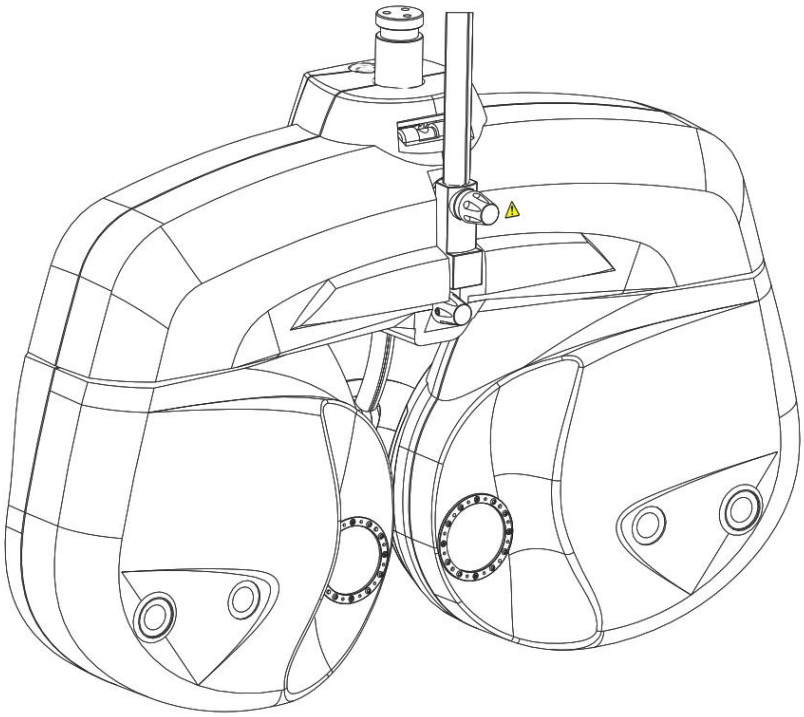
COMPUTERIZED VISION TESTER

C V - 7 6 0 0

OPERATOR'S MANUAL

CE 0120



Contents

 Please read this manual before use.

This device is manufactured accord to GB9706.1 Medical electrical equipment general requirements for safety, have to connect the power plug to a grounded outlet.
In order to ensure use the product safely, and prevent damage to operator and other people, or cause a lose to other devices, warning labels are indicate on the machine as well as in the manual, please pay attention and read the accompanying documents carefully.

ISO 9001/13485 certification—R&D, Manufacture and service of the products by Our company have passed ISO 9001/13485 certification. IEC standards applied in this manual. The dioptre are indicated with a reference wavelength of 546.07nm. Materials in direct contact with the patient passed the ISO10993 assess, not made up unacceptable risk.

The safety precautions and operating procedures must be thoroughly understood before using the device. And please safekeeping this manual. If you encounter any problems or have questions about the device, please contact Ningbo Ming Sing's local authorized distributor or contact with our customer service department directly.

This manual is meanwