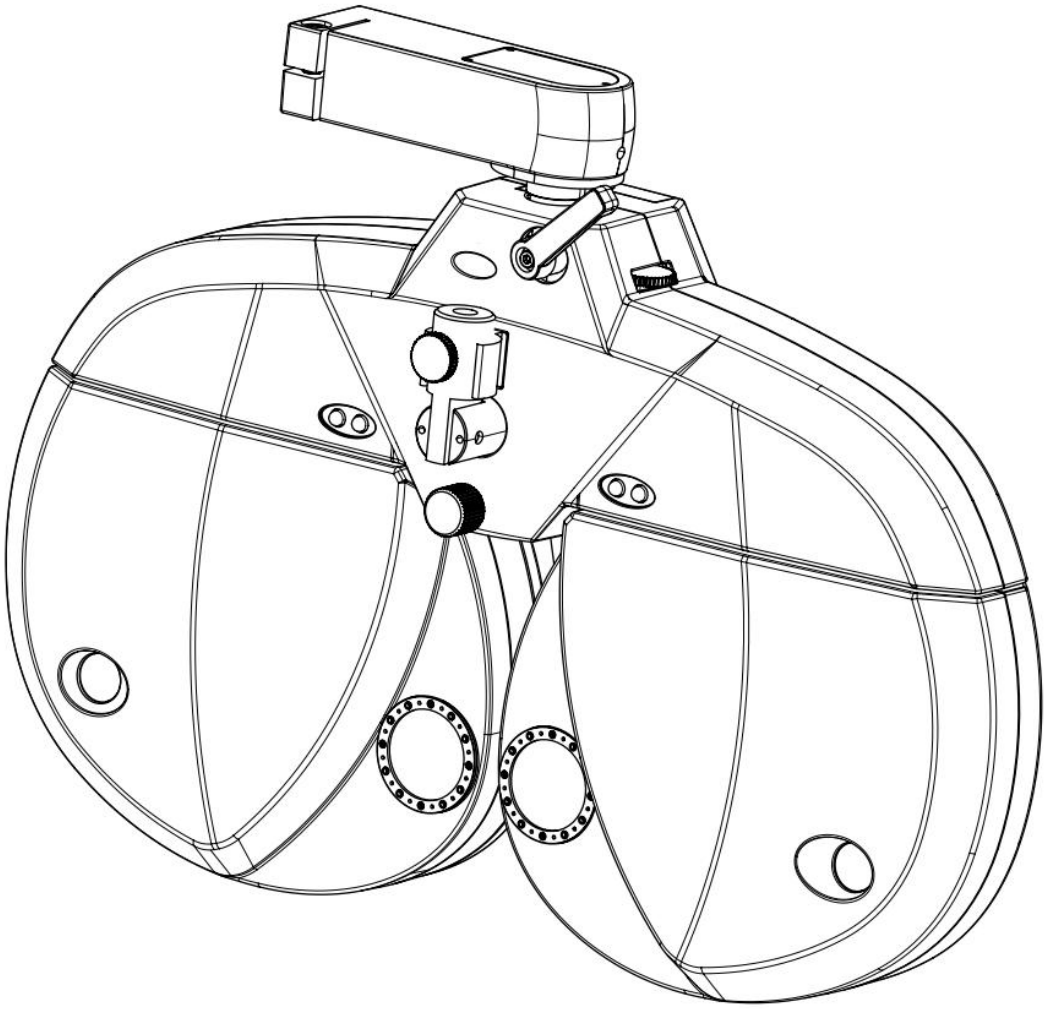
Automatic Phoropter User Manual



Pubilcation Date：November 16.2023

Version：A0

Introduction

Thank you for purchasing the RX MECH & OPTICAL series automatic phoropter.

Please read this manual carefully and thoroughly before using this equipment. We sincerely hope that this manual will provide you with sufficient information to use this equipment correctly.

Please do not disassemble this optical equipment without professional training.

Do not touch the lenses with your hands or apply pressure on them.

When moving the main unit of the automatic phoropter, please hold the installation bracket on the top of the main unit horizontally or hold both sides of the main unDo not place this equipment in humid or dusty environments.

The wipeable plastic parts (such as the shell, face pads, forehead rests, etc.) should be wiped with a cotton cloth. Do not use corrosive chemicals for cleaning.

The company is not responsible for any direct, indirect, special, or incidental losses caused by operating and using this equipment.

The company is not responsible for any damage or loss caused by using non-original parts.

The contents of this manual may change without prior notice.

Some illustrations in this manual may differ slightly from the actual equipment.

Table of Contents

1.1Product Information

Product name: Automatic Phoropter
Model Specs: CV-700A, CV-700B, CV-700C
Manufacturer: RX MECH & OPTICAL, LLC.
Power Input: 100-240VAC, 50/60Hz, 1.3-0.6A
Power Output: 24VDC, 3.75A, 90W max
Production Date: See Product Label
Shelf Life: 8 years (8 hours of usage per day).
After-Sale Support: support@rxmech.com / +1-313-747-0580

1.2 Software Information

1.2.1 Software Release Version:

Software Name	Model	Release Version	Remarks
Operation ControlSoftware	CV-700A、CV-700B、CV-700C	APK_V1.0.0.0	
Main Unit Lens DeckEmbedded Software		STCM_V1.0.0.0	Main Unit Embedded Software
		STCK_V1.0.0.0	Control Panel Embedded Software
		STCL_V1.0.0.0	Left Side Embedded Software
		STCR_V1.0.0.0	Right Side Embedded Software

1.2.2 Software and Network Security Information:

Interface Description					
Interface Type	Intended User	Usage Scenario	Intended Use	TechnicalCharacteristics	Data Type
Network Interface (Bluetooth Protocol)	Optometrist	Medical Institutions	Data Transmission	Wireless, Standard Bluetooth Protocol	Sensitive Medical Data, Non-sensitive Medical Data

Typical Operating Environment of Software	
Hardware Configuration	
Processor	Dual-core 2.0GHz or above
Memory	4G+64G
External Software Environment	
Operating System	Android 6.0 or above
Platform Software	None
Database Software	None

Configuration of Security Features （CNFS）： The product has the ability to configure security features as needed by the user	This capability is not applicable. The security capabilities of this product can only be installed/upgraded by the manufacturer.
Data Backup and Disaster Recovery （DTBK）： The ability to recover data, hardware, or software after damage or destruction	Manual backup by the user
Risk List when Network Fails	Unauthorized access; Unexpected data transmission; Data loss, damage, tampering; Personal information leakage

1.3 Product Structure

The automatic phoropter consists of a main unit, a power adapter, software, and a control keyboard.
The main unit consists of spherical lenses, cylindrical lenses, prism lenses, auxiliary lenses, and an electromechanical lens exchange mechanism.
The software includes tablet operation control software and main unit lens deck embedded software.

1.4 Intended Use

For subjective measurement of the refractive status of the human eye.

1.5 Model Specifications

The model specifications of the Rongxin CV-700 series automatic phoropter are as follows:

No.	Mode	Appearance Difference
1	CV-700A	Smiling Forehead Rest
2	CV-700B	Trapezoidal Forehead Rest
3	CV-700C	Round Forehead Rest

1.6 Operating Environment

Item	Transport Environment	Storage Environment	Operating Environment
Temperature Range	- 10℃ ~ 55℃	- 10℃ ~ 55℃	10℃ ~ 35℃
Humidity Range	10% ~ 85% (Non-condensing)	10% ~ 85% (Non-condensing)	30% ~ 85% (Non-condensing)
Pressure	500 ~ 1060 hPa	500 ~ 1060 hPa	800 ~ 1060 hPa

1.7 Classification

The classification information for this instrument according to GB9706.1-2020 General Requirements for Safety of Medical Electrical Equipment is:
- Type of protection against electric shock: Class I.

- Degree of protection against electric shock: Type B applied part.
- Degree of protection against ingress of water: ordinary equipment.
- This equipment is not suitable for use in the presence of flammable anesthetic gas mixed with air, or with oxygen or nitrous oxide.
- This equipment is non-permanent installation equipment
- Operating mode: Continuous operation

2.Safety Instructions

Please strictly follow the safety instructions in this manual when using this equipment. If you lose this manual, you can obtain an electronic copy from the company's official website. You can also request an electronic copy by sending an email to support@rxmech.com.

In this manual, the following icons indicate the degree or level of safety warnings, defined as follows:

⚠ **Warning *** Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
⚠ **Caution *** Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury or some property damage.

2.1 Warnings

2.1.1 When supplying power to this equipment, ensure proper grounding and that the input voltage is within the allowable range of the equipment. Otherwise, it may cause fire or electric shock.

2.1.2 Do not plug or unplug the electrical cord with wet hands, as this may cause electric shock.

2.1.3 When unplugging the power cord, do not pull the cable directly.

2.1.4 Except for the forehead rest and face pads, this equipment does not contain user-serviceable parts. Do not disassemble the instrument’ s casing.

2.1.5 Always use power outlets that meet the power specifications of this equipment.
2.1.6 Do not use this equipment for purposes other than its intended use.

2.1.7 Immediately turn off the power and unplug the power cord in the following situations:
- The instrument gets wet or liquid flows inside.
- The instrument's casing is damaged.
- The machine shows abnormal behaviour and needs repair.

2.1.8 Do not use this equipment under direct sunlight, near water, heat sources, or in dusty environments. This equipment is ordinary equipment with no protection against water ingress.

2.1.9 Do not touch the lenses with your hands or apply pressure on them.

2.1.10 Unauthorized modification of this equipment is not permitted.

2.1.11 Do not place the power adapter directly on the ground. During continuous use, the

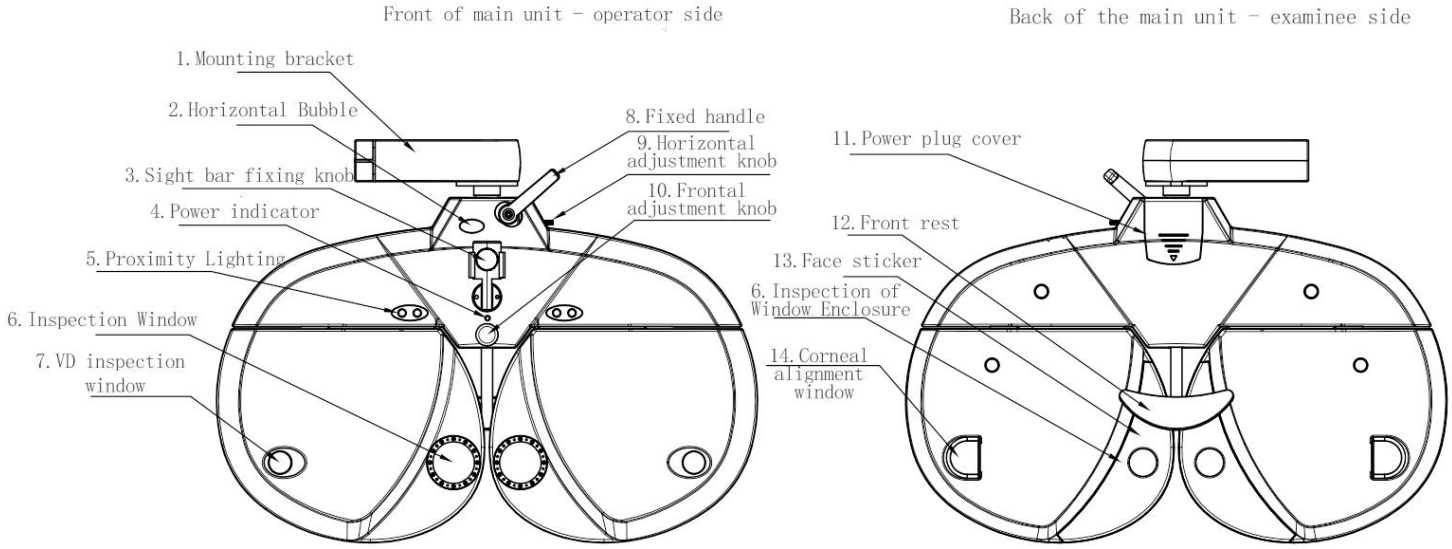
temperature of the power adapter may exceed 41 ° C. Do not touch it to prevent scalding. Users are not allowed to open the power adapter casing to avoid personal injury.

2.2 Cautions

2.2.1 Do not install the refractometer main unit on unstable or uneven surfaces or slopes to prevent equipment tilting, sliding or causing injury.
2.2.2 Ensure that the equipment is securely installed to prevent it from falling.
2.2.3 When not using this equipment for a long time, turn off the power and unplug the power cord.

3.Product Structure

3.1 Main Unit



1. Installation Bracket: Used to mount the CV-700 series main unit on the combination table.

2.Level Bubble: Displays the level condition of the refractometer main unit.

3.Vision Test Rod Fixing Knob: Fixes the near vision test rod.

4.Power Indicator Light: Indicates the power status of the main unit. When powered, this light shows green.

5.Near Vision Light: Illuminates the near vision chart during near vision test.

6.Examination Window: Contains lenses through which the vision chart can be observed.
7.VD Check Window: Window through which the examiner observes and confirms the corneal vertex distance of the test subject.

8.Fixing Handle: Fixes the tilt of the CV-700 main unit.

9.Horizontal Adjustment Knob: Adjusts the refractometer main unit to a horizontal position.

10.Forehead Rest Adjustment Knob: Adjusts the forward and backward position of the forehead rest.

11.Power Plug Cover: The power cable passes through the hole on top of this cover.

12.Forehead Rest: The patient rests their forehead against it during the refractometer process. Please clean this component before each refract.(see '7.1 Cleaning and Disinfecting the Forehead Rest,' page 28)

13.Face Pad: Part that patient's face may touch during the refractometer process. Clean this component before each refract.(see '7.2 Cleaning and Disinfecting the Face Pads,' page 29)

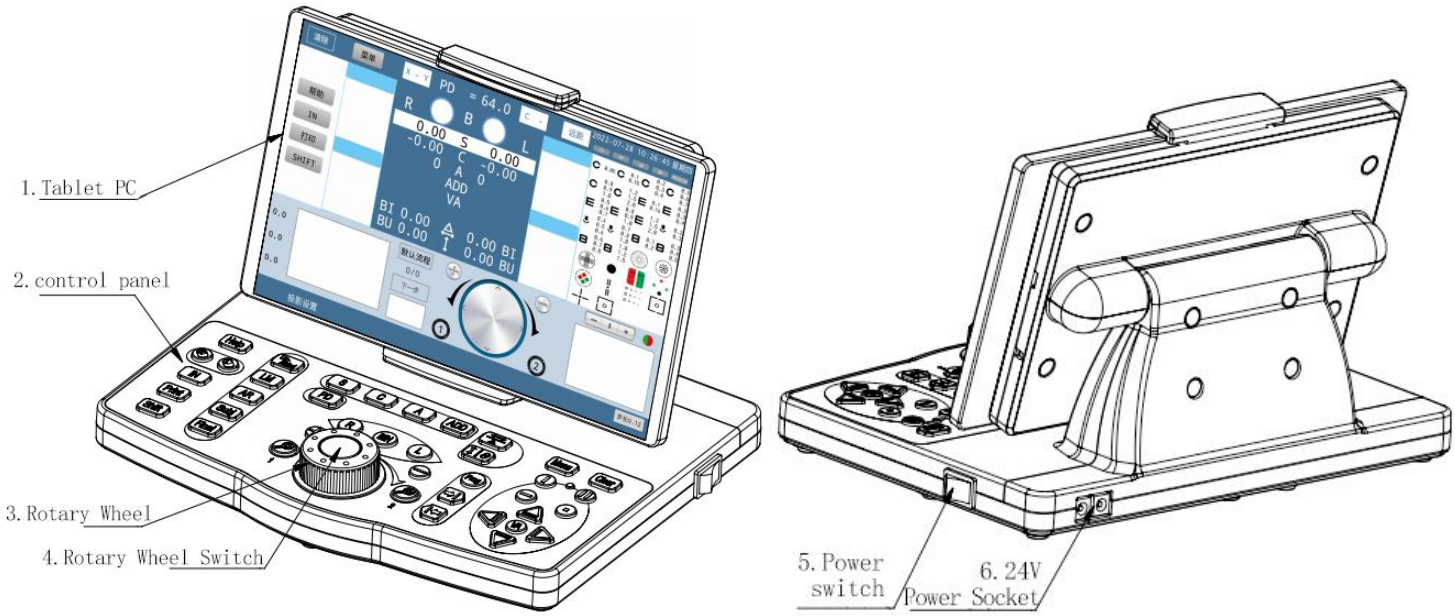
14.Corneal Alignment Window: Position for aligning the corneal vertex of the test subject.
Note: Parts that come into contact with the patient during the refractometer process are made of the following materials: Forehead Rest: ABS plastic, Face Pads: ABS plastic.

3.2 Control Keyboard and Tablet

CV-700 Automatic Phoropter Control Methods:

1.Tablet (User-provided, connection method see '3.2.2 Tablet,' page 8)

2.Control Keyboard (connection method see '5.5 Connecting the Main Unit and Control Keyboard,' page 13)
Note: The control keyboard, with buttons, is made of ABS plastic.



3.2.1 Control Keyboard

①Display Screen: Shows the data and the presented vision chart. This display is the tablet.
(see '6.2 User Interface,' page 15 for detailed information)

②Control Panel: Used to control the contents displayed on the screen. (see '3.2.1 Control Keyboard,' page 4 for detailed information)

③Wheel: Changes the selected (highlighted) value.
Rotate clockwise: the value becomes negative.
Rotate counterclockwise: the value becomes positive.

