OPERATION MANUAL

DIGITAL REFRACTOR EDR-H





https://usophthalmic.com

Before using the instrument, be sure to read this manual thoroughly.

IMPORTANT NOTICE

This product may malfunction due to electromagnetic waves caused by portable personal telephones, transceivers, radio-controlled toys, etc. Be sure to avoid having objects such as, which affect this product, brought near the product.

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SAFETY INFORMATION

Accessory equipment connected to the analog and digital interfaces must be certificated according to the respective IEC standards (e.g. IEC 60950-1 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all configurations shall comply with the system standard EN 60601-1:2006, Clause 16. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard IEC 601-1-1. If in doubt, consult the technical service department or your local representative.

For U.S.A

Do not make any changes or modifications to the equipment unless otherwise specified in the manual.
If such changes or modifications should be made, you could be required to stop operation of the equipment.

For EU Countries

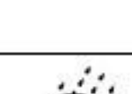
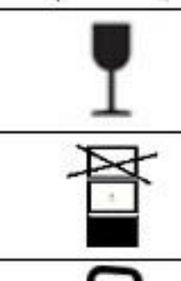
The following mark, the name & address of the EU Representative shows compliance of the instrument with MEDICAL DEVICE REGULATION (EU) 2017/745.

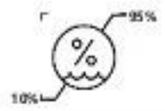
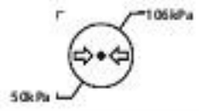
EC REP

Authorized Representative:
Medical Device Safety Service GmbH
Schiffgraben 41, 30175 Hannover, Germany

CE

Symbols marked on the Instrument

Symbol	Title
~	Alternating current
	Protective earth (ground)
	Refer to operating instructions
	Caution
	I and **O** on the power switch represent ON and OFF respectively
	Manufacturer
	Authorized Representative in the European Community
	Serial Number.
	Medical Device
	Date of manufacture
	Refer to instruction manual/ booklet (ISO 7010-M002)
 I	Disposal of your old appliance ● When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC. ● All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities. ● The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health. ● For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or the shop where you purchased the product
	Keep dry
	This way up
	Fragile, handle with care
	Do not build up more than 7 boxes
	Do not use hand-hooks
	Temperature between - 40℃~ 70℃

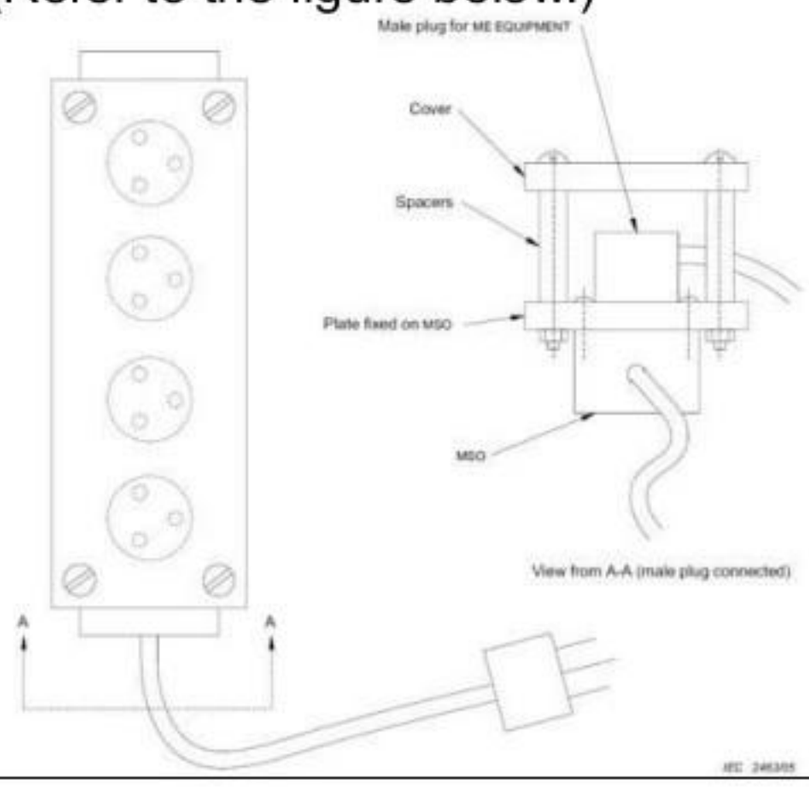
	Humidity between 10%RH ~ 95%RH
	Air pressure between 50kPa ~ 106kPa

General Safety Information

If you see any warnings or cautions printed on the warning labels, follow the safety instructions in this manual. Ignoring such cautions or warnings while handling the product may result in injury or accident. Be sure to read and fully understand the manual before using this product.
Keep this manual in easy-to-access place.

Caution Sign	Description
⚠WARNING	This indicates a potentially hazardous situation which could results in death or serious injury to you or others.
⚠CAUTION	This indicates hazardous situations which may result in minor injury to you or others, or may result in machine damage.
NOTE	This is used to emphasize essential information. Be sure to read this information to avoid incorrect operation.

⚠WARNING	If any serious device-related incident occurs, report it to EZER and the competent authority in the country where user or patient, or both reside.
⚠WARNING	To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
⚠WARNING	Only operate the instrument with the power supply indicated on the rating plate. Otherwise, it may result in fire or electric shock.
⚠WARNING	Be sure to turn OFF the power switch before connecting or disconnecting the cables. Also, do not handle them with wet hands. Otherwise, you may get an electric shock that may result in death or serious injury.
⚠WARNING	Never disassemble or modify this instrument because it may result in fire or electric shock. Also, since this instrument incorporates high-voltage parts and other hazardous parts, touching them may cause death or serious injury.
⚠WARNING	Should any of the following occur, immediately turn OFF the power switch, unplug the power cable from the AC outlet, and contact the dealer or the agent who/where you purchase this instrument. ● When there is smoke, strange odor or abnormal sound. ● When liquid has been spilled into the instrument or a metal object has entered through an opening. ● When the product has been dropped or its housing damaged.
⚠CAUTION	Do not Use this device for any purposes other than those intended. EZER is not responsible for accidents or malfunctions caused by misuse.
⚠CAUTION	This instrument is shipped with a grounding type power cable. To

	reduce the risk of electric shock, always plug the cable into a grounded power outlet.
⚠CAUTION	Wipe the forehead rest with ethanol or glutaraldehyde solution to disinfect it each time a different examinee uses it, in order to prevent infection.
⚠CAUTION	Do not use the device near, on, or under other electronic equipment to avoid electromagnetic interference with the operation of the device.
⚠CAUTION	Do not use the device in the same room with other equipment such as life-support equipment, other equipment that has major affects on the life of patient an results of treatment , or other measurement or treatment equipment that involve small electric current.
⚠CAUTION	Do not use the device simultaneously with portable and mobile radio frequency communication systems because it may have an adverse effect on operation of the device.
⚠CAUTION	Do not use cables and accessories that are not specified for the device because that may increase the emission of electromagnetic waves from the device or the system and decrease the immunity of the device to electromagnetic disturbance.
⚠CAUTION	Do not place the multiple socket-outlet for EDR-H system on the floor in order to prevent liquid penetration and damage to the product.
⚠CAUTION	EDR-H system shall not be connected with additional multiple socket-outlets or extension cords in addition to a designated single multiple socket-outlet.
⚠CAUTION	Maximum permissible load of each socket-outlet used for the EDR-H system, shall not be less than 100VA.
⚠CAUTION	If non-medical electrical equipments (e.g. Video monitor, IT equipment, etc.) that are connected with the EDR-H are, directly connected to the wall socket-outlets, high touch current may flow since the earth continuity is not ensured.
⚠CAUTION	Multiple socket-outlet should be a grounding-type and complied with IEC 60884-1.
⚠CAUTION	Connection of the plug shall be possible only by using the tool. (Refer to the figure below.) 

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1 BEFORE USE

1.1 Outline of the Refractor

The EZER REFRACTOR Model EDR-H is a computerized refractor used for subjective refraction with the connected EZER AUTO REF/KERATOMETER, LENSMETER, CHART PROJECTOR[1].
The EDR-H includes a refractor head, control box, junction box.
The control box includes the key panel and display. The display is touch-screen panel. The control box allows the data to be displayed and almost all operations to be performed. In addition, the control box operates the refractor head and also connected chart presenting device. It allows the refractor and charts to be controlled together.

1.2 Intended Use

Instrument providing means of positioning spherical and cylindrical lenses, prisms and other optical devices in front of a subject's eyes for purpose of determining refractive error and binocular functions.

This product(EDR-H) is used for detecting and measuring any anomalies in binocular vision such as muscle balance, binocular balance, aniseikonia, fusion, and stereopsis.
This product is for medical use which must be used under instructions of an eye care professional or a doctor.
No contraindication.

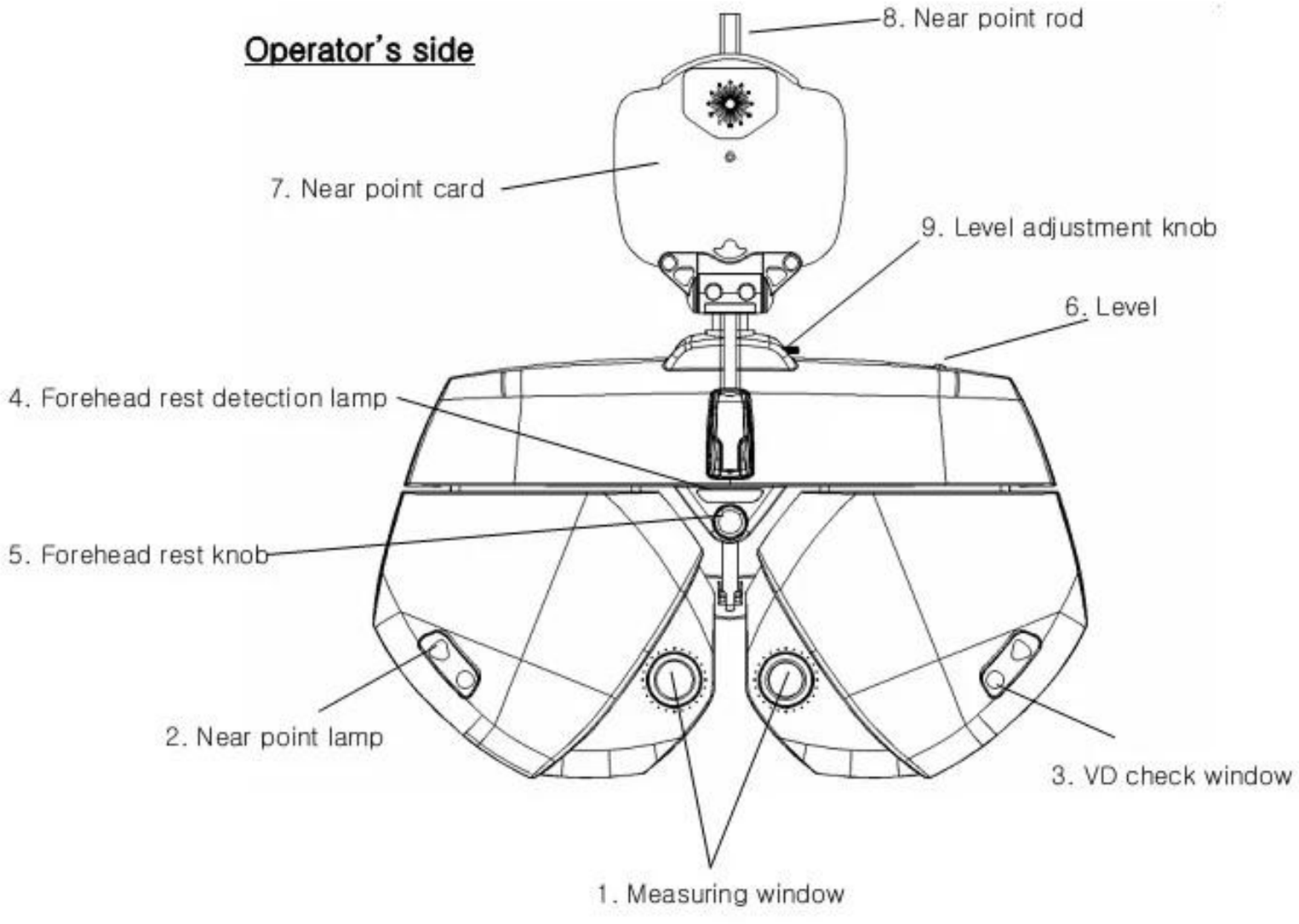
In this operator's manual, the keys on the control box are indicated by key representations like Shift or S

The touch buttons on the touch panel other than chart buttons are indicated by brackets like [LAMP].
The touch panel chart buttons are indicated by button representations like C 0.3

[1] Connectable instruments: ERK-H, ERK-BH, ELM-BH, EDC-BH, EDC-BH/P

1.3 Configuration

1.3.1 Refractor head



1.Measuring window

The patient looks at any chart through these windows.

2.Near point lamp

Illuminates the near point card.

The lamp lights up or goes out by pressing the ON/OFF button in 'Near chart lamp control' of [LAMP] pop-up on the right-up window.

3.VD check window

Used to check the patient's VD(vertex distance : distance from the corneal apex to the lens). The windows have calibration markings of 12, 13.5, 16, 18, and 20mm.

4.Forehead rest detection lamp

Used to confirm that the patient's forehead contacts the forehead rest.

When the forehead contacts the forehead rest, the lamp lights out.

5.Forehead rest knob

Moves the forehead rest forward and backward in order to adjust the VD.

6.Level

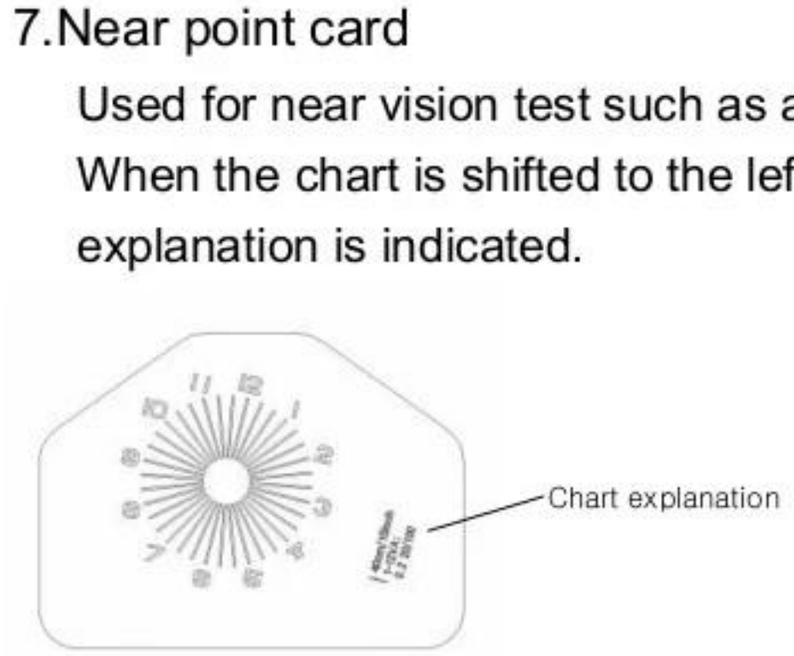
Used to confirm that the refractor head is level.

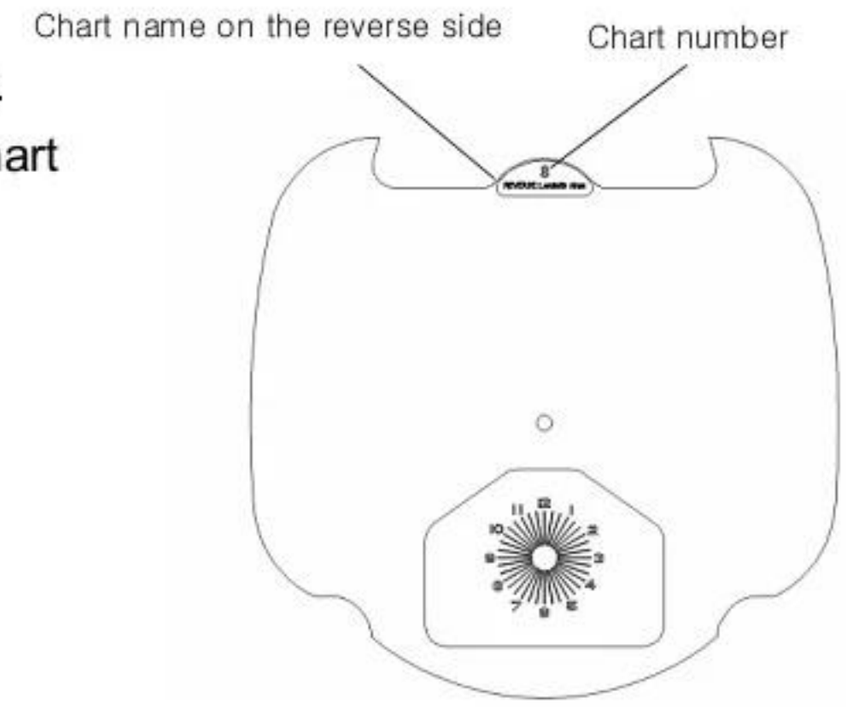
Turn the level adjustment knob until the air bubble is centered in the level.

7.Near point card

Used for near vision test such as addition powers.

When the chart is shifted to the left slightly, the chart explanation is indicated.



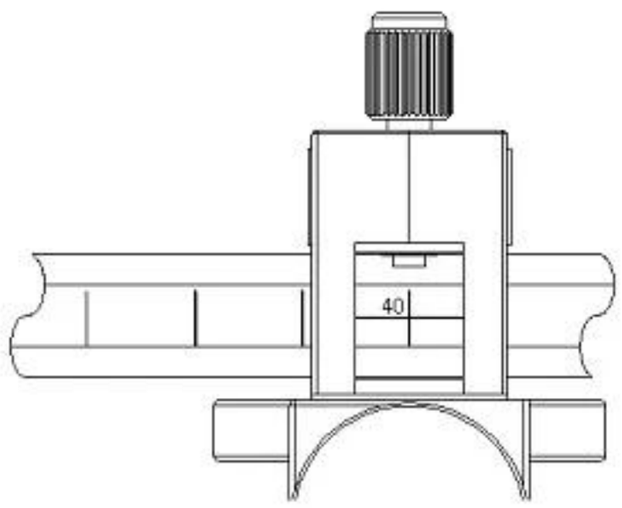


8.Near point rod

The distance from the patient's eye to the near point card is marked in inches and centimeters.

Align the black line at the near point card holder with the scale of a desired distance.

The number in red represents the power(diopter) corresponding to each distance in meters.



9.Level adjustment knob

Adjusts the level of the refractor head.

The refractor head is tilted by 2.5° at maximum to the left or right.

10.Forehead rest

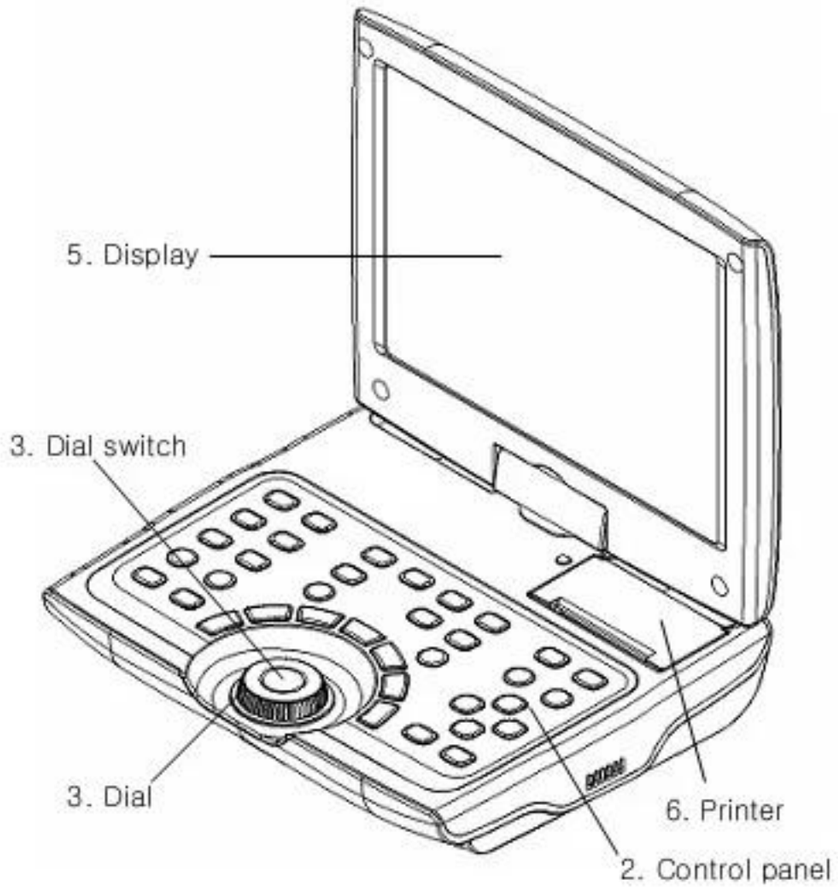
The patient's forehead touches here during refraction. Clean it before ach refraction.

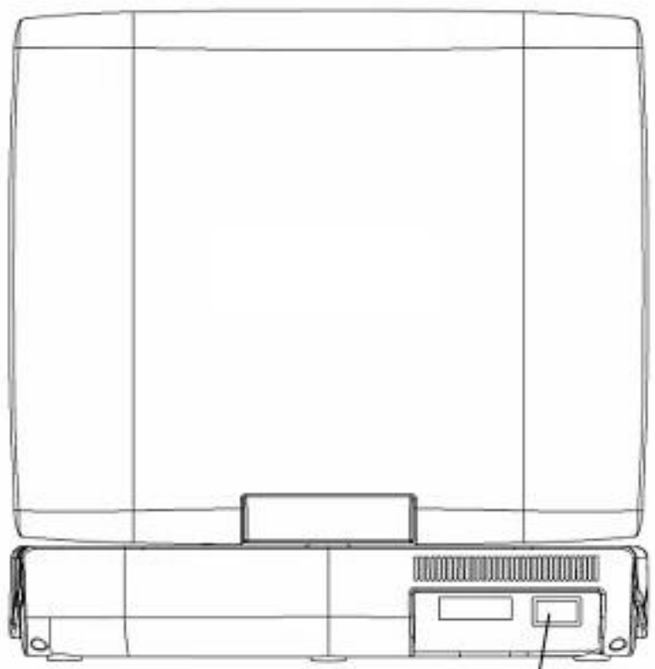
11.Face shield

The patient's face touches here during refraction. Clean the face shields before each refraction.

NOTE	The materials composed of the parts that contact the patient during refraction are as follows. - Forehead rest: polypropylene, Face shields: ABS resin

1.3.2 Control box(CB)





1.USB Slot

Used to upgrade CB software.

2.Control panel

See "Control panel"(page 8) for details.

3. Dial

Changes any measurement value.

The selected(highlightened) value can be changed

Turn it clockwise ➔ The value changes to the negative.

Turn it counterclockwise ➔ The value changes to the positive.

Turn the dial while pressing (Shift) changes the increment. See page 51.

4. Dial switch

Switches the mode (S, C, A, VA).

The values of S, C, A, and/or VA selected or selection order varies depending on the Dial switch parameter setting.

5. Display

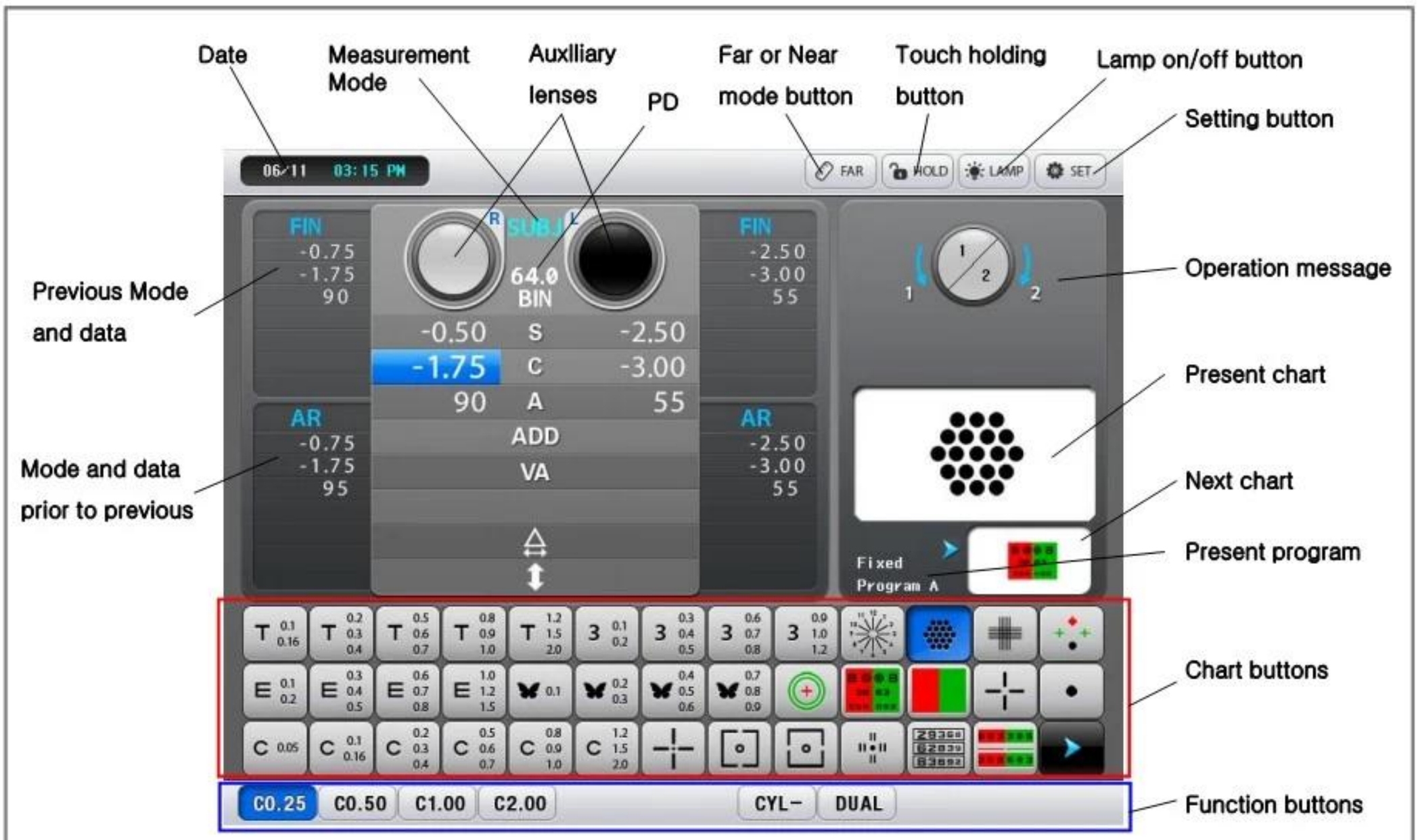
Displays the data such as SPH(S), CYL(C), AXIS(A) and the presented chart.

The LCD display is a touch-screen panel.

6. Print

Used for printing data.

○ Display



○ Control panel

1. Data keys

Used to enter the data into the EDR-H and measure each data.

The selected data is displayed at the center of the screen. Which key is selected is displayed in the upper-left corner of the screen. pressing the empty data key copies the previously displayed data into that field.

See “2.2 Entering Data” for data entry method.

1-1. Ua

Measures the unaided visual acuity.

The corrective lens power in the refractor head is 0 D.

1-2. LM

Enter the lensmeter(LM) data.

1-3. AR

Enters the data from an auto Ref/Keratometer

1-4. Sub.

Used to obtain the full correction.

When the data is received from an auto Ref/Keratometer or a lensmeter, this field opens automatically.

The elapsed time from data entry is displayed in the subjective data field when the Operating timer parameter is set to Yes.

1-5. Final

Used to obtain the final prescription and best-corrected visual acuity.

Pressing this key copies the full correction data from the subjective data field and adjusts it to the final prescription.

2. Shift

The increment or mode changes when a key is pressed or the dial is turned with this key.

3. Print

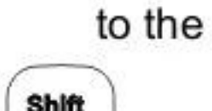
Prints the data or exports it to an external computer.

See “2.7 Printing”

4. IN

Enters the data from an auto refractometer or lensmeter.

Press this key and confirm that the data No. on the screen are the same with the point data No. of the auto Ref/Keratometer or lensmeter. Specify the field that the data is entered with the data key like , AR LM

5. 

Switches the measuring windows to be opened or occluded.

6. HELP

Indicates the explanation about the present chart.

