pupil position confirmation window, remove the dust on the window with an air brush.
- Wiping the dusty window may scratch the glass of the measuring window.
- If the measurement window is dirty from fingerprints, mascara, or dust, an accurate vision measurement cannot be performed. Always check the measurement window before optometry. Clean them if necessary.
- Clean measurement window on the patient's side with a cloth dampened with disinfecting alcohol before refraction.
- Do not clean with a cloth dampened with detergent or similar.
Wipe marks may be left or the surface coating may be damaged.

1. Blow off the dust on the measuring window with a blowing brush.

2. For stubborn stains, gently wipe with a soft cloth that will not scratch the protective glass a.

3 Before optometry, clean measurement window on the patient's side with a cloth dipped in disinfectant alcohol.





6 Specifications and Technical Information

6.1 specification

Visual target		
Visual target (For distance/near distance)	• Accuracy of visual target • Background brightness of visual target • Unevenness of optotype background brightness	• For long distances: 5 m • For close range: 40 cm Visual acuity values from 0.05 to 1.5 are within $\pm 5\%$ of the standard values for the E, digital visual acuity chart, while visual acuity values from 1.5 to 2.0 are within $\pm 5\%$ of the standard values Within $\pm 10\%$. • The luminance range of the measurement area is ≥ 320 CD/m² • Less than 30 percent
Other functions	• Central presentation function • Toggle presentation of optotypes • Up and down motion mechanism of the optical head • Forehead support	• A single column display chart, a single row display chart, or a single letter chart appears in the center of the screen. • With the control box, the sight mark can be changed. When the control box is used to switch between distant and near optotypes, the position of the LCD automatically switches between distant and near optotypes. • Easy to remove for easy replacement of forehead support Adjustment range: 12 mm or more
Communication	Communication method	• Use dedicated communication cables

Check the head	
Sphere Range	0D ~ + 16.75 D, 0D ~ -19 D, step 0.25 D
Cylinder Range	-8.75 D ~ + 8.75 D, step 0.25 D;
Axis Angle	1-180 ° (0 ° equals 180 °) (1 °/5 °)
PD Range	50mm ~ 80mm, step pitch 1mm;
Prism	0 ~ 20 Δ, step distance 0.1 Δ;
Prism Base	0 ° ~ 360 °, step distance 1 °;

Size and weight	
Dimensions	Size of optical head 384mm × 125mm × 454mm
	CM100 Eye Chart Projector 450mm X 500mm X 555mm
weight	31.8 Kg ± 10%
Power supply specification	
Voltage	220V
power	175VA
Environmental conditions of use	
Installation environment	Interior (ensure no direct sunlight)
Temperature	5 ° to 40 °
Humidity	30 % to 90 %
Other	
Service life	8 years from the date of first operation, proper maintenance is required.