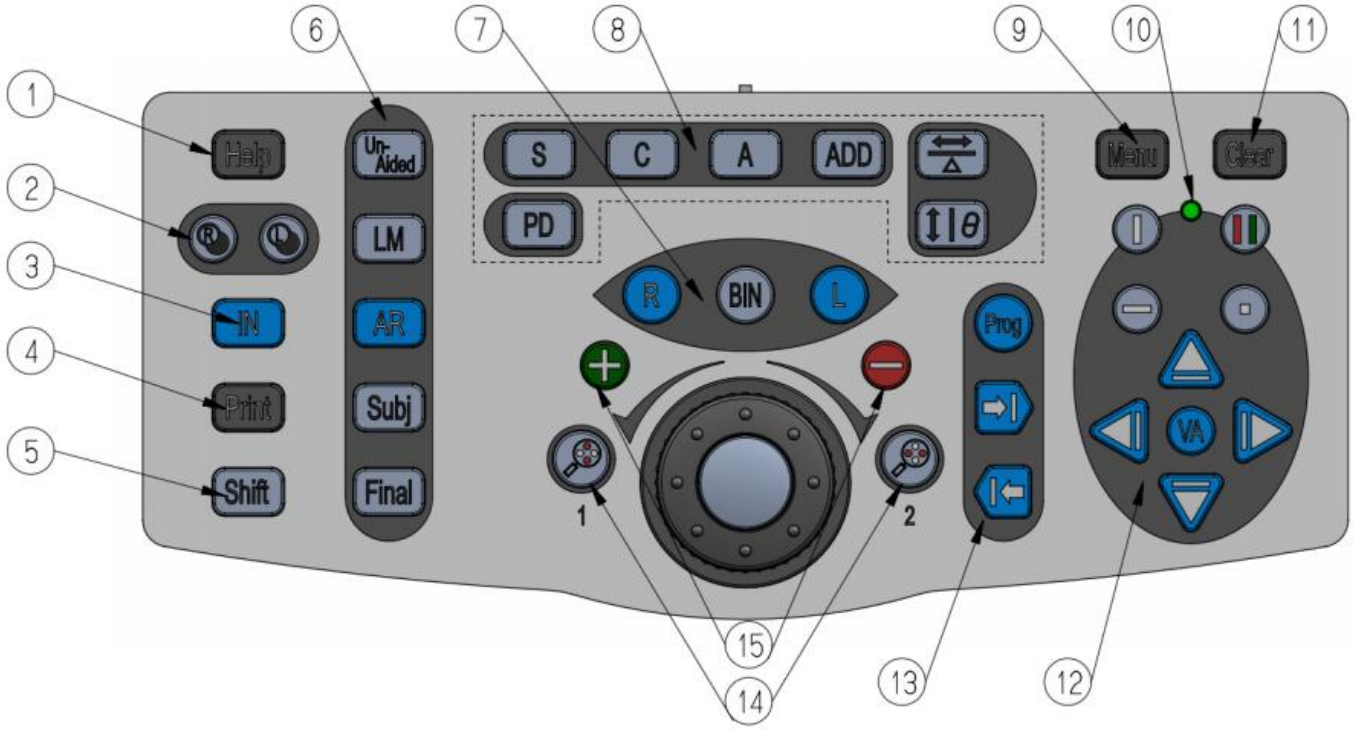
Hold the shift key and rotate the wheel to change the increment.

④Wheel Switch: Switches modes (S, C, A, VA). The selected S, C, A value or selection order changes according to the center switch settings of the wheel.

⑤Power Switch: Used to manage the control keyboard power on and off.

⑥Power Socket: Used to insert the power adapter and DC power cable.

Control Panel



1. Help

Displays an explanation related to the current vision chart.

Press this key or [End] to cancel the display.

If you press this key during the standard program or program with demonstration instructions in operation, the demonstration instructions for that test will appear.

2. Switches the measuring window to open or closed state.

3. IN

Input ke

4. Print

Prints the data.

5. Shift

Hold this key while pressing another key or rotating the wheel to change the increment or mode.

6.Function Key Area

(1) Un-Aided Measures uncorrected vision.

(2) LM

Saves the current refractometer data.

(3) AR

Saves the current refractometer data.

(4) Subj

Saves the current refractometer data.

(5) Fainl

Automates copying Subj data, subsequent operations save the current refractometer data.

7.Eye Selection Key

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

- The occluder can automatically be placed on the unselected eye side.

- However, during binocular vision testing using polarizing filters, the occluder will not be placed.

8. Mode Key

Selects the mode in which the data is changed.
Press any key to highlight the corresponding data field to be changed.
Use the wheel, + or − to change the values in each mode.

(1) S

Enters SPH mode, allowing adjustment of spherical power.

(2) C

nters CYL mode, allowing adjustment of cylindrical power.

(3) A

Enters AXIS mode, allowing adjustment of the cylindrical axis.

(4) ADD

Enters ADD mode, allowing adjustment of additional power.
In near vision mode, the refractometer main unit automatically converges to a working distance of 40 cm (adjustable).

(5) PD

The mode entered allows adjustment of the interpupillary distance of the refractometer head PD(PD) PD Mode, press or L

Exit this mode press PD again

(6) 

The mode entered allows the input of base-in/base-out prismatic power in rectangular coordinates or the absolute value of prism in polar coordinates (see '6.2.1 15 Items 13 Items Set Prism Lens,' page 17). Learn prism input methods.

(7) 

Allows input of base-up/base-down prismatic power in rectangular coordinates or the base angle of the prism in polar coordinates.

9. MENU

Displays the 'Main Menu' screen.

10. Power Indicator Light

Lights green when the control keyboard has power.

11. Clear

Clears all displayed data.

12. Vision Occlusion Key

Separates certain horizontal or vertical lines or single letter visual targets on the vision chart.
Press any vision key to cancel the occlusion function.
The visual acuity of the separated horizontal or vertical line will be displayed in the vision field on the screen.

(1)

Separates horizontal lines on the vision chart

(2)

Separates vertical lines on the vision chart

(3)

Blocks the red-green filter

(4)

Separates single visual target on the vision chart

(5) VA

This switch is used to check visual acuity.
If prismatic data is displayed in the main data area, press this switch and the vision value will be displayed in the main data area.

(6)

Front and rear, up and down, switch vision chart or occluder.
Press the arrow switch to move visible parts.

13.Program Selection Key

The operator can select the program.

14.Cross Cylinder Key

Inserts a cross-cylinder lens to measure the astigmatism axis or power.
When both eyes are open, press this key to automatically shield the left detection window.

Using, open the  left detection window to measure astigmatism with both eyes open.

You can select the cross-cylinder lens to be inserted by setting the cross-cylinder lens parameter.
When this parameter is set to ± 0. 25 or ± 0. 50, the following cross-cylinder lens can be inserted:

(1) 

•Insert a cross-cylinder lens when measuring the astigmatism axis so that the negative axis is positioned at a 45 ° angle to the negative axis of the cylindrical lens.

•Insert a cross-cylinder lens when measuring the cylindrical power so that the negative axis is positioned at a 90 ° angle to the negative axis of the cylindrical lens.

(2) 

•Insert a cross-cylinder lens when measuring the astigmatism axis so that the negative axis is positioned at a 135 ° angle to the negative axis of the cylindrical lens.

•Insert a cross-cylinder lens when measuring the cylindrical power so that the negative axis is positioned at a 0 ° angle to the negative axis of the cylindrical lens.

15.Value Change Key

Functions the same as the wheel.

(1)  Increase the value in increments of 1 to the positive side.

(2)  Increase the value in increments of 1 to the negative side.

3.2.2 Tablet (self-provided)

To connect this equipment to a tablet, first enable Bluetooth on the tablet, enter the automatic phoropter software, click 'Menu' on the main interface, enter the 'Bluetooth' option to connect the bullseye (automatic phoropter).
This company recommends a tablet equipped with Android system and a screen of 16:10 (see 6.2.3 Bluetooth section)

3.3 Accessories

In addition to the refractometer main unit, the packaging includes the following accessories:

1.Control Keyboard	4.DC Power Cable	7.Blower with Brush	10.Certificate
2.Power Adapter	5.User and Technical Manual (this book)	8.Dust Cover	
3.Power Cable	6.S5 Hex Wrench	9.Warranty Card	

⚠ Note: The provided power adapter is limited to use at altitudes below 2000 meters (see 1.5 Operating Environment).

4.Technical Specifications

4.1 Accessories

Item	Measurement Range	Steps
Spherical Power	-29.00D～+26.75D (Note: Cross-cylinder test and prism test within the range of -19.00D to +16.75D)	0.12D、0.25D、0.50D、1.00D、3.00D
Cylindrical Power	-8.75D～+8.75D	0.25D、0.50D、1D、2D、3D
Cylindrical Axis	0°～180°	1°、5°、15°
Prism Power	0～20△	0.1△、0.5△、1△、2△、3△
Prism Base	0°～360°	1°、5°(Prism base can be marked horizontally or vertically)

4.2 Optical Requirements

The diopters given in Tables 1, 2, and 5 should be measured using a wavelength of λ=546.07nm according to GB10050-1988.

Table 1 Spherical Power Tolerance

Nominal Spherical Power (D) (Absolute Value)	Spherical Power Tolerance (D)	Permissible Residual Cylindrical Power (D) |S1-S2|
0.00 ~ 3.00	± 0.06	0.03
> 3.00 ~ 6.00	± 0.09	
> 6.00 ~ 9.00	± 0.12	
> 9.00 ~ 12.00	± 0.15	
> 12.00 ~ 15.00	± 0.18	
> 15.00	± 0.25	
Note S1 and S2 are the focal power values in the meridian direction.		

Table 2 Cylindrical Power Tolerance

Maximum Absolute Focal Power in Meridian Direction (Nominal Value) D	Cylindrical Power Nominal Value (D)				
	≤0.50	> 0.50-1.00	> 1.00-3.00	> 3.00-6.00	> 6.00
	Tolerance (D)				
0.00 ~ 5.00	0.06	0.06	0.06	0.09	0.12
> 5.00 ~ 10.00	0.06	0.06	0.06	0.09	0.12
> 10.00 ~ 15.00	0.06	0.06	0.09	0.12	0.18
> 15.00	0.06	0.09	0.12	0.18	0.25
Note: In addition to the cylindrical power tolerances in Table 2, the larger meridian direction focal power tolerances given in Table 1 are effective for both meridian directions.					

Table 3: Optical Center Difference in Cylindrical and Spherical Lenses under Optical Mechanical Combination

Nominal Diopter (Absolute Value) (D)	Tolerance (cm/m)
0.00	0.12
> 0.00 ~ 6.00	0.25
> 6.00 ~ 12.00	0.37
> 12.00	0.50
Note: Does not include cross-cylinder power	
A The optical center difference is expressed in prism diopters	

Table 4: Prism Power Tolerance

Nominal Diopter/ (cm/m)	Tolerance
≤5.00	± 0.25 cm/m
> 5.00	± 5%
Note: The nominal prism power identification is based on the reference of parallel optical system axis incident light (the angle of deviation of the emergent light from the incident light).	

Table 5: Cylindrical Axis and Prism Base Tolerance

Item Content	Marked Diopter (Absolute)	Tolerance
Cylindrical Ⓐ Including Cross-cylinder	> 0D ~ 0.25 D	± 5 °
	> 0.25D ~ 1 D	± 3 °
	> 1D	± 2 °
Base Orientation	≤1 cm/m	± 5 °
	> 1 cm/m ~ 10 cm/m	± 3 °
	> 10 cm/m	± 2 °
Note: Cylindrical axis zero position and prism base definition: When the equipment is adjusted to zero height difference on both sides, the line direction connecting the centers of the apertures		
A Cylindrical power and prism base should be marked according to ISO8429:1986.		

Table 6: Pupil Distance and Reference Distance Tolerance

Item	Tolerance/mm
Reference Distance Scale	± 0.5
Pupil Distance Scale	± 0.5

4.3 Structure and Function

4.3.1 The minimum clear aperture of all lenses in the refractometer head should not be less than 16mm; For prisms of 6cm/m and above, the minimum clear aperture can be reduced to 11mm;

4.3.2 The main unit should have reference distance markings with a +15.00D reference plane, measured on both sides.

4.3.3 The main unit should have at least one occluder and separation device, with each system installed with a Jackson cross-cylinder.

4.3.4 The pupil distance should be adjustable continuously, with a minimum range of 48mm – 80mm;

4.3.5 The adjustment range of the forehead rest should be at least 14mm;

4.3.6 The observation system should be free from reflected and scattered light.

4.3.7 The structure of the lens chamber should not affect the examination of the patient's visual function.

4.3.8 When lenses and accessories are fixed in front of the observation hole, the instrument should be aligned and centered.

4.3.9 Auxiliary lenses: Fixed cross-cylinders, pinhole lens, cross lens, red filter (right)/green filter (left), polarizer, Maddox rod lens (right: horizontal, left: vertical), retinoscopy lens (+1.5D, +2.0D), prism (right 6△BU/left 10△BI), occluder.

4.3.10 Appearance Function: The product's surface should be smooth without scratches, stains, and the appearance color should be consistent and harmonious, with no significant color difference. Each lens should be clear and free from dust and obstructions that affect visual effects.

4.3.11 Software function:

(1) Auxiliary Lens Operation Mode: The product supports auxiliary lens operation;

(2) Pupil Distance Input Operation Mode: The product can perform auxiliary lens operation;

(3) System Settings: The product supports system settings, such as step size, time, Bluetooth connection, etc.;

(4) Binocular Function Testing Mode: The product supports binocular function testing;

(5) Self-check Function: After the power is turned on, it automatically runs to the preset settings and automatically connects the already set CV and CP Bluetooth to see whether it is online. If connected successfully, the corresponding control shows blue; if not connected, it is grey, and the APP shows the Bluetooth connection failure for the corresponding device at the knob control.

(6) Display Function: After the software is opened, each control in the APP displays relevant information and data.

(7) Touch Button Function: Each control in the APP, except time display and device online connection display, has a touch button function.

4.3.12 Transmission Function

(1) Bluetooth Connection: The equipment transmits data through a Bluetooth module paired via tablet APP. Once connected successfully via Bluetooth, the Bluetooth icon remains lit.

(2) Bluetooth Connection Access Control: No access control.

(3) Bluetooth Protocol: Bluetooth Specification V5.1 BLE

Operating Frequency: 2.4GHz ISM band
Service UUID: FFE0

Notify & Write UUID: FFE1
Write UUID: FFE2

4.3.13 Data Interface

The product does not have a physical data interface; the automatic phoropter and vision chart projector are connected via Bluetooth.
Connect the specified models of the company’ s vision chart projector through Bluetooth module for data transmission.

4.4 Dimensions and Weight

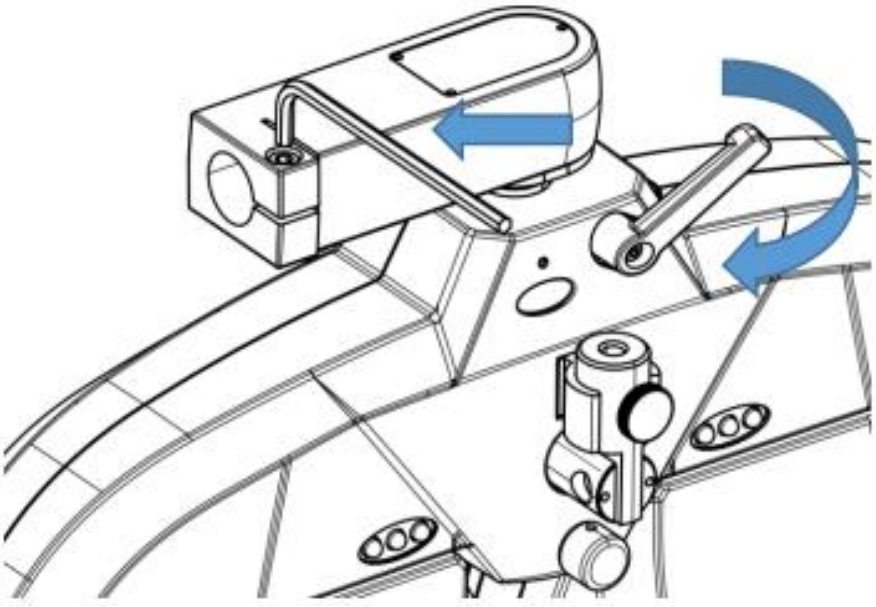
Product	Dimensions (mm)	Weight(kg)
Main Unit	390 ((Length) × 110 (Width) × 310 (Height)	4.0
Control Keyboard	265 (Length) × 210 (Width) × 195 (Height)	1.4

5. Installation Method

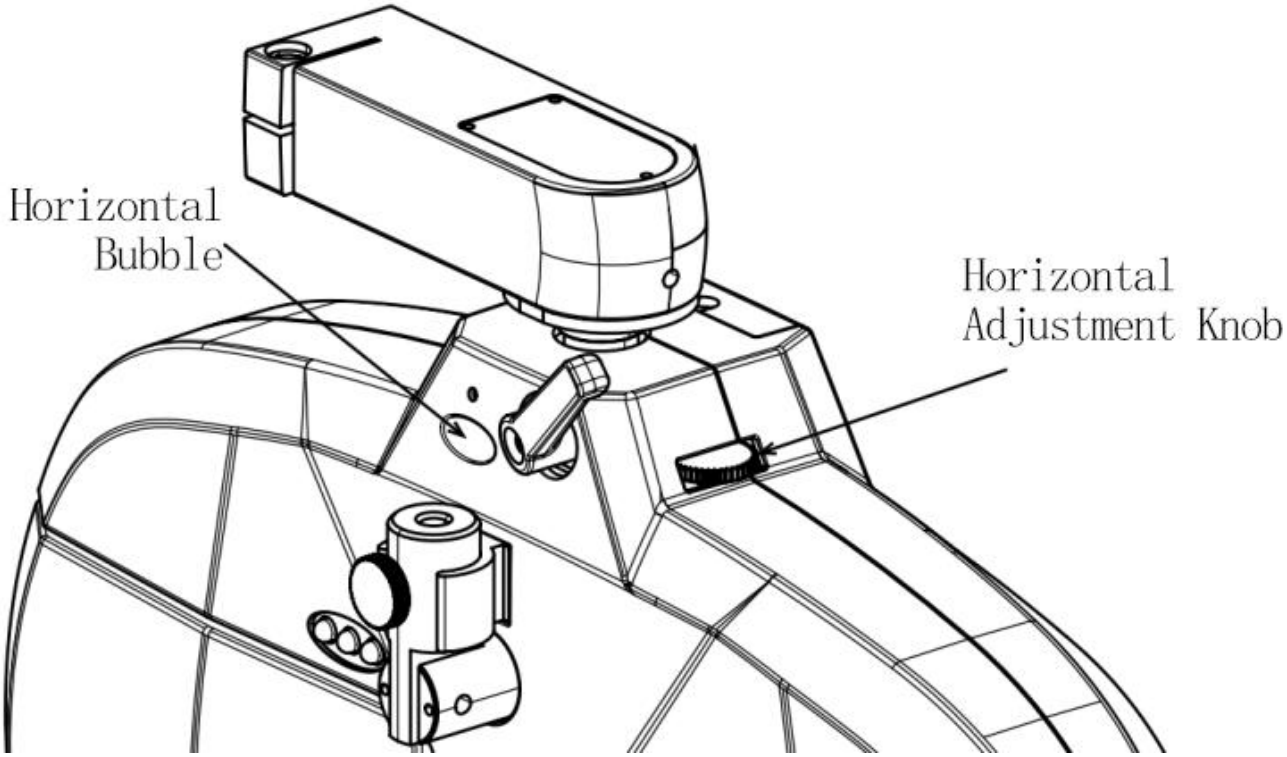
5.1 Installing the Main Unit

Insert the hole of the main unit's installation bracket onto the axis of the optical combination table. Use the S5 hex wrench included in the accessories to tighten the M6 screws of the main unit. Then tighten the M5 screws at the bottom of the installation bracket with a washer to lock and secure the main unit.

⚠ Note: 1. The M5 screws at the bottom of the installation bracket must be locked to ensure secure and reliable installation, preventing loosening or falling, which may cause equipment damage and personal injury. Be sure to install a protective ground wire to prevent electric shock, causing injury.
2. To prevent damage and injury from falling, the hanging axis bearing weight for mounting the CV-700 automatic phoropter on the optical combination table should not be less than 16 kg.



5.2 Horizontal Adjustment



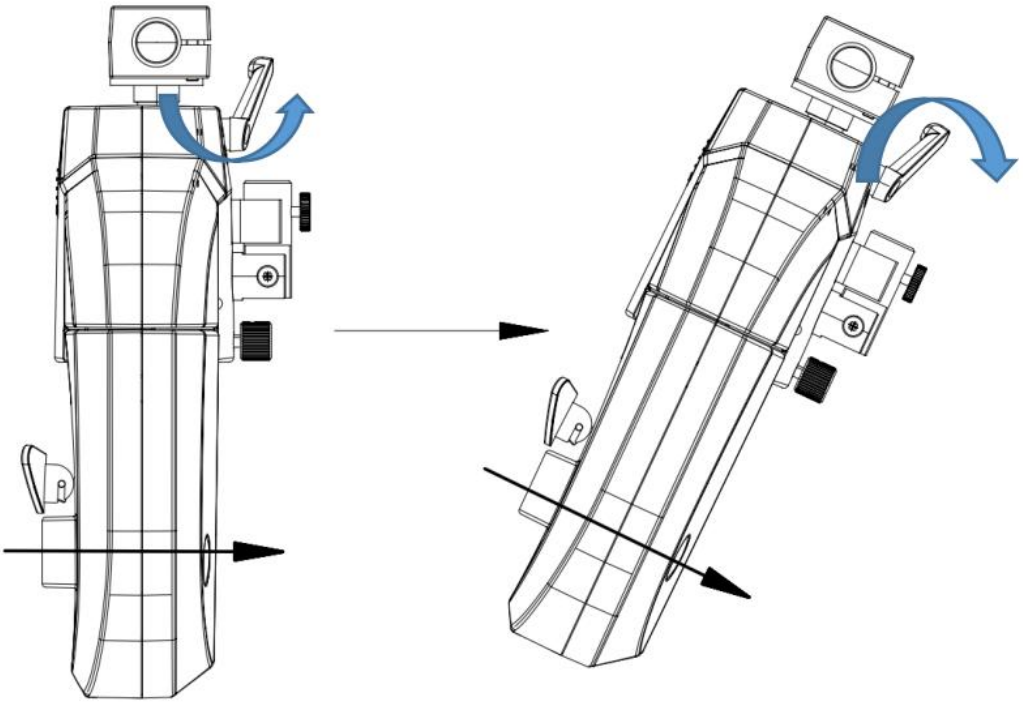
5.2 Main Unit Tilt

In near-distance detection, after tilting the main unit, the equipment can be set in the correct position.

1.Loosen the fixing handle screw counterclockwise, allowing the main unit to swing back and forth.

2.Tilt the main unit to the ideal position desired.

3.Tighten the fixing handle screw clockwise to secure the main unit position.



5.3 Main Unit Tilt

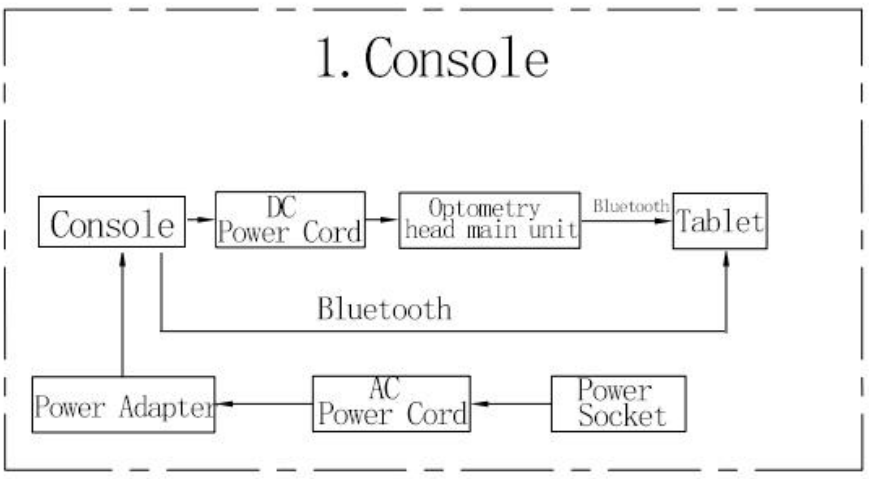
In near-distance detection, after tilting the main unit, the equipment can be set in the correct position.
Loosen the fixing handle screw counterclockwise, allowing the main unit to swing back and forth.
Tilt the main unit to the ideal position desired.
Tighten the fixing handle screw clockwise to secure the main unit position.

5.4 Connecting the Main Unit and Control Keyboard

Click 'Menu' on the main interface, go to the 'Bluetooth' option to connect the refractometer (CV-700) and control keyboard (CV-700).
(see 6.2.3 Bluetooth section)

5.5 Whole Machine Connection Diagram

The overall installation diagram after the product is assembled is as follows:



6.Operating Instructions

6.1 Switching the Device On/Off

6.1.1 Starting the Device

1.Insert the special power adapter configured for this equipment (model: GSM90A24, input 100-240VAC 50/60Hz 1.3-0.6A, output 24V 3.75A) into the 24V power socket of the control keyboard. Connect the DC power line of the control keyboard to the refractometer main unit.

⚠ Note: Do not use power cords or adapters not provided by the manufacturer. Do not use the provided power cords or adapters for other non-designated uses. Otherwise, it may cause malfunctions or fires.

2. Insert the power plug into an outlet. The power adapter configured with this equipment is a three-pin plug; please choose a matching power outlet.

⚠ Note: Connect the power plug to the ground plug, as faults or leakage may cause electric shock and fire.

3.Start the main unit: Press the power switch on the control keyboard, the power light illuminates, and the device is powered.

4.Start the tablet, and the main unit enters its initial state.

6.1.2 Shutting Down the Device

1.Press the power switch on the control keyboard to turn off the device, and the power indicator goes off. Shut down the tablet. Unplug the adapter power plug.

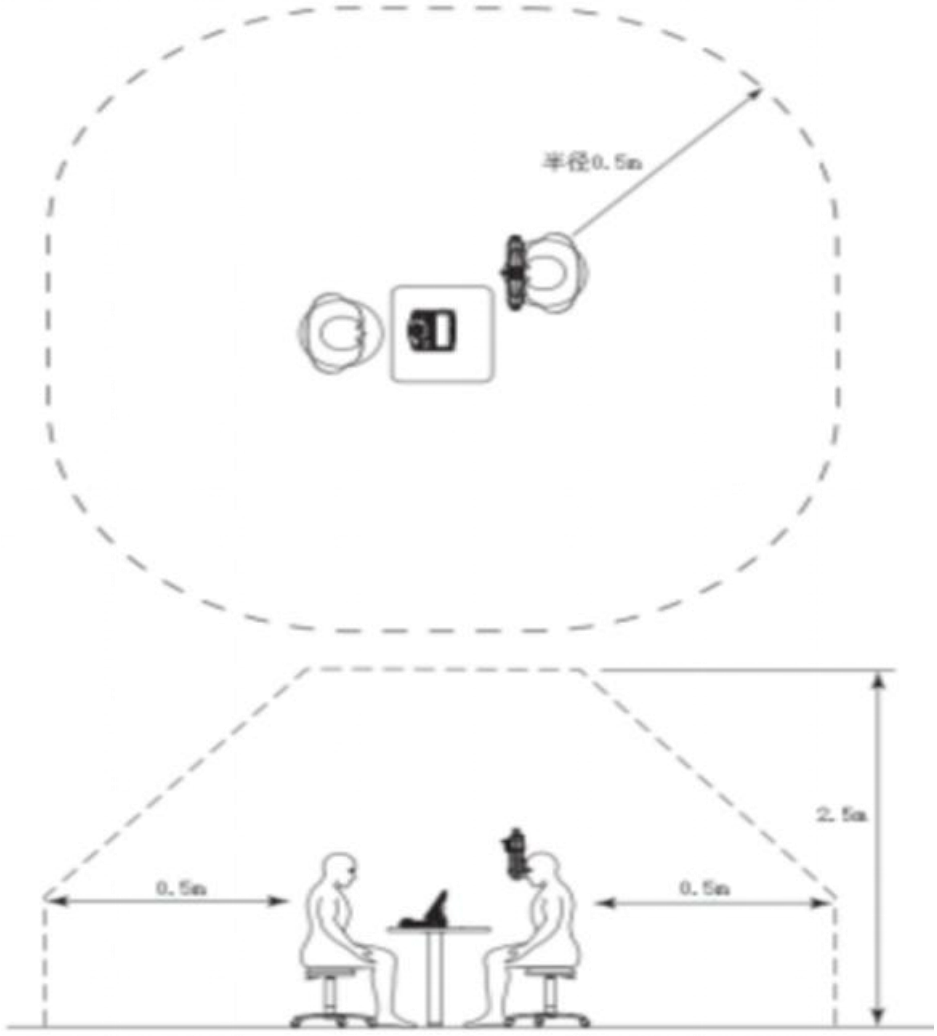
⚠ Note: After using the device, please cover it with a dust cover. Dust accumulation may affect data accuracy.

6.1.3 User Requirements for the Product

1.The user of this product should be a hospital ophthalmologist or optometrist in an eyeglass shop, possessing related knowledge of refraction and glasses fitting and having skills to operate this product.

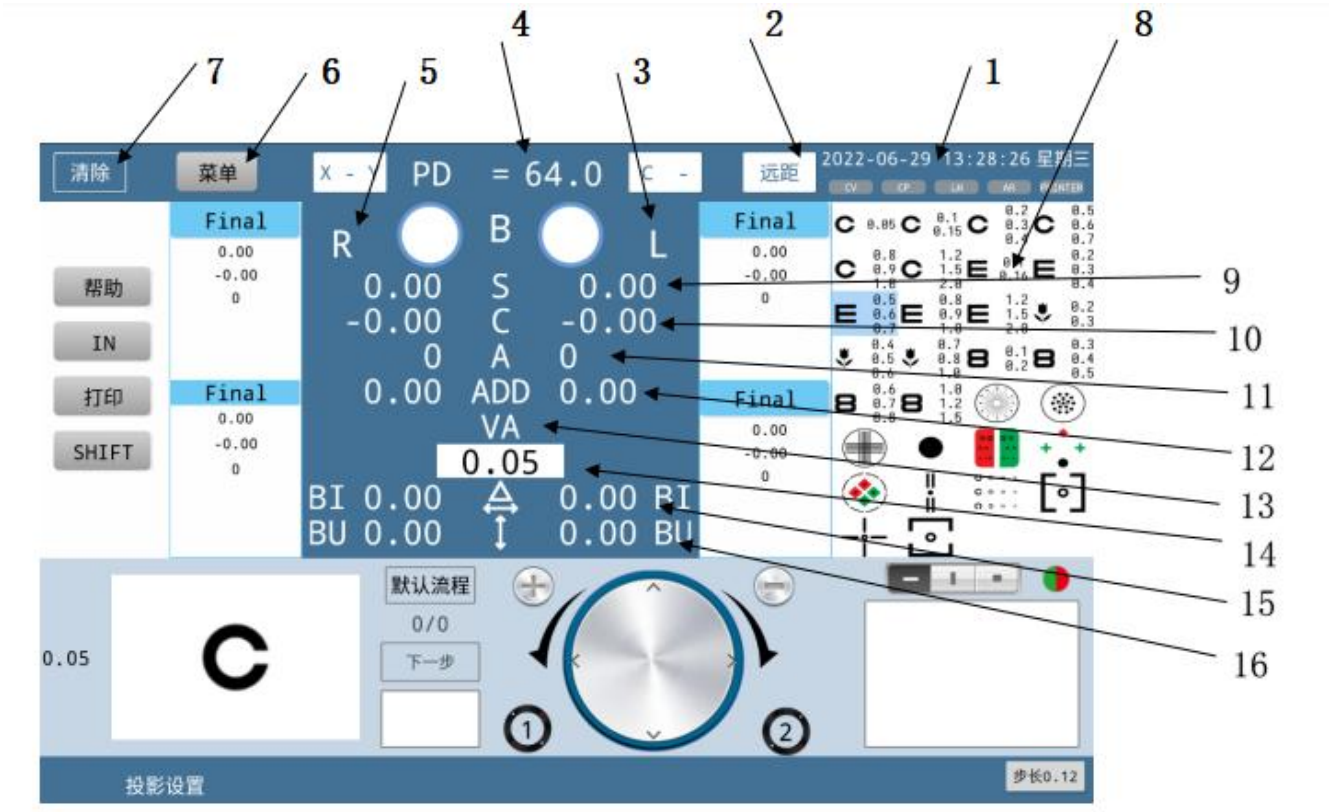
6.1.4 Patient Environment

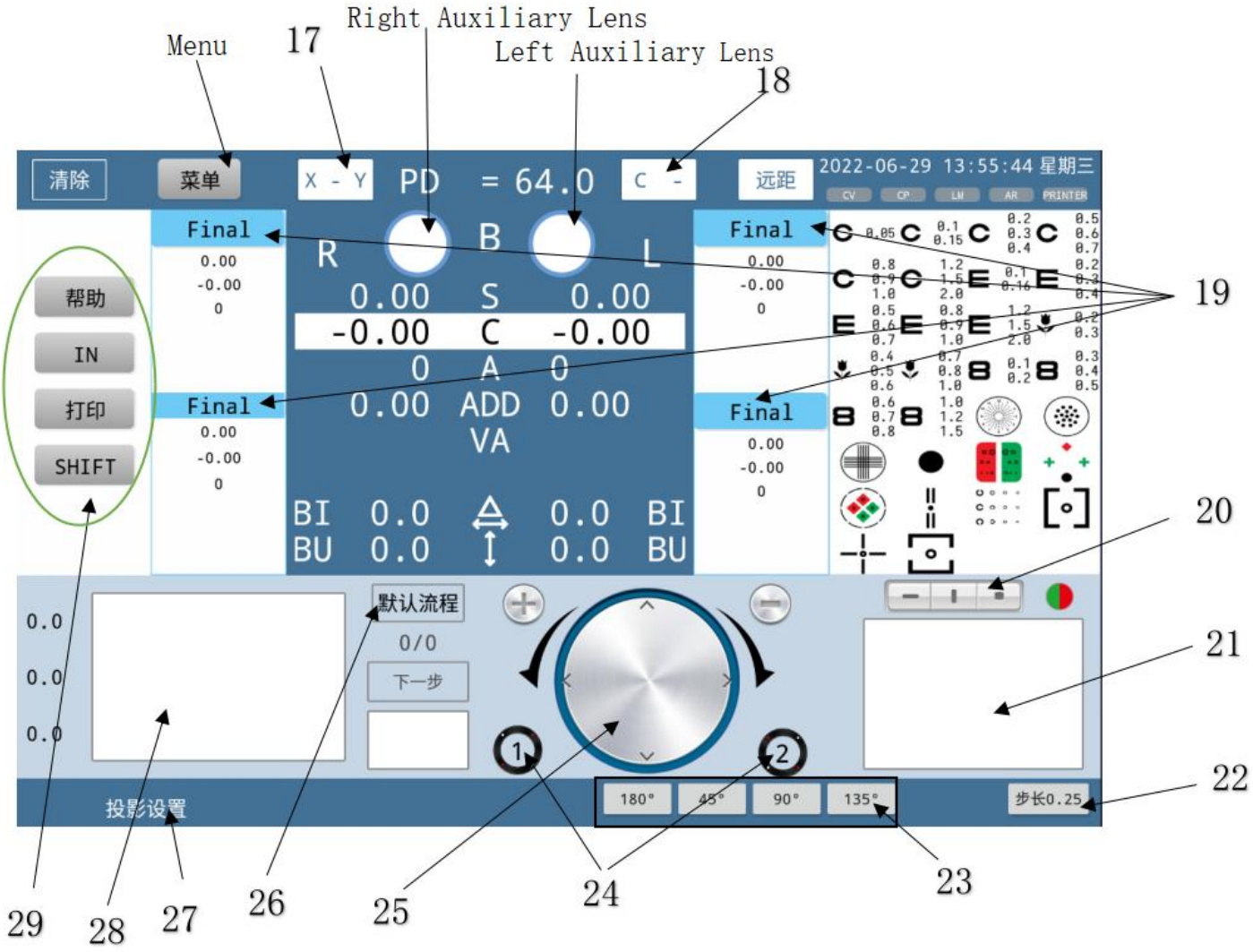
Patient environment refers to the space where contact may occur between the patient and any part of the device (including connected devices) or between the patient and anyone else in contact with the device (including connected devices). Use equipment that meets GB9706.1 standards in the patient's environment.