Press this key again or [X] button to cancel the indication.

When this key is pressed during the standard program or program with sample instruction, the sample instructions for the test appear.

7. Mode Keys

Select the mode whose data is changed.

Pressing any keys highlights the corresponding field to be changed.

The value in each mode can be changed with the dial  or 

7-1. S

Goes into SPH mode which allows spherical powers to be adjusted.

7-2. C

Goes into CYL mode which allows cylindrical powers to be adjusted.

7-3. A

Goes into AXIS mode which allows cylindrical axis to be adjusted.

7-4. ADD

Goes into ADD mode which allows addition powers to be adjusted.

The refractor head converges to the working distance of 40cm (variable) automatically in near mode.[2]

See the Working Distance.(WD) parameter(3.12 Parameter Settings).

- When the Preset ADD parameter is set to Yes, the patient's age can be selected.
- Each time the key is pressed while the refractor head converges, the addition powers are added or removed.

When the addition powers are removed, the highlight color for ADD on the screen changes and the time display switches powers are added.

After addition power entry, the WD display appears to select a desired WD with the function button.

7-5. VA

Goes into the mode which allows the visual acuity to be entered with the dial.

7-6. PD

Goes into the mode which allows the PD in the refractor head to be adjusted.

Monocular PD(1/2 PD) ➔ Adjust the PD after pressing R or L in PD mode.

To exit from the mode ➔ Press again PD or mode button(S,C,A, …)

7-7. ⇄/△

Goes into the mode which allows base in/out prism power in rectangular coordinates or prism absolute value in polar coordinates to be entered.

See "2.3 Setting Prism".

7-8. ↕|θ

Goes into the mode which allows base up/down prism power in rectangular coordinates or prism base angle in polar coordinates to be entered.

---

[2] The addition powers are preset according to the selected age. See "7.3 Preset Addition Power".

8. Eye selection keys

Select the right eye (R), left eye (L), or both eyes (BIN) for subjective refinement.

- The occluder is placed automatically in the non-selected eye side.
- However, it is not placed during the binocular vision test with polarizing.

8-1. R

Opens the right measuring window and places the occluder in the left one.
When the binocular vision test chart is selected, the left eye side is not occluded but the data entry only for the right eye is also possible.

8-2. L

Opens the left measuring window and places the occluder in the right one.
When the binocular vision test chart is selected, the left eye side is not occluded but the data entry only for the right eye is also possible.

8-3. BIN

Opens the both measuring windows.
The data entry for both eyes are available.

9. Menu

Displays the Main Menu screen.

10. Clear

Clears all displayed data.(Initializes the CB(Control box) data).

- Shift + Clear : Initializes the CB with aligning refractor head

11. Mask keys

Isolate any horizontal or vertical line or single letter on the chart. Press any of the chart keys to cancel the mask functions. the visual acuity of the isolated horizontal line or letter is shown in the VA field on the screen.

11-1. ^ v

Isolates a horizontal line (same visual acuity letters) on the top or bottom line of the VA chart.

- This key also moves the isolation up and down when the horizontal line has been isolated.
- Shift + ^ : Isolates the horizontal line on the top line of the chart.
- Shift + v : Isolates the horizontal line on the bottom line of the chart.

11-2. < >

Isolates a vertical line on the VA chart.

- This key also moves the isolation to the left or right when the vertical line or single letter has been isolated.
- Shift + < or > : Isolates a single letter in the lower-left or right corner on the chart.

11-3. •

Isolates a single letter on the VA chart.
The letter in the upper-right corner of the chart is isolated.

- Shift + • : Isolates a single letter in the upper-left corner on the chart.

11-4. (−)

Isolates a horizontal line in the middle of the VA chart.

- (Shift) + (−) : Applies the red-green filter on the VA chart.
- (Shift) + (−) again : Releases the red-green filter.

12. Program keys

See “2.5 Standard Program Refraction” for programmed refraction.

12-1. (Prog.)

Starts a program.

- Pressing this key again restarts the program.
- (Shift) + (Prog.) : Switches the program between FixA, B and userA~H.

12-2. (▮▶)

Used to forward next programmed refraction sequence.

- (Shift) + (▮▶) : Returns to the previous sequence.

13. Cross cylinder keys

Place a cross cylinder lens to measure the cylindrical axis or power. when the key is pressed with both eyes open, the left measuring window is occluded automatically. Open the left measuring window with (👓) to perform the astigmatism test with both eyes open.

It is possible to select the cross cylinder lens to be inserted with the Cross cylinder (XC) test parameter.

When the parameter is set to ±0.25 or ±0.50, the cross cylinder lens is inserted as follows.

13-1. 

In the cylindrical axis measurement, the cross cylinder lens is inserted so that the minus axis is located at 45° from the minus axis position of the cylindrical lens.
In the cylindrical power measurement, the cross cylinder lens is inserted so that the minus axis is located at 90° from the minus axis position of the cylindrical lens.
Clears the prism data for the right eye in prism entry mode.

13-2. 

In the cylindrical axis measurement, the cross cylinder lens is inserted so that the minus axis is located at 135° from the minus axis position of the cylindrical lens.
In the cylindrical power measurement, the cross cylinder lens is inserted so that the minus axis is located at 0° from the minus axis position of the cylindrical lens.

14. Value change keys

Functions as the same as the dial.

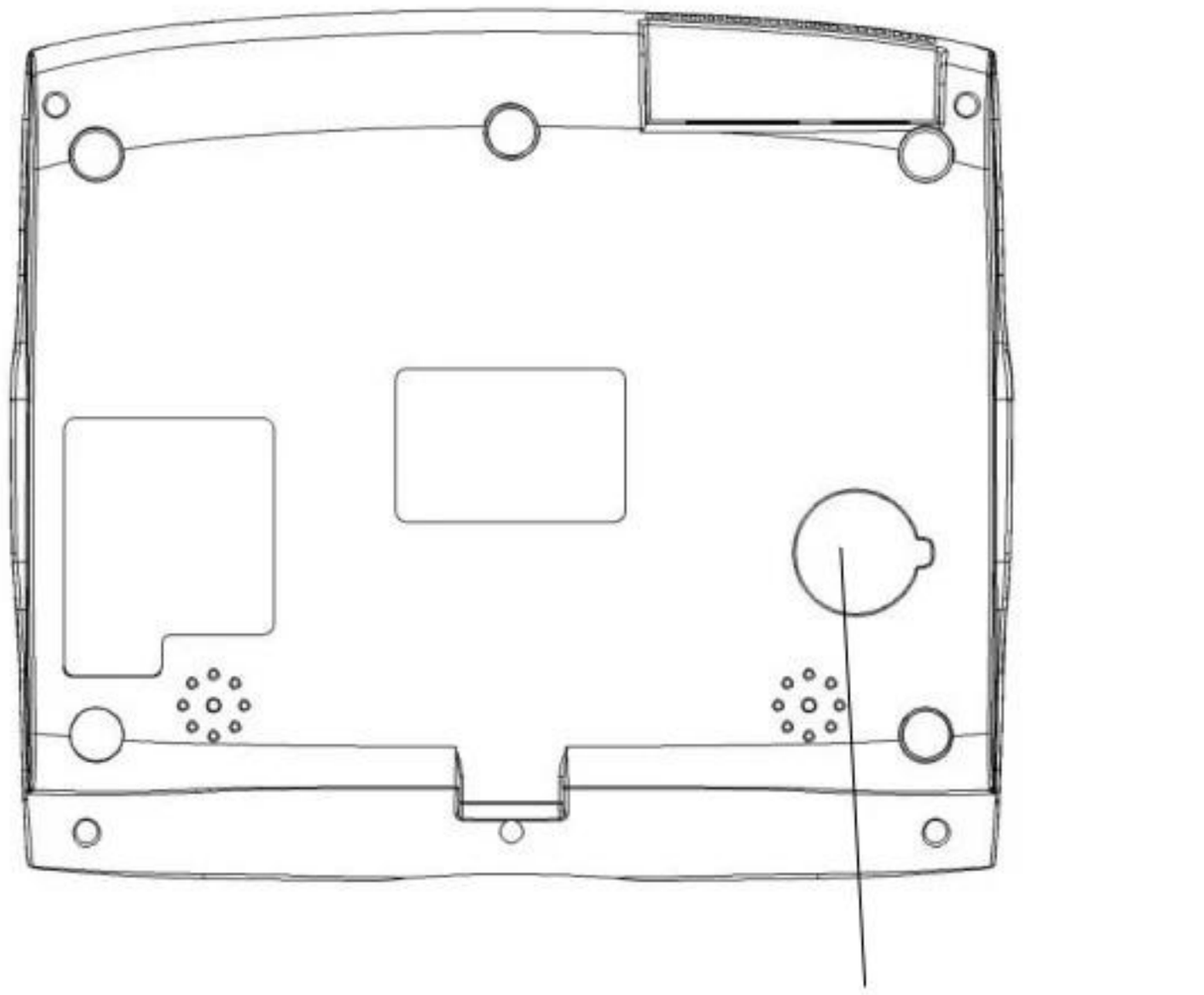
14-1. (+)

Increases the value to the positive side in increments of one.

14-2. (−)

Decreases the value to the negative side in increments of one.

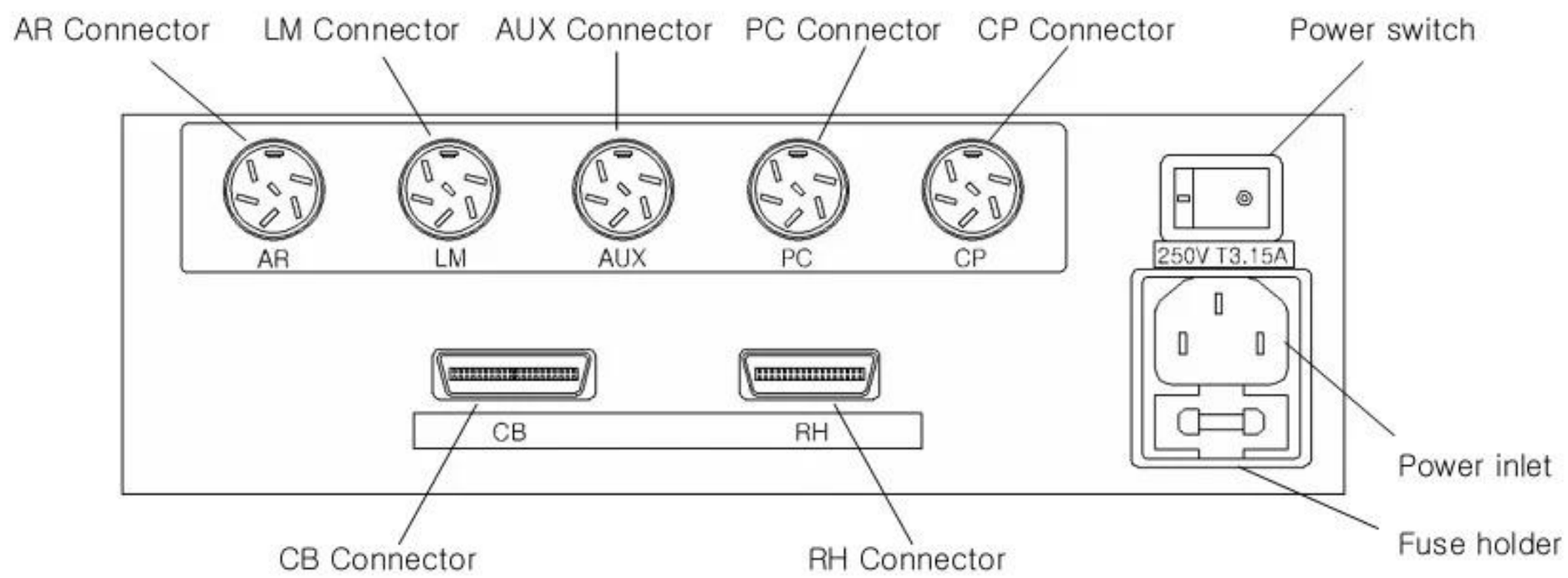
○ Bottom of the control box



1. CMOS BATTERY COVER
Used for changing CMOS BATTERY.

1.3.3 Junction box (JB)

This junction box is installed in the system table normally.



1. AR connector

   Connects to an auto Ref/Keratometer(ERK-H, ERK-BH).

2. LM connector

   Connects to a lensmeter(ELM-BH).

3. AUX connector

   Auxiliary (AUX) communication connector.

4. PC connector

   Connects to a PC.

5. CP connector

   Connects to a chart presenting device (EDC-BH, EDC-BH/P).

6. CB connector

   Connects to the control box(CB).

7. RH connector

   Connects to the refractor head(RH).

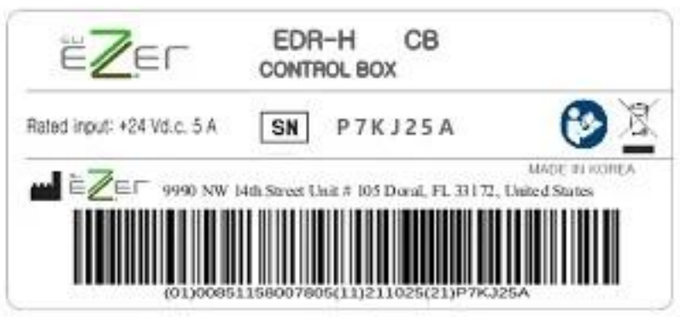
SAFEYT INFORMATION: Accessory equipment connected to the analog and digital interfaces must be certificated according to the respective IEC standards (e.g. IEC 60950-1 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all configurations shall comply with the system standard EN 60601-1:2006, Clause 16. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard (IEC 601-1-1 →) IEC 60601-1:2005, Clause 16. If in doubt, consult the technical service department or your local representative.

1.4 Labels

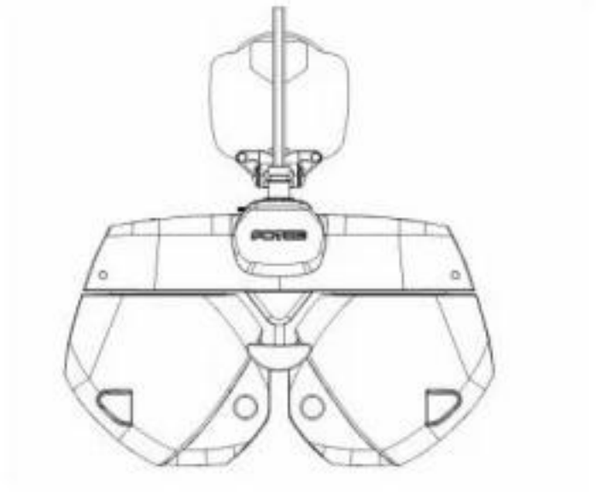
The symbols shown on the display correspond to the symbols and those names defined in ISO 10341(Ophthalmic instruments - Refractor heads) as shown in the following table.

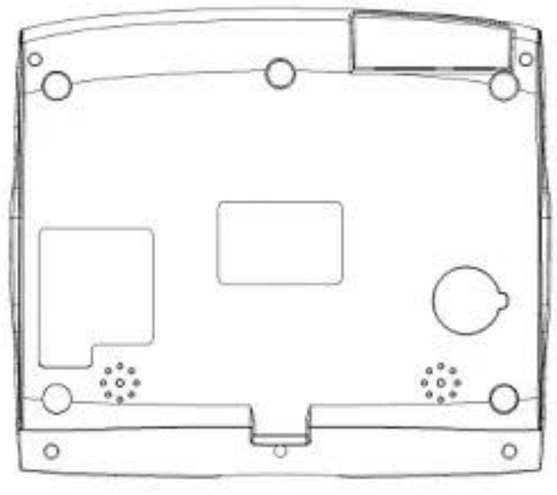
Auxiliary lens	Marking		
	EDR-H	ISO 10341	
Red Maddox rod		MR	Maddox Rods
Pinhole plate		PH or ○	Pinhole
Occluder		BL or ●	Occluder
PD check lens		CL or ⊕	Cross line
Red filter		RF	Red filter
Green filter		GF	Green filter
Polarization filter		PF	Polarization filter
Open aperture		OA	Open aperture
Retinoscopic lens		RL	Retinoscopic lens

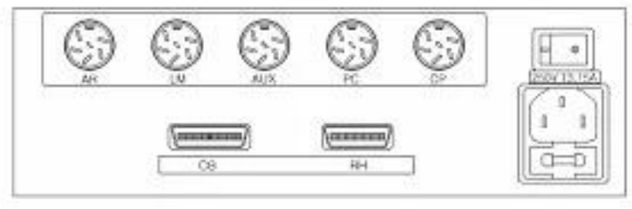










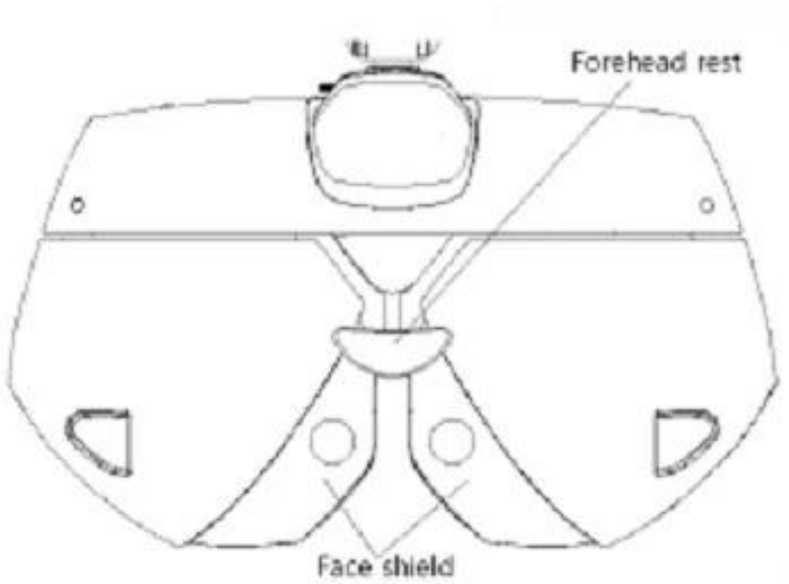


1.5 Before First Use

1. Confirm that the power cord of the EDR-H is connected into the wall outlet.
   Connect 'Refractor head' to Junction box' with communication cable (RH-JB).
   Connect 'Control box' to Junction box' with communication cable (CB-JB).

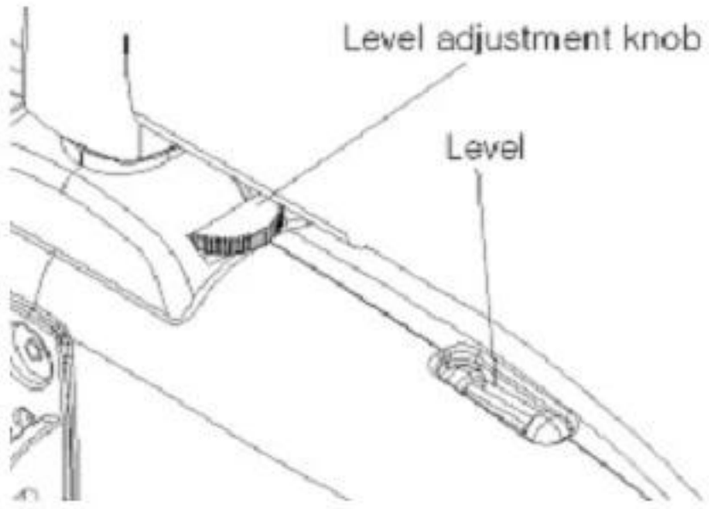
NOTE	Confirm that the power is off before connecting the communication cable to the system.
NOTE	Do not position the equipment to make it difficult to operate the disconnection Device (Appliance coupler or separable plug)

2. Attach the forehead rest on the refractor head.

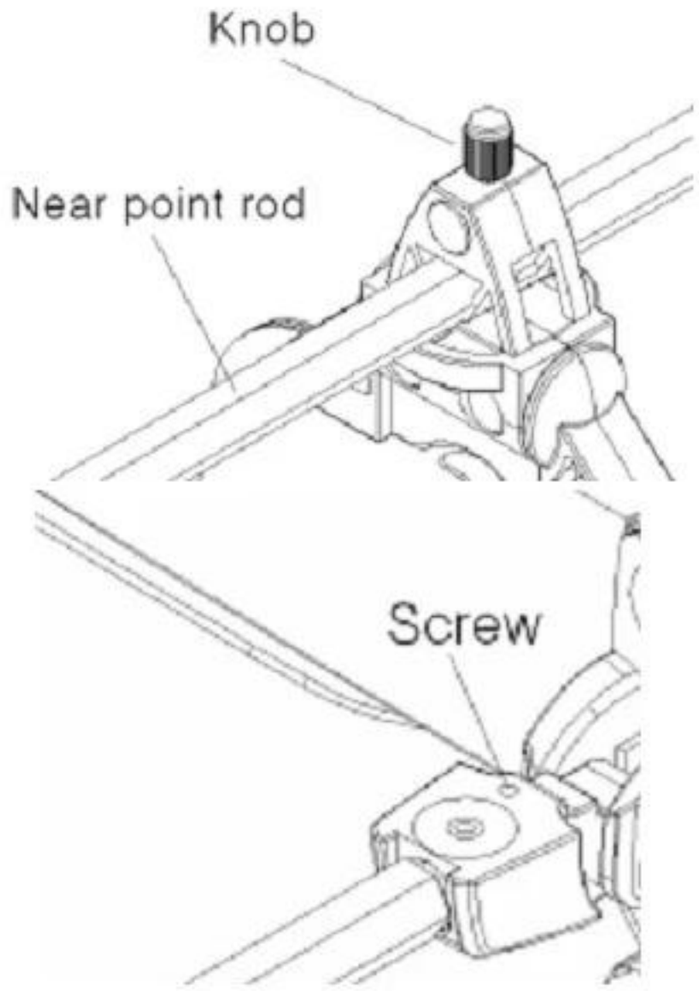


3. Attach the two face shields on the refractor head.
   They are magnetic.

4. Confirm that the refractor head is level.
   Turn the level adjustment knob until the air bubble is centered in the level



5. Attach the near point rod on the near point card.
   Insert the rod into the card so that the scale is installed shown in the right figure and tighten the knob



6. Attach the near point rod in the refractor head.

1.6 Getting Started and Exiting

1.6.1 Getting started

Turn on the EDR-H and connected chart presenting device like the chart projector.

1. Turn on the connected chart presenting device like the chart projector.
2. Remove the dust cover from the refractor head and turn the Unit table on.
   Turn the power switch of the unit table on.
   The lowest VA chart is presented.
3. Check the following before use.
   Perform the following checks before use.
   - The measurement windows are clean.
   - The screen to the right appears without any error.
   - The lowest VA chart is presented in the chart presenting device.



1.6.2 Restore from power saving mode

The EDR-H is not operated for about 5 minutes (variable) without any key operation, it goes into power saving mode. In this mode, the screen backlight and chart presenting device lamp go out.
The EDR-H restores from the mode by pressing any key.

1.6.3 Exiting

1. Turn the power of the unit table off.
2. Clean the forehead rest and face shields.

NOTE	**Be sure to put the dust cover on the refractor while it is not used.** If optical parts become dirt, the chart visibility becomes worse. It decreases the measurement accuracy.

2 OPERATING PROCEDURES

2.1 Operation Flow

1.6.1 Getting started

↓

2.2 Entering Data
2.2.1 From an auto Ref/Keratometer
2.2.2 From a lensmeter
2.2.3 From a PC
2.2.4 Manual data entry with the dial .

↓

2.4 Preparation

↓

Refraction
2.5 Standard Program Refraction
2.6.1 Chart selection
2.6.2 Visual acuity chart mask functions

↓

2.7 Printing

2.2 Entering Data

Enter objective (AR) and/or lensmeter (LM) data.

2.2.1 From an auto Ref/Keractometer

When the EDR-H interfaces with one of the EZER auto Ref/Keratometer, the measured data will be automatically transferred to the EDR-H by pressing the Print button of the auto Ref/Keratometer.
The EDR-H stores the data in the DOM DISK of the control box(CB). When the data is already in the memory, skip Steps 1 and 2.

1. Measure the patient's eye with the auto Ref/Keratometer.
   See the corresponding operator's manual.
2. After the measurement, press the Print button of the auto Ref/Keratometer.
   The measured data is printed and automatically stored in the memory of the EDR-H control box.
   The number at the top of the printout is called a data No.
   The number is necessary to call up the stored data.

NOTE	The maximum data count is 9999. However, only the last 50 measurements are retained. Whenever the data count exceeds 50 measurements, the prior data up to the start of those 50 measurements are deleted.

1. Press (IN) .
   The last data No. read from an auto Ref/Keractometer or a lensmeter appears on the screen.
   (Select AR, LM, SUBJ(saved data list in refractor) by using keypad or touch-screen)



2. Set the data No. at the top of the printout.
   Change the data No. with the dial.

3. Enter the data.
   Press (AR) or [AR].
   The elapsed time from data entry start in the subjective data field is displayed when the Operating timer parameter is set to Yes.
   (Except when the elapsed time indication has already started.)



2.2.2 From a lensmeter

When the EDR-H interfaces with one of the EZER lensmeter, the measured data is automatically transferred to the EDR-H by pressing the Print button of the lensmeter.

The EDR-H stores the data in the memory of the relay box.

When the data is already in the memory, skip Steps 1 and 2.

1. Measure the patient's glasses with the lensmeter.
2. After the measurement, press the Print button of the lensmeter.
   The measured data is printed and automatically stored in the memory of the EDR-H Control box.
   The number at the top of the printout is called a data No. The number is necessary to call up the stored data.

NOTE	The maximum data count is 9999. However, only the last 50 measurements are retained. Whenever the data count exceeds 50 measurements, the prior data up to the start of those 50 measurements are deleted.

3. Press (IN)
   The last data No. read from an auto Ref/Keratometer or a lensmeter appears on the screen.
   ("NO DATA" is shown if no data exists)



4. Set the data No. at the top of the printout.
   Change the data No. with the dial.
5. Enter the data.
   Press (LM) or [LM].
   The refractor head is automatically set depending on the selected data.
   The subjective refinement starts.
   The elapsed time from data entry start in the subjective data field is displayed when the Operating timer parameter is set to Yes.
   (Except when the elapsed time indication has already started.)

2.2.3 From a PC

1. Push the ‘Menu’ button in the CB(Control Box).



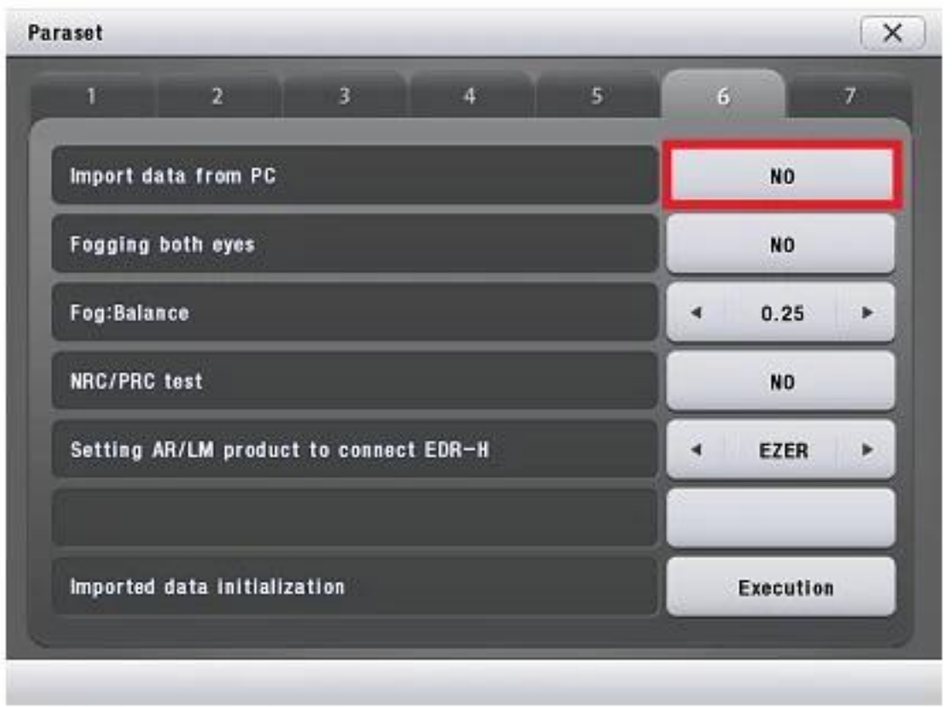
2. Push the ‘PARASET’ button on the screen.



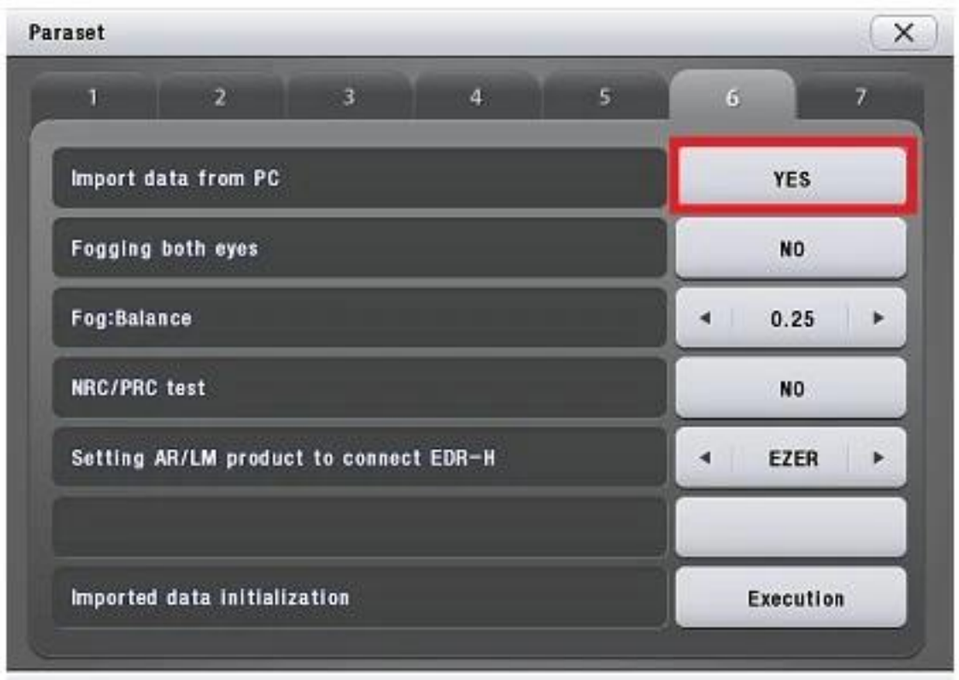
3. Push the ‘6’ tab button on the screen.



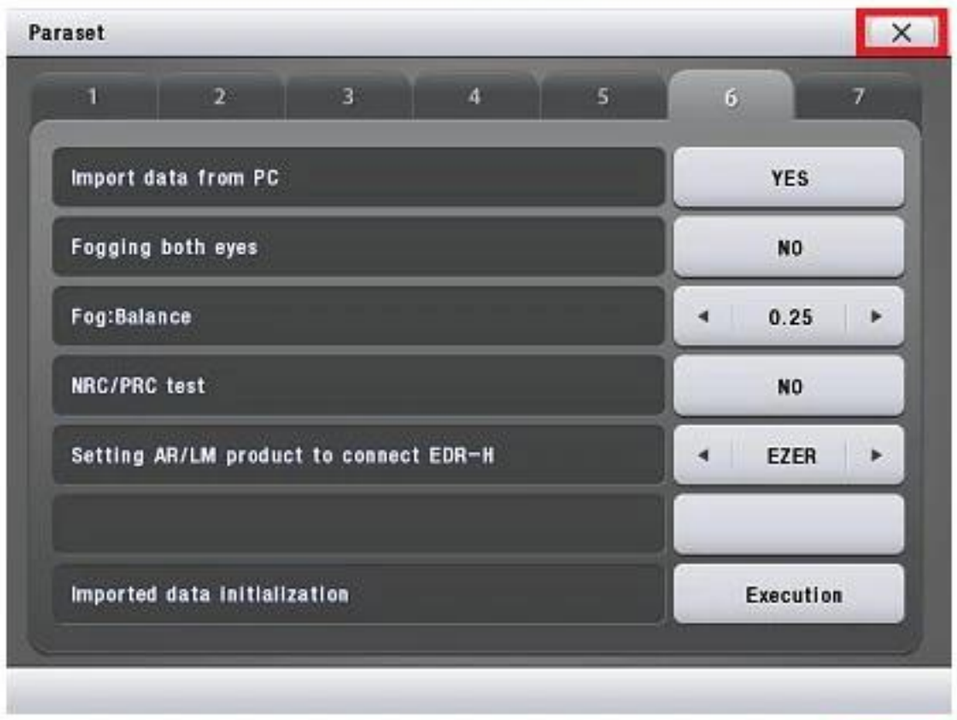
4. Change the properties info. of the ‘Import data from PC’ as ‘Yes’.



5. You can see the changed properties of ‘Import data from PC’ as ‘Yes’.



6. Push the ‘X’ button.



7. Push the ‘X’ button.



8. Push the ‘Clear’ button in the CB(Control Box).



9. Initialize the status of EDR-H as pushing the 'YES' button.



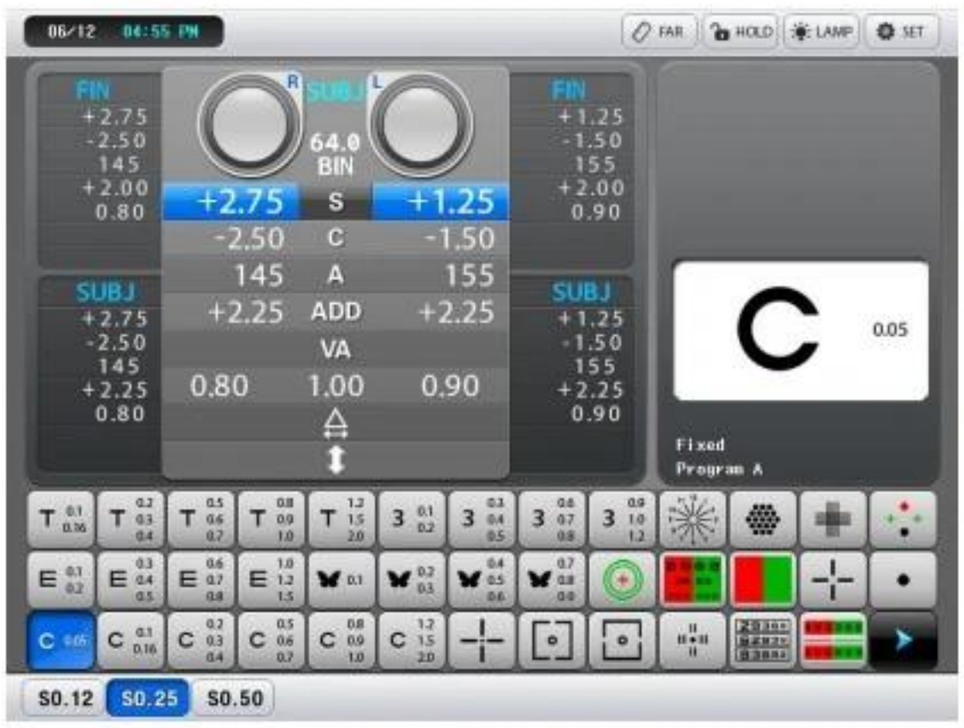
10. Transfer the data from PC to EDR-H.

⚠ CAUTION	Please wait until finishing the transmission for safety data transmission.

11. Push the 'IN' button and 'PC' button in order and you can see the NO info. of imported data.



12. Finally, push the 'PC' button one more time and EDR-H loads the imported data.



2.2.4 Manual data entry with the dial

Manual data entry is also available with the dial.

NOTE	When the AR or LM data is entered with the dial, the subjective data field does not open automatically. The subjective refinement starts with the data when is Sub. pressed. Select the start values with LM or AR as necessary and press Sub. to open the subjective data field.

1. Specify the data to be entered.
   Select LM or AR

2. Specify the eye side.
   Select R for the right eye, L for the left eye, or BIN for both eyes.

3. Specify the mode.
   Select S, C, A, ADD, or PD.

4. Enter the values.
   Turn the dial to enter the values.

2.3 Setting Prism

2.3.1 Switching between rectangular and polar coordinates

Press [XY] or [rθ] on the screen.

This key toggles between rectangular (XY) and polar coordinates (rθ).

Example)

Right eye: 1.0ΔBI, 1.0ΔBU ⇒1.40Δ, BASE 45°

Left eye: 2.0ΔBO, 1.5ΔBD ⇒ 2.50Δ, BASE 323°

2.3.2 Rectangular coordinates (XY)

1. Press ⇄/Δ.
   The rotary prism lenses are placed in the refractor head.
   The prism powers are highlighted in the central screen.
2. Enter base in/out prism powers.
   Turn the dial to change the prism powers (in increments of 0.5Δ).
   Turn the dial clockwise. ➔ The powers increase to the BO (base out) side.
   Turn the dial counterclockwise. ➔ The powers increase to the BI (base in) side.
3. Press ↕|θ
4. Enter base up/down prism powers.
   Turn the dial to change the prism powers (in increments of 0.5Δ).
   Turn the dial clockwise ➔ Left eye: The powers increase to the BD (base down) side.
   Right eye: The powers increase to the BU (base up) side.
   Turn the dial counterclockwise
   ➔ Left eye: The powers increase to the BU (base up) side.
   Right eye: The powers increase to the BD (base down) side.
   It is also possible to change the prism powers in increments of 0.1Δ with + or - instead of the dial.
   Pressing either key changes the power continuously.
   Turning the dial while pressing shift changes the power in increments of 2Δ.

2.3.3 Polar coordinates (rθ)

1. Press (⇌/△)
   The rotary prism lenses are placed in the refractor head.
   The prism powers are highlighted in the central screen.

2. Enter the prism absolute values.
   Turn the dial to change the absolute values (in increments of 0.5Δ).
   It is also possible to change the prism powers in increments of 0.1Δ with (+) or (−) instead of the dial.
3. Press (↕|θ)
4. Enter the prism base angle.
   Turn the dial to change the angle (in increments of 1°).
   Turning the dial while pressing (Shift) changes it in increments of 5°.

2.3.4 Removing rotary prism lenses

The rotary prism lenses can be instantly removed with a single touch of any key.
Press (⇌/△) or (↕|θ) again while the rotary prism lenses are placed in the measuring windows.
The rotary prism lenses are removed from the measuring windows.
The highlight color on the screen changes and the time display changes to Δ-OFF.
It indicates that the rotary prism lenses are removed.
When the rotary prism lenses are removed, the selected prism powers can be changed.
Pressing (⇌/△) or (↕|θ) again allows the rotary prism lenses to be placed.

2.3.5 Prism data clear

The prism powers of the right and left eyes can be cleared separately.



➔The prism power of the right eye is cleared.

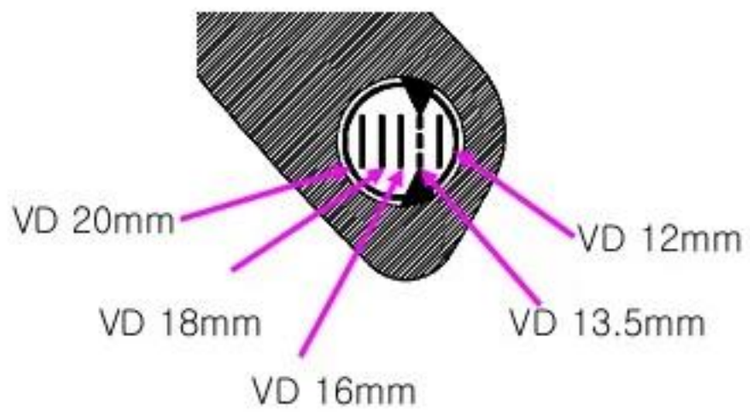
➔The prism power of the left eye is cleared.

2.4 Preparation

1. Place the refractor head in front of the patient's eyes.
   Clean the forehead rest, face shields, and measuring windows beforehand.
   See "5 MAINTENANCE".
   Instruct the patient to lean against the forehead rest and look through the measuring windows.

   Confirm that the forehead detection lamp goes out. When it lights up, the patient's forehead is away from the forehead rest.

2. Press PD
   The PD adjustment lenses are placed in the measuring windows and the anterior segments of the patient's eyes are lighted.
3. Observe the patient's eyes from the operator's side.
   Confirm that both eyes are located in the center of each measuring window.
   When they are shifted horizontally: Turn the dial to adjust the pupillary distance (PD).
   When either eye is shifted vertically: The patient's head is tilted. Instruct the patient to make the head level.
4. Adjust the vertex distance (VD).
   Look through the VD check windows.
   The windows are located on the both sides of the refractor head.
   Align the patient's corneal vertex to a desired VD marking.
   Turn the forehead rest knob.



5. Press PD again.
   The PD adjustment lenses are removed from the measuring windows and the light goes off. Other keys(S C A)can be used for exiting PD status.

2.5 Standard Program Refraction

The EDR-H includes two standard programs (Fixed Programs A, B) for full-corrected far value and prescription.

See “7.4 Standard Programs” for all test items in the standard programs.

2.5.1 Fixed Program A

1. Select ‘Fixed Program A’.
   Click ‘Select’ button of ‘Fixed Program A’ on the view of selecting program.



2. Press (Prog.)
   Program A starts.

3. Load the AR data [3]

   1) Measure the patient’s eye with an auto Ref/Keratometer and print the result.

   2) Press (IN)
   Confirm that the data No. is the same as the print data No. of the auto Ref/Keratometer.
   See “2.2.1 From an auto Ref/Keratometer ”



   3) Press (AR)
   The AR data appears in the subjective and AR data fields.



4. Press
   It is possible to measure the unaided visual acuity for right eye.
   Instruct the patient to look at the presented chart through the measuring windows of the refractor.



---

[3] When the data has already been entered from an auto Ref/Keratometer or a lensmeter before Program A, Steps 3 and 6 are skipped automatically.

5. Measure the unaided visual acuity.

   Refer to Steps 3 to 7 in “4.1 Unaided Visual Acuity Test”



6. Enter the LM data

   1) Measure the patient’s glasses with a lensmeter and print the result.

   2) Press (IN)

      Confirm that the data No. is the same as the print data No. of the lensmeter.
      See “2.2.2 From a lensmeter”

   3) Press (LM)



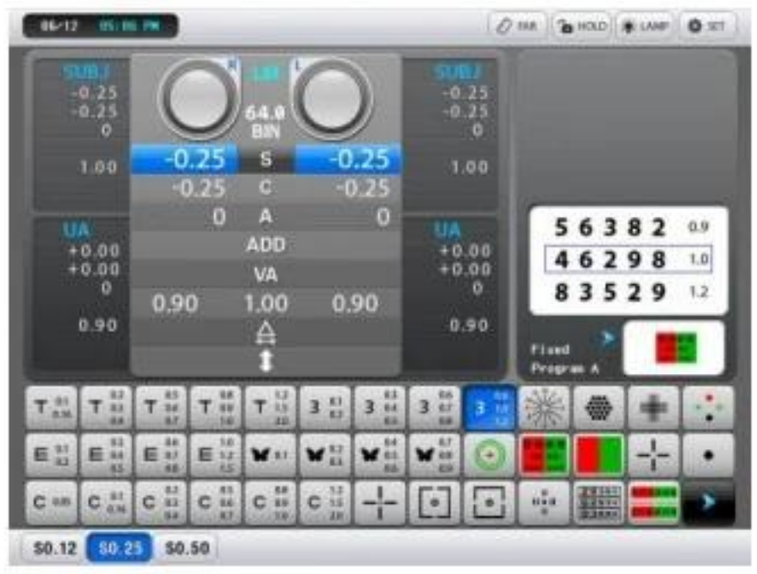
When the LM data is measured with the lens-meter not connected to the EDR-H, enter the data manually.

Refer to Steps 2 to 4 in “2.2.3 Manual data entry with the dial”

The aided visual acuity test starts and a chart is presented.

7. Measure the aided visual acuity.

   Refer to Step 2 in “4.2 Aided Visual Acuity Test”



8. Press (➠)

9. Start subjective refinement.

   1) The left eye is occulded.
      The subjective refinement starts.
   2) Confirm that the patient can read the presented chart.
      When the patient can read even one letter on the chart, go to the next red-green test.



10. Refine the spherical power with the red-green test.

1) Press ⏩



The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

When the cylindrical power is 0.00, the message whether the cross cylinder test is skipped or not appears.

When the skip is selected, Steps 10 to 12 are skipped and the red-green test starts in Step 13.

2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.
Letters on the red side are sharper→Turn the dial clockwise by increments of one.
Letters on the green side are sharper→ Turn the dial counterclockwise by increments of one

NOTE	In this spherical refinement, circle of least confusion is maintained on the retina for the next cylindrical axis measurement with the cross cylinder. When the patient can not see the red and green sides equally, make the green side sharper slightly.

11. Measure the cylindrical axis.

1) Press ⏩
The dots chart is presented.
A cross cylinder lens is placed. The cross cylinder lens type is switched between [Auto], [±0.25], and [±0.50].
When the cylindrical power is 0.00 in the cylindrical power measurement, Steps 11 and 12 are skipped.

2) Measure the cylindrical axis with the cross cylinder lens.



Flipped cross cylinder :
Ask the patient which is sharper, chart 1 presented by pressing 1 or chart 2 presented by pressing 2
when chart 1 is sharper.
→ Turn the dial counterclockwise by increments of one.
(Also possible by pressing +)

when chart 2 is sharper.
→ Turn the dial clockwise by increments of one. (Also possible by pressing -)
Repeat the above until the both charts appear equal.
Dual cross cylinder:
Charts 1 and 2 are presented simultaneously.
Both chart positions appear in the lower left corner of the screen.

when chart 1 is sharper.

→ Turn the dial counterclockwise by increments of one. (Also possible by pressing (+))

when chart 2 is sharper.

→ Turn the dial clockwise by increments of one. (Also possible by pressing (-))

Repeat the above until the both charts appear equal.



12. Measure the cylindrical power.

    1) Press (➡)

       The cross cylinder lens axis changes.

    2) Measure the cylindrical power with the cross cylinder lens.

       Follow the same procedure as 2) of Step 11.



13. Refine the spherical power with the red-green chart.

    1) Press (➡)

       The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

    2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.



Letters on the red side are sharper ➔ Turn the dial clockwise by increments of one.
Letters on the green side are sharper ➔ Turn the dial counterclockwise by increments of one

14. Refine the spherical power as high as possible to achieve the best possible visual acuity.

    1) Press (➡)

       The isolated 1.0 line is presented.

    2) Check the best possible visual acuity with (^) or (v).

    3) Refine the spherical power as high as possible to achieve the best possible visual acuity.



Turn the dial counterclockwise to add SPH +0.25D
When the chart appears blur, turn the dial clock-wise by increments of one.

The spherical power for the right eye is perfectly refined.

15. Follow the same procedures as Steps 9 to 14 for the left eye.

    The spherical power for the left eye is perfectly refined.



16. Press ⏩

17. Perform the binocular balance test.

    1) Press ⏩

    The polarizing filters are placed in the measuring windows.

    Right eye: 135°, Left eye: 45°

    2) Make the top and bottom lines appear equal.



The top line is sharper.

→ Press R and turn the dial counter-clockwise by increments of one.

The bottom line is sharper.

→ Press L and turn the dial counter-clockwise by increments of one.

When the patient can see them equally, the binocular vision is balanced.

NOTE	When the patient cannot see the top and bottom lines equally, select which eye is seen sharper according to the LM data or dominant eye for that determine either eye.

The binocular spherical power is perfectly refined.

18. Perform the stereo test.

    1) Press ⏩

    The polarizing filters are placed in the measuring windows.(Right eye: 135°, Left eye: 45°)

    The stereo test chart is presented.

    The fog which has been applied during the binocular balance test is automatically released.



    2) Confirm that the patient can see four vertical lines stereoscopically.

    Enter the recognized stereoparallax with the function button. For a patient who cannot see those lines stereoscopically, perform the binocular visual function test as necessary.

    When the patient has stereoscopic vision with a high accuracy (normally 1′) and has no symptoms of headache or eye strain, his/her phoria is usually negligible. When the patient can recognize the stereoscopic difference between the top and right lines, his/her

stereoparallax is 1′. In this case, it is considered that the phoria test is skipped.

19. Perform adjustment.

1) Press ➠

2) Check the patient's flexibility to the corrective lenses.

When making a decision about the patient's flexibility based on age, the dividing line is about 40 years of age.

The far powers are adjusted automatically and set in [Final 1].

The chart of 1.0 to 2.0 is presented.



20. Check the corrected visual acuity.

Compare the data with the saved data in each device (ex:LM, AR, SUBJ,…)
Remove the refractor head and check the viewability or visual acuity with a trial frame as necessary.

21. Select whether the near vision test is performed or not.

Press ➠

22. Enter the patient's age.

Select the age with the function buttons.
Go to Step 23 when the Preset ADD parameter is set to No.
The far powers are switched to the full correction powers to measure the addition powers accurately.
The refractor head converges.



23. Pull down the near point rod and set the near point card to a desired working-distance (normally 40cm).

24. Measure the addition powers.

1) Select the cross-grid chart on the near point card.

2) Ask the patient, "Which lines are sharper, the horizontal or vertical ones? or are they about the same?"



Horizontal lines → Turn the dial counter-clockwise in increments of one until the lines appear equal.
Vertical lines → Turn the dial clockwise in increments of one until the lines appear equal.
Same → It is not necessary to change the addition powers.

NOTE	When the patient cannot see the horizontal and vertical lines equally, change the addition power so that the horizontal lines appear sharper than the vertical ones.

25. Check the near visual acuity.

1) Press ⏩

The cross cylinder lenses are removed.
Set the values of the addition powers adjusted in Step 19 substructed from the ones measured in Step 24 as the addition powers for prescription.

2) Reverse the near point card and place the visual acuity chart in front of the patient.

3) Confirm that the patient can read the letter whose visual acuity is 0.6.



26. Press ⏩

Program A is finished.
The near point lamp goes out.



27. Print the measured data

Press Print



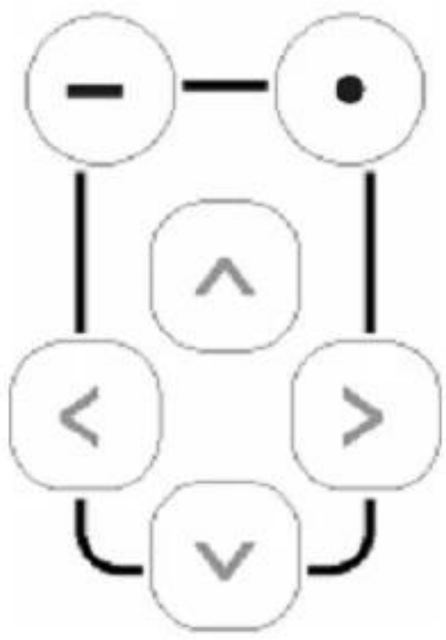
28. Place the final prescription lens in a trial frame.

2.6 Chart Presentation

2.6.1 Chart selection

Pressing a desired chart button at the right of the screen presents the corresponding chart. The selected chart is displayed at the center of the screen.

2.6.2 Visual acuity chart mask functions



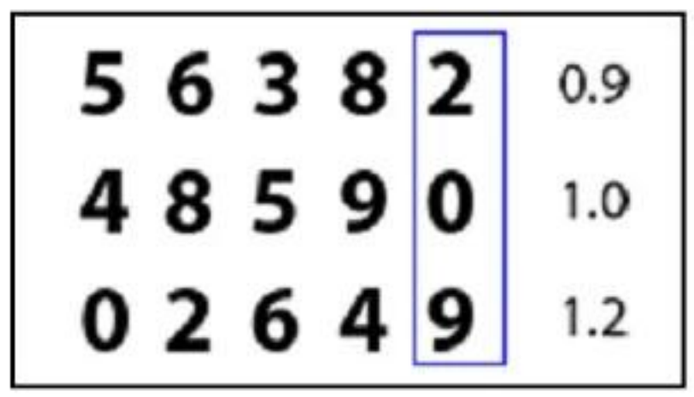
Press any mask key on the control box to use the mask functions.

○ How to isolate a vertical line

Press < or > When the vertical line is isolated:

Press < or > ➔ The isolation moves to the left or right. (when the same key is pressed again to continue moving an isolation located at one end of the chart, short beeps are audible and the isolation moves to the opposite end of the chart.)

Press ^ or v ➔ The isolation moves up or down.

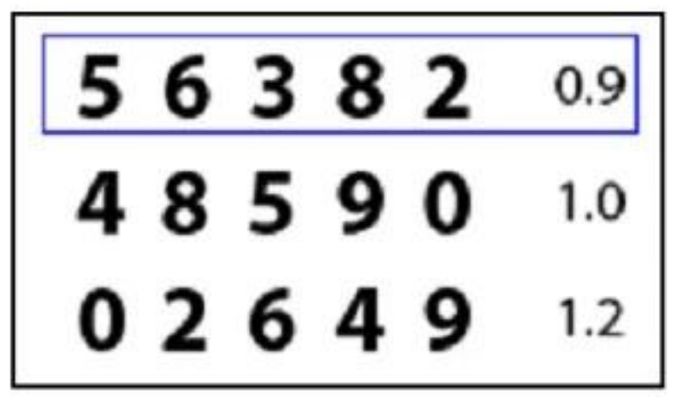


○ How to isolate a horizontal line

Press ^ ➔ The top line is isolated.

Press – ➔ The middle line is isolated.

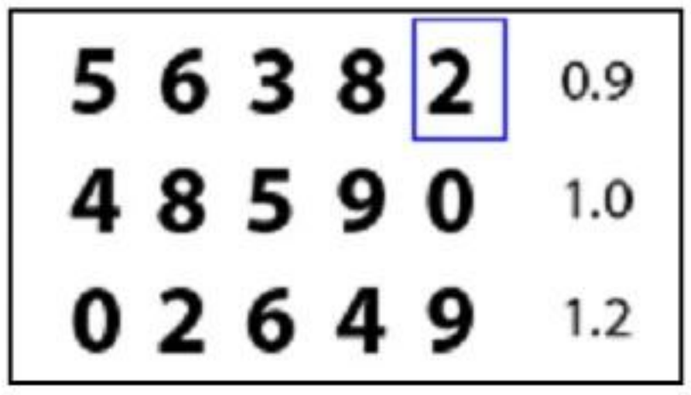
Press v ➔ The bottom line is isolated.



When the horizontal line is isolated:

- Press ^ or v ➔ The isolation moves up or down.

○ How to isolate a single letter



Press (•)

➔The letter in the upper-right corner of the chart is isolated.

Press (Shift) + (•)

➔The letter in the upper-left corner of the chart is isolated.

Press (Shift) + (<) ➔ The letter in the lower-left corner of the chart is isolated.

Press (Shift) + (>) ➔ The letter in the lower-right corner of the chart is isolated.

When a single letter is isolated:

Press (<) or (>) ➔ The isolation moves to the left or right.

(When the same key is pressed again to continue moving an isolation located at one end of the chart, short beeps are audible and the isolation moves to the opposite end of the chart.)

Press (^) or (v) ➔ The isolation moves up or down.

NOTE	There are two letter charts of 1.0 to 2.0 to prevent patient memorization. When the vertical line or single letter isolation is moved to up or down, or the same visual acuity chart is selected twice or more, the two charts are presented alternately.

○ How to apply the red-green filter

Press (Shift) + (−)

The red-green filter is applied to the presented visual acuity chart.



While the red-green filter is applied :

Press (v) or (^) ➔ The visual acuity chart changes to another.(It is only used when the 'Keeping Red & Green Filter' parameter item value is set as Yes.)

Press (Shift) + (−) ➔ The red-green filter is released.

○ How to release the mask and filter

Pressing any chart button releases the applied mask or filter.

2.6.3 Random chart function

User can use random chart function by the control box of EDR-H. This function is possible for the communication between EDC-BH, EDC-BH/P and EDR-H.

[Operation sequence]

1. Select the VA chart.

2. After masking visual acuity chart, click the RANDOM (random button) at the right of the bottom on control box.

⇒ The optotype of EDC-BH, EDC-BH/P will be changed randomly and the chart of control box in EDR-H will be updated randomly at the same time.

※ Caution: when using random chart, some delay occurs due to transmission and reception of data and data processing time after pressing random button on the monitor of control box. Therefore, if user clicks the random button quickly and continuously the operation may be delayed.

2.7 Printing

The data is printed with Print

The contents of the printout can be selected with the Print format parameter.

See “3.12 Parameter Settings”

○ Whether the data is cleared after printing

The Clear after print parameter selects whether the displayed data is cleared automatically after printing. See “3.12 Parameter Setting”

The latest 50 data which is already printed is stored in the memory. See “3.6 Calling up measurement data”

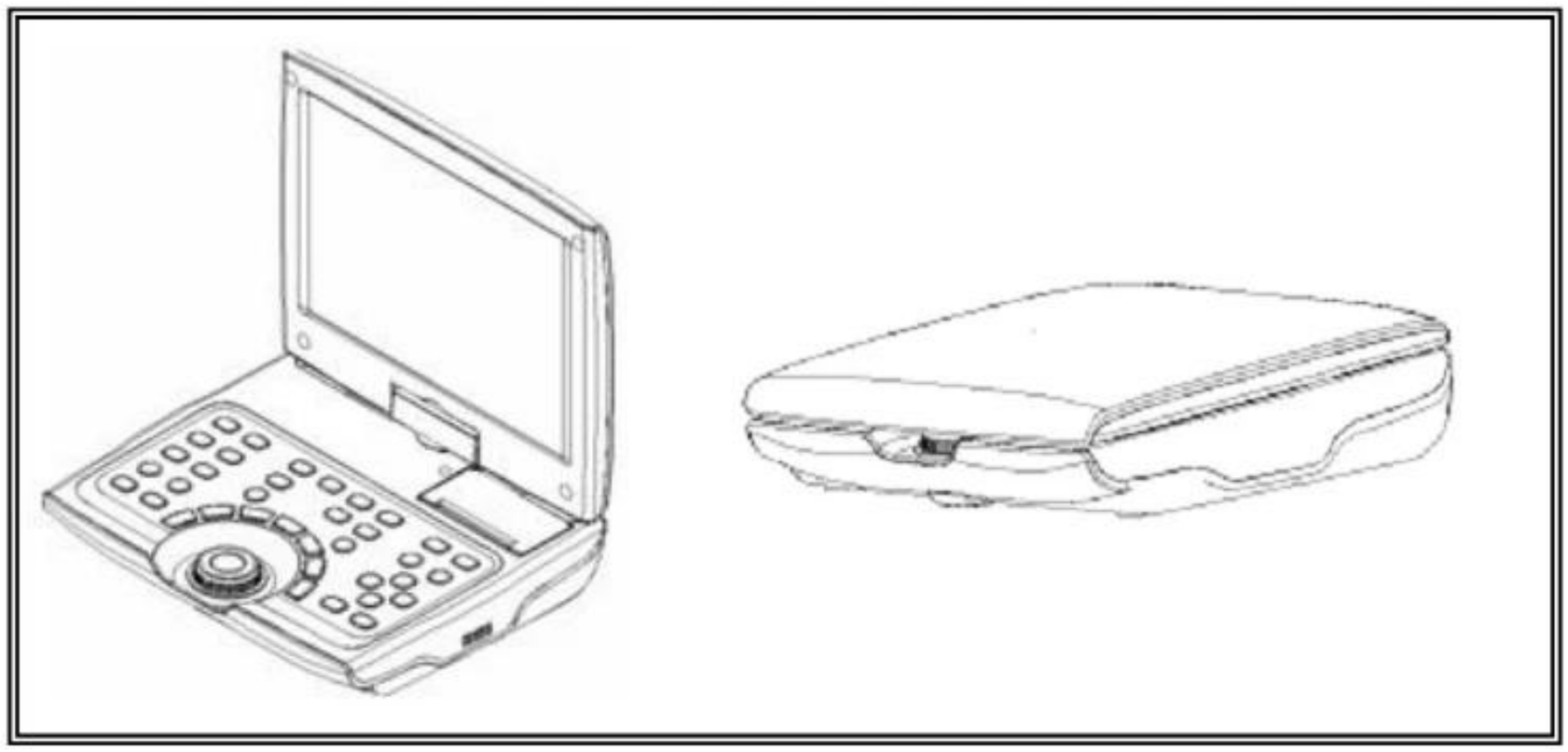
3 ADVANCED FEATURES

This section explains the more useful features of the EDR-H.

- To show vision test screens to the patient
  ⇒ 3.1 Vision Test Screens Presented to Patient
- To list measured data
  ⇒ 3.2 Data List
- To select the connecting chart projector
  ⇒ 3.3 Setting for connection with the Chart projectors
- To place auxiliary lenses in the measuring windows
  ⇒ 3.4 Setting Auxiliary Lenses
- To fog a monocular vision with both eyes open
  ⇒ 3.5 Fog Function for testing both eyes
- To call up measured data
  ⇒ 3.6 Calling up measurement data
- To prevent auxiliary lenses or mode from being switched automatically when changing a chart
  ⇒ 3.7 Link Off Function
- To explain the programming Function
  ⇒ 3.8 Programming
- To enter the comments
  ⇒ 3.9 Entering Comments
- To adjust the clock for time display and printout
  ⇒ 3.10 Setting Time and Date
- To calibrate the touch-screen panel
  ⇒ 3.11 Touch-Screen Panel Calibration
- To explain the parameter settings
  ⇒ 3.12 Parameter Settings

3.1 Vision Test Screens Presented to Patient

EDR-H's display provides Touch-Screen Function with broad 10.4" display
EDR-H provides TILT and SWIVEL Functions



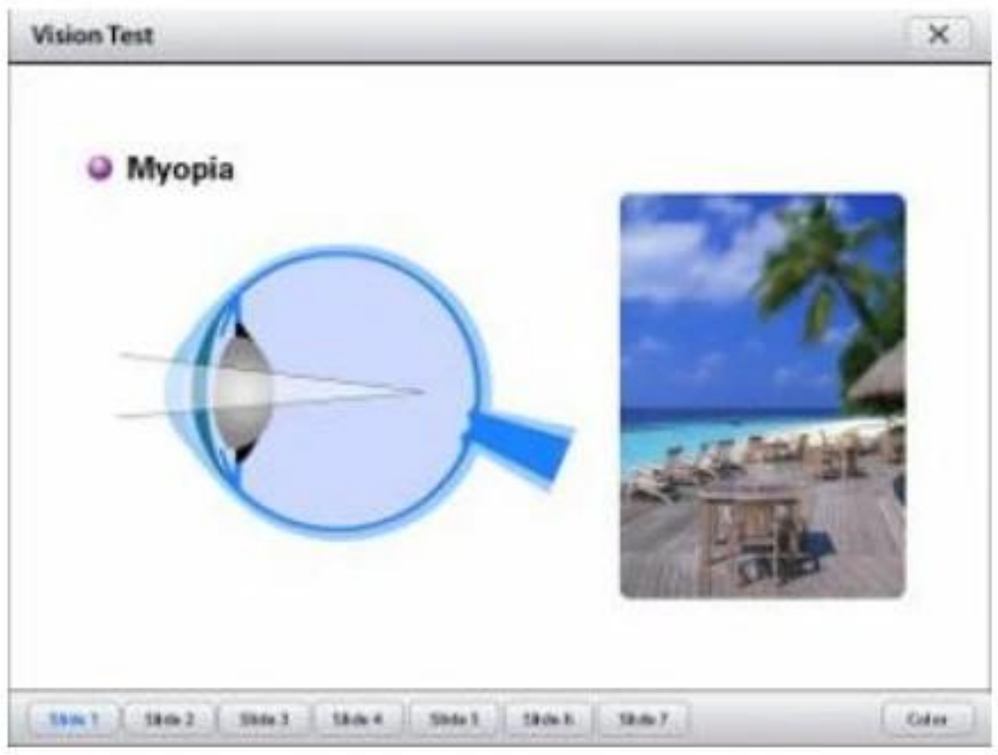
Instead of the normal measurement screen, it is possible to show images like near vision chart, schematic section of eye, refraction status patterns, ideal visions.

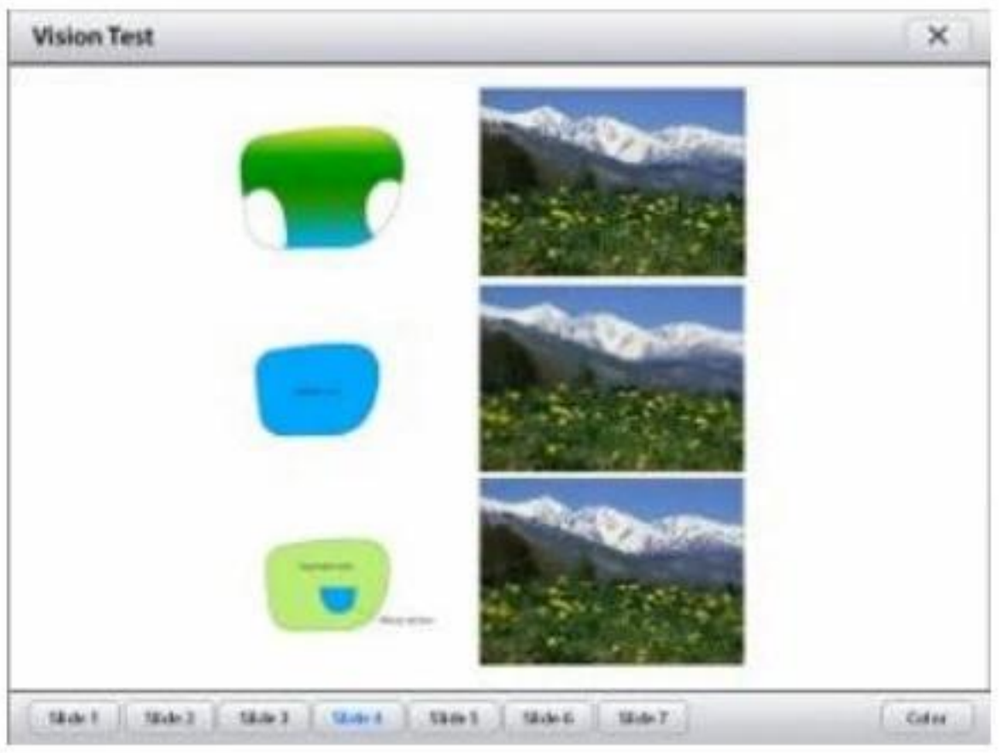
1. Call up the Main Menu screen.
   Press [Menu]

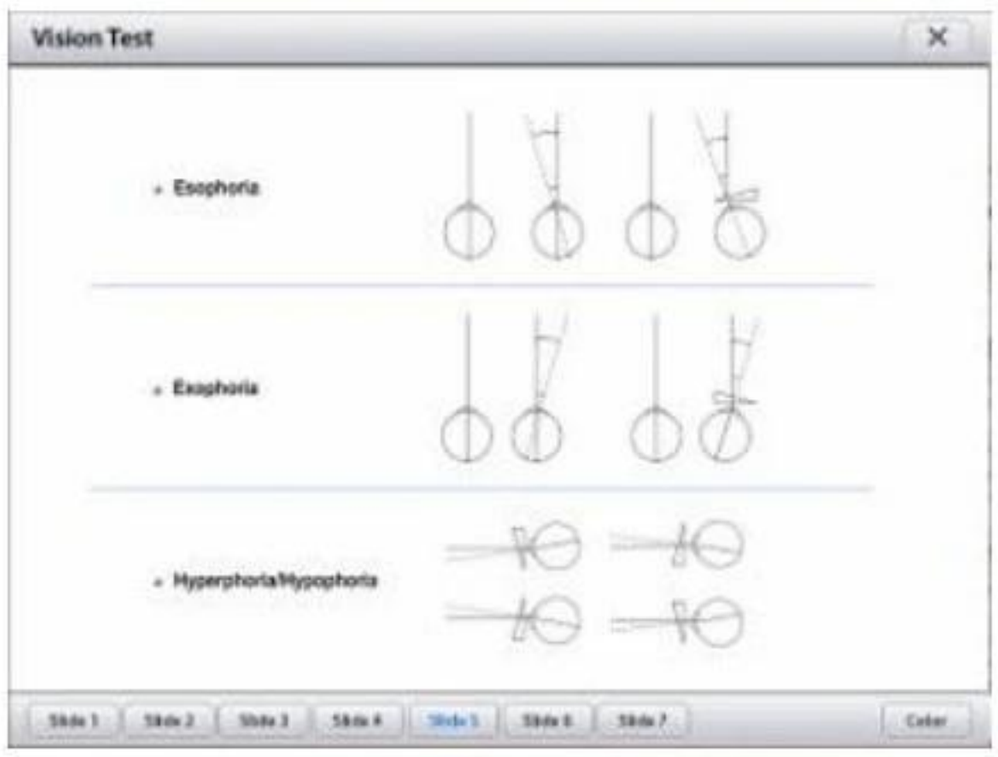
2. Press [Vision] on the screen.

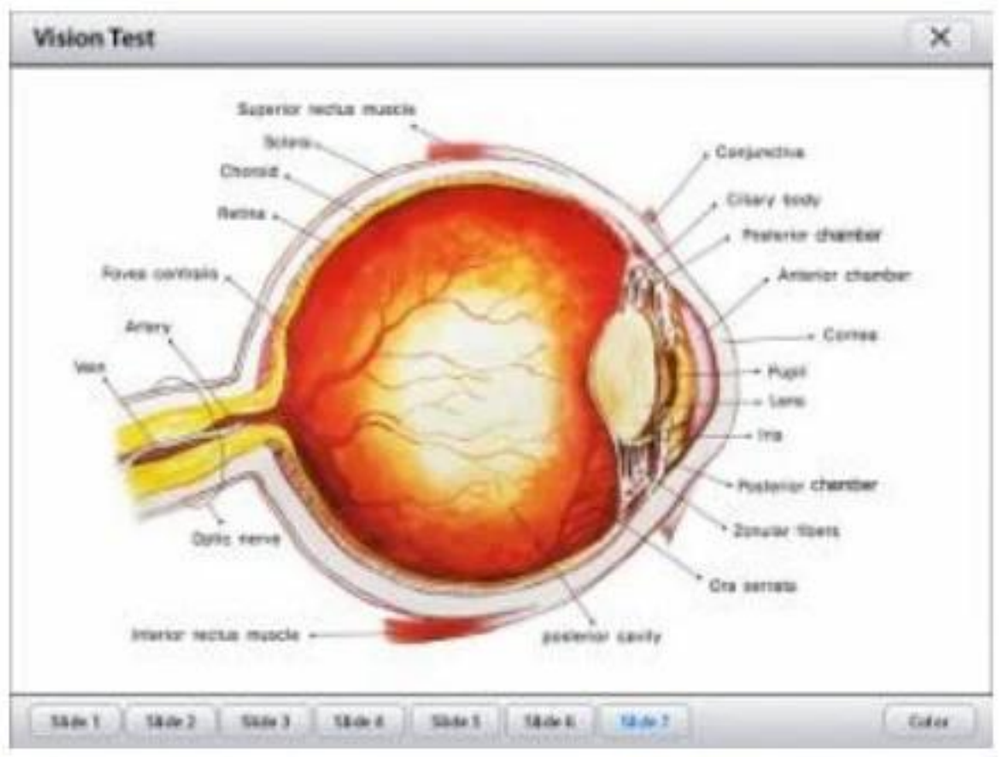


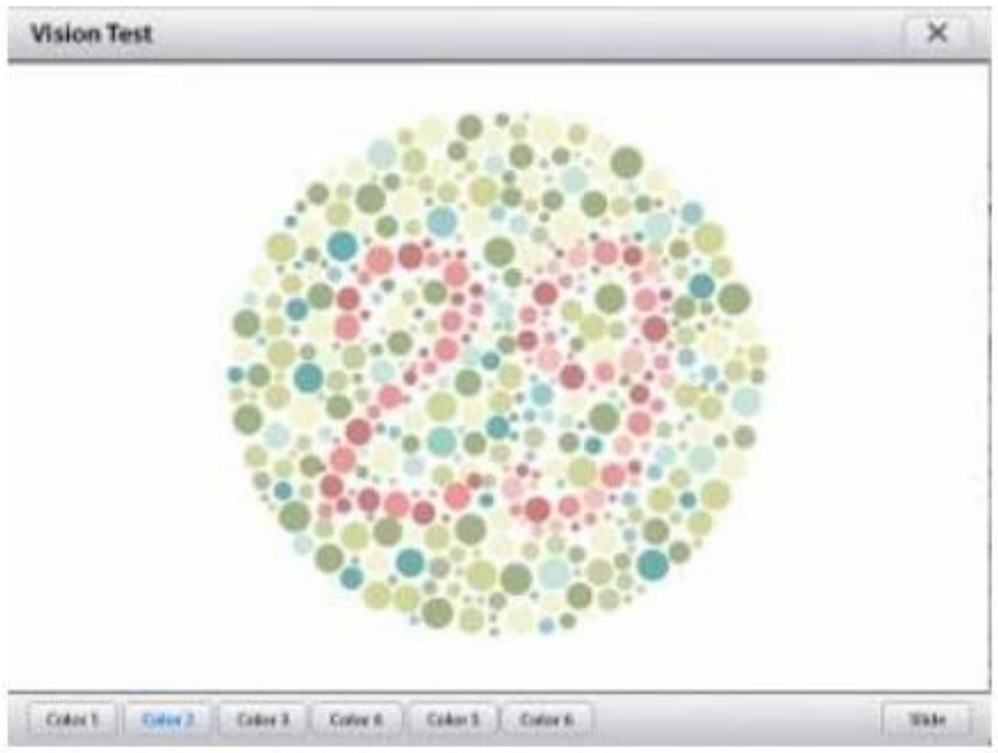
3. Select a desired screen with the buttons at the button of the screen

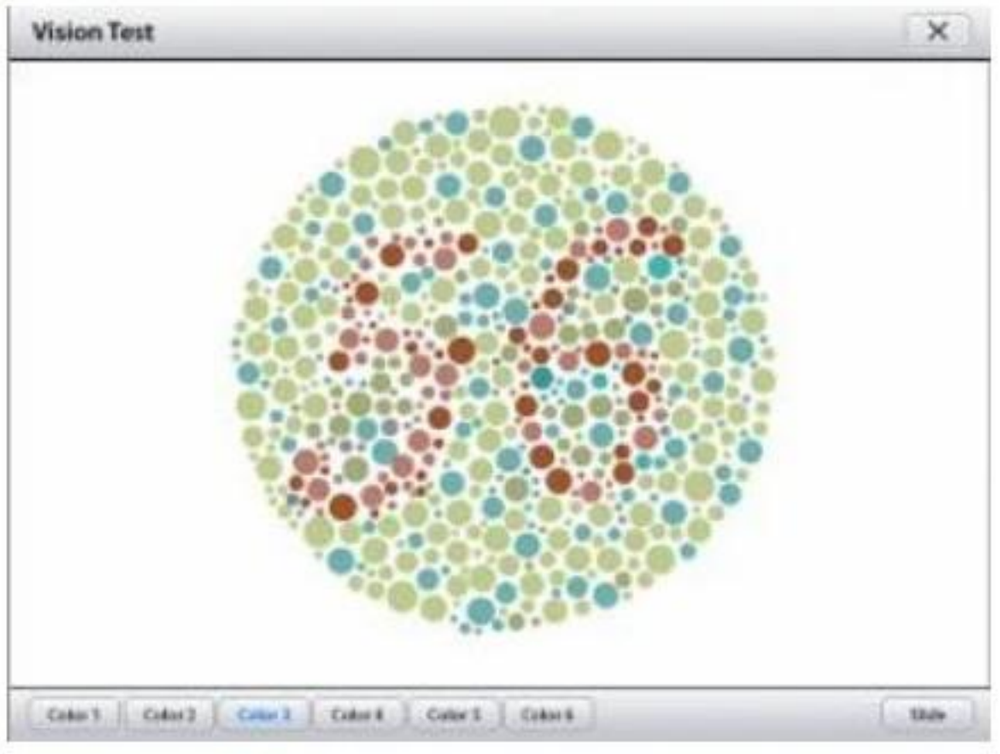

Vision Test
Myopia


Vision Test


Vision Test
Esophoria
Exophoria
Hyperphoria/Hypophoria


Vision Test
Superior rectus muscle
Sclera
Choroid
Retina
Fovea centralis
Artery
Vein
Optic nerve
Interior rectus muscle
Conjunctiva
Ciliary body
Posterior chamber
Anterior chamber
Cornea
Pupil
Lens
Iris
Posterior chamber
Zonular fibers
Ora serrata
posterior cavity


Vision Test


Vision Test

3.2 Data List

It is possible to show all measured data by a list.

1. Select [Data List]
   1) Call up the Main Menu screen.
      Press **Menu**
   2) Press [Data List]

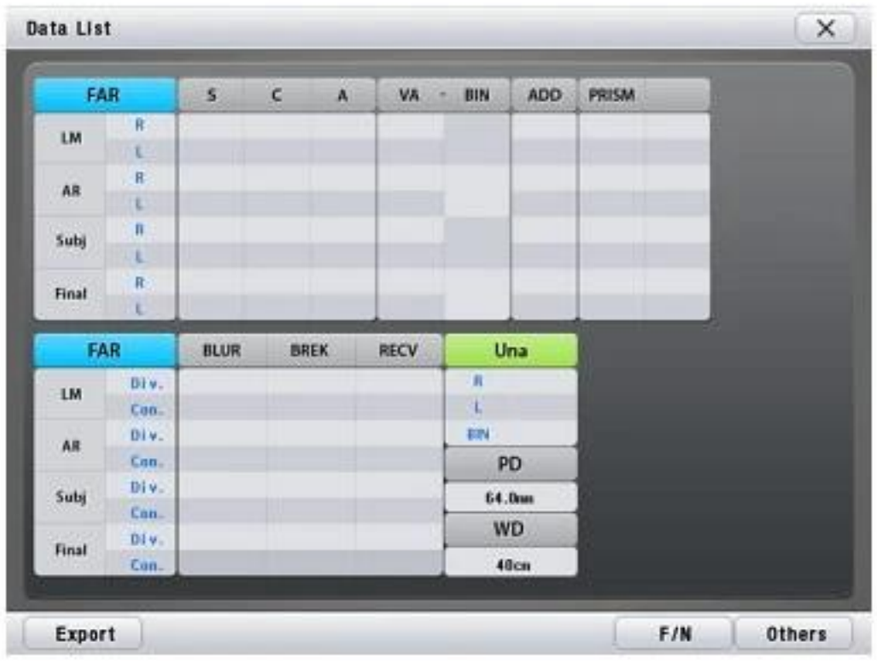


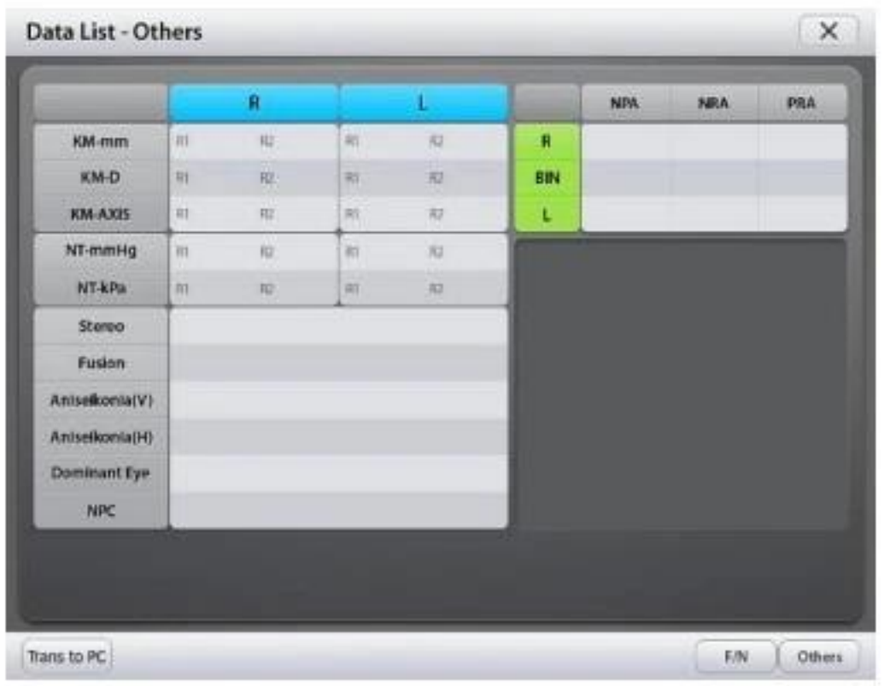
2. Select a desired data.
   Select the data with the function button.
   [F/N] switches between the far and near modes.

   [Export] sends EDR-H measured data to PC

   [Others] displays other measurement results.

   [X] returns to the main screen.

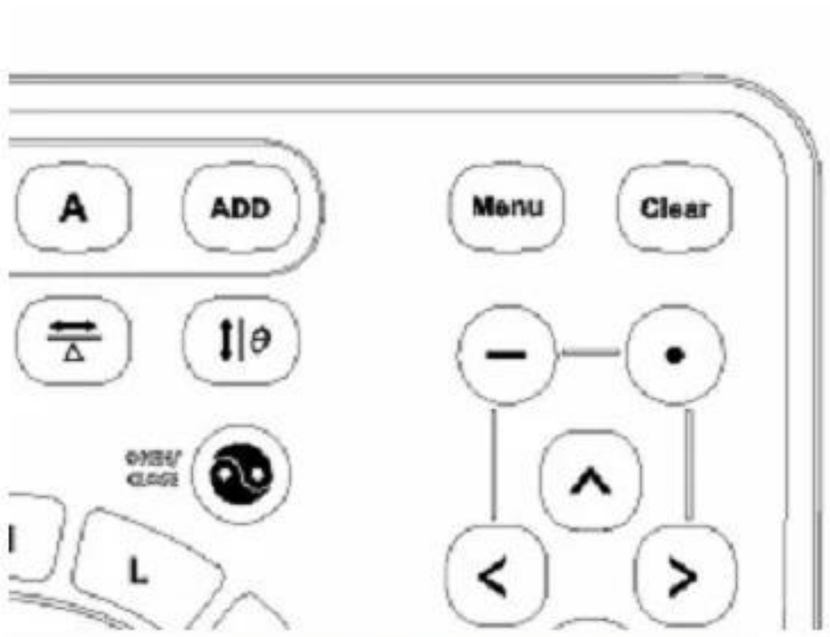




3.3 Setting for connection with Chart projectors

1. Turn on the power of the EDR-H

2. Press the Menu button of the Control Box.



3. Select ‘Select Chart’ button.

4. Select the type of chart you want to connect with EDR-H.

5. Exit by pressing the ‘X’ button.



Chart projector lamp ON/OFF sequence

1. Push the LAMP button (at the right-top of the LCD).

“Light Control” pop-up window appears.

2. Push the “ChartLamp” ON/OFF button
3. Exit by ‘X’ button

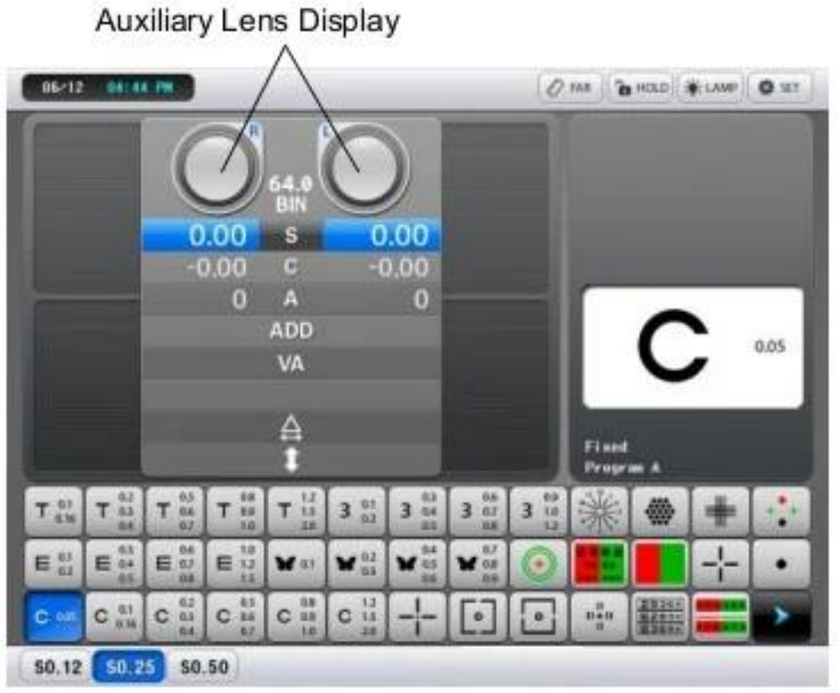


3.4 Setting Auxiliary Lenses

Auxiliary lenses are automatically placed according to a selected chart. However, setting other lenses are also possible as follows:

* It is possible to switch the lens power for retinoscope (+1.5/+2.0) and to set the fog amount for both eyes open.

1. Open the Auxiliary Lenses window
   Press the auxiliary lens display at the top of the measurement screen.



2. Select a desired auxiliary lens with the corresponding button.



The selected auxiliary lenses are placed in the refractor head and the screen returns to the main measurement screen.