6.2 User Interface

6.2.1 Main Interface





1.Status Information Bar
① Date, Time.
② Device Connection Status (CV: Automatic Phoropter, CP: Vision Chart Projector) Icon indicator shows connection status.

2.Measurement Mode Switch Button
Far Distance: Far-use mode.
Near Distance: Near-use mode.
Press 'Far Distance' or 'Near Distance' to switch between far-use mode and near-use mode.

3.L
Left Detection Window, input data for the left eye, dominant eye selection for the left eye.

4.Pupil Distance Display
Press this button to display binocular pupil distance.

5.R
Right Detection Window, input data for the right eye, dominant eye selection for the right eye.

6.Menu

Click 'Menu' to bring up a settings pop-up containing 'Icon Settings', 'Bluetooth Settings', 'Time Settings', 'Program Settings', 'Reference Data', etc.

7.Clear
Press this button to clear data displayed on the interface.

8.Vision Symbol Area
Select and display vision symbols. Divided into vision symbol area and function symbol area.

Vision Symbol Area

 : C Vision Mark, displayed range 0.05 – 2.0, used for adult and children's vision.

 : E Vision Mark, displayed range 0.1 – 2.0, used for adult and children's vision detection.

 : Children's Vision Mark, displayed range 0.2 – 1.0, used for children's vision detection.

 : Numerical Vision Mark, displayed range 0.1 – 1.5, used for adult and children's vision detection.

Function Symbol Area

 : Dashed Astigmatism Mark, used to detect the axis and degree of astigmatism.

 : Spot Vision Mark, used for cross-cylinder astigmatism axis and degree testing, also used for binocular balance testing.

 : Cross Grid Vision Mark, used for spherical vision testing.

 : Maddox Rod Vision Mark, used to detect heterophoria.

 : Red-Green Vision Mark, used for spherical vision testing.

 : Worth 4 Dot Vision Mark, used to detect simultaneous binocular vision.

 : Focal Balance Vision Mark, used to test binocular spherical correction status, also used for binocular visual balance and strabismus testing.

 : Stereopsis Vision Mark, used to test binocular vision and fusion function.

 : Polarized Binocular Vision Balance Mark, used for strabismus and fusion power testing.

 : Polarized Alignment Vision Mark, used to detect horizontal heterophoria and binocular image disparity.

 : Cross Fixation Point Vision Mark, used to detect heterophoria.

 : Polarized Alignment Vision Mark, used to detect vertical heterophoria and binocular image disparity.

9.S
Spherical Power Input Window: Press the S input field on the R side to enter the right eye spherical power. Press the S input field on the L side to enter the left eye spherical power.

10.C
Cylindrical Power Input Window: Press the C input field on the R side to enter the right eye cylindrical power. Press the C input field on the L side to enter the left eye cylindrical power.

11.A
Cylinder Axis Input Window: Press the A input field on the R side to enter the right eye cylinder axis. Press the A input field on the L side to enter the left eye cylinder axis.

12.ADD
Additional Power Input Window: Press the ADD input field on the R side to enter the right eye additional power. Press the ADD input field on the L side to enter the left eye additional power.

13.VA
Uncorrected Vision Test Button.

14.Uncorrected Vision Test Parameter Display Window.

15. 

Prism Power Input Window: Press the X△ input field on the R side to enter the right eye prism power. Press the X△ input field on the L side to enter the left eye prism power.

16. 

Prism Base Input Window: Press the Y△ input field on the R side to enter the right eye prism base. Press the Y△ input field on the L side to enter the left eye prism base.

17.Prism Power Mode
Press this button, and the prism power can switch between X/Y (rectangular coordinates) and r/ θ (polar coordinates).

18.Cylinder Conversion Button
Press this button to convert positive/negative cylinders.

19.Uncorrected Vision Measurement Data Display Button
Press this button, options appear in sequence: Un-aided (Uncorrected Vision Measurement), Subj (Subjective Correction), Final (Final Result).

20.Occlusion Mode Button
From left to right, the occlusion buttons are: Line Occlusion Button, Column Occlusion Button, Block Occlusion Button.

21.Cross Cylinder Preview Window

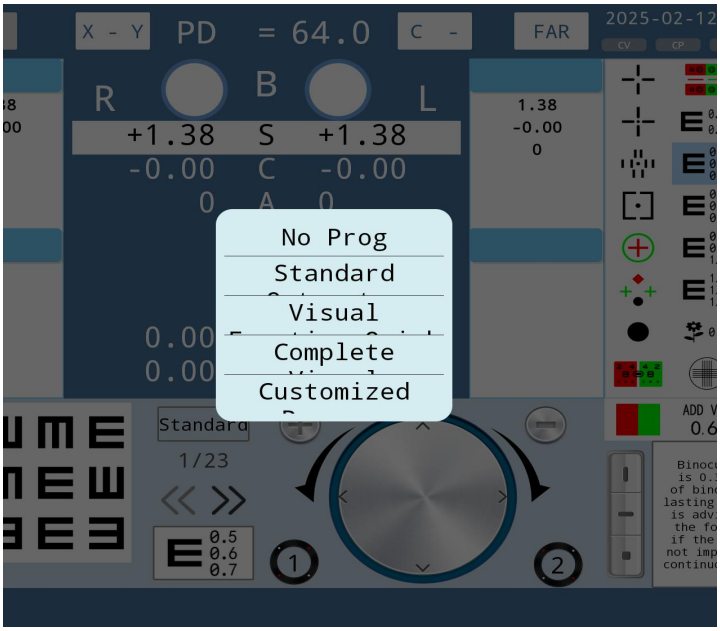
22.Step Conversion Button

23.Press this button to switch step parameters.

24.Prism Axis Pre-set Button

25.The pre-set angle allows quick selection.
Cross Cylinder Activation Button

26.Wheel Rotate clockwise, rotate counterclockwise.



27.Program Selection Button
Press this interface to convert to projection adjustment options 'Brightness Adjustment', 'Height Adjustment', 'Mask Adjustment'. To return, press the 'Return' button to exit the projection settings mode.

28.Projection Symbol Preview Window

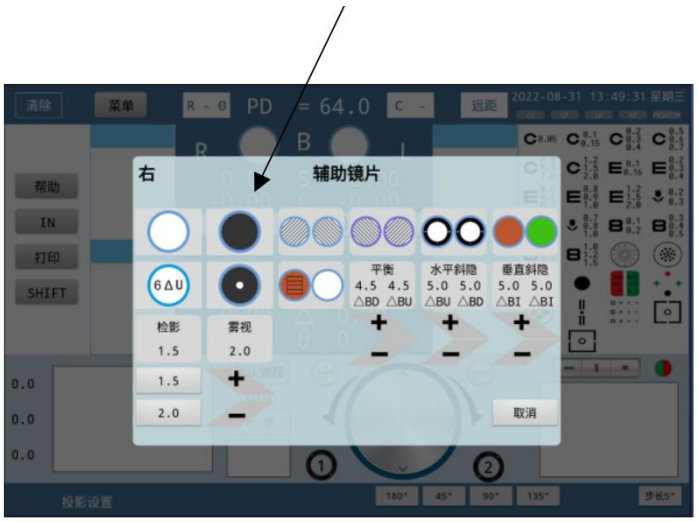
29.Function Key
Help (Help): Displays an explanation related to the current vision symbol.
IN: Input key.
Print: Prints data.
Shift: Hold this key and press another key or turn the wheel to change increment or mode.
(Key function is the same as on the control keyboard, see 3.2.1 ② Control Keyboard 1, 3, 4, 5 items. Page 5.)

6.2.2 Auxiliary Lens Operation

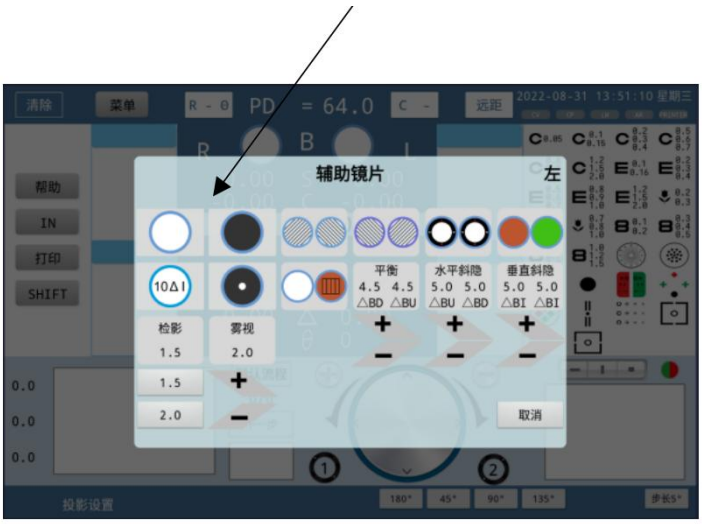
1.Press the 'Auxiliary Lens' button, and the auxiliary lens interface pops up.

2.Press the corresponding buttons on the interface to select the auxiliary lens into the examination window and return to the detection interface automatically.

Right Auxiliary Lens



Left Auxiliary Lens



The purposes of each button are as follows:

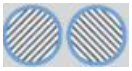
 : Open Examination Window

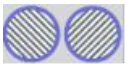
 : Occluder, covers the examination window

 : Pinhole Plate (Hole Diameter 2mm)

: Left Eye, 10△ Base-In Prism.

: Right Eye, 6△ Base-Up Prism.

 : Right Eye, 45 ° Line Polarizing Filter. Left Eye, 135 ° Line Polarizing Filter.

 : Right Eye, 135 ° Line Polarizing Filter. Left Eye, 45 ° Line Polarizing Filter.

 : Right Eye, Fixed Cross Cylinder. Left Eye, Fixed Cross Cylinder.

 : Right Eye, Red Filter. Left Eye, Green Filter.

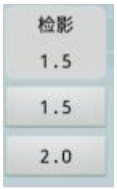
 : Right Eye, Horizontal Maddox Rod. Left Eye, Open Examination Window.

 : Right Eye, Open Examination Window. Left Eye, Vertical Maddox Rod.

: Binocular Balance Prism, press '+' and '−' to change the prism power.

: Horizontal Heterophoria Prism, press '+' and '−' to change the prism power.

: Vertical Heterophoria Prism, press '+' and '−' to change the prism power.



: Retinoscopy Lens, 1.5D, 2.0D button selectable.

: Fog Vision, press '+' and '−' to change the fog vision amount.

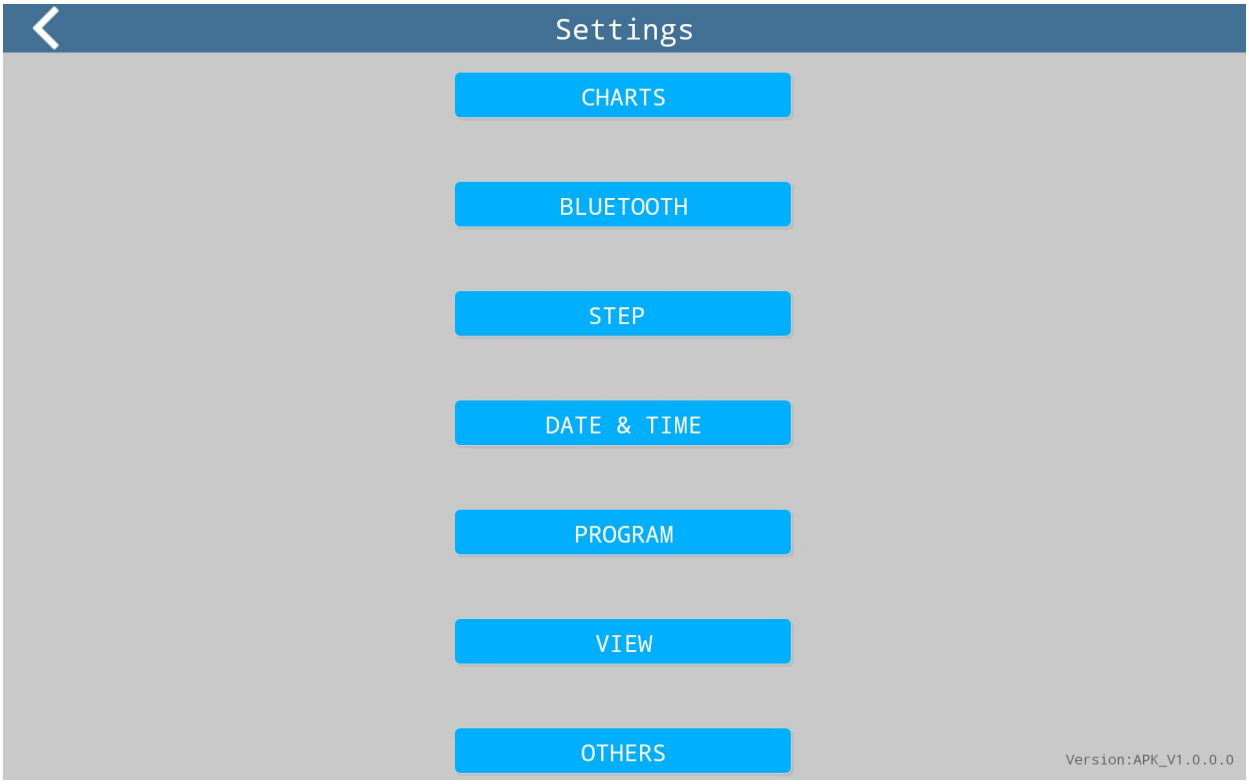
: Cancel, press this button to exit the 'Auxiliary Lens Interface'.

6.2.3 Pupil Distance Input Operation

1.Press the button or controller PD button to automatically load the pupil distance adjustment lens; the factory default pupil distance is 64.
2.Click the button to enter the pupil distance.

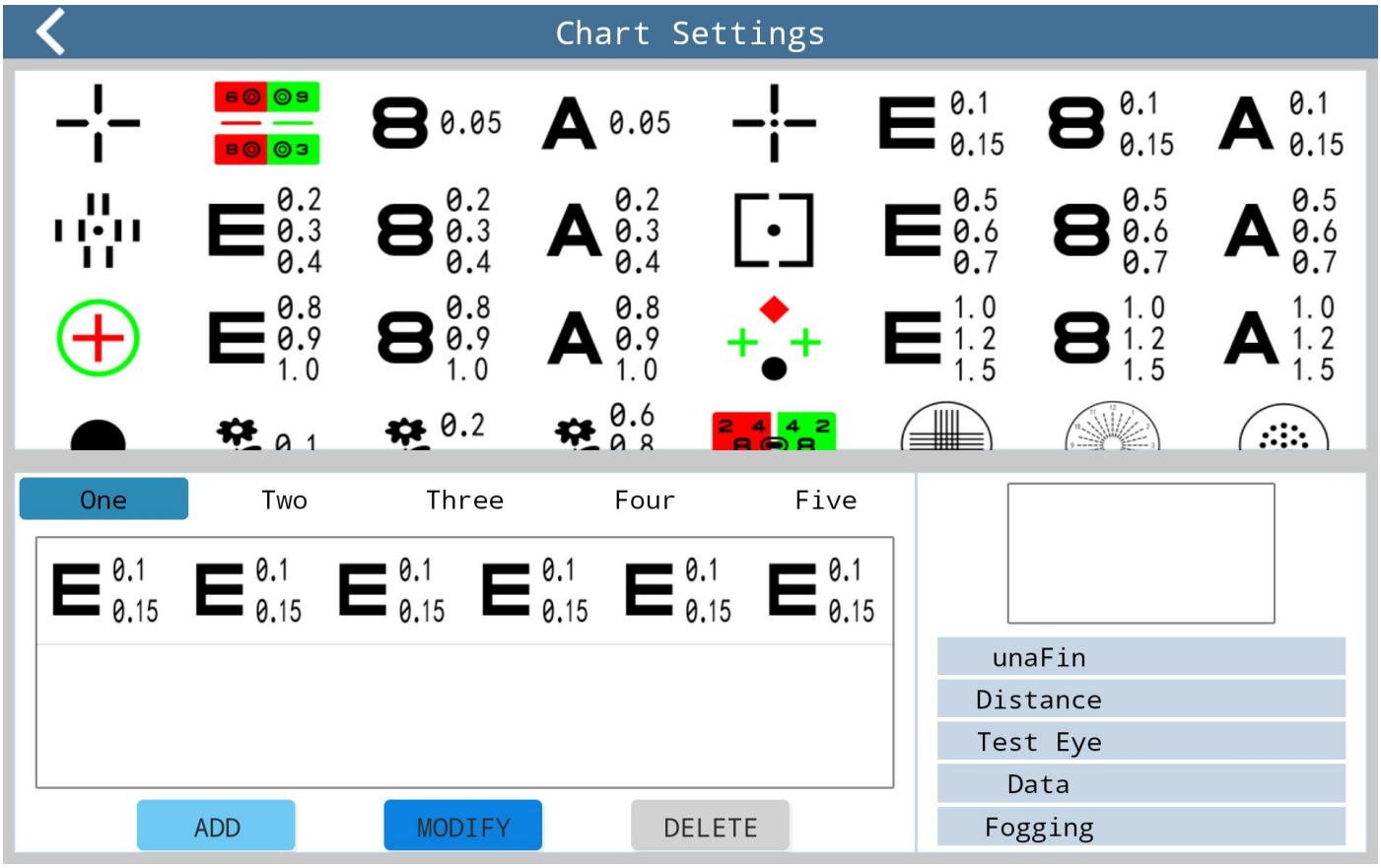
6.2.4 System Settings

1.Press the 'Menu' button on the main interface or the Menu key on the control keyboard panel to enter the settings interface.
2.Choose the desired option to set and click to enter.
3.After setting, press Save or Confirm. Press the guide arrow at the top left of the interface or the Clear key on the control panel to return to the main interface.