Open aperture


Occluder

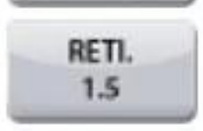

Polarizing filters (Right eye: 45°, Left eye: 135°)


Polarizing filters (Right eye: 135°, Left eye: 45°)

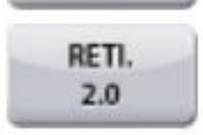

Right eye: Fixed cross cylinder lens, Left eye: Occluder


Right eye: Occluder, Left eye: Fixed cross cylinder lens


Right eye : Red Filter, Left eye : Green Filter



Spherical lenses for retinoscope. The lens power is selectable with [1.5]



Selects the spherical lens power for retinoscope between +1.5D and +2.0D



Fogging



Increases or decreases the fog amount



Base up prism of 6Δ



Base in prism of 10Δ



Base down prism of 3Δ in the right eye, base up prism of 3Δ in the left eye.



Right eye: Horizontal maddox rod, Left eye: Open aperture



Right eye: Open aperture, Left eye: Vertical maddox rod



Pinhole plate (Φ 2 mm)

3.5 Fog Function for testing a single eye

It is possible to test both eyes while the both measuring windows are opened.

1. Press the auxiliary lens display at the top of the measurement screen to appears the Auxiliary Lenses window.



2. Press [FOG].

3. Adjust the amount of the FOG by using +/-.

4. Press [FOG] again.
   The selected side is fogged with the preset amount instead of the occluder.



   Perform one of the following operations to clear the fog.

   Clear

   - Press
   - Turn the power off and on again.
   - Press any chart button which specifies auxiliary lenses other than open or occluder.
   - Select any auxiliary lens.

Pressing [+] or [–] in the Auxiliary Lenses window changes the fog amount. The variable range is from 0.00 D to +9.00 D. The factory setting is +1.75 D.

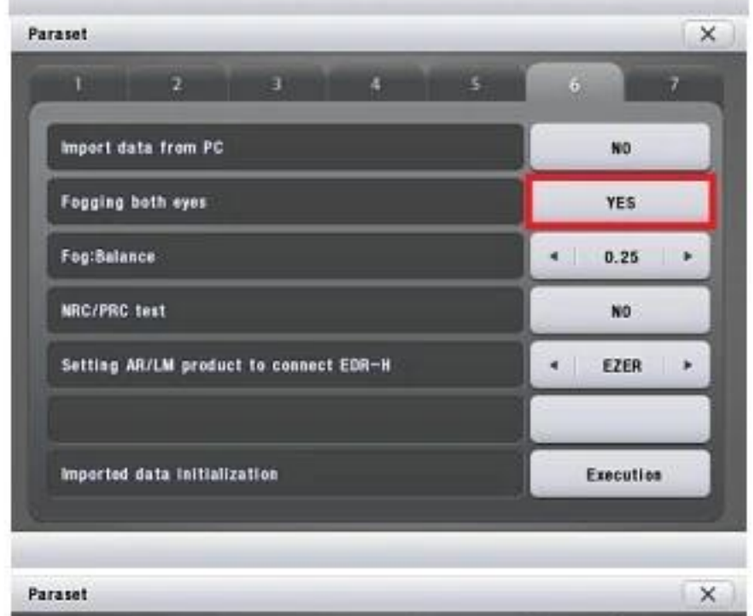
3.6 Fog Function for testing both eyes

It is possible to test both eyes while the both measuring windows are opened.

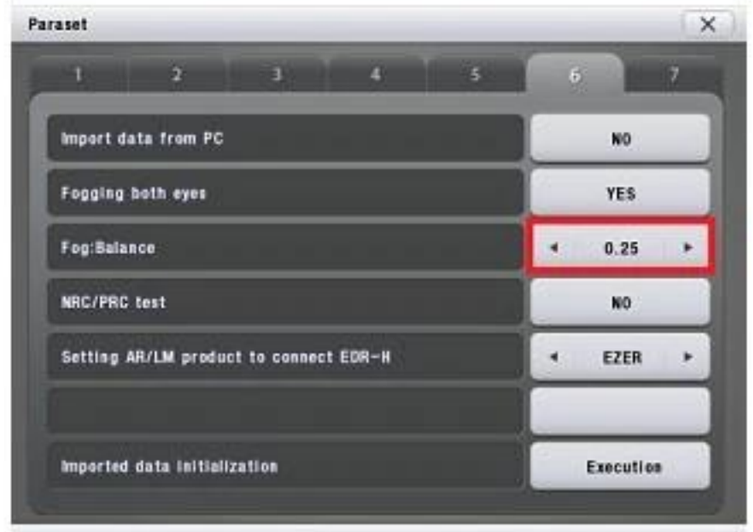
1. Change the setting about the ‘Fog’.
   1) Click the ‘Menu’ button on the CB.
   2) Click the ‘PARASET’ button on setting view.



   3) Click ‘6’ tap button.
   4) Set ‘Fogging both eyes’ item as ‘YES’.



2. Adjust the fog mount according to eye sight.
   1) Change ‘Fog : Balance’ item as you want with left-right arrow.
   2) Pressing ← or → of Fog : Balance in Paraset window changes the fog amount. The variable range is from 0.00 D to +1.00D.



3. Click the ‘Fog[+X.XX]’ or ‘Fog[-X.XX]’ button on the bottom of main screen in CB and fog is executed.



3.7 Calling Up Measurement Data.

The EDR-H stores the last 50 measurement data. It is possible to display the data.

1. Display the Recall Data screen.
   Press (IN)
   Press (Sub.)



2. Select a desired data.
   Press the far left button of the desired data. the whole data is read.

3.8 Link Off Function

This function prevents auxiliary lenses or mode (S/C/A) from being switched automatically when changing a chart. See “3.12 Parameter Settings”.

3.9 Programming

The EDR-H has ten programs of Fixed(A, B) and User(A ~ H).
The standard program has already been written in Fixed Programs A and B as factory setting.
User Programs(A~H) are empty. All programs (Fixed(A,B) and User(A~H).) are programmable.
See “2.5 Standard Program Refraction” for the contents of Fixed Program A.
See “7.4 Standard Program” for the contents of Fixed Program B.

3.9.1 Programming

To program Fixed Program A or B, set these programs to User beforehand.



1. Display the Programming screen.
   Call up the Main Menu screen.
   Press **Menu**



2. Press [Programming].
   [Select] : Selecting preset program
   [Edit] : Editing the selected program



3. Select the program to be changed or programmed.
   Press [Edit] button of the desired program.
   The contents of the selected program are displayed. (When the program is empty, each step button is blank.

4. Select the step button to be written or changed.

5. Select a desired chart to be programmed.
   Select the chart with the chart button.

6. Select a mode and message to be set with the chart.
   Press the desired items.
   - Set the auxiliary lenses and fog amount.
   - Also set the mask functions (horizontal and vertical lines, single letter) and the red-green filter.

   The following items are programmable.
   - Chart (including the mask functions)
   - Far or near mode
   - Data field (SPH, CYL, AXIS, VA)
   - Eye to be measured (R, L, BIN)

- Cross cylinder test
- Fog amount
- Data to be entered (Unaided to Final)
- Auxiliary lenses
- With or without beep sounds
- Whether the near point lamp lights up or goes out

NOTE	- It is impossible to select the cross cylinder setting between Flipped and Auto. Set the lens type with the Cross cylinder (XC) test parameter. - It is possible to add the fog function with both eyes open. Set the fog according to “3.5 Fog Function with Both Eyes Open”. The setting is programmed the same as other auxiliary lenses.

7. When the steps on the screen are programmed, go to the next page.
   Press  on the middle of right of the screen.
   When all steps are programmed, press [X] button.

8. Repeat Steps 4 and 6 until the desired charts are programmed in the presentation order.
   It is possible to store up to 30 steps.

9. Exit from programming mode.
   Press [X] until the screen returns to the normal measurement screen.

3.9.2 Operating programs

The charts are presented in the programmed order.

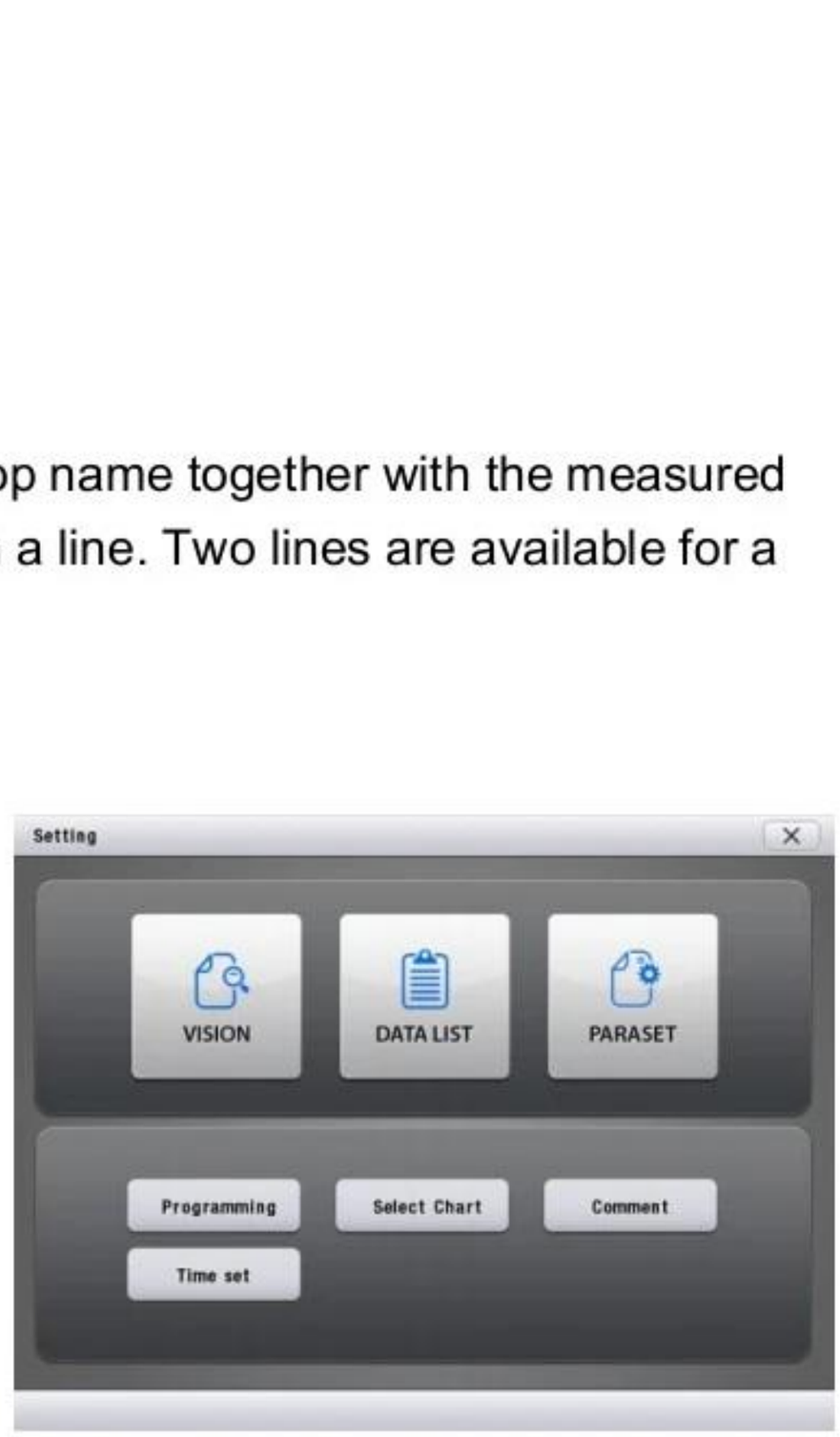
1. Select the program to be used with Shift + Prog.
2. Start the program.
   Press Prog.
   The first chart in the program is presented and the refractor head is set as programmed.
3. Present the next chart.
   Press ⇥. Each time the key is pressed, the chart is presented in the programmed order and the refractor is set as programmed.
   Shift + ⇥ Returns to the previous chart

3.10 Entering Comments

It is possible to print comments such as shop name together with the measured data. Up to 24 characters can be entered in a line. Two lines are available for a total of 48 characters.

1. Display the Comments screen.
   Call up the Main Menu screen.
   Press Menu

   Press [Comments].
   The Comments screen appears.



2. Press a line on the black box to revise comments.



3. Press a desired character button.
   The character is entered and the cursor is moved to the next.

4. Repeat Steps 2 and 3 to revise comments.
   [CLEAR]: clear all comments in the box.
   [RESET]: change back comments into that of the factory initialization.

5. Press the [X] Button.
   [X]: save comments entered to CB(control box) and close the window.

3.11 Setting Time and Date

The clock in the EDR-H can be adjusted.

1. Display the Adjust Clock screen.
   Call up the Main Menu screen.
   Press (Menu)
   Press [Time set].



2. Press the item to be adjusted.
   The selected item is highlighted.



3. Enter a desired number with the numeric keypad.

4. Repeat Steps 2 and 3 until the time and date are set.

5. Press [Enter] for adjusting the time if finishing setting up the time

3.12 Touch-screen Panel Calibration

The touch-screen panel is calibrated.
When incorrect responses from the touch-screen panel are received, the detection point of the touch screen panel may shift from the pressure point of the touch-screen pen. In this case, calibrate the touch screen panel.
The calibration must be performed when the display is tilted to the operator's side.

1. Display the Management Menu window.

   Press Shift + Menu

2. Select [Touch Compensation] button



3. Touch the center of the rectangle in the center of the screen.

4. Push the Dial-switch.



5. Repeat the same operation according to the instructions for each mode to be changed.

   MODE : TEST➔LEFT➔RIGHT➔TOP➔BOTTOM

6. When you push the dial switch more than 1 second(displayed MODE : EXIT), return to the Admin mode.



3.13 Parameter Settings

1. Display the parameter setting screen.
   Call up the Main Menu screen.
   Press (Menu)
   Press [Paraset].



2. The pages can be changed by pressing [1] ~ [7] Tab in the upper side of the window.

3. Pressing the setting field on the right side of the parameter to be changed toggles the setting.

   In parameters like AXIS auto step with many options, when the setting field is pressed, the field is framed in green.
   At this time, select the option with the dial.



4. Change the other parameter settings in the same manner as Steps 2 and 3.

5. Return to the normal measurement screen.
   Press [X] button.

○ Detailed parameter options



1. **SPH step: 0.12 D, 0.25 D**
   Factory setting: 0.25 D
   Setting of the increment to adjust sphere values.
   Selectable between 0.12 D and 0.25 D.
2. **CYL mode: –, +**
   Factory setting: –
   Setting of the cylinder reading.
   Selectable between + and –.
3. **AXIS step: 1, 5**
   Factory setting: 5
   Setting of the increment to adjust axis values. Selectable between 1° and 5°.
4. **SPH step (Shift): 0.50 D ~ 3.00 D (0.25 Step)**
   Factory setting: 1.00 D

Setting of the increment to adjust sphere values with . Shift

Selectable from 0.50 D to 3.00 D (0.25 Step).

5. **CYL step (Shift): 1.00 D, 2.00 D, 3.00 D**

   Factory setting: 1.00 D

   Setting of the increment to adjust cylinder values with Shift Selectable among 1.00 D, 2.00 D, and 3.00 D.

6. **AXIS step (Shift): 1 → 5/5 → 1, 1 → 5/5 →15**

   Factory setting: 1 → 5/5 → 1

   Setting of the increment to adjust axis values with Shift when the AXIS step parameter is set to 5.

   1 → 5/5 →1 In increments of 1° while pressing Shift

   1 → 5/5 →15 In increments of 15° while pressing Shift

   When the AXIS step parameter is set to 1, the increment to adjust axis values with Shift is 5°.

7. **AXIS Auto step: 0.00 D to 4.00 D**

   Factory setting: 0.00 D

   In cylindrical axis measurement with a cross cylinder lens, the AXIS step becomes 5° when the obtained cylinder value is less than the setting. The AXIS step becomes 1° when the obtained cylinder value is the setting one or more. The setting value changes in increments of 0.25 D. When the setting is 0.00D, the AXIS step does not change regardless of the cylinder value.

8. **Cross Cylinder (XC) test: Dual, ±0.25, ±0.50**

   Factory setting: Dual

   Setting of the cross cylinder lens placed in the cross cylinder test.

   Dual ⇒ ±0.25 D dual cross cylinder lens

   ±0.25 ⇒±0.25 D cross cylinder lens

   ±0.50 ⇒±0.50 D cross cylinder lens



9. **XC mode S.E fix: Yes, No**

   Factory setting: Yes

   Selection of whether or not to adjust sphere values

   for maintaining the spherical equivalency in the cross cylinder test.

10. **CYL mode S.E fix: Yes, No**

    Factory setting: No

    Selection of whether or not to adjust sphere values

    for maintaining the spherical equivalency in normal cylindrical power refinement.

11. **Prism display format: X/Y, rθ**

    Factory setting: X/Y

    Setting of the prism display format.

    X/Y ⇒ Rectangular coordinates

    rθ ⇒ Polar coordinates

12. **Preset ADD: Yes, No**

    Factory setting: Yes

    Selection of whether or not to enter the patient's age and preset the estimated additional power when (ADD) is pressed.
    The estimated additional power is lower than the actual one corresponding to the age.

13. **SPH Far → Near: SPH, SPH + ADD**

    Factory setting: SPH + ADD

    Setting of the sphere values when far mode is switched to near one.

    SPH ⇒ The sphere values in far mode are also used in near mode.

    SPH + ADD ⇒ The additional powers are added to the sphere values in far mode.

14. **(–) ADD: Yes, No**

    Factory setting: No

    Selection of whether or not to enter the negative value as additional power.

15. **Working distance (WD): 35 cm to 70 cm**

    Factory setting: 40 cm

    Setting of the working distance in increments of 5 cm.



16. **Clear confirmation : Yes, No**

    Factory setting: Yes

    Selection of whether or not to display confirmation window when initializing the system

17. **Clear after print: Yes, No**

    Factory setting: Yes

    Setting of whether or not to clear measured data after printing.

18. **Print format: All data, w/o AR, Unaided,Sugj,Final**

    Factory setting: All data

    Setting of the contents to be printed.

    All ⇒ All data

    w/o AR ⇒ All data except AR data

    U.S.F. ⇒ Unaided visual acuity, subjective refinement data, and final data

19. **Date format for print: mm/dd/yyyy, dd/mm/yyyy, yyyy/mm/dd**

    Factory setting: mm/dd/yyyy

    Setting of the data format to be printed.

    mm/dd/yyyy ⇒ AUG/20/2010

    dd/mm/yyyy ⇒ 20/ 8/2010

    yyyy/mm/dd ⇒ 2010. 8.20

20. Print list: Yes, No

Factory setting: Yes

When the setting is Yes, the data list is displayed automatically when Print is pressed.

Confirm that all necessary tests have been performed and press Print again to print the data.

When any test is omitted, press [X] button on the screen and return to the measurement screen.

21. Operating timer: Yes, No

Factory setting: Yes

Selection of whether or not to display and print the elapsed time from data entry start in the subjective field. when the setting is Yes, it is displayed instead of the time in the upper-right of the screen.

In addition, the elapsed time is displayed as test time on the Recall Data screen.



22. Program A: Fix, User

Factory setting: Fix

Selection of whether to use the default Program A or user-programmed one. Set the parameter to User when Program A is reprogrammed. It is possible to use the default Program A by resetting to Fix.

23. Program B: Fix, User

Factory setting: Fix

Selection of whether to use the default Program B or user-programmed one. Set the parameter to User when Program B is reprogrammed. It is possible to use the default Program B by resetting to Fix.

24. Preset power of Subj : All data, CYL=0, Clear

Factory setting: All data

Selection of whether or not to use the data entered in the Preset power of Subj 1 parameter without being corrected.

All data ⇒ Uses all data without being corrected.

CYL=0 ⇒ Uses only sphere data. (The cylindrical and axis values become 0.)

Clear ⇒ Enters 0 in all data fields.

This function is not available for the data entered with the dial.

25. Dial switch: S→C→A, S→C→A→VA, S→A→C, S→A→C→VA

Factory setting: S→C→A

Setting of the function with the dial switch.

Each time it is pressed, the modes change in the selected order.

26. Power-saving time : Off, 5 min, 15 min, 30 min, 60 min

Factory setting: 5 min

Selection of whether or not to use power-saving mode and the setting time.Push any keys for restoring from power saving mode.

27. Near lamp link : Yes, No, Other than grid

Factory setting: Yes

Setting of near lamp link.



28. Chart link: Yes, No

Factory setting: Yes

Selection of whether or not to use the chart presenting device other than EZER.

Select No to use the chart presenting device other than EZER.

29. Link off(Lens): Yes, No

Factory setting: No

Setting of the connection about automatic switching between lenses or measure modes (S/C/A/ADD/VA/ PX/PY) according to the selection of a chart.

(If setting Yes, not allowing lenses or modes to be switched automatically.)

30. Prism Step : 0.1, 0.2, 0.5

Factory setting: 0.5

Setting of the increment value for the prism step.

31. Prism Step(SHIFT) : 0.5, 1.0, 2.0

Factory setting: 2.0

Setting up the prism step with Shift

32. Brightness : 1~9

Factory setting: 6

Setting up the brightness of the back light in CB.

33. Beep volume : 1~7

Factory setting: 2

Setting up the beep and error sound volume in Control box(CB).

34. Print key function: Print Data, Send Data to PC

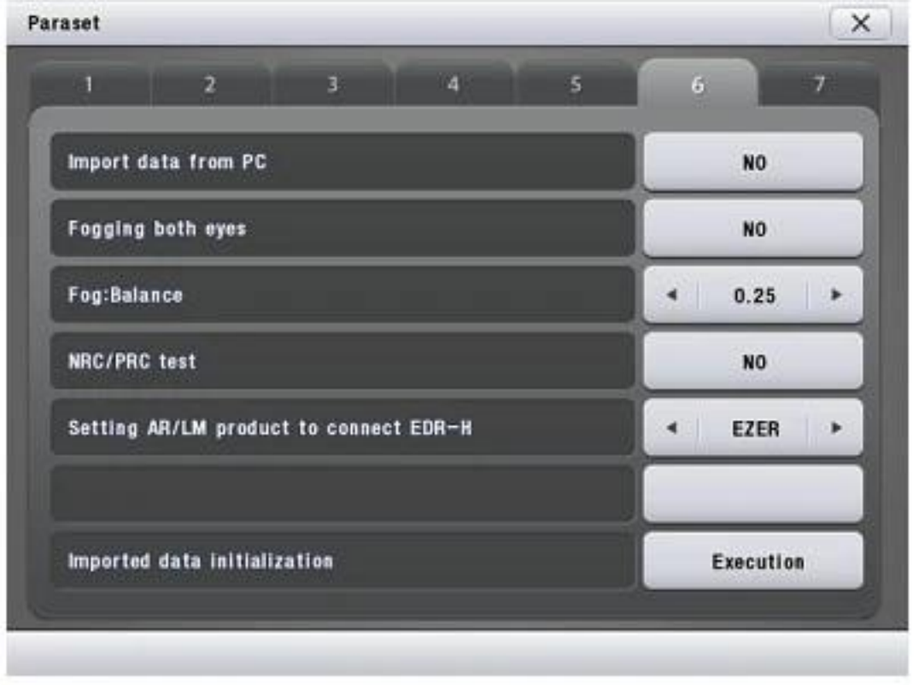
Factory setting: Print Data

Setting up the print key option, when pressing PRINT KEY on keypad.

35. Import data from PC : Yes, No

Factory setting: No

Setting up whether or not exporting data to the PC.



36. Fogging both eyes : Yes, No

Factory setting: No

Setting up whether or not using fogging function for both eyes.

37. Fog : Balance : 0.00D ~ 1.00D

Factory setting: 0.00D

Setting up the amount of the Fog.

38. **NRC / PRC test : Yes, No**

    Factory setting: No

    Setting up whether or not to use Negative Relative Convergence(NRC) and Positive Relative Convergence(PRC) test.

39. **Setting AR product to connect EDR-H: EZER, TOMEY, CANON, NIDEK, TOPCON-OLD, TOPCON-KR800**

    Factory setting: EZER

    Setting up the AR model which is connected with EDR-H.

40. **Imported data initialization : Execution**

    Initializing the imported data(RK, LM and subjective data).

    ➔ Press the [YES] button of confirmation window after clicking the [Execution] button.

41. **Auto Cross Cylinder insertion in ADD : Yes, No**

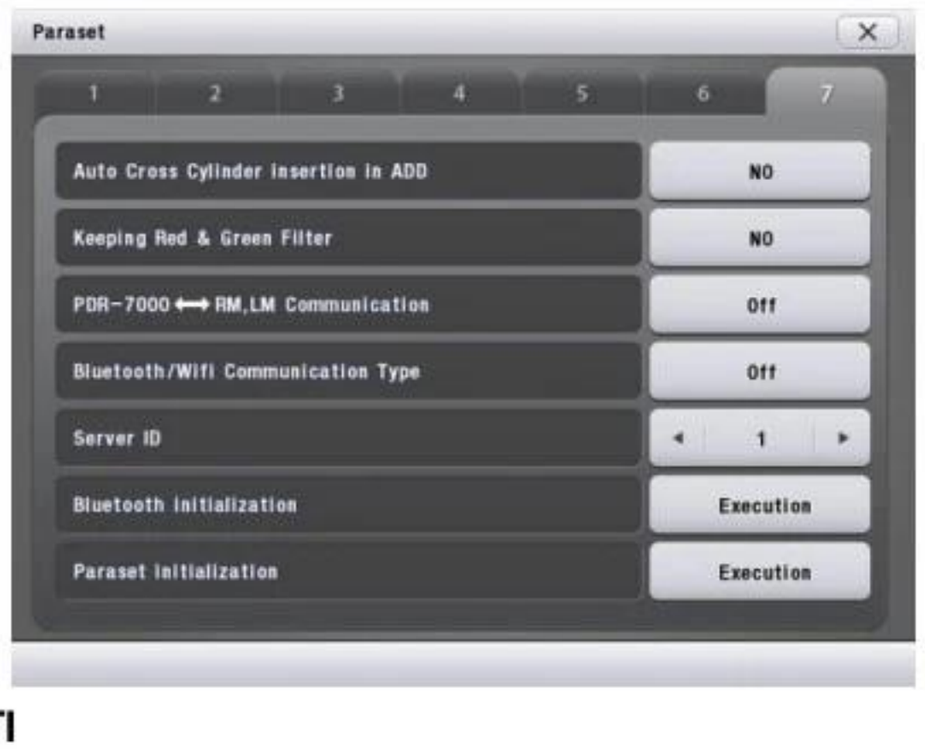
    Factory setting: No

    Setting up whether or not to insert cross cylinder lens automatically as the measurement mode come into the ADD.

42. **Keeping Red & Green Filter**

    Factory setting: No

    Setting up whether or not to keep Red and Green filter during changing the chart.



43. **EDR-H ←→RK,LM Communication : SINGLE,MULTI**

    Factory setting: SINGLE

    Communication : SINGLE / MULTI

44. **Bluetooth / Wifi Communication Type : Off, Bluetooth, Wifi**

    Factory setting: Off

    Communication : Bluetooth / Wifi

45. **Server ID**

    Factory setting: 1

46. **Bluetooth Initialization : Execution**

47. **Paraset Initialization : Execution**

    Initializing the parameter value as the Factory setting.

    ➔ Press the [YES] button of confirmation window after clicking the [Execution] button.

4 TEST METHOD

4.1 Unaided Visual Acuity Test

1. Press Ua
2. Press R
   The left measuring window is occluded.
3. Obtain the unaided VA for the right eye.
   Change the chart with ^ or v
   The VA of the last presented chart is in the VA field.
4. Press L
   The left measuring window is opened and the right one is occluded.
5. Obtain the unaided VA for the left eye.
   Follow the same procedure as Step 3.
6. Press BIN
   The both measuring windows are opened.
7. Obtain the binocular unaided VA.
   Follow the same procedure as Step 3.
   The unaided VA test is completed.



4.2 Aided Visual Acuity Test

It is possible to measure the aided VA when LM data is entered.

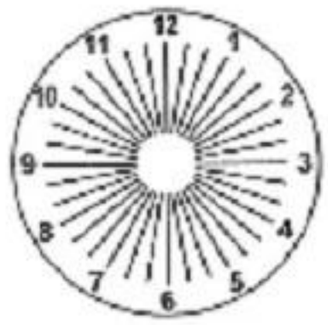
1. Press LM
   The aided VA test starts.
   According to the LM data, the corrective lenses are placed in the measuring windows.
2. Test the right, left, and binocular VA.
   Follow the same procedures as Steps 2 to 7 of 4.1 Unaided Visual Acuity Test.