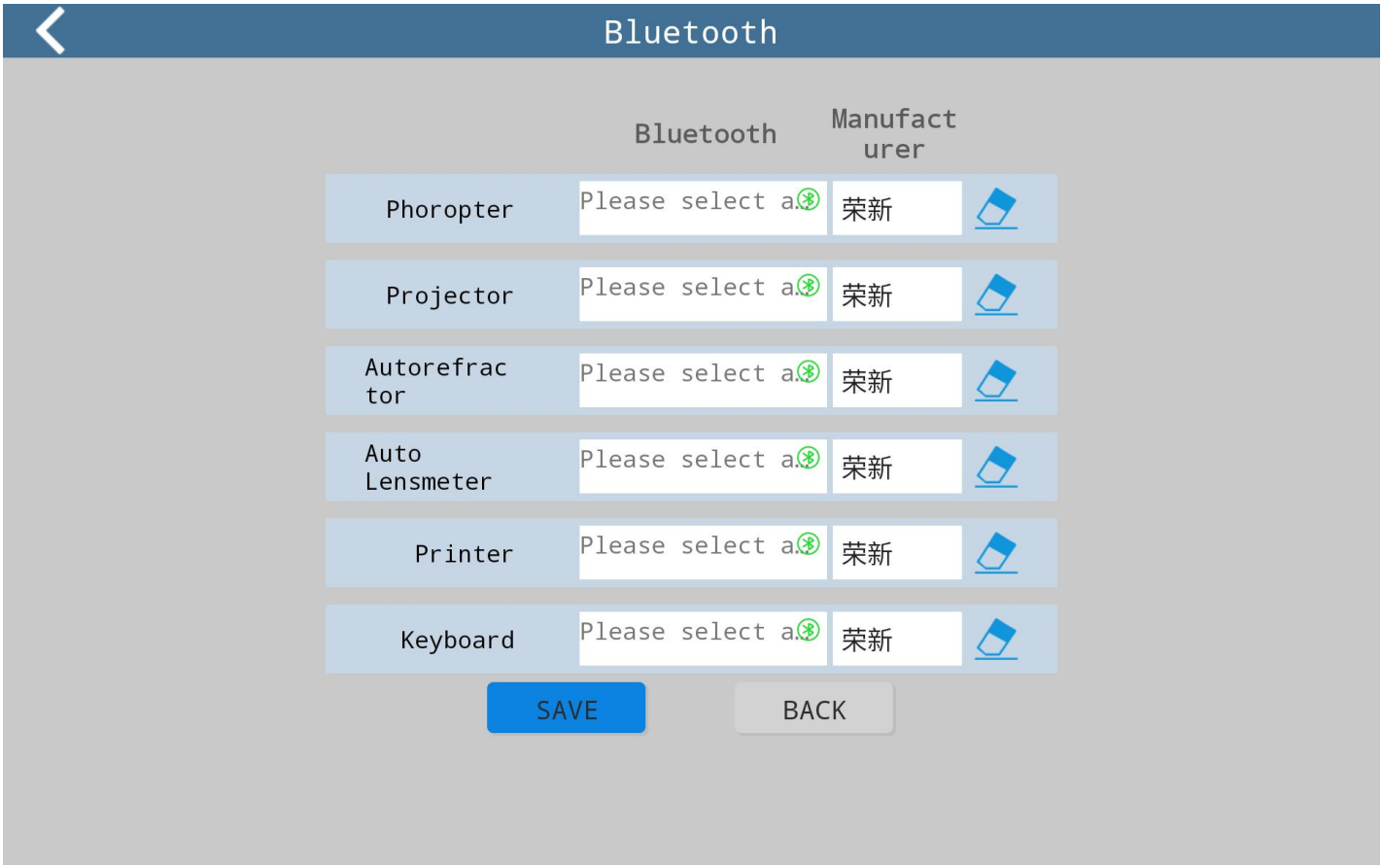
Parameter settings are as follows:

1. Chart, Reference Chart List for Vision Chart Projector.



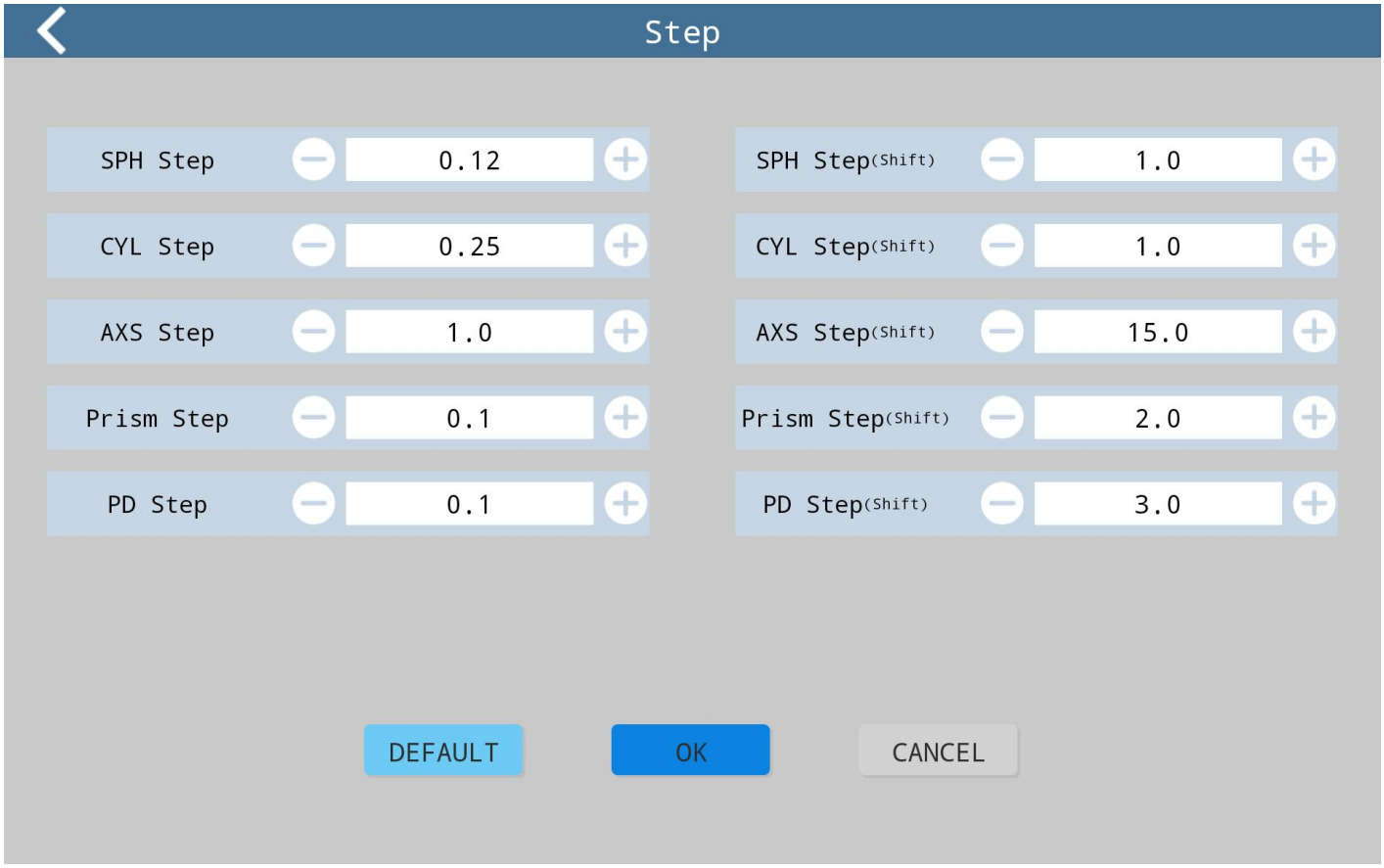
2. Bluetooth, Set the Bluetooth connection for the device (for paired use)

Bluetooth connections can connect and use various models of refractometers in the CV-700 series (Bullseye) produced by the company, and vision chart projectors (CP-500 series).



Step

Set the step size when changing diopters



(1) SPH (Spherical Power) step can be customized to: 0.12D, 0.25D, 0.50D, 1.00D, 3.00D. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 0.12D. Quick switch in the main interface defaults to 0.12D and 0.25D.

(2) CYL (Cylindrical Power) step can be customized to: 0.25D, 0.5D, 1D, 2D, 3D. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 0.25D. Quick switch in the main interface defaults to 0.25D and 0.50D.

(3) AXS (Cylinder Axis) step can be customized to: 1 °, 5 °, 15 °. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 1 °. Quick switch in the main interface defaults to 1 ° and 5 °.

(4) Prism (Prismatic Power) step can be customized to: 0.1△, 0.5△, 1.0△, 2.0△, 3.0△. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 0.1△.

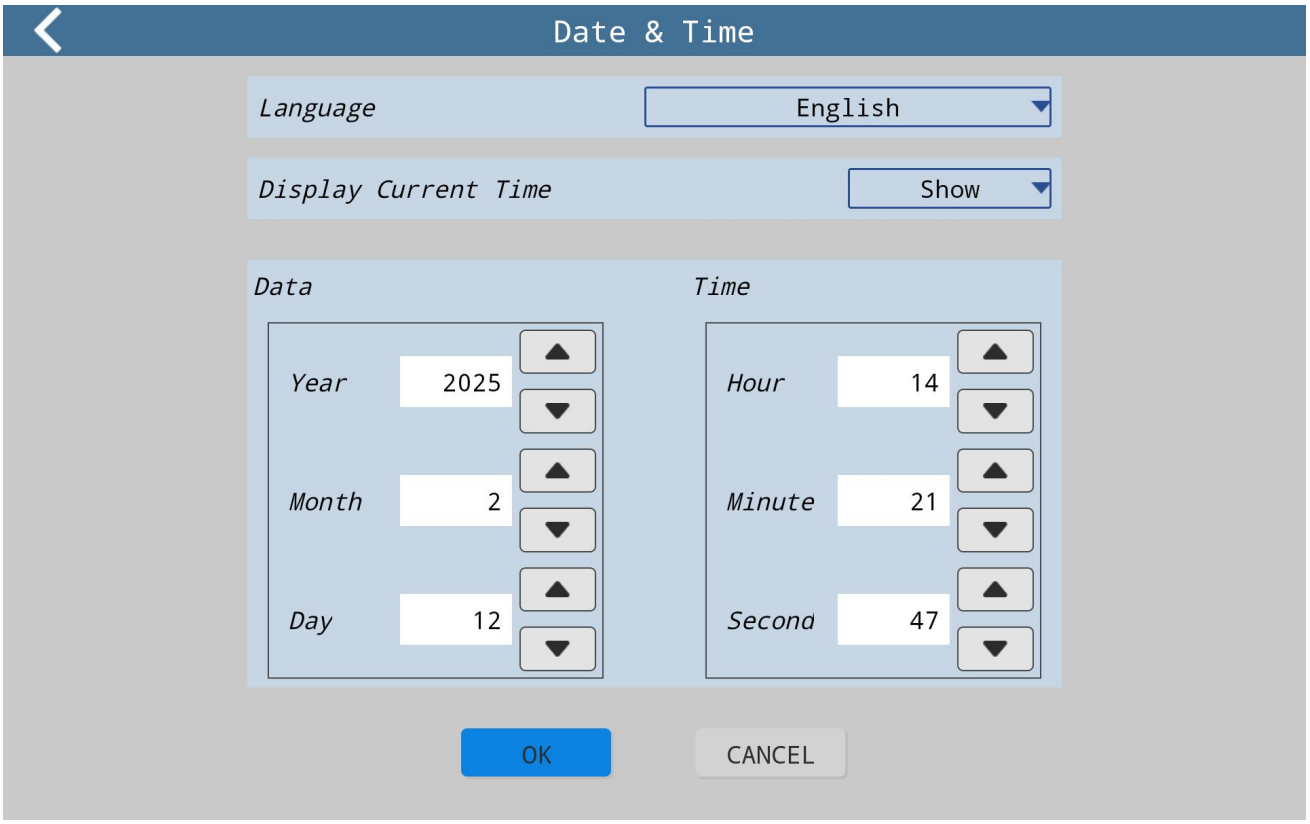
(5) Prism△ (Prism Power Rectangular Coordinates) step can be customized to: 0.1△, 0.5△, 1.0△, 2.0△, 3.0△. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 0.5△. Quick switch in the main interface defaults to 0.1△ and 0.5△.

(6) Prism θ (Prism Power Polar Coordinates) step can be customized to: 1.0, 5. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 1.0. Quick switch in the main interface defaults to 1.0 and 5.

(7) PD (Pupil Distance) step can be customized to: 0.1, 0.5, 1.0, 2.0, 5.0. Left and right '−' and '+' buttons allow selection of the appropriate step size. Default setting: 0.1.

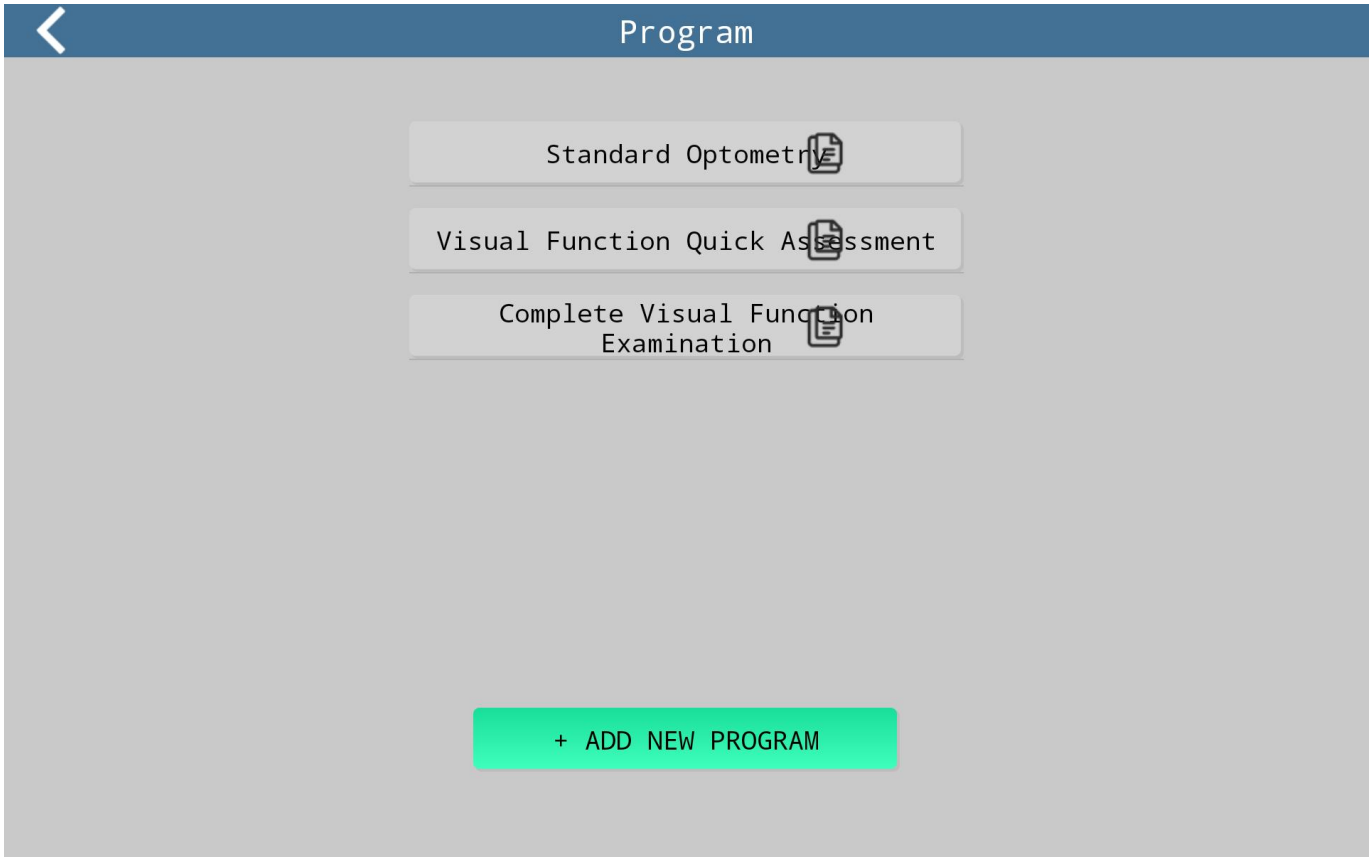
3.Time, set the usage language, time, date

Language, click the dropdown menu on the right to select 'Chinese' or 'English'. Use the up ▲, down ▼ keys to adjust settings year, month, day, hour, minute, second. Click confirm, save successfully.



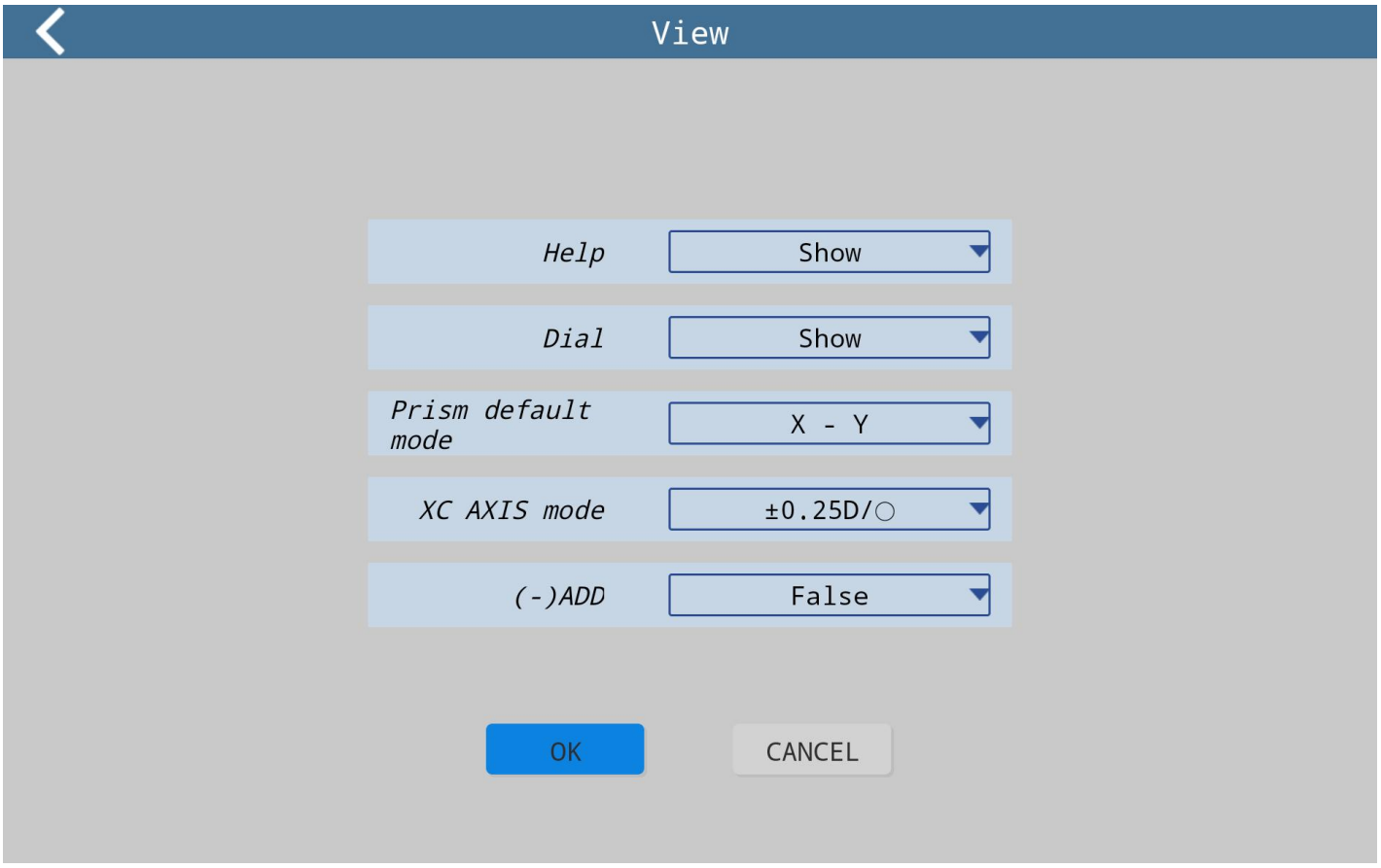
4.Program, set or edit the selected program

Five preset programs. Click to enter user-customizable editing settings. Click the button to change the program name. Users may add programs.

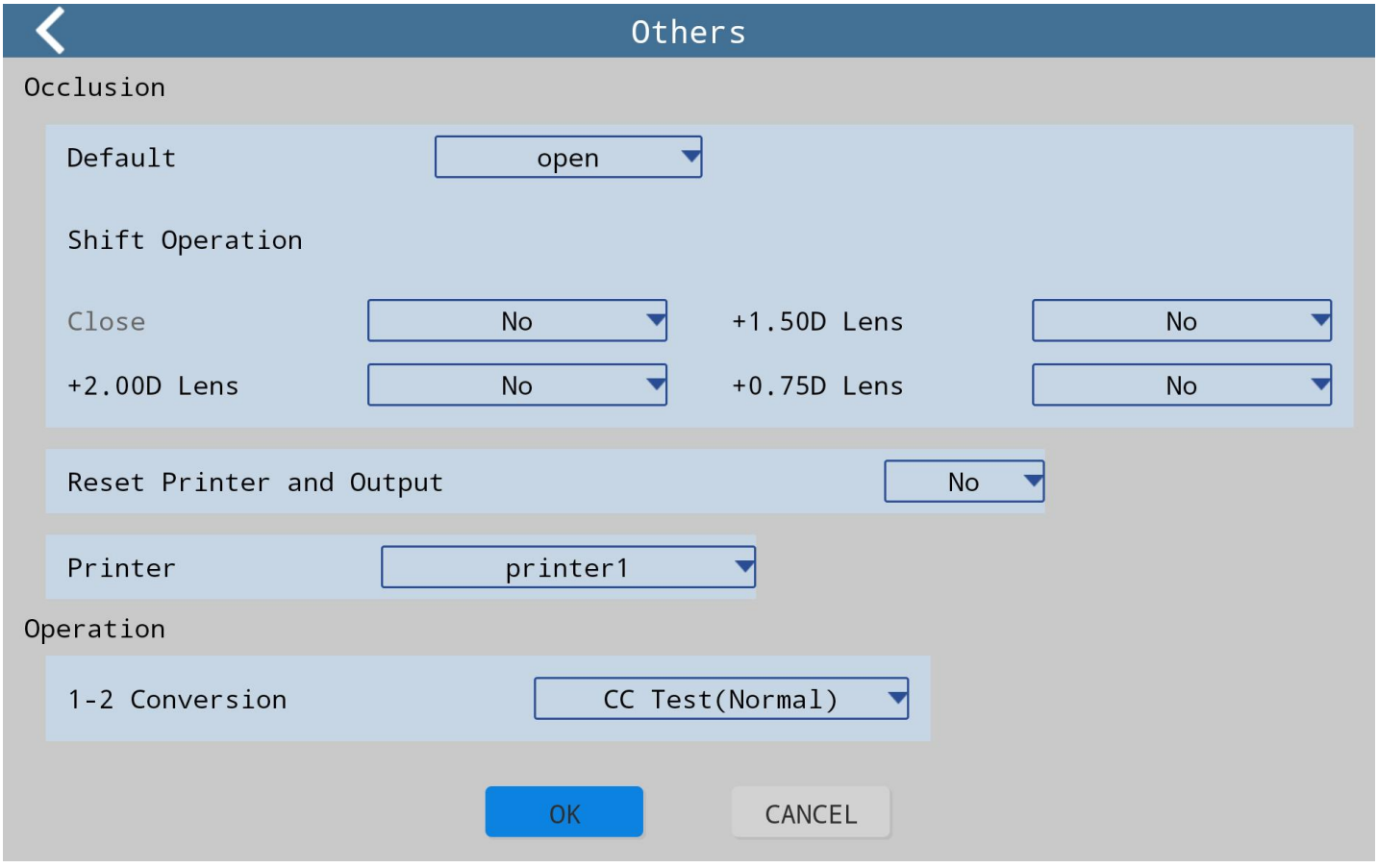


5.Reference Data, set the display of reference data, dial navigation, help, etc.

Help dropdown menu to 'Show' or 'Hide' the help function. Dial item dropdown menu to 'Show' or 'Hide' the dial navigation function.



6.Others, set other items



6.3 Preparation Before Use

6.3.1 Confirm that the CV-700, control keyboard, and tablet are properly installed and connected, and that the power is connected.

6.3.2 Attach the forehead rest on the refractometer
Please refer to '7.1 Cleaning and Disinfecting the Forehead Rest'.

6.3.3 Attach the face pads on the refractometer
Refer to the face pad position in the '3.1 Main Unit' structure diagram. The face pad has magnetic adsorption for easy installation.

6.3.4 Confirm that the refractometer is level
Rotate the horizontal adjustment knob so that the bubble in the level is centered (see '3.1 Main Unit' structure diagram for horizontal adjustment knob and level position).

6.3.5 Attach the near vision test rod to the near vision chart and secure it on the refractometer
The near vision test rod has scale markings; the near vision chart is mounted on the near vision test rod. Insert one end of the test rod into the marker seat and tighten the test rod fixing knob.

⚠ Warning: After securing the refractometer, do not move or rotate it arbitrarily, as the near vision test rod may tilt and injure others.

6.3.6 Turn on the power switch, and the device will automatically initialize
Start the tablet, open the interface for connection.

⚠ Note: If the device fails, please unplug the power cord from the socket and then contact the manufacturer or authorized local dealer. Do not touch inside the equipment to prevent fingers from being caught in moving parts, causing injury.

6.3.7 

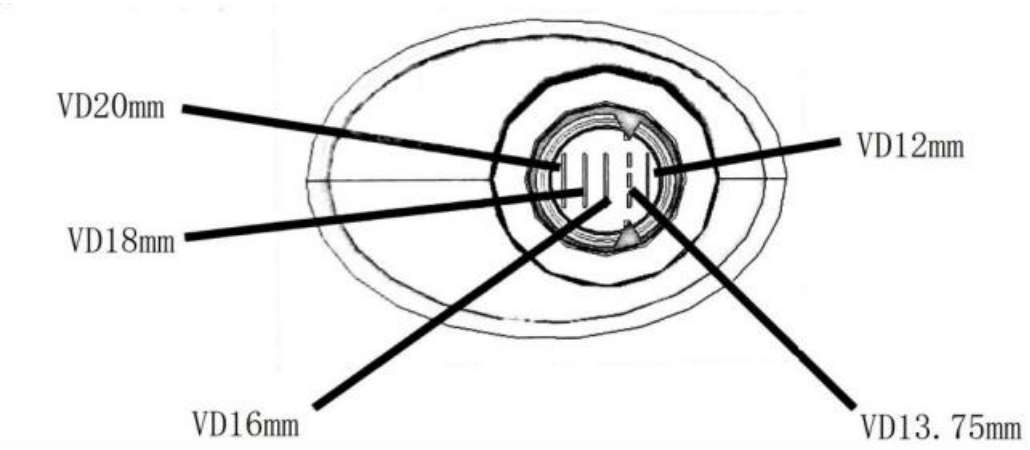
Press the button to input the subject's pupil distance, and the pupil distance adjustment lens will enter the examination window

6.3.8 Allow the test subject's forehead to rest on the forehead plate

6.3.9 Observe the subject's eyes through the examination window and confirm that both eyes are positioned at the center of the window

6.3.10 Adjust the Corneal Vertex Distance (VD)
Observe the corneal vertex distance of the subject through the near vertex window and rotate the forehead rest adjustment knob to adjust the subject's corneal vertex to the desired position.

The corneal apex markings are shown below:



6.3.11 PD = 64.0 Press the button to enter or exit the adjustment window for pupil distance adjustment

⚠ Note: Before using this equipment, perform a visual and operational inspection. If any abnormalities are found, do not use this equipment, as it may affect data accuracy.

6.4 Binocular Function Testing

6.4.1 Cross Grid Detection (Presbyopia Testing)

Testing Purpose: Detect spherical power.
Testing Vision Target: Cross Grid Vision Mark.
Auxiliary Lens: Binocular ± 0.50D Fixed Cross Cylinder.

1. Complete binocular far-use vision testing, and add the far-use degree to the examination window.

2. Add ± 0.50D fixed cross-cylinder for both eyes.

3. Lower the near vision test rod and place the near vision chart at the desired working distance, typically 40cm.

4.Select the cross grid vision mark in the near vision chart.

5.Ask the subject: Which looks clearer, horizontal or vertical lines, or the same?

(1) If the horizontal lines are clearer than the vertical lines: increase both eyes synchronously by +0.25D spherical power until horizontal and vertical lines are equally clear.
(2) If horizontal and vertical lines are equally clear: no further presbyopia testing is needed; there's no need for reading glasses.

6.Remove ± 0.50D fixed cross-cylinder for both eyes.

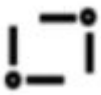
7.Choose a near vision chart and fine-tune the spherical lens to let the subject see the vision target and reach the ideal vision value.

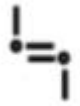
6.4.2 Cross Fixation Point Detection (Heterophoria Testing)

Testing Purpose: Detect heterophoria.
Testing Vision Target: Cross Fixation Point Vision Mark.
Auxiliary Lens: Binocular Rotating Prism, Binocular Polarizing Filter.

1. Display the cross fixation point vision mark.

2. Ask the test subject about the vision target they see and detect according to their response.

Reticle Shape	Diagnostics	Correction
	Invisible strabismus	Positive eye position, no correction needed
	occult strabismus	Increase BO prism degree until it becomes a cross
	Esotropia	Increase BI prism degrees until it becomes a cross.
	Upper Esotropia	Increase BU prism degrees in the right eye and BD prism degrees in the left eye until it becomes a cross.
	Right Esotropia	Increase BU prism degrees in the left eye and BD prism degrees in the right eye until it becomes a cross.
	Esotropia + Right Esotropia	Correct the horizontal occultation by following the method of internal occultation and the vertical occultation by following the method of left eye upper occultation until it becomes a cross.
	internal occult tilt + left superior occult tilt	Correct horizontal esotropia by the internal esotropia method and vertical esotropia by the left superior esotropia method until it becomes a cross.
	Esotropia + Right Superior Esotropia	Correction of horizontal occultation and vertical occultation by the method of external occultation until it becomes a cross.

	Esotropia + Left Esotropia	Correct horizontal esotropia by the method of external esotropia and vertical esotropia by the method of left supraocular esotropia until it becomes a cross.

Note: When increasing prismatic power, only increase the prism power for one eye instead of both eyes.

6.4.3 Horizontal Conjugation Detection (Horizontal Image Disparity, Horizontal Heterophoria Detection)

Testing Purpose: Detect horizontal image disparity, horizontal heterophoria.
Testing Vision Target: Horizontal Conjugation Vision Mark.

Auxiliary Lens: Binocular Rotating Prism, Binocular Polarizing Filter.

1. Display the horizontal conjugation vision mark.

2.Ask the test subject about the vision target they see and detect according to their response.
Horizontal Image Disparity

(1) If the upper and lower frames are equal in size, there is no horizontal image disparity; if the upper and lower frames are unequal, there is horizontal image disparity.
As shown in the figure on the right: there is about 3.5% image disparity.
The width of the vision target line is equivalent to 3.5% image disparity.

(2) Horizontal Heterophoria

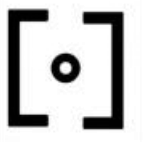
Reticle Shape	Diagnostics	Correction
	Invisible strabismus	Correct eye position, no correction needed
	occult strabismus	Increase the B0 prism degree until the upper and lower frames are aligned
	Esotropia	Increase the BI prism degree until the upper and lower frames are aligned

Note: When increasing prismatic power, only increase the prism power for one eye instead of both eyes.

6.4.4 Vertical Conjugation Detection (Vertical Image Disparity, Vertical Heterophoria Detection)

Testing Purpose: Detect vertical image disparity, vertical heterophoria.
Testing Vision Target: Vertical Conjugation Vision Mark.
Auxiliary Lens: Binocular Rotating Prism, Binocular Polarizing Filter.

1.Display the vertical conjugation vision mark.
2.Ask the test subject about the vision target they see and detect according to their response.
(1) Vertical Image Disparity
If the left and right frames are equal, there is no vertical image disparity; if the left and right frames are unequal, there is vertical image disparity.
As shown in the figure on the right: there is about 3.5% image disparity.
The width of the vision target line is equivalent to 3.5% image disparity.



(2) Vertical Heterophoria

Reticle Shape	Diagnostics	Correction
	Invisible strabismus	Correct eye position, no correction needed
	Upper esotropia of the right eye	Increase BU prism degree in left eye and BD prism degree in right eye until right and left frames are aligned
	Upper esotropia of the left eye	Increase BU prism degree in the right eye and BD prism degree in the left eye until the left and right frames are aligned

Note: When increasing prismatic power, only increase the prism power for one eye instead of both eyes.

6.4.5 Horizontal Maddox Rod Detection (Horizontal Heterophoria Detection)

Testing Purpose: Detect horizontal heterophoria.
Testing Vision Target: Maddox Rod Vision Mark.
Auxiliary Lens: Right Eye Horizontal Maddox Rod, Left Eye Rotating Prism.

1.Display the Maddox rod vision mark.
2.Ask the test subject about the vision target they see and detect according to their response.

Reticle Shape	Diagnostics	Correction
	no occult strabismus	Correct eye position, no correction needed
	Upper esotropia of the left eye	Increase BU prism in right eye until white dot coincides with straight line
	Upper esotropia of the right eye	Increase BD prism in the right eye until the white dot coincides with a straight line.

Note: When increasing prismatic power, only increase the prism power for one eye instead of both eyes.

6.4.6 Vertical Maddox Rod Detection (Vertical Heterophoria Detection)

Testing Purpose: Detect vertical heterophoria.
Testing Vision Target: Maddox Rod Vision Mark.
Auxiliary Lens: Right Eye Rotating Prism, Left Eye Horizontal Maddox Rod.