4.3 Astigmatism Test

4.3.1 Astigmatism test with astigmatism clock dial

Chart: Astigmatism clock dial

Ideal appearance: The sharpness of all bars is equal.



[Procedure example]

1. Press R or L to occlude either measuring window.
2. Present the astigmatism clock dial chart.
   Press 
   The EDR-H goes into CYL mode.
   When the cylinder value is not 0, change it to 0.
3. Fog the vision until the VA becomes about 0.1.
   Press S to go into SPH mode.
   Turn the dial counterclockwise and add positive lenses.
4. Reduce the fogging until the VA becomes about 0.5.
   Turn the dial clockwise.
5. Ask the patient, “Does any bar appear especially sharper than the others? Or, are theyabout the same?”
   All the bars appear equal. → No astigmatism. The test is completed.
   One of the bars appears shaper. → Obtain the cylindrical axis in minus reading by multiplying the smaller number (1 to 6) next to the bar by 30°.
   For example: When Bar 2 appears sharper: 2 × 30° = 60°
6. Set the axis of the minus cylindrical lens to the value obtained is Step 5.
   Press A and turn the dial.
7. Add minus cylinder in increment of 0.25D so that all the bars appear equal.
   Press C and turn the dial.
   When adding the cylindrical power changes the sharper bar
   When the sharpest bar moves in the counterclockwise direction → Decrease the axis value.
   When the sharpest bar moves in the clockwise direction → Increase the axis value.

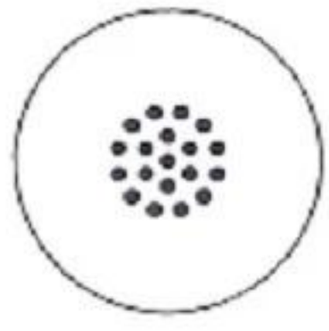
4.3.2 Astigmatism test with cross cylinder lens

Use: Cylindrical axis and power refinement with the cross cylinder lens

Chart: Dots

Auxiliary lens: Cross cylinder lens

Ideal appearance: The sharpness of dots does not change even though the cross cylinder lens is flipped.



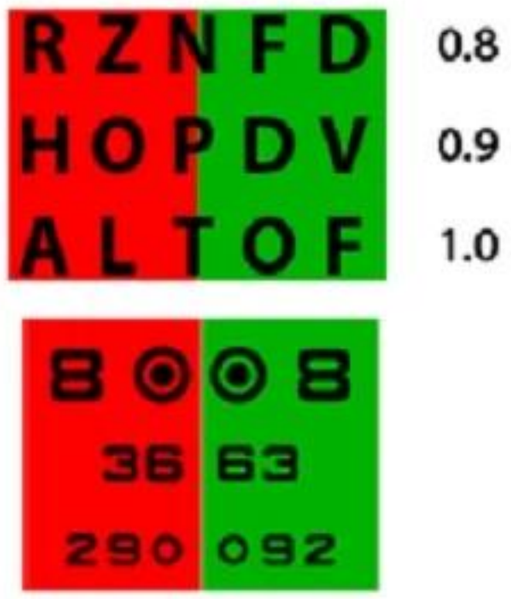
[Procedure example]

1. Set the refractor according to the AR data and occlude either measuring window.
2. Perform the red-green test.
   When the patient can not see the red and green sides equally, make the red side sharper slightly. See “4.4.1 Red-green test”
3. Present the dots chart.
   Press 
   The EDR-H goes into AXIS mode. The cross cylinder lens is set.
4. Measure the cylindrical axis.
   See “2.5.1 Fixed program A”
5. Go into CYL mode.
   Press **c**
   The axis of the cross cylinder lens changes.
6. Measure the cylindrical power.
   See 2 of Step 13 of “2.5.1 Fixed program A”

4.4 Spherical Refinement

4.4.1 Red-green test

Chart: Red-green
Ideal appearance: The sharpness of the letters on the red and green sides appears equal.



[Procedure example]

1. Press R or L to occlude either measuring window.
2. Present the red-green chart.
   Press the red-green chart → The EDR-H goes into SPH mode.
3. Fog the vision.
   Turn the dial counterclockwise by increments of two to add SPH + 0.50 D.
4. Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.
   Turn the dial clockwise.

The letters on the red side are sharper. → Turn the dial clockwise.
The letters on the green side are sharper. → Turn the dial counterclockwise.

4.4.2 Cross grid test for far vision

Use: Spherical refinement

Chart: Cross-grid

Auxiliary lens: ±0.50 D cross cylinder lens (Fixed with the axis set at 90º.)

Ideal appearance: The sharpness of the horizontal and vertical lines appears equal.



[Procedure example]

1. Press Sub.
2. Pres R or L to occlude either measuring window.
3. Present the cross-grid chart.
   Press +
   The cross cylinder lens of ±0.50 D is placed in the specified measuring window.
4. Ask a patient, “Which are sharper, the horizontal or vertical line?”
   The horizontal and vertical lines appear equal. → The spherical power is properly refined.
   The horizontal lines are sharper. → In the case of myopia, the spherical power is over-minused.In the case of hyperopia, the spherical power is undercorrected.
   The vertical lines are sharper. → In the case of myopia, the spherical power is under-minused.In the case of hyperopia, the spherical power is overcorrected.

4.5 Binocular Visual Function Test

4.5.1 Binocular balance test

Use: To check the binocular balancing
Chart: Binocular balance
Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters
Ideal appearance (EDC-BH/P)

Right eye	Left eye	Binocular ideal	
			The sharpness of the top and bottom lines is equal.

[Procedure example]

1. Present the binocular balance chart.
   Press the binocular balance testing chart
   The polarizing filters are placed in the measuring windows. The EDR-H goes into SPH mode.
2. Fog the binocular vision.
   Press BIN and turn the dial counterclockwise so that the binocular VA becomes between 0.63 and 0.8.
   The VA of each letter on the chart is 0.4, 0.5, 0.63, 0.8, and 1.0 moving from the left to light.
3. Ask the patient, “Which is sharper, the top or bottom line?"
   The top line is sharper. → Press R and add SPH +0.25 D. (Turn the dial counterclockwise.)
   The bottom line is sharper. → Press L and add SPH +0.25 D. (Turn the dial counterclockwise.)
   The top and bottom lines should appear equal. When the patient can not see them equally, select which eye is seen sharper according to the LM data or dominant eye for that determine either eye.
4. Clear fogging applied in Step 2.
   Press BIN and turn the dial.

4.5.2 Polarized red-green test

Use: To check equality of accommodation in both eyes

Chart: Polarized red/green

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters

Ideal appearance:

Right eye	Left eye	Binocular ideal
		 The sharpness of the top and bottom lines is equal.

[Procedure example]

1. Present the polarized red-green chart.
   Press the polarized red-green chart.

   The polarizing filters are placed in the measuring windows. The EDR-H goes into SPH mode.

2. Ask the patient, “How do the four numbers and double circles appear?”.
   1) The sharpness of all four double circles(◎) are equal.

   2) The sharpness of two double circles(◎) on the red side are equal.

   3) The sharpness of two double circles(◎) on the green side are equal.
   → Binocularly well balanced4

   4) The top line is sharper on the green side and the bottom line is sharper on the red side.
   → Press R and add SPH +0.25 D. (Turn the dial counterclockwise.)

   5) The top line is sharper on the red side and the bottom line is sharper on the green side.
   → Press L and add SPH +0.25 D. (Turn the dial counterclockwise.)

[4] In the case of (c), the both powers are overcorrected even though well balanced. Therefore, it is recommended to add positive powers to the both eyes until the chart appears as (a) or (b).

4.5.3 Phoria test

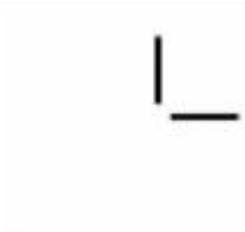
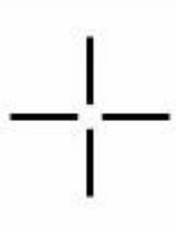
Use: To detect exophoria, esophoria, hypophoria, and hyperphoria

Chart: Phoria

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism

Ideal appearance

(EDC-BH/P)

Right eye	Left eye	Binocular ideal
		 (Orthophoria)

[Procedure example]

1. Present the phoria chart.

   Press 

   The polarizing filters are placed in the measuring windows.

   The base in/out prism powers can be entered.

   When  is pressed again, the base up/down prism powers can be entered.

2. Ask the patient, “Can you see the four bars?”

   Yes → Go to the next step.

   No → Impossible to continue the test.

3. Ask the patient, “Do the vertical and horizontal bars form a cross?”

   Yes → Orthophoria

   No → Heterophoria - Go to the next step.

4. Ask the patient, “Do the vertical bars line up?”

   Yes → No esophoria nor exophoria

   No → Esophoria or exophoria

5. Ask the patient, “Is the top bar shifted to the left or right?”

   Right → Esophoria

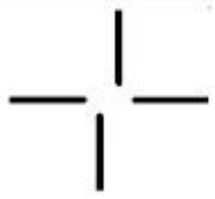
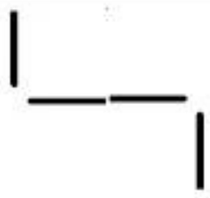
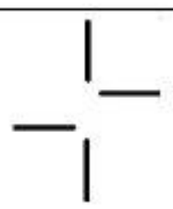
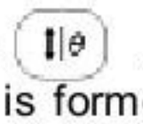
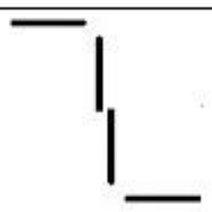
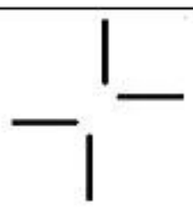
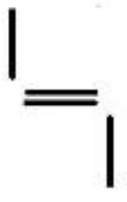
   Left → Exophoria

6. Ask the patient, “Do the horizontal bars line up?”

   Yes → No hyperphoria nor hypophoria

   No → Hyperphoria nor hypophoria

NOTE	The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode. Ex. When  is pressed in the base in/out prism, the rotary prism lenses are removed.

Appearance of chart	Phoria	Correction
1) 	Esophoria	Turn the dial clockwise to add the BO prism powers until a cross is formed.
2) 	Exophoria	Turn the dial counterclockwise to add the BI prism powers until a cross is formed.
3) 	Left eye hyperphoria	Press  . Turn the dial clockwise until a cross is formed. (Add BU to the right eye and BD to the left eye.)
4) 	Right eye hyperphoria	Press  . Turn the dial counterclockwise until a cross is formed. (Add BD to the right eye and BU to the left eye.)
5) 	Esophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for 1) and the vertical phoria in the same manner as for 4).
6) 	Esophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for 1) and the vertical phoria in the same manner as for 3).
7) 	Exophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for 2) and the vertical phoria in the same manner as for 4).
8) 	Exophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for 2) and the vertical phoria in the same manner as for 3).

4.5.4 Phoria with fixation test

Use: To detect heterophoria by giving stimuli for fusion

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism

Applicable model: EDC-BH/P

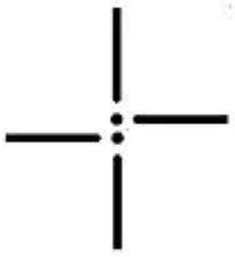
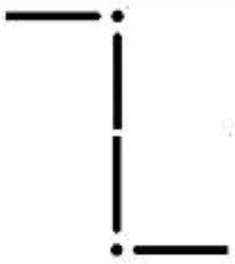
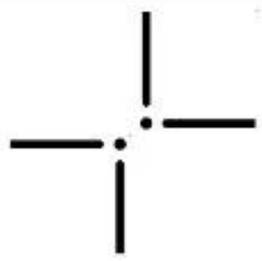
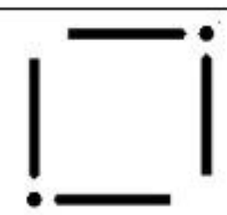
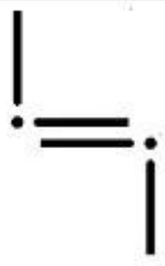
Ideal appearance:

Right eye	Left eye	Binocular ideal
		 (Orthophoria)

[Procedure example]

1. Present the phoria with fixation chart.
   Press the chart button
   The polarizing filters are placed in the measuring windows.
   The base in/out prism powers can be entered.
   When the chart button is pressed again, the base up/down prism powers can be entered.
2. Ask the patient, “Can you see the four bars ?”
   Yes → Go to the next step.
   No → Impossible to continue the test.
3. Ask the patient, “Do the vertical and horizontal bars form a cross?"
   Yes → Orthophoria
   No → Heterophoria – Go to the next step.
4. Ask the patient, “Do the vertical bars line up?”
   Yes → No exophoria nor esophoria
   No → Exophoria or esophoria
5. Ask the patient, “Is the top bar shifted to the left or right?”
   Right → Esophoria
   Left → Exophoria
6. Ask the patient, “Do the horizontal bars line up?”
   Yes → No hyperphoria nor hypophoria
   No → Hyperphoria or hypophoria

When a cross is not formed, correct it as follows:

Appearance of chart	Phoria	Correction
1) 	Esophoria	Turn the dial clockwise to add the BO prism powers until a cross is formed.
2) 	Exophoria	Turn the dial counterclockwise to add the BI prism powers until a cross is formed.
3) 	Left eye hyperphoria	Press ⇕|θ . Turn the dial clockwise until a cross is formed. (Add BU to the right eye and BD to the left eye.)
4) 	Right eye hyperphoria	Press ⇕|θ . Turn the dial counterclockwise until a cross is formed. (Add BD to the right eye and BU to the left eye.)
5) 	Esophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <4>.
6) 	Esophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <3>.
7) 	Exophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <4>.
8) 	Exophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <3>.

➔ Use + or – instead of the dial for fine adjustment.

4.5.5 Von Graefe test (horizontal phoria)

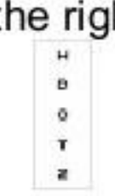
Use: To detect horizontal phoria
Chart: Vertical line
Auxiliary lens: 6ΔBU to the right eye, rotary prism to the left eye
Applicable model: EDC-BH, EDC-BH/P
[For the other types, use the highest VA letter chart or the letter chart which is little higher than the patient's VA.]
Ideal appearance:

Right eye	Left eye	Binocular ideal

[Procedure example]

1. Present the vertical line chart.
   Press .
   6ΔBU is placed in the right measuring window.
   The base in/out prism powers can be entered.

1. Press  to occlude the left measuring window.
2. Press  to open the left measuring window.
3. Ask the patient, "Can you see two circles with a column of letters in each of them? Do the letters line-up, like buttons on a shirt?"
   When they are not in line, correct them so that they appear in line at the instant the occluder is removed. (Use the Flashing Technique as shown in Steps 2 and 3.)

Appearance of chart	Phoria	Correction
The upper column is on the left.  	Esophoria	Turn the dial clockwise to add the BO prism powers until the two columns line up.
The upper column is on the right.  	Exophoria	Turn the dial counterclockwise to add the BI prism powers until the two columns line up.

➔ Use  or  instead of the dial for fine adjustment.

4.5.6 Von Graefe test (vertical phoria)

Use: To detect vertical phoria

Chart: Horizontal line

Auxiliary lens: Rotary prism to the right eye, 10ΔBI to the left eye

Applicable model: EDC-BH, EDC-BH/P

[For the other types, use the highest VA letter chart or the letter chart which is little higher than the patient's VA.]

Ideal appearance:

Right eye	Left eye	Binocular ideal

[Procedure example]

1. Present the horizontal line chart.
   Press the horizontal line chart.

   10ΔBI prism lens is placed in the left measuring window.

   The base up/down prism powers can be entered.

2. Ask the patient, "Can you see two circles with a row of letters in each of them? Do the letters line-up, like headlights on a car?"

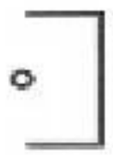
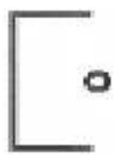
When they are not in line, correct them as follows:

Appearance of chart	Phoria	Correction
1) The left row is higher. 	Right eye hyperphoria	Turn the dial counterclockwise until the two rows line up.
2) The right row is higher. 	Left eye hyperphoria	Turn the dial clockwise until the two rows line up.

➔ Use  or  instead of the dial for fine adjustment.

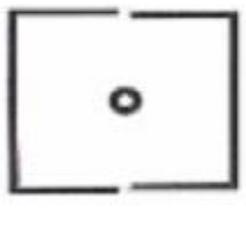
4.5.7 Vertical coincidence test

Use: To detect aniseikonia and to correct vertical phoria
Chart: Vertical coincidence
Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism
Applicable model: EDC-BH/P
Ideal appearance:

Right eye	Left eye	Binocular ideal
		

O Aniseikonia detection

1. Present the vertical coincidence chart.
   Press 
   The polarizing filters are placed in the measuring windows.
2. Ask the patient, “Can you see a square with a dot in the center? Are the left and right frames the same size? Or, is one smaller than the other?”

Ex.)  3.5% aniseikonia

The width of a line corresponds to 3.5% aniseikonia.

When the aniseikonia is due to anisometropia (refractive power difference of 2.00 D or more between the left and right eyes), a spectacle lens prescription is suitable for axial anisometropia and contact lens one is suitable for refractive anisometropia.

O Vertical phoria correction

1. Present the vertical coincidence chart.

   Press 

   The polarizing filters are placed in the measuring windows.

   The base up/down prism powers can be entered.

2. Ask the patient, “Can you see a square with a dot in the center? Are the left and right frames aligned? Or, is one higher than the other?

   When they are not aligned, correct them as follows:

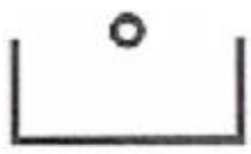
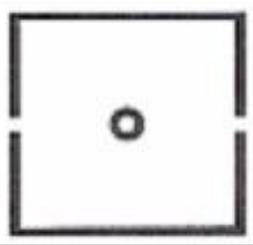
Appearance of chart	Phoria	Correction
	Right eye hyperphoria	Press BIN. Turn the dial counterclockwise until the left and right frames are aligned. (Add BD to the right eye and BU to the left eye.)
	Left eye hyperphoria	Press BIN. Turn the dial clockwise until the left and right frames are aligned. (Add BU to the right eye and BD to the left eye.)

➔ Use + or − instead of the dial for fine adjustment.

4.5.8 Horizontal coincidence test

Use: To detect aniseikonia and to correct horizontal phoria
Chart: Horizontal coincidence
Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism
Applicable model: EDC-BH/P

Ideal appearance:

Right eye	Left eye	Binocular ideal
		

O Aniseikoia detection

1. Present the horizontal coincidence chart.

   Press 

   The polarizing filters are placed in the measuring windows.

   The base in/out prism powers can be entered.

2. Ask the patient, “Can you see a square with a dot in the center? Are the top and bottomframes the same size? Or, is one smaller than the other?”

   Ex.)  3.5% aniseikonia

   The width of a line corresponds to 3.5% aniseikonia

   When the aniseikonia is due to anisometropia (refractive power difference of 2.00 D or more between the right and left eyes), a spectacle lens prescription is suitable for axial anisometropia and contact lens one is suitable for refractive anisometropia.

O Horizontal phoria correction

1. Present the horizontal coincidence chart.

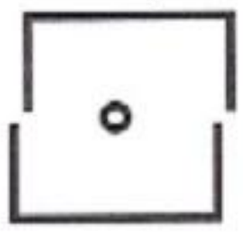
   Press 

   The polarizing filters are placed in the measuring windows.

   The base in/out prism powers can be entered.

2. Ask the patient, “Can you see a square with a dot in the center? Are the top and bottom frames aligned? Or, is one to the left or right of the other?”

When they are not aligned, correct them as follows:

Appearance of chart	Phoria	Correction
1) The top frame is shifted to the left. 	Right eye hyperphoria	Press BIN Turn the dial counterclockwise until the top and bottom frames are aligned.
2) The top frame is shifted to the right. 	Left eye hyperphoria	Press BIN. Turn the dial clockwise until the top and bottom frames are aligned.

➔ Use + or − instead of the dial for fine adjustment.

4.5.9 Schober test

Use: To correct heterophoria

Chart: Schober

Auxiliary lens: Red filter on the right eye, green filter on the left eye, binocular rotary prism

Applicable model: EDC-BH, EDC-BH/P

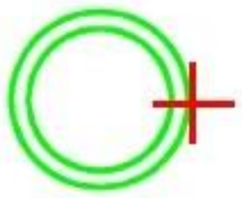
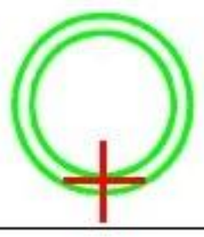
Ideal appearance:

Right eye	Left eye	Binocular ideal
		

[Procedure example]

1. Present the Schober chart.
   Press 
   The red filter is placed in the right measuring window and the green filter is placed in the left measuring window.
   The base in/out prism powers can be entered.
   When the Schober chart button is pressed again, the base up/down prism powers can be entered.
2. Ask the patient, “Can you see a green circle and red cross?”
   Yes → Go to the next step.
   No → Impossible to continue the test.
3. Ask the patient, “Is the cross in the center of the circle?”
   Yes → Orthophoria
   No → Heterophoria – Go to the next step.
4. Ask the patient, “Is the cross shifted to the left or right?”
   Right → Esophoria
   Left → Exophoria
   The cross is in the center. → No horizontal phoria
5. Ask the patient, “Is the cross shifted upward or downward?”
   Upward → Left eye hyperphoria
   Downward → Right eye hyperphoria
   The cross is in the center. → No vertical phoria

When the cross is shifted from the center, correct it as follows:

Appearance of chart	Phoria	Correction
	Esophoria	Turn the dial clockwise to add the BO prism powers until the cross comes to the center of the circle.
	Exophoria	Turn the dial counterclockwise to add the BI prism powers until the cross comes to the center of the circle.
	Left eye hyperphoria	Press ↕|θ. Turn the dial clockwise until the cross comes to the center of the circle. (Add BU to the right eye and BD to the left eye.)
	Right eye hyperphoria	Press ↕|θ. Turn the dial counterclockwise until the cross comes to the center of the circle. (Add BD to the right eye and BU to the left eye.)

➔ Use + or − instead of the dial for fine adjustment.

4.5.10 Stereo test

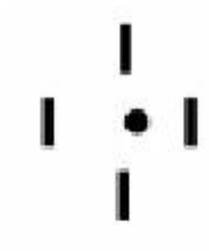
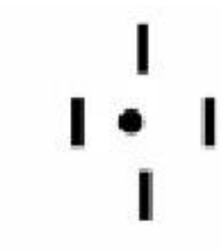
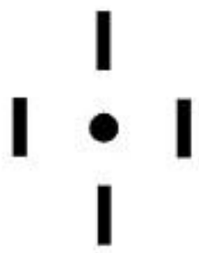
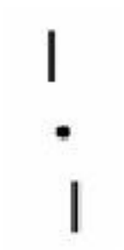
Use: To detect stereoscopic vision

Chart: Stereo test

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters

Applicable model: EDC-BH/P

Ideal appearance:

Right eye	Left eye	Binocular ideal
		
		

1. Present the stereo test chart.
   Press  
   The polarizing filters are placed in the measuring windows.

2. Confirm that the patient can see four bars stereoscopically and can see them at a different depth.

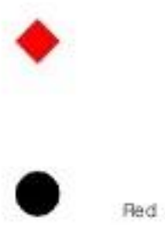
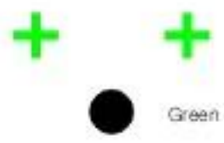
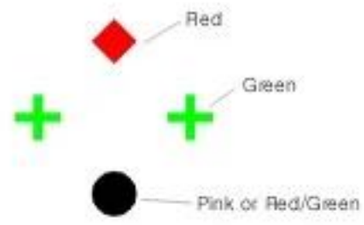
4.5.11 Worth test

Use: To detect fusion and suppression

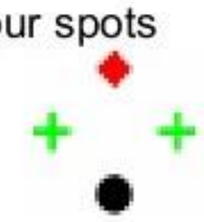
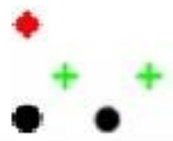
Chart: Worth

Auxiliary lens: Red filter on the right eye and green filter on the left eye

Ideal appearance:

Right eye	Left eye	Binocular ideal
		

1. Present the worth chart.
   Press 
   The red filter is placed in the right measuring window and the green one is placed in the left measuring window.
2. Ask the patient, “How many bright spots can you see? What colors are they?”

Appearance of chart	Symptom	Correction
1) Four spots 	Fushion	◆: Red, ✚: Green, ●: Pink or Red/Green alternately However, when the patient has an obvious dominant eye, Right dominant eye →●: Red Left dominant eye → ●: Green
2) Three spots 	Right eye supression	The two green ✚ and ● are seen.
3) Two spots 	Left eye supression	The red ◆ and are ● seen.
4) Five spots at the same time 	Diplopia	The red  and green  are seen at the same time.
5) Five spots 2) and 3) blink alternately.	Alternate supression	The red  and green  blink alternately.

4.5.12 Maddox test (horizontal phoria)

Use: To detect horizontal phoria

Chart: Fixation

Auxiliary lens: Horizontal maddox rod to the right eye, rotary prism to the left eye

Ideal appearance:

Right eye	Left eye	Binocular ideal
		

1. Present the fixation chart.
   Press 
   The horizontal maddox rod is placed in the right measuring window.
   The base in/out prism powers can be entered.
2. Ask the patient “Is the white spot shifted to the left or right? Or, it is overlaid on the red bar?”

When the spot is shifted to the left or right, correct it as follows:

Appearance of chart	Phoria	Correction
1) The white spot is at the left of the red bar. 	Esophoria	Press  Turn the dial clockwise to add the BO prism power until the spot is overlaid on the bar.
2) The white spot is at the right of the red bar. 	Exophoria	Press  Turn the dial counterclockwise to add the BI prism power until the spot is overlaid on the bar.

➔ Use  or  instead of the dial for fine adjustment.

4.5.13 Maddox test (vertical phoria)

Use: To detect vertical phoria

Chart: Fixation

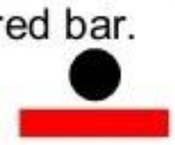
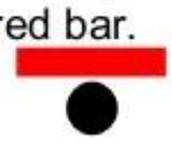
Auxiliary lens: Rotary prism to the right eye, vertical maddox rod to the left eye

Ideal appearance:

Right eye	Left eye	Binocular ideal
		

1. Present the fixation chart.
   Press •
   The horizontal maddox rod is set in the right measuring window.
   The base in/out prism powers can be entered.
2. Press • again.
   The maddox rod is removed from the right measuring window and the vertical maddox rod is placed in the left measuring window.
   The base up/down prism powers can be entered.
3. Ask the patient “Is the white spot above or below the red bar? Or, it is overlaid on the red bar?”

When the spot is shifted upward or downward, correct it as follows:

Appearance of Chart	Phoria	Correction
1) The white spot is above the red bar. 	Left eye hyperphoria	Press L Turn the dial clockwise to add the BU prism power until the spot is overlaid on the red bar.
2) The white spot is below the red bar. 	Right eye hyperphoria	Press L Turn the dial counterclockwise to add the BD prism power until the spot is overlaid on the red bar.

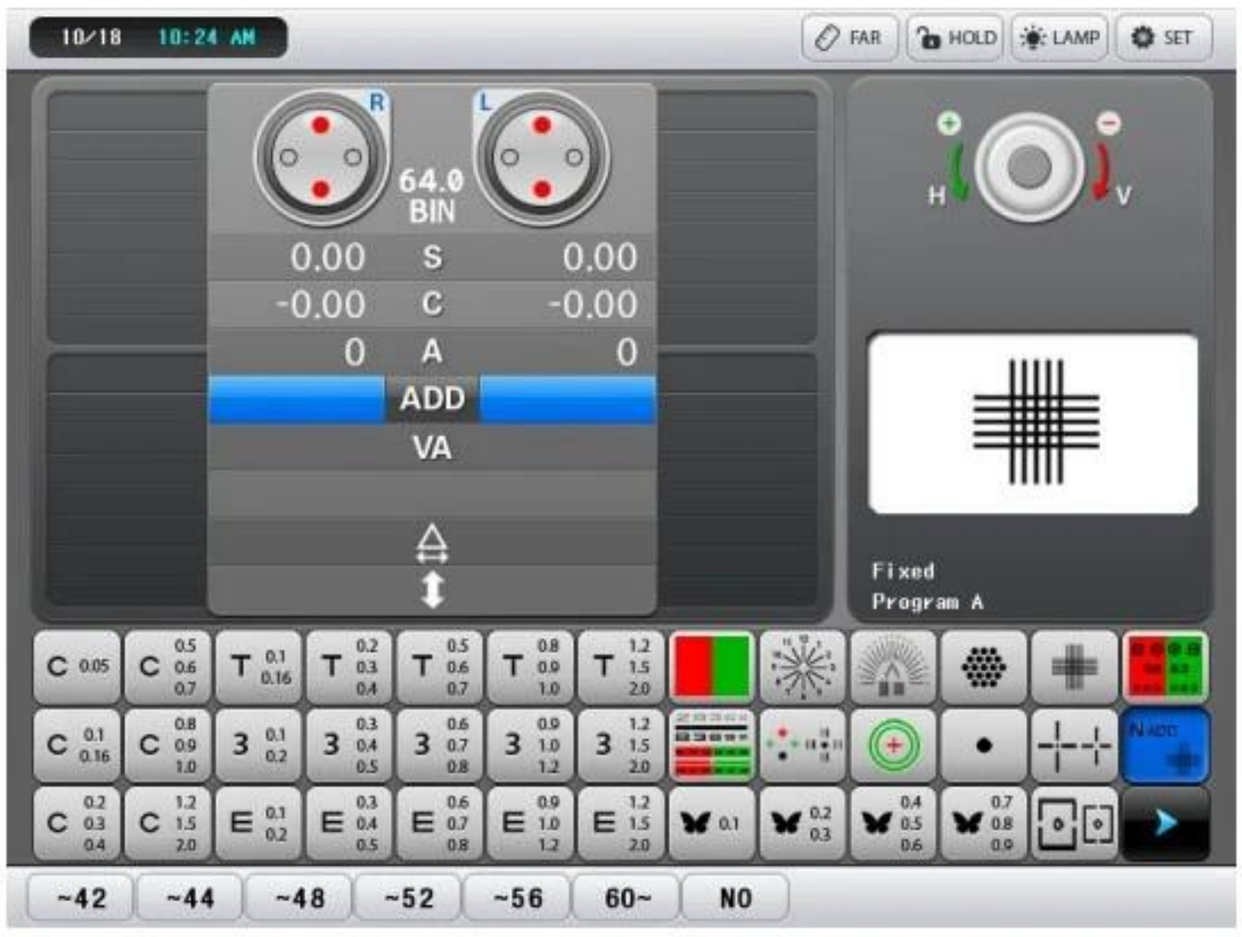
➔ Use + or − instead of the dial for fine adjustment.

4.6 Near Addition Test with Fused Cross Cylinder Lenses

Use: To correct the ADD according to the accommodation using Cross Grid
Chart: Near Distance chart(Cross Grid)
Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters
Ideal appearance: The sharpness of the horizontal and vertical lines appears equal.

[Operation sequence]

1. Press the  button in control box and lower the Near Chart and position the Near Cross Grid chart at 40cm.
2. Press the [R], [L], [BIN] button to select the field to measure.
3. Change the ADD value till the horizontal and vertical rods have the same clarity and width. Write down each result for the right and left eye and for the both eyes.
   ※ In order to change ADD value as minus diopter, please check if the "(-)ADD" item is set as "Yes" or "No"(paraset 2 pgae - 7th item)
4. Turn the dial clockwise("-" direction) if the vertical bar is seen more clearly.
5. Turn the dial counterclockwise("+" direction) if the horizontal bar is seen more clearly.



4.7 Negative Relative Accommodation Test

Use: To measure the Negative Relative Accommodation Test during the subjective test.
Chart: Near Distance chart
Auxiliary lens: None
Expectation: To obtain BLUR and RECOVERY value for the right or left eye or for both eyes.

[Operation sequence]

1. Press the ADD button and then click the NRA button at the leftmost of the bottom on the screen.
2. Press the [R], [L], [BIN] button to select the field to measure.
3. After pressing the [BLUR] button of the touch screen, place the Near Distance chart with 1.0 VA to 40cm away position from the patient's eye. Turn the dial to find the spot where the letters on the chart start to fade away. If the break spot has been found, press the [RECOV] button of the touch screen to enter recovery mode.
4. Find the recovery spot while turning the dial clockwise("-" direction). Press the [SAVE] button of the touch screen to finish this test after the recovery spot has been found.



4.8 Positive Relative Accommodation Test

Use: To measure the Positive Relative Accommodation Test during the subjective test.
Chart: Near Distance chart
Auxiliary lens: None
Expectation: To obtain BLUR and RECOVERY value for the right or left eye or for both eyes.

[Operation sequence]

1. Press the ADD button and then click the PRA button at the leftmost of the bottom on the screen.
2. Press the [R], [L], [BIN] button to select the field to measure.
3. After pressing the [BLUR] button of the touch screen, place the Near Distance chart with 1.0 VA to 40cm away position from the patient's eye. Turn the dial to find the spot where the letters on the chart start to fade away. If the break spot has been found, press the [RECOV] button of the touch screen to enter recovery mode.
4. Find the recovery spot while turning the dial counterclockwise("+" direction). Press the [SAVE] button of the touch screen to finish this test after the recovery spot has been found.



4.9 Negative Relative Convergence Test

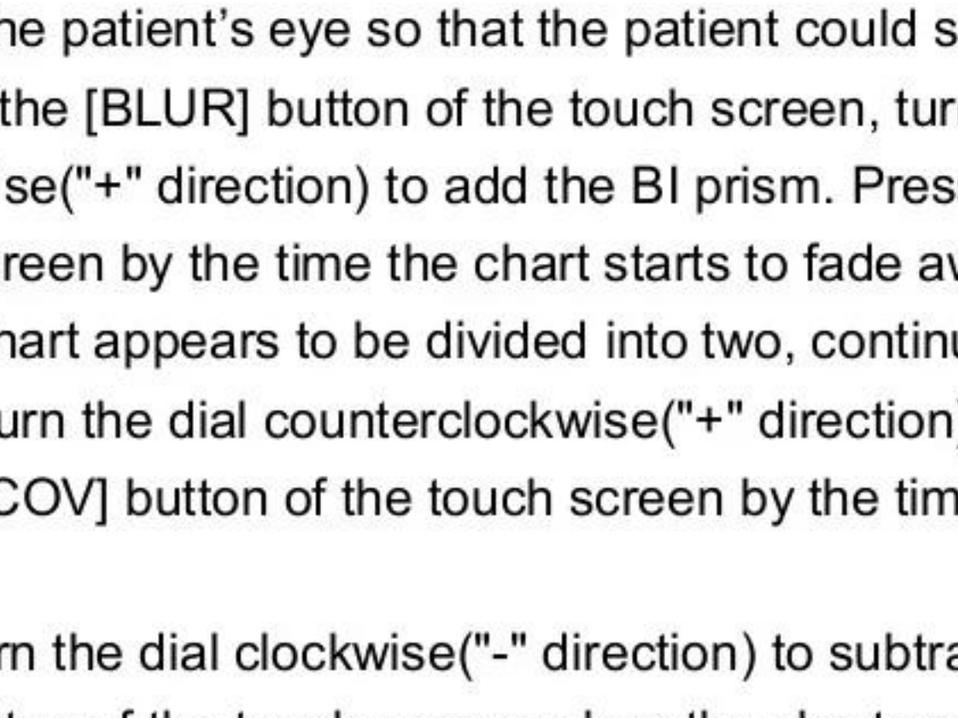
Use: To measure the Negative Convergence test during the subjective test.
Chart: Near Distance chart
Auxiliary lens: None
Expectation: To obtain BLUR, BREAK and RECOVERY value for the right or left eye or for both eyes.

[Operation sequence]

1. Press the [FAR] or [NEAR] button of the touch screen to select near or far mode.
2. Press the  button and then click the 

button at the leftmost of the bottom on the screen in FAR vision mode.
3. Press the  (prism in/out) button of control box and then click the 

button at the leftmost of the bottom on the screen in NEAR vision mode.
4. In the far mode, horizontal Von Graefe Chart will be spread on the screen. In the Near Mode, lower the Von Graefe chart until it is placed to 40cm away position from the patient's eye so that the patient could see this chart.
5. After pressing the [BLUR] button of the touch screen, turn the dial counterclockwise("+" direction) to add the BI prism. Press the [BREAK] button of the touch screen by the time the chart starts to fade away. If there is no such spot and the chart appears to be divided into two, continue the test.
6. Continuously turn the dial counterclockwise("+" direction) to add the BI prism. Press the [RECOV] button of the touch screen by the time the chart is divided into two.
7. At this time, turn the dial clockwise("-" direction) to subtract the BI prism. Press the [SAVE] button of the touch screen when the charts come together. All done.



4.10 Positive Relative Convergence Test

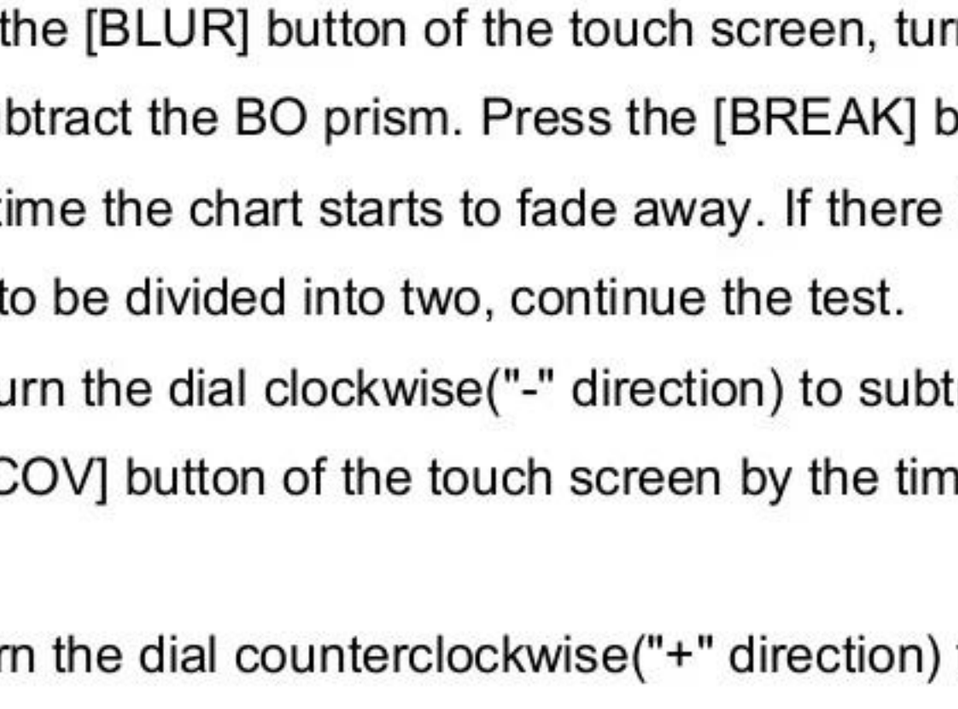
Use: To measure the Positive Relative Convergence test during the subjective test.
Chart: Near Distance chart
Auxiliary lens: None
Expectation: To obtain BLUR and RECOVERY value for the right or left eye or for both eyes.

[Operation sequence]

1. Press the [FAR] or [NEAR] button of the touch screen to select near or far mode.
2. Press the  button and then click the 

button at the left of the bottom on the screen in FAR vision mode.
3. Press the  (prism in/out) button of control box and then click the 

button at the leftmost of the bottom on the screen in NEAR vision mode.
4. In the far mode, horizontal Von Graefe Chart will be spread on the screen. In the Near Mode, lower the Von Graefe chart until it is placed to 40cm away position from the patient's eye so that the patient could see this chart.
5. After pressing the [BLUR] button of the touch screen, turn the dial clockwise("-" direction) to subtract the BO prism. Press the [BREAK] button of the touch screen by the time the chart starts to fade away. If there is no such spot and the chart appears to be divided into two, continue the test.
6. Continuously turn the dial clockwise("-" direction) to subtract the BO prism. Press the [RECOV] button of the touch screen by the time the chart is divided into two.
7. At this time, turn the dial counterclockwise("+" direction) to add the BO prism. Press the [SAVE] button of the touch screen when the charts come together. All done.



5 MAINTENANCE

5.1 Troubleshooting

In the event that the EDR-H does not work correctly, check the problem according to the following table before contacting your authorized distributor.

Symptom	Action
The refractor does not start even though the power is turned on.	• Confirm that the power cord is connected to a wall outlet. • Confirm that the system table is turned on.
The display and presented chart disappear suddenly.	• The EDR-H goes into power saving mode. Press any key to restore the display.
None of the keys on the control box function.	• Any abnormalities occurs. Turn the main switch of the system table off and then turn it on again.
Does not feed printer paper.	• Replace the printer paper. • Confirm that the Printer parameter is not set to Off.
Does not print the result.	• Check that the printer paper is set with the correct side up.
Incorrect responses from the touchscreen panel are received.	• Calibrate the touch-screen panel (see page 47).

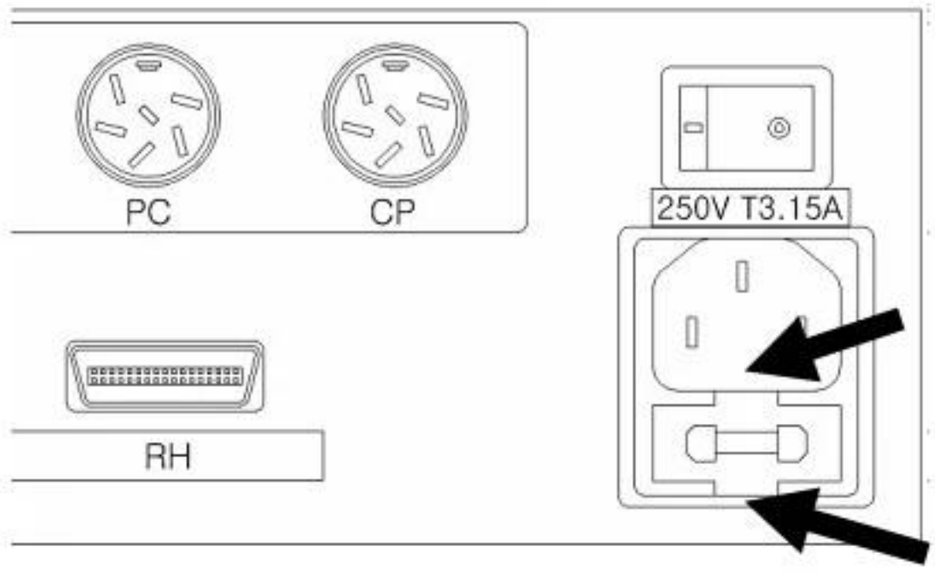
If the symptom cannot be corrected with the above actions, contact your authorized distributor.

5.2 Replacing Fuses

When the EDR-H does not normally turn on, the fuses may be blown.
Replace them with the spare fuses provided.
When the EDR-H is connected to the system table, the junction box is in the system table. Replace the fuses of the system table according to the system table operator's manual.

WARNING	Be sure to turn off and disconnect the power cord from the outlet before replacing the fuses. Otherwise, it may result in fire or electric shock. If the fuses often blows, contact your authorized distributor.
WARNING	Only the specified fuses must be used. **Rating: 250V T3.15A**

1. Turn off the power.
2. Remove the power cord from the electrical outlet of the junction box.
3. Replace fuses.
   1) Fuse holder in the direction of the arrow to pull it out.



   2) Replace the fuses and reset the fuse holder in its original position.



5.3 Replacing printing paper

1. Turn the LCD of control box as a 90-degree.

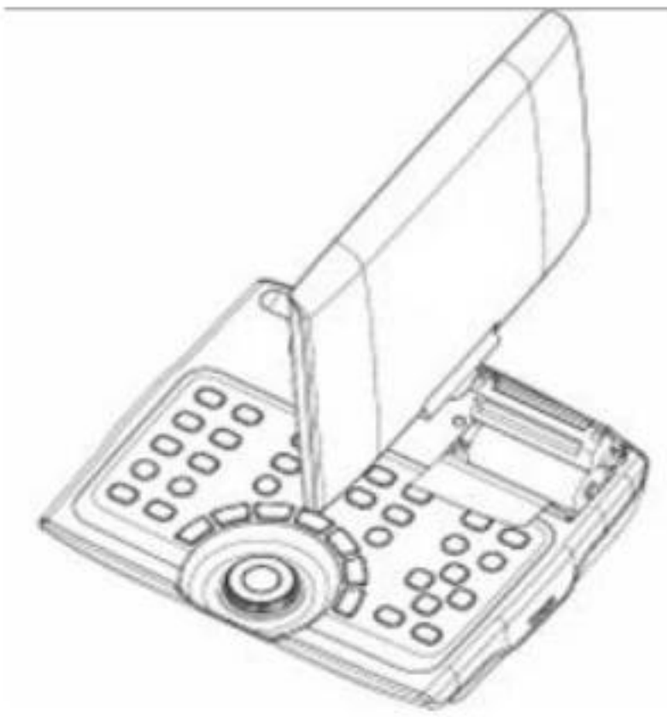
2. Push down the button next to the printer with the rear end of touch-screen pen.



3. Take the paper roll out of printer box.

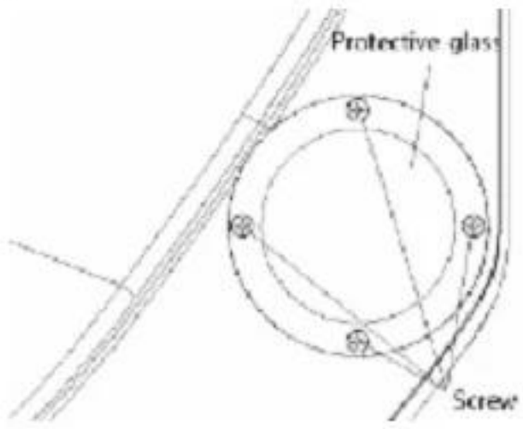
4. Put the new paper roll into a printer box.

5. Pull the printer paper out of the printer cover and close the printer cover.



5.4 Cleaning Measuring Windows

Fingerprints, oil from eyelashes, or dusts on the measuring windows affect the measurement accuracy. Be sure to check the windows before each refraction. When the windows are dirty, wipe with a clean and soft cloth or cotton swabs.
If condensation forms inside the measuring windows,remove the protective glasses and wipe the inside.



The protective glasses of the operator and patient sides are removed by unscrewing the two screws with a precise screwdriver.

Remove the face shields before removing the patient's side protective glasses.

NOTE	Attach the protective glasses with the screws just after cleaning. Failure to do so could allow dusts to be settled inside the EDR-H. It may affect the viewability or cause malfunction.

5.5 Cleaning Exterior

When the cover or panel becomes dirty, wipe with a soft cloth. For stubborn dirt, soak the cloth in a neutral detergent, wring well, and wipe. Finally wipe with a dry and soft cloth.

NOTE	Never use an organic solvent such as paint thinner. It may ruin the surface of the refractor.

5.6 Service Information

- If you can't contact with your local distributor, you can directly get in touch with the service department of the EZER using the phone number and the address written in the below table.

Manufacturer: EZER.
Address: 9990 NW 14th Street Unit # 105 Doral, FL 33172, United States
Tel: +1(888) 881-1122
Fax: +1(786) 621 0521

- Disposal of equipment

WARNING	This equipment has battery that can cause environment pollution when be left. Ahead of going into the discard, ask way to do it or consult with selling agency
WARNING	Upon request, circuit diagrams, component part lists, descriptions, calibration instructions, or other information will be provided to assist service personnel to repair parts of the equipment that are designated by EZER as repairable by service personnel.

6 TECHNICAL INFORMATIONS

6.1 Classifications

Classification under the REGULATION (EU) 2017/745: Class I

Type of protection against electric shock: Class I

Degree of protection against ingress of water in accordance with IEC60529: IP20

Method of sterilization or disinfection recommended by the manufacturer: Not applicable

Stability of use in an Oxygen Rich Environment: Not suitable

Mode of operation: Continuous operation

Mode of transport: Stationary equipment

6.2 Specifications

Measurable range

Spherical power	-29.00 ~ +26.75D (In increments of 0.12, 0.25, 0.5, 1, 2, 3D) -19.00 ~ +16.75D (Cross cylinder test, prism test)
Cylindrical power	0.00 ~ ±8.75D (In increments of 0.25, 0.5, 1, 2, 3D)
Cylindrical axis	0 ~ 180° (In increments of 1°, 5°, 15°)
Pupillary distance	48 ~ 80 mm (Far mode, in increments of 0.5/1mm) 50 ~ 74 mm (Near working distance of 35 cm) 54 ~ 80 mm (Fad PD possible for 100% convergence)
Prism	0 ~ 20Δ (In increments of 0.1Δ, 0.5Δ, 2Δ)

Refractor head

Auxiliary lens ens)	Cross cylinder lens (±0.25D, ±0.50D, ±0.25D auto-cross cylinder l
	Occluder Pinhole plate (φ2 mm) Red-green filter (Right eye = red, Left eye = green) Polarizing filters (Right eye = 135° / Left eye = 45°, Right Eye = 45° / Left Eye = 135°) Fixed cross cylinder lens (±0.50 D) Spherical lenses for Retinoscope (+1.5 D / +2.0D) Red Maddox rod (Right eye = horizontal, Left eye = vertical) Dissociation prism (Right eye = 6ΔBU, Left Eye = 10ΔBI) Dissociation prism (Right eye = 3ΔBD, Left Eye = 10ΔBU)
Visual field	40° (VD = 12 mm) 39° (VD = 13.75 mm)
Refraction distance for near vision	350 to 700 mm (selectable in increments of 50 mm)
Forehead rest adjustment range	14±2 mm
Vertex distance marking	12 mm, 14 mm, 16 mm, 18 mm, 20 mm
Level adjustment	±2.5°

Control box

Display	Color TFT-LCD (10.4inch) with touch panel
Printer	Built-in thermal

Power specification

Power source	AC 110/220V (±10%)
Frequency	50/60Hz
Power consumption	220-270VA

Environmental requirements

Operation	Temperature: +10℃ ~ +40℃ Humidity: 30%RH ~ 85%RH Pressure: 700hPA ~ 1060hPA
Storage and Transportation	Temperature: -10℃ ~ +55℃ Humidity: 10%RH ~ 90%RH Pressure: 600hPA ~ 1060hPA

6.3 Components

Refractor head	1
Control box	1
Junction box	1
Vision chart assembly	1
Position bar	1
Communication cable (JB - RH)	1
Communication cable (JB - CB)	1
Communication cable (JB – ERK)	1
Communication cable (JB - PACP)	1
Power cord	1
Dust cover	1
Spare fuse	2
Printer paper	2
Operation manual	1

Optional components

Communication cable (JB – EDC)

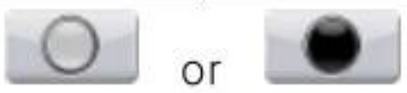
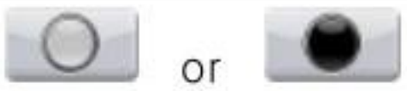
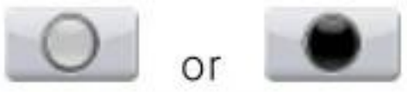
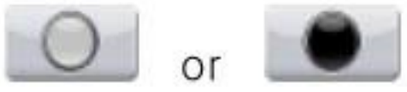
Communication cable (JB - ELM)

Communication cable (JB - PC)

7 APPENDIX

7.1 Linkage between Charts and Auxiliary Lenses

The following table shows the auxiliary lenses linked to the charts when the Chart link parameter is set to Yes.

Chart	Auxiliary lens		MODE
	Right eye	Left eye	
VA charts			S
Astigmatism clock dial			C/A
Red-green			S
Dots			A/C
Binocular balance			S
Polarized red-green			S
Phoria			Prism H/V
Phoria with fixation			Prism H/V
Vertical coincidence			Prism V
Horizontal coincidence			Prism H
Stereo	 		-
Worth 4 dots	Red filter : ●	Green filter : ●	-
Vertical line			Prism H
Horizontal line			Prism V
Fixation			Prism H/V
Schober	Red filter : ●	Green filter : ●	Prism H/V
Cross grid for near vision	 		ADD
VA chart for near vision			ADD

* The slash “/” indicates that the auxiliary lens changes alternately each time the chart button is pressed. The lens on the right side is placed in the first pression of the chart button.

* The Prism H indicates base in/out prism (BI/BO) and V indicates base up/down prism (BU/BD).

7.2 VA Conversion Table

Decimal	Fraction(feet)	Fraction(meters)
0.05	20/400	6/120
0.1	20/200	6/60
0.15	20/150	6/45
0.2	20/100	6/30
0.25	20/80	6/24
-	20/70	6/21
0.32	20/60	6/18
0.4	20/50	6/15
0.5	20/40	6/12
0.63	20/30	6/9
0.8	20/25	6/7.5
1.0	20/20	6/6
-	20/15	6/4.5
2	20/20	6/3

7.3 Preset Addition Power

The preset addition (ADD) powers are lower than the expected ones corresponding to the patient's age by increments of three (0.75 D).

Age	Near Addition(Dptr)	Age	Near Addition(Dptr)
~42	0.25	up to 56	2.00
~44	0.50	up to 60 or later	2.50
~48	1.00		
~52	1.50		

7.4 Estimated Visual Acuity Table

The estimated unaided VA is calculated from the AR(objective) data.
The estimated aided VA is calculated by subtracting the LM data from the AR data.
For the patient who has cylindrical powers, add -CYL to the spherical power.
The unaided VA is minimum and the aided VA is 0.63 without the AR data.

Spherical power(D)	Estimated VA value		
	Decimal	Fraction(feet)	Fraction(meters)
From -4.25	0.05	20/400	6/120
-2.25 to -4.00	0.1	20/200	6/60
-2.00	0.2	20/100	6/30
-1.75	0.3	20/60	6/20
	0.32		
-1.50	0.4	20/50	6/15
-1.25	0.5	20/40	6/12
-1.00	0.6	20/30	6/10
	0.63		
-0.75	0.7		6/7.5
-0.50	0.8	20/25	
-0.25	0.9	20/20	6/6
0	1.0		

※ The table may not correspond to the VA depending on the chart type.

7.5 Standard Programs

The EDR-H has ten programs of Fixed Program(A,B) and User Program(A-H), which can be programmed by the user.
The following standard programs have already been written in (Fixed) Programs A and B as factory setting.

○ Fixed Program A

The final prescription is obtained after the monocular full correction (subjective data) is store. The binocular balance test and auto adjustment are performed in the final field. Then the precise addition power is measured with the cross grid for near vision in the subjective field. (R: right eye, L: left eye, B: binocular eye)

1. AR data entry Enter the AR data.

<Unaided field>

2. Unaided VA test Measure the unaided VA.

<Aided field>

3. LM data entry Enter the LM data.
4. Aided VA entry Measure the aided VA.

<Subjective field>

5. R: AR data check	Check that the VA is about 0.7 in the AR data
6. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
7. R: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
8. R: Cross cylinder test (power).	Measure the cylindrical power with the cross cylinder lens
9. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
10. R: Best possible VA check (monocular full correction)	Best possible VA on the chart with most positive power
11. L: AR data check	Check that the VA is about 0.7 in the AR data.
12. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
13. L: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
14. L: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
15. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
16. L: Best possible VA check (monocular full correction)	Best possible VA on the chart with most positive power

<Final field>

17. B: Binocular balance test	Test the binocular balance.
18. B: Stereo test	Check the steroscopic vision and enter the stereoparallax
19. B: Power adjustment (auto)	Power adjustment depending on the purpose (auto djustment)

<Subjective field>

20. B: Addition power measurement	Measure the addition power with the cross grid chart for near vision

<Final field>

21. B: Addition power check	Check the addition power with the near VA chart.

○ Fixed Program B

The unaided and aided VA tests and auto adjustment are omitted from Fixed Program A.
It is necessary to enter the objective and subljective (copied from the objective) data with an auto refractometer before Fixed Program B.