1. Display the Maddox rod vision mark.

2. Ask the test subject about the vision target they see and detect according to their response.

Reticle Shape	Diagnostics	Correction
	no occult strabismus	Correct eye position, no correction needed
	Esotropia	Increase B0 prism degree in the right eye until the white dot coincides with a straight line.
	Exotropia	Increase the BI prism degree of the right eye until the white dot coincides with a straight line.

Note: When increasing prismatic power, only increase the prism power for one eye instead of both eyes.

6.4.7 Worth 4-Point Detection

Testing Purpose: Detect binocular fusion, suppression, dominance.
Testing Vision Target: Worth 4 Vision Mark.
Auxiliary Lens: Right Eye Red Filter, Left Eye Green Filter.

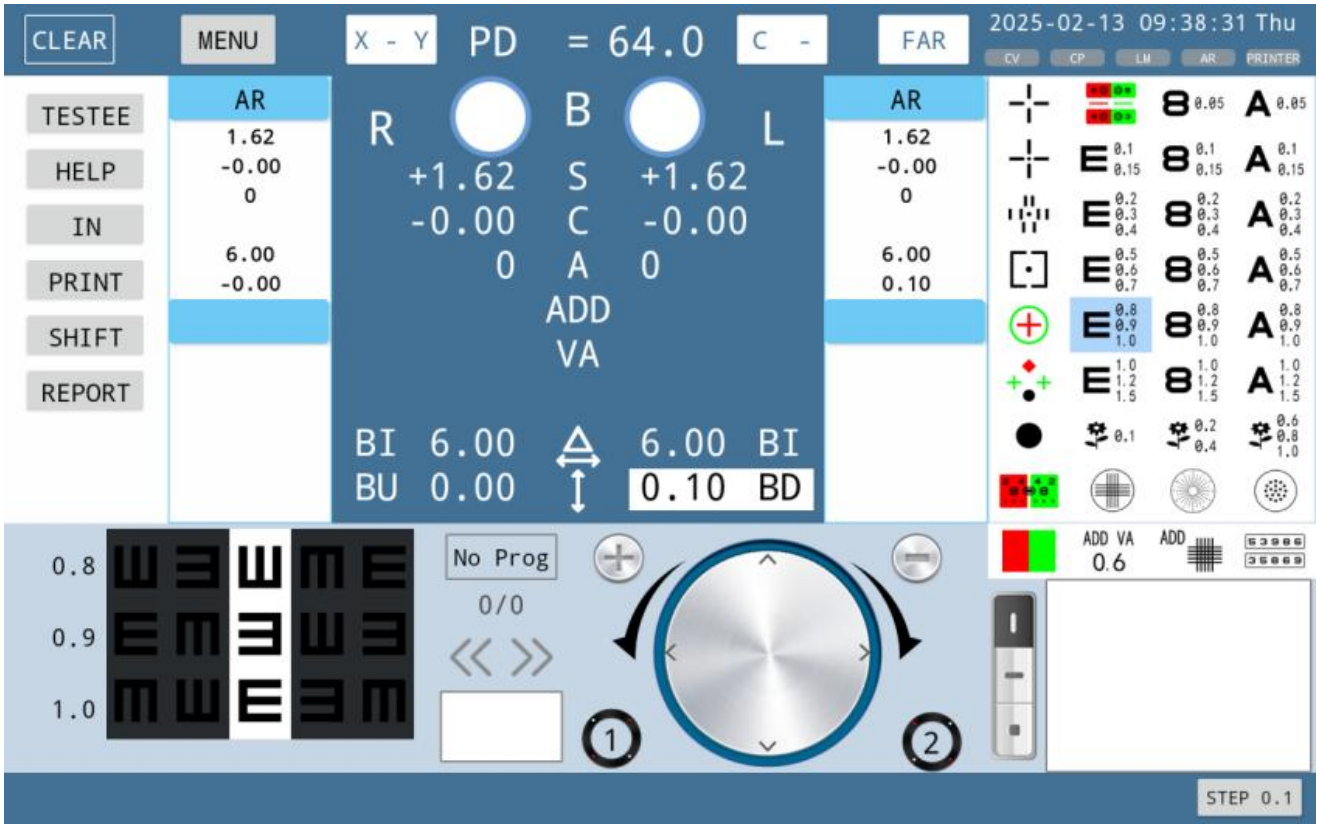
1.Display the Worth 4 vision mark.
2.Ask the test subject about the vision target they see and detect according to their response.

A few points.	Viewfinder Appearance	Descripci ó n	Diagnostics
4		Red squares and dots, green crosses	The two eyes have fusion function, and the right eye is the dominant eye.
4		Red Square, Green Cross and Dots	The two eyes have fusion function, and the left eye is the dominant eye.
3		Green Cross and Dots	Right eye suppression.

2		Red square and dot	Left eye suppression.
5		Seeing 5 dots at the same time	Diplopia.
5	Alternate flashing	2 red and 3 green flashing alternately	Alternating suppression.

6.4.8 Divergence Detection

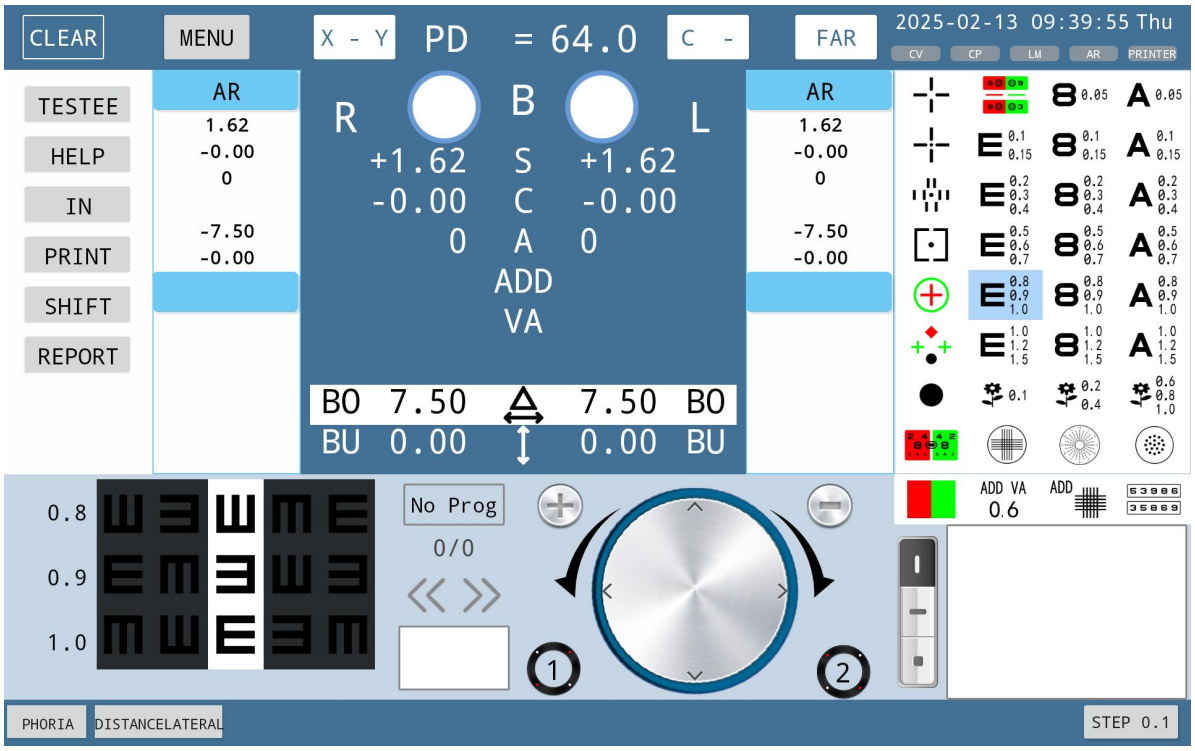
Testing Purpose: Detect the convergence ability of the eyes.
Testing Vision Target: Vertical Line Vision Target on Vision Chart.
Auxiliary Lens: Binocular Rotating Prism.



1.Transfer the vision target and highlight the vertical line vision target.
2.Increase BI prism power for both eyes until the vision target blurs, recording the blur point prism power.
3.Increase BI prism power for both eyes until the vision target splits into two, recording the break point prism power.
4.Decrease BI prism power for both eyes until the vision target returns to one, recording the recovery point prism power.

6.4.9 Convergence Detection

Testing Purpose: Detect the convergence ability of the eyes.
Testing Vision Target: Vertical Line Vision Target on Vision Chart.
Auxiliary Lens: Binocular Rotating Prism.



1. Transfer the vision target and highlight the vertical line vision target.

2.Increase BO prism power for both eyes until the vision target blurs, recording the blur point prism power.

3.Increase BO prism power for both eyes until the vision target splits into two, recording the break point prism power.

4.Decrease BO prism power for both eyes until the vision target returns to one, recording the recovery point prism power.

7.Maintenance

⚠Note: Do not use any corrosive cleaners when maintaining the equipment to avoid surface damage.

⚠Note: Only manufacturer's technical service personnel or qualified after-sales service personnel trained by the manufacturer are authorized to repair and touch the equipment's internals. Before maintenance, ensure to unplug and disconnect the power to avoid hazards. (The manufacturer is not responsible for any accidents resulting from improper maintenance.)

⚠Note: To ensure continued safe use of the equipment, it is recommended that the equipment administrator clean and inspect the refractometer main unit, work table, or mounting bracket for looseness every week. If there is any looseness, tighten it immediately.

1.Replaceable parts, such as the power adapter, can only be used with the company-provided power adapter. Using unauthorized power adapters may lower the minimum safety of the equipment.

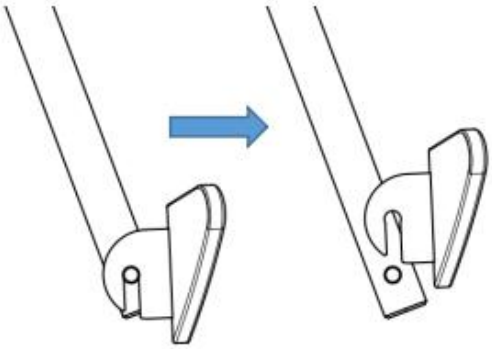
2.Do not disassemble and repair the equipment in case of failure; contact the local dealer or manufacturer.

3.The company promises to provide the necessary equipment circuit diagrams, component lists, and related information required for user maintenance of this equipment.

7.1 Cleaning and Disinfecting the Forehead Rest

7.1.1 Remove the Forehead Rest

See the view below, pull it up to remove.



7.1.2 Clean and Disinfect the Forehead Rest

Gently wipe the forehead rest with a clean, soft cloth. For stubborn stains, use a clean, soft cloth moistened with water, wring it out, and then wipe clean. Finally, dry with a soft cloth. Use 75% medical alcohol to disinfect the forehead rest area. Please clean this part before each refraction.

7.1.3 Reinstall the Forehead Rest

Insert it at a certain angle and press it in place.

7.2 Cleaning and Disinfecting the Face Pads

7.2.1 Remove the Face Pads

The face pads are magnetically fixed on the refractometer main unit and can be removed easily.

7.2.2 Clean and Disinfect the Face Pads

Gently wipe the face pads with a clean, soft cloth. For stubborn stains, use a clean, soft cloth moistened with water, wring it out, and then wipe clean. Finally, dry with a soft cloth. Use 75% medical alcohol to disinfect the face pad area. Please clean this part before each refraction.

7.2.3 Reinstall the Face Pads

Simply place the face pads back in their original position.

7.3 Cleaning the Examination Window

If the examination window is dirty or has smudges, fingerprints, dust, etc., it will affect the detection accuracy.

1.For dust: Use a blower with a brush to blow it off.
2.For smudges, oil, fingerprints, etc.: Gently wipe clean with a soft, clean cloth.

⚠ Note: Do not clean with hard cloths or paper to avoid scratching the examination window glass.

⚠ Note: Clean the examination window gently to avoid scratches from excessive force.

7.4 Cleaning the Housing and Control Keyboard

If external components such as the housing or control keyboard become dirty, wipe them clean with a soft, clean cloth.
Parts of the control keyboard (buttons and other parts handled by the operator) should be cleaned once a week with 75% medical alcohol.
For stubborn stains, moisten a clean, soft cloth with water, wring it out, and then wipe clean. Finally, dry with a soft cloth.

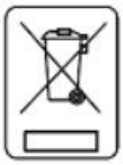
8. Troubleshooting

If a device fault occurs, first check the following table for guidance.

Fault Phenomenon	Possible Cause	Solution	Remarks
1.The device does not start	The power cord is not correctly connected to the power outlet	Correctly connect the power line	
2.The display suddenly turns off	The device enters power-saving mode	Press any key to restore the display	
3.Refractometer Bluetooth disconnects	Bluetooth connection disconnects after tablet sleep	Close the software, clear the software running in the tablet taskbar. Then disconnect and reconnect the tablet Bluetooth. Reopen the software to set up the Bluetooth connection.	

If the fault persists or is not listed in the table above, contact Ningbo Rongxin Ansheng Machinery Co., Ltd. or an authorized dealer.

9. Disposal and Recycling Information

⚠ 注意 	① Dispose of expired or scrapped products, accessories, and their parts in accordance with local jurisdiction regulations and recycling programs regarding the disposal or recycling of equipment components. Scrapping the products or lithium batteries may cause environmental pollution. (It is recommended to entrust a designated industrial waste disposal contractor for disposal). ② When disposing of scrapped packaging materials, sort by material category and follow local regulations and recycling requirements. Improper disposal may cause environmental pollution.

10. Electromagnetic Compatibility

Special precautions regarding electromagnetic compatibility (EMC) must be taken for this equipment and it must be installed and used according to the electromagnetic information provided in this manual.

Portable and mobile RF communication equipment may interfere with this device.
You must use the cables and accessories provided with this equipment. Cable information is as follows:

Name	Cable Length (m)
Power Line	1.8
Adapter Line	1.2
DC Power Line	1.5

Using unapproved accessories and cables (transducers) other than those sold as spare parts for internal components may result in increased emissions or decreased immunity of ME equipment or ME systems.

ME equipment or ME systems should not be used in close proximity or stacked with other equipment; if necessary, they should be observed to verify normal operation in configuration.
The product does not have essential performance.

Guidelines and manufacturer's declaration— electromagnetic emission in which equipment is intended for use within the following specified electromagnetic environment, buyers or users should ensure it is used under such an environment:		
Emission Test	Compliance	Electromagnetic Environment—Guidelines
RF Emissions GB 4824	Group 1	The equipment uses RF energy only for its internal function. Therefore, its radio-frequency emissions are very low and unlikely to cause any interference in nearby electronic equipment.
RF Emissions GB 4824	Class A	The equipment is suitable for use in all establishments except domestic establishments and establishments directly connected to public low-voltage power supply networks that supply buildings used for domestic purposes.
Harmonic Emissions GB	Not Applicabl	

17625.1	e	The equipment is suitable for use in all installations that are not domestic and are not directly connected to the public low-voltage supply network of domestic dwellings.
Voltage Fluctuation/Flicker Emission GB/T 17625.2	Not Applicable	

Guidelines and manufacturer's declaration— electromagnetic immunity, equipment is intended for use within the following specified electromagnetic environment, buyers or users should ensure it is used under such an environment:			
Immunity Test	Test Level	Compliance Level	Electromagnetic Environment—Guidelines
Electrostatic Discharge (ESD) GB/T 17626.2	± 6kV contact discharge ± 8kV air discharge	± 6kV contact ± 8kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast Transient/Burst GB/T 17626.4	± 2kV for power supply lines ± 1kV for input/output lines	± 2kV for power supply lines Not Applicable	Main power should be in commercial or hospital practice quality.
Surge GB/T 17626.5	± 1kV differential mode ± 2kV common mode	± 1kV differential ± 2kV common	Main power should be in commercial or hospital practice quality.
Voltage dips, short interruptions, and voltage variations on power supply input lines GB/T 17626.11	< 5% UT for 0.5 cycles (> 95% dip in UT) 40% UT for 5 cycles (60% dip in UT) 70% UT for 25 cycles (30% dip in UT) < 5% UT for 5 s (> 95% dip in UT)	< 5% UT for 0.5 cycles (> 95% dip in UT) 40% UT for 5 cycles (60% dip in UT) 70% UT for 25 cycles (30% dip in UT) < 5% UT for 5 s (> 95% dip in UT)	The main power should be in commercial or hospital practice quality. If the user of the equipment requires continuous operation in power supply interruption, it is recommended that the equipment be powered by an uninterruptible power supply or battery.
Power frequency (50Hz) magnetic field GB/T 17626.8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment
Note: UT refers to the AC mains voltage before application of the test level.			

Guidelines and manufacturer's declaration— electromagnetic immunity, equipment is intended for use within the following specified electromagnetic environment, buyers or users should ensure it is used under such an environment:			
Immunity Test	Test Level	Compliance Level	Electromagnetic

			Environment—Guidelines
RF Conducted GB/T 17626.6-2017 RF Radiated GB/T 17626.3	3 V rms 150kHz - 80MHz 3 V/m 80MHz - 2.5GHz	3 V (rms) 3 V/m	Portable and mobile RF communication equipment should not be closer to any part of the [ME equipment or ME system], including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance d =1.2√P 150kHz-80MHz d =1.2√P 80MHz-800MHz d=2.3√P 800MHz-2.5GHz where P is the maximum output power of the transmitter in watts (W) according to the transmitter manufacturer, and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,a should be less than the compliance level in each frequency range.b Interference may occur in the vicinity of equipment marked with the following symbol: 
Note 1: At 80 MHz and 800 MHz, apply the higher frequency range. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the equipment is used exceeds the applicable RF compliance level above, the equipment should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the equipment. [b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Recommended separation distances between portable and mobile RF communication equipment and the equipment based on communications equipment’ s maximum rated

output power. The buyer or user can maintain minimum distances between portable and mobile RF communication equipment (transmitters) and the equipment to prevent electromagnetic interference.			
Maximum rated output power of transmitter (W)	Separation distance corresponding to transmitter frequency (m)		
	150kHz - 80MHz $d = 1.2\sqrt{(P)}$	80MHz - 800MHz $d = 1.2\sqrt{(P)}$	800MHz - 2.5GHz $d = 2.3\sqrt{(P)}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output of transmitter in watts (W) according to the transmitter manufacturer. Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

11.Explanation of Symbols


Type of Equipment Applied Part is Type B


Rainproof


Production Date


Warning! Pay Attention!