<Subjective field>

1. R: AR data check.	Check that the VA is about 0.7 in the AR data
2. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
3. R: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
4. R: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
5. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
6. R: Best possible VA check (monocular full correction)	Best possible VA on the chart with most positive power
7. L: AR data check	Check that the VA is about 0.7 in the AR data.
8. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
9. L: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
10. L: Cross cylinder test (power).	Measure the cylindrical power with the cross cylinder lens
11. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
12. L: Best possible VA check (monocular full correction)	Best possible VA on the chart with most positive power

<Final field>

13. B: Binocular balance test	Test the binocular balance.
14. B: Stereo test	Check the steroscopic vision and enter the stereoparallax
15. B: Power adjustment	Power adjustment depending on the purpose (auto adjustment)

<Subjective field>

16. B: Addition power measurement	Measure the addition power with the cross grid chart for near vision

<Final field>

17. B: Addition power check	Check the addition power with the near VA chart.

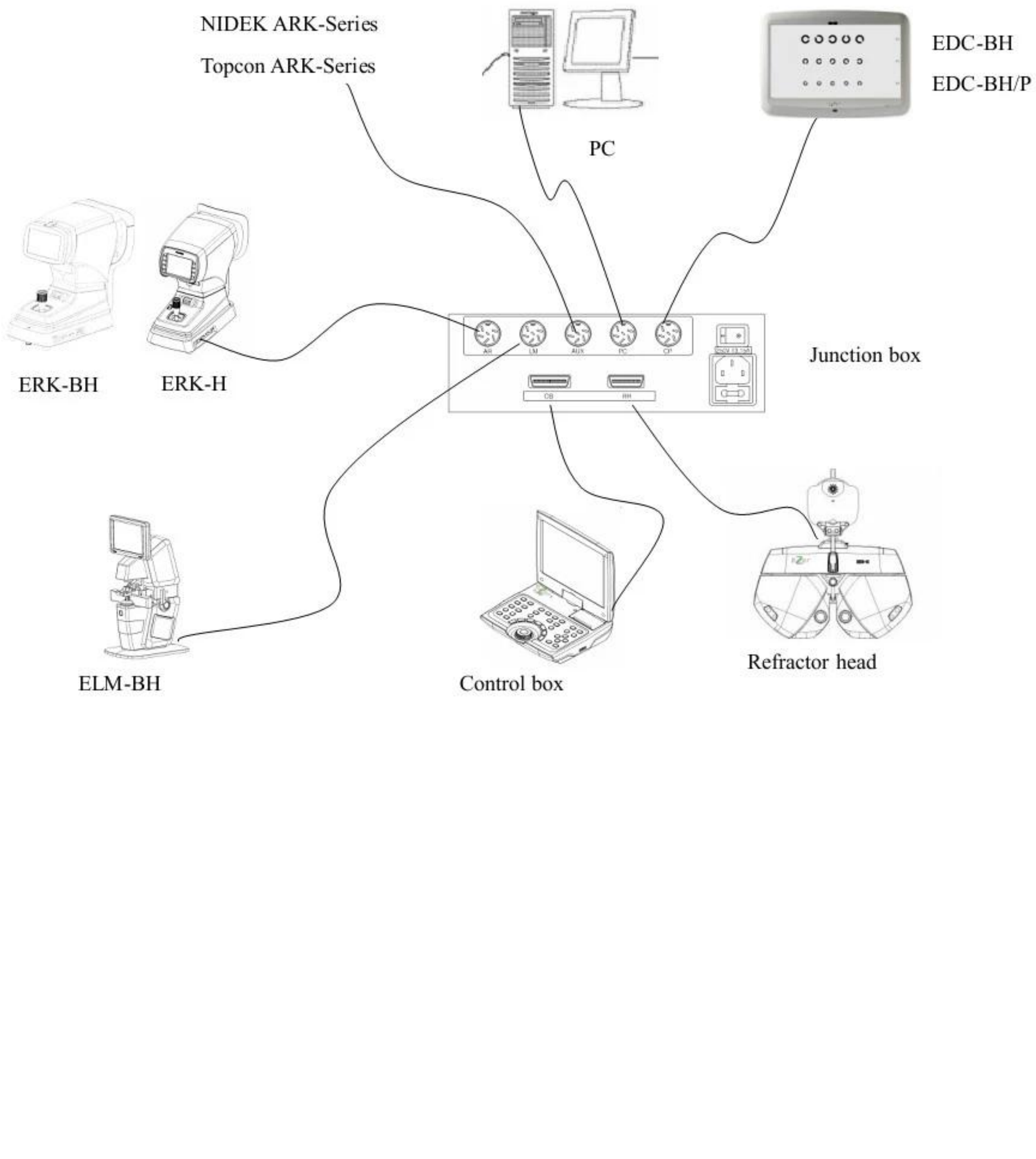
○ User Programs A to H: Empty

7.6 Guidance for connection of EDR-H with other devices

Connect all cables as the below configuration

- Before connecting cables, be sure to TURN OFF the power switch of all devices.
- If it is NOT TURNED OFF while connecting cables, it may cause the damage to electronic parts.

○ Configuration

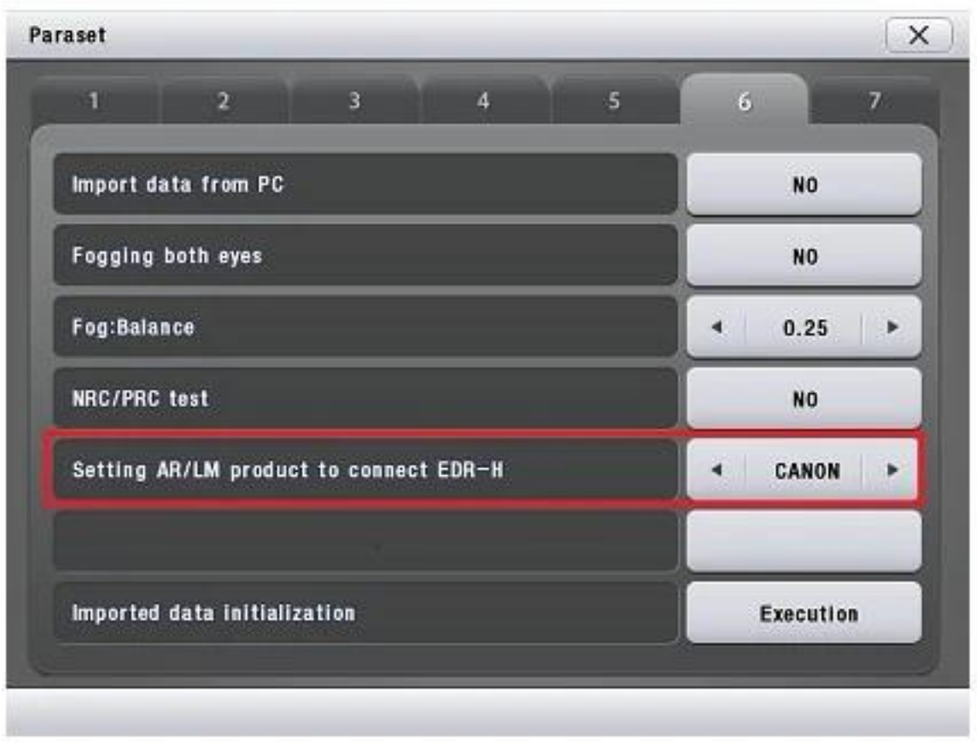


7.6.1 How to import data from CANON R/K to EDR-H

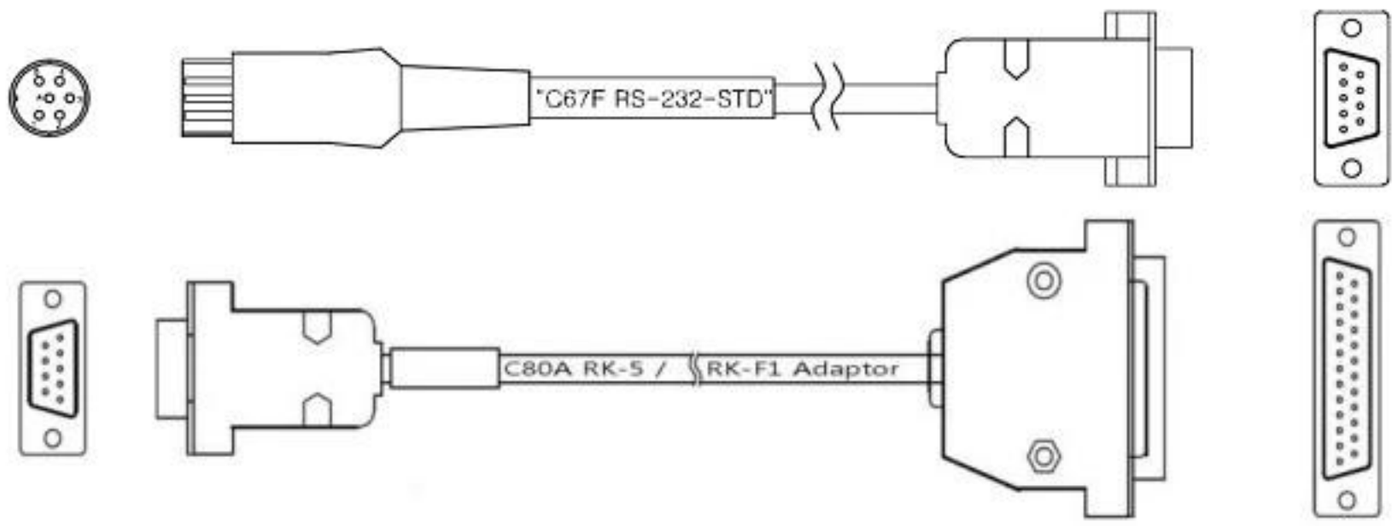
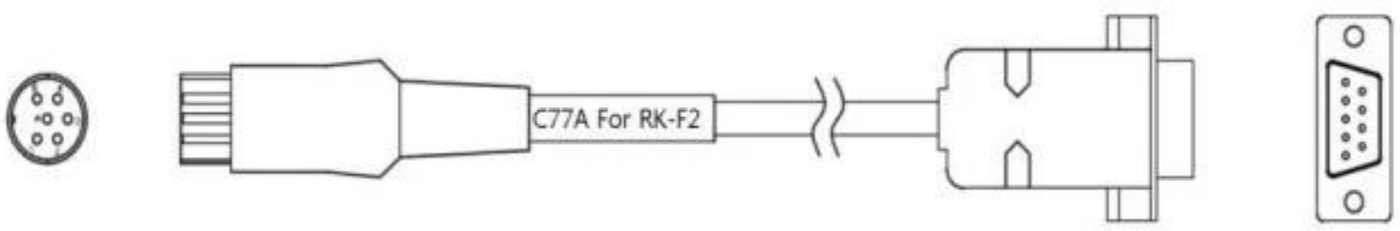
1. Check the communication setting of CANON R/K.

CANON RK-5	CANON RK-F1	CANON RK-F2
- COUNT: ON - TRANS: RS232C - FMT: 3 C - Baud Rate: 9600, 8N1	- COUNT: ON - TRANS: ON - FMT: 3 - Baud Rate: 9600, 8N1	- Ref: STANDARD - Ker: STANDARD - Interface: RS-232C - Format: RK-F2 - Baud Rate: 9600 - Bit: 8 bit - Parity: NONE - Stop Bit: 1bit - Patient No: ON - Patient ID - Numeric: ON

2. Check the communication setting of EDR-H

1) Enter [PARASET] mode.	
2) Go to page6. 3) Change the fifth item setting (Setting AR product to connect EDR-H) as 'CANON'.	

3. The linking cable for CANON R/K(RK-5, RK-F1, RK-F2)

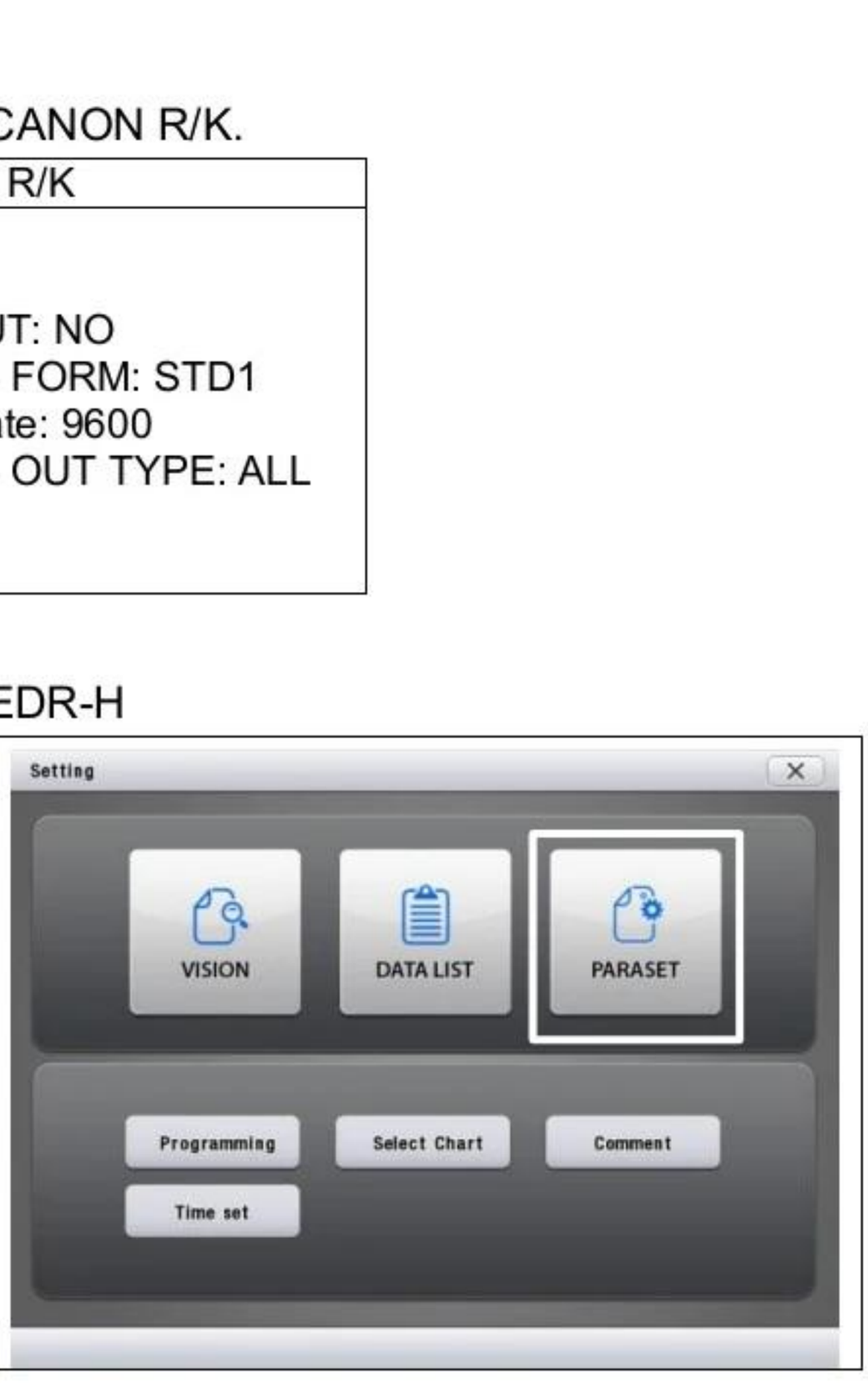
Junction Box	Conectors	Devices
AR	 Communication cable (C67F + C80A(Adaptor))	RK-5, RK-F1
AR	 Communication cable (C77A)	RK-F2

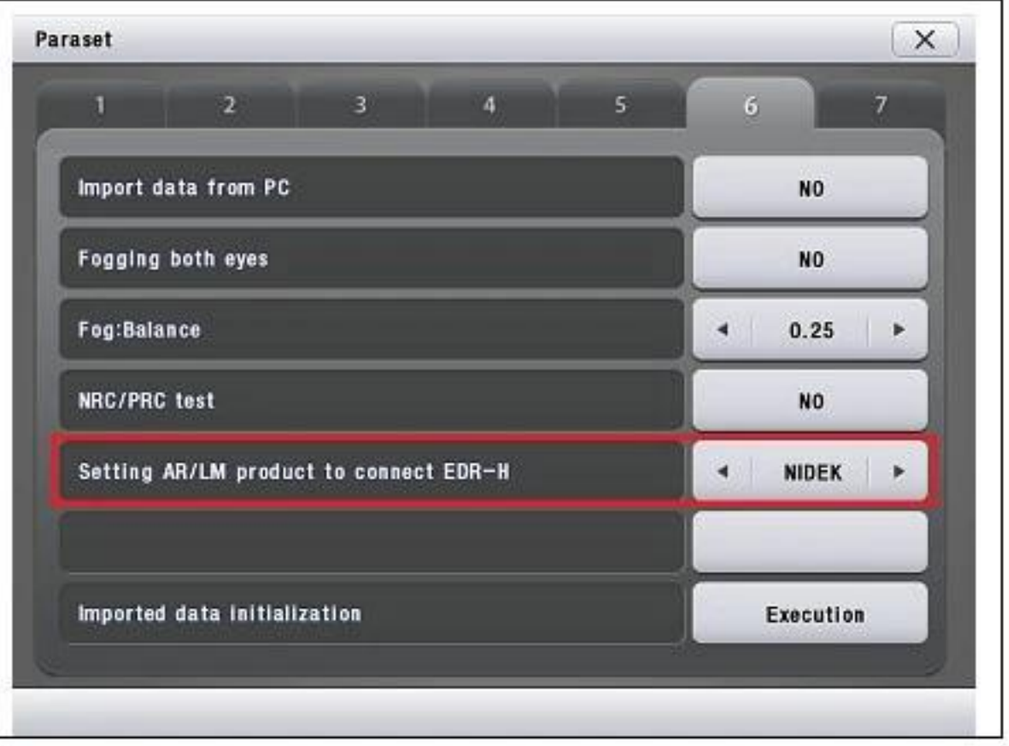
7.6.2 How to import data from NIDEK and TOPCON R/K to EDR-H

1. Check the communication setting of CANON R/K.

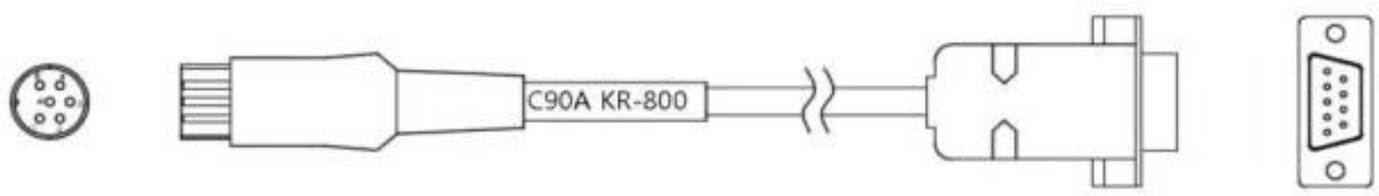
NIDEK R/K	TOPCON R/K
- I/F MODE: NCP10 - I/F FORMAT: All or Short - Baud Rate: 9600 - Bit: 8 bit - CR CODE: YES or NO - LM DATA PRINT: NO - RT TYPE: NONE	- CL INPUT: NO - RS232C FORM: STD1 - Baud Rate: 9600 - RS232C OUT TYPE: ALL

2. Check the communication setting of EDR-H

1) Enter [PARASET] mode.	

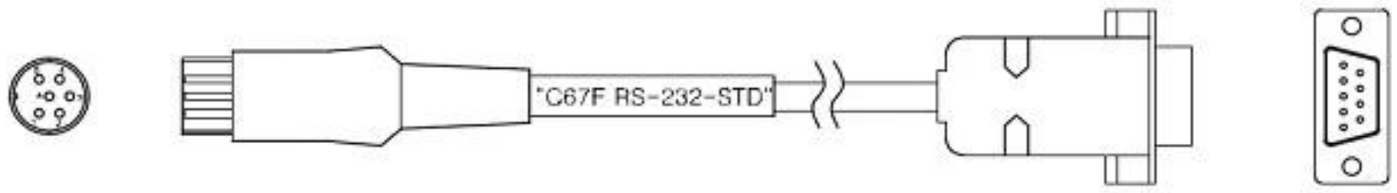
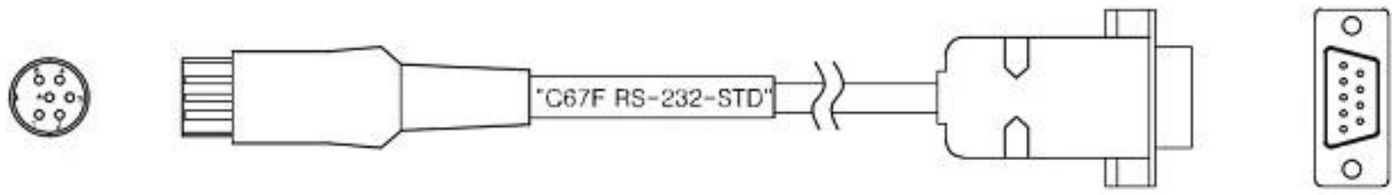
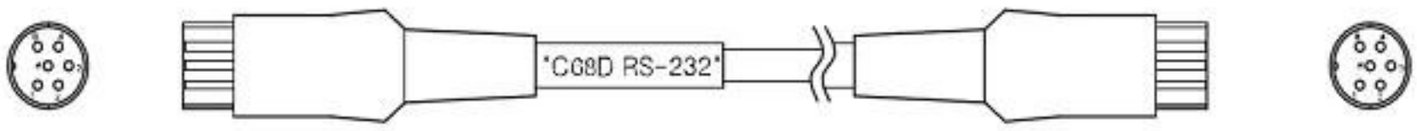
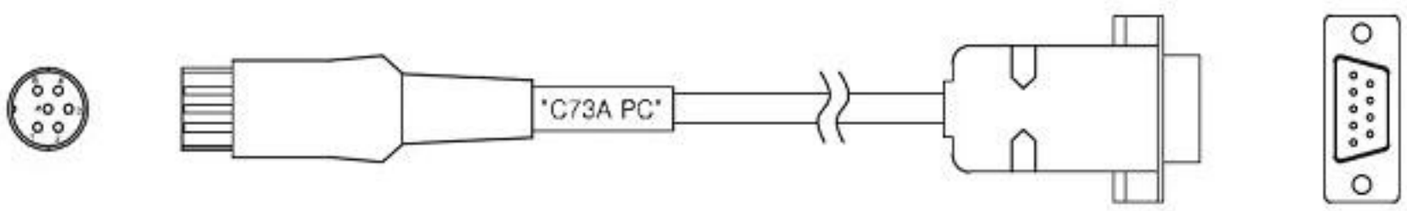
2) Go to page6. 3) Change the fifth item setting (Setting AR product to connect EDR-H) as 'NIDEK' or 'TOPCON'.	

3. The linking cable for NIDEK and TOPCON ARK

Junction Box	Conectors	Devices
AUX	 Communication cable (C79A)	NIDEK R/K TOPCON R/K
AUX	 Communication cable (C90A)	TOPCON R/K (KR-800)

※ Please connect the linking cable to [AUX] port of junction box for communicating NIDEK and TOPCON ARK with EDR-H.

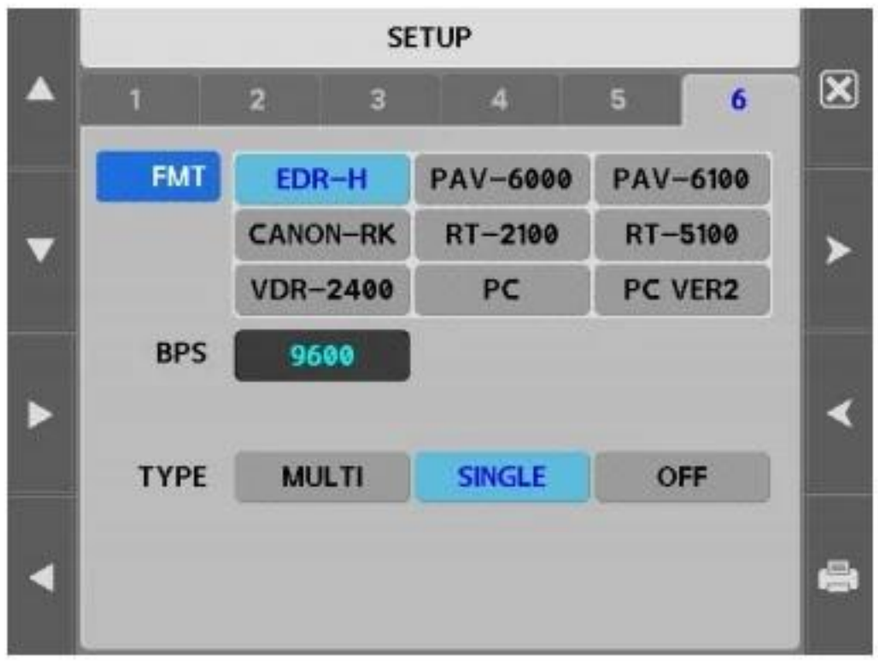
7.6.3 Connectors

Junction Box	Conectors	Devices
RH	 Communication cable (JB - RH) : 5m	Refractor Head
CB	 Communication cable (JB - CB) : 3m	Control Box
AR	 Communication cable (JB - ERK) : DIN 6-pin to RS-232 (5m)	ERK-H ERK-BH
CP	 Communication cable (JB - EDC) : DIN 6-pin to RS-232 (10m)	EDC-BH EDC-BH/P
LM	 Communication cable (JB - ELM) : DIN 6-pin to 6-pin (5m)	ELM-BH
PC	 Communication cable (JB - PC) : DIN 6-pin to RS-232 (5m)	PC port (RS232)

7.6.4 Setting for connection with the external instrument

1. ERK-H

- To make data link with EDR-H, ERK-H must have software version upper than version v1.00a.
- In case ERK-H has lower software version, the ERK-H has to be updated by software version more than v1.00a.



1)Turn on the power
- The version will be displayed on the monitor.

2) Touch the “SETUP” button
3) Touch the “PAGE6”
4) Select “FMT : **EDR-H**”
5) Touch "YES" button
6) Exit by “END” button

2. ERK-BH

- To make data link with EDR-H, ERK-BH must have software version upper than version v1.0.00.A.
- In case ERK-BH has lower software version, the ERK-BH has to be updated by software version more than v1.0.00.A.

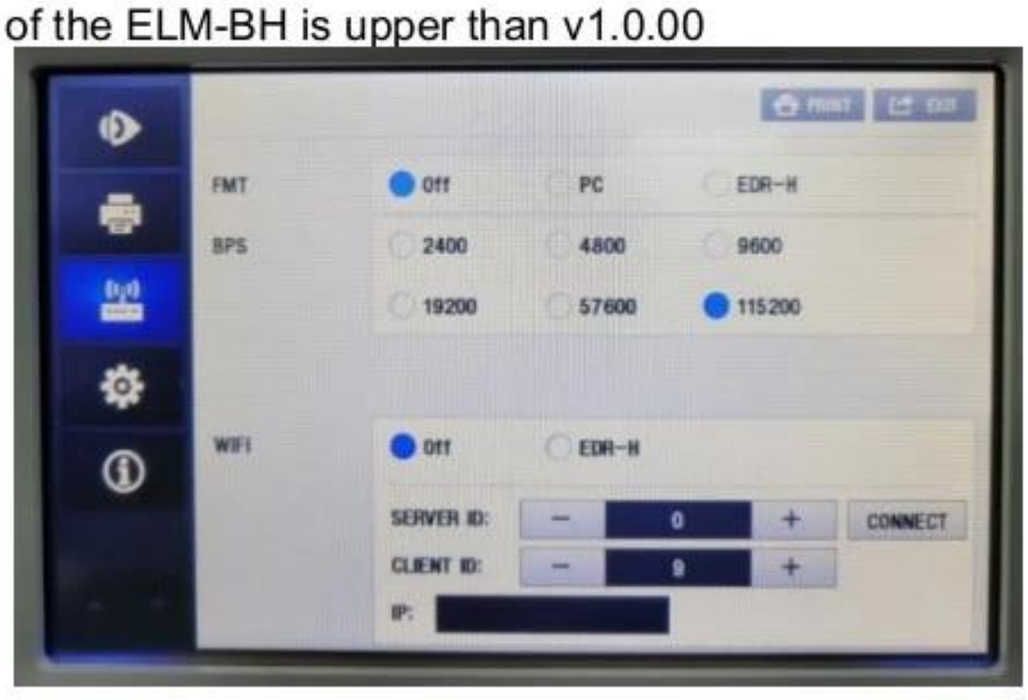


1)Turn on the power
- The version will be displayed on the monitor.

2) Touch the “SETUP” button
3) Touch the third menu from the top of the left("communication setting icon").
4) Select “FMT : **EDR-H**”
5) Touch "YES" button
6) Exit by “END” button

3. ELM-BH

- To make data link with EDR-H, the software version of the ELM-BH is upper than v1.0.00



1) Turn on the power
- The version will be displayed on the monitor.

2) Touch the “MENU” button
3) Touch the 
4) Set it up like the picture on the right.
5) Exit by “EXIT” button