Upward


Manufacturer


RF Equipment


Fragile


Temperature Limit


Protective Grounding


Instructions for Use


Humidity Limit


Power Off

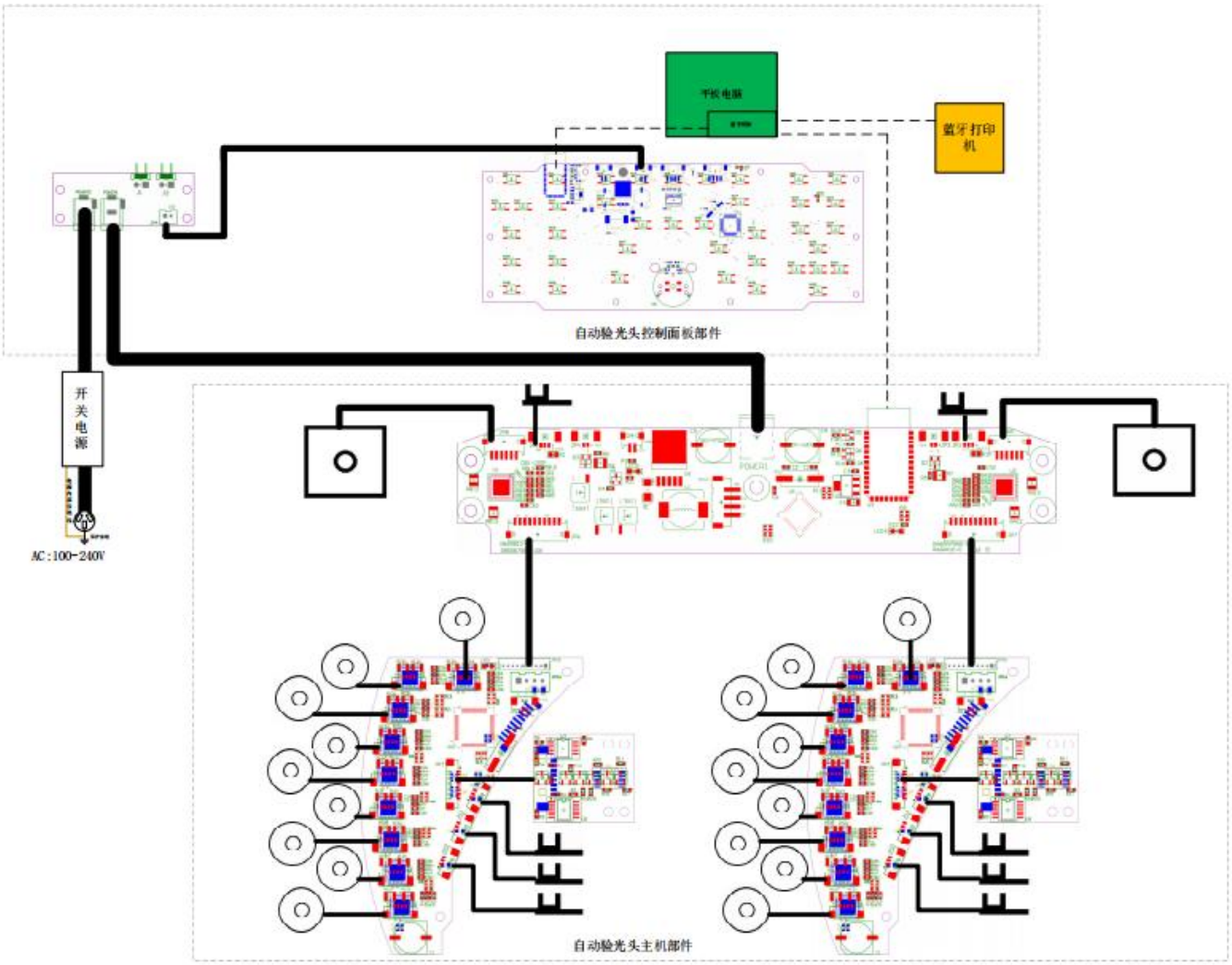

Recycling Mark


Atmospheric Pressure Limit

Power On

SN Serial Number

12 Electrical Schematic Diagram



自动验光头接线图

Dear User, if you have any questions and suggestions, please contact the company's authorized dealer or directly contact the company. We will be at your service.

13.Periodic Testing Methods and Frequency for Electrical Safety Performance

The CV-700 series automatic phoropter produced by the company undergoes batch sampling tests according to GB9706.1-2020 'Medical Electrical Equipment—Part 1: General Requirements for Safety' test every batch. Sampling requirements are performed according to GB/2828.1 'Sampling Inspection Standards' general inspection level (I) normal inspection single sampling plan (AQL=1.0) Class A executed.

Basic Safety Performance Test Items and Parameters Table

Test Basis	GB9706.1-2020 'Medical Electrical Equipment
test equipment	Ground Resistance Tester (CS2678Y), Medical Pressure Tester (CS2670Y), Medical Leakage Current Tester (CS2675FX-1)

No.	Test Project		Standard Clause	Safety Requirements
1	Protective Ground Resistance		8.6.4a	Resistance between the protective grounding terminal and any protected grounded component should not exceed 100mΩ.。
2	Leakage Curent	Ground Leakage Current	8.7.3d	Normal Condition≤5 mA
				Single Fault Condition≤10 mA
		Contact Leakage Current	8.7.3c	Normal Condition≤0.1 mA
				Single Fault Condition≤0.5 mA
		Patient exposure leakage current	8.7.3b	Normal Condition≤0.1 mA
				Single Fault Condition≤0.5 mA
3	Dielectric Strength		8.8.3	Dielectric strength of solid electrical insulation of ME equipment should withstand the test voltage specified in Table 6 see below table 14-1 CV-700 Automatic Phoropter Dielectric Strength

Table Automatic Phoropter Dielectric Strength

placemen	Route description	Insulation type (MOOP,MOPP)	peak operating voltage (V)	Test Voltage (V)	electrical gap(mm)	creepage distancemm)
					Network power supply voltage class', pollution class 2, CTI class IIIb, altitude not exceeding 2000	

t					m.	
A	,L/NTo the metal part of the protective earthing enclosure	1 × MOOP	312V	1500V	2.0mm	4.0mm
B	L/N to plastic housing	2 × MOOP	312V	3000V	4.0mm	5.0mm
C	L/N to plastic housing	2 × MOOP	312V	3000V	4.0mm	5.0mm
D	L/N to plastic housing	2 × MOOP	312V	3000V	4.0mm	5.0mm
E	L/N to application section	2 × MOPP	312V	4000V	5.0mm	8.0mm

14.Appendix

Appendix 1 Power Adapter Specification Model and Parameters:

The series automatic phoropter produced by the company is configured with 'Meanwell Power Adapter' model GSM90A24-P1M, transient current 60A/230VAC. The power adapter parameters are as follows:

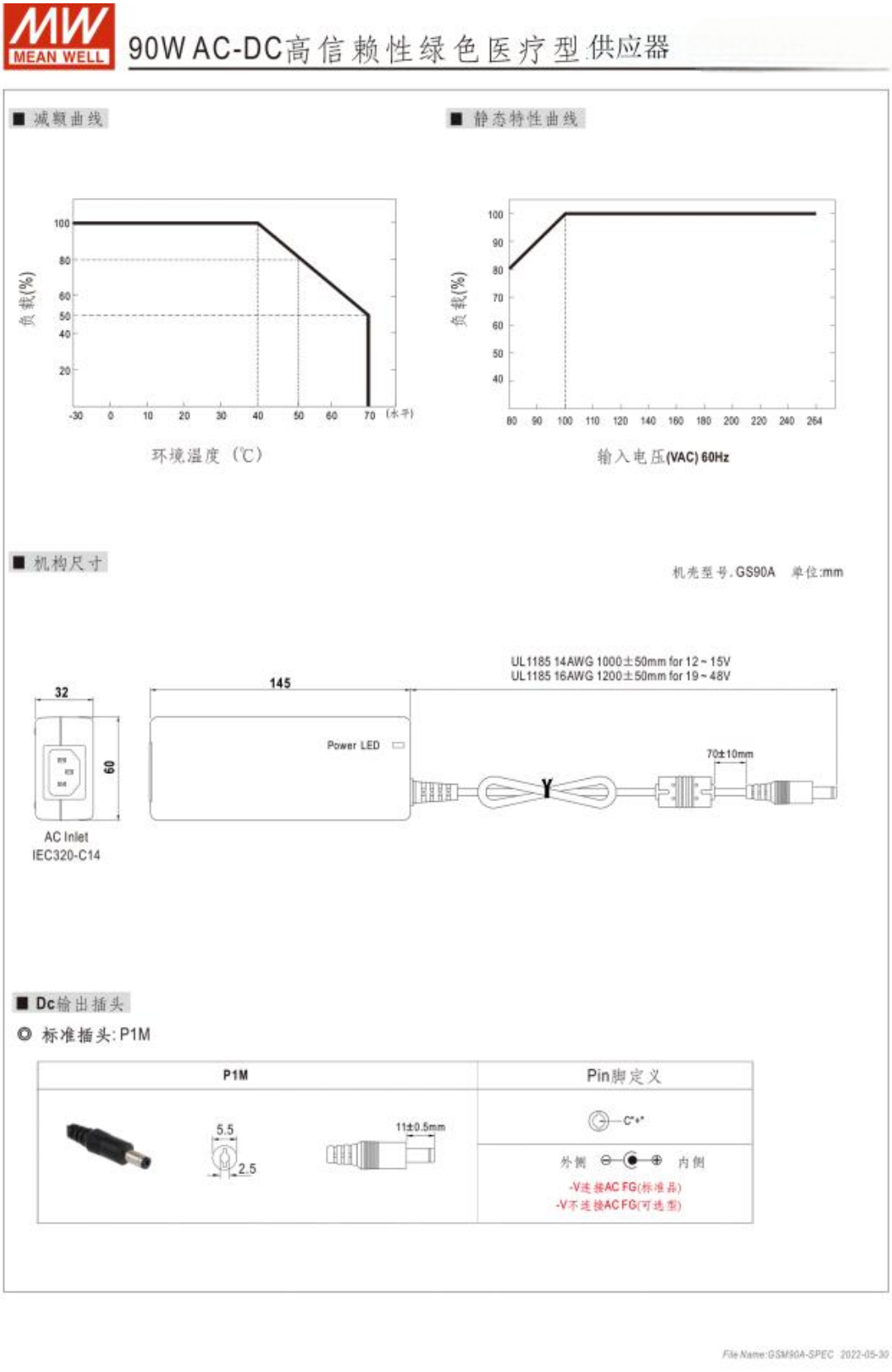
90W AC-DC高信赖性绿色医疗型 供应器

电气规格

型号		GSM90A12-P1M	GSM90A15-P1M	GSM90A19-P1M	GSM90A24-P1M	GSM90A48-P1M
输出	安规型号	GSM90A12	GSM90A15	GSM90A19	GSM90A24	GSM90A48
	直流电压 备注2	12V	15V	19V	24V	48V
	额定电流	6.67A	6A	4.74A	3.75A	1.87A
	电流范围	0 ~ 6.67A	0 ~ 6A	0 ~ 4.74A	0 ~ 3.75A	0 ~ 1.87A
	额定功率(最大)	80W	90W	90W	90W	90W
	纹波与噪声(最大) 备注3	120mVp-p	120mVp-p	120mVp-p	180mVp-p	200mVp-p
	电压精度 备注4	±5.0%	±5.0%	±4.0%	±3.0%	±2.5%
	线性调整率 备注5	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%
	负载调整率	±5.0%	±5.0%	±4.0%	±3.0%	±2.5%
	启动,上升时间 备注6	1000ms, 50ms / 230VAC　　1000ms, 50ms / 115VAC(满载时)				
	保持时间(Typ.)	40ms / 230VAC　　25ms / 115VAC(满载时)				
输入	电压范围 备注7	80 ~ 264VAC				
	频率范围	47 ~ 63Hz				
	功率因数(Typ.)	PF>0.91 / 230VAC　　PF>0.95 / 115VAC(满载时)				
	效率(Typ.)	88%	89%	89%	90%	91%
	交流电流(Typ.)	1.3A / 115VAC　　0.6A / 230VAC				
	浪涌电流(Typ.)	冷启动：30A / 115VAC　　60A / 230VAC				
	漏电流(最大)	对地漏电流< 125μA/264VAC　接触电流< 100μA/264VAC				
保护	过负载	额定输出功率的110%~150%				
		保护模式:打嗝模式，负载异常条件移除后可自动恢复				
	过电压	额定输出电压的105%~135%				
		保护模式:关断输出电压，重启恢复				
	过温度	关断输出电压，重启恢复				
环境	工作温度	-30～+70℃（请参考"减额曲线"）				
	工作湿度	20 ~ 90% RH,无冷凝				
	储存温度、湿度	-40 ~ +85℃, 10 ~ 95% RH,无冷凝				
	温度系数	±0.03% /℃ (0～40℃)				
	耐振动	10 ~ 500Hz, 2G 10分钟 / 周期，X、Y、Z轴各60分钟				
	操作高度 备注8	3000米				
安规和电磁兼容 (备注9)	安全规范	IEC60601-1, TUV BS EN/EN60601-1, ANSI/AAMI ES60601-1(3.1 version), CAN/CSA-C22.2 No. 60601-1:14 - Edition 3, EAC TP TC 004认证通过				
	绝缘防护等级	初级侧-次级侧: 2xMOPP, 初级侧-接地:1xMOPP				
	耐压	I/P-O/P:4KVAC　I/P-FG:2KVAC　　O/P-FG:短路				
	绝缘阻抗	I/P-O/P, I/P-FG:100M Ohms / 500VDC / 25℃ / 70% RH				
	电磁兼容发射	**Parameter**	**Standard**	**Test Level / Note**		
		Conducted emission	BS EN/EN55011(CISPR11),FCC PART 15 / CISPR22, CAN ICES-3(B)/NMB-3(B)	Class B		
		Radiated emission	BS EN/EN55011(CISPR11),FCC PART 15 / CISPR22, CAN ICES-3(B)/NMB-3(B)	Class B		
		Harmonic current	BS EN/EN61000-3-2	Class A		
		Voltage flicker	BS EN/EN61000-3-3	-----		
	电磁兼容抗扰度	BS EN/EN60601-1-2, BS EN/EN61204-3				
		Parameter	**Standard**	**Test Level / Note**		
		ESD	BS EN/EN61000-4-2	Level 4, 15KV air ; Level 4, 8KV contact		
		RF field susceptibility	BS EN/EN61000-4-3	Level 3, 10V/m(80MHz~2.7GHz) Table 9, 9~28V/m(385MHz~5.78GHz)		
		EFT bursts	BS EN/EN61000-4-4	Level 3, 2KV		
		Surge susceptibility	BS EN/EN61000-4-5	Level 3, 1KV/Line-Line , 2KV/Line-FG		
		Conducted susceptibility	BS EN/EN61000-4-6	Level 3, 10V		
		Magnetic field immunity	BS EN/EN61000-4-8	Level 4, 30A/m		
		Voltage dip, interruption	BS EN/EN61000-4-11	100% dip 1 periods, 30% dip 25 periods, 100% interruptions 250 periods		
其它	MTBF	2538.4K hrs min.　Telcordia SR-332 (Bellcore) ; 387.5K hrs min.　MIL-HDBK-217F (25℃)				
	尺寸	145*60*32mm (L*W*H)				
	包装	0.45Kg; 30pcs/14.5Kg/0.9CUFT				
连接器	插头	参考第4～5页,其它型号可依客户需求订制				
	配线	参考第4～5页,其它型号可依客户需求订制				

备注

1. 如未特别说明，所有规格参数均在输入为230VAC、额定负载、25℃ 70%RH 环境温度下进行量测。
2. 直流电压测量方法:在50%负载条件下,在插座端子点量测。
3. 纹波和噪声测量方法：使用一条12"双绞线，同时终端要并联0.1μf和47μf的电容，在20MHZ带宽下进行量测。
4. 精度：包含设定误差、线性调整率和负载调整率。
5. 线性调整率测量方法：在额定负载下,从低电压到高电压测试。
6. 启动时间是在冷机启动下测得，频繁的开关机可能使启动时间增长。
7. 低输入电压情况下需减额输出，具体请参照静态特性曲线图。
8. 当海拔高度超过2000米(6500英尺)时，无风扇机型环境温度依每3.5℃/1000m比例下降，有风扇机型环境温度依每5℃/1000m比例下降。
9. 电源被视为系统内元件的一部分，需结合终端设备进行电磁兼容相关确认。
   EMC测试方法的指引，请参照明纬公司网站http://www.meanwell.cc 上的 "EMI测试声明书"。



Appendix 2 Key Components Parts List:

No.	Name	Model and Specification	Technical Parameters
1	Power Adapter	GSM90A24-P1M	

Power Input: 100-240VAC, 50/60Hz, 1.3-0.6A
Power Output: 24VDC, 3.75A, 90W max
Production Date: See Product Label
Shelf Life: 8 years (8 hours of usage per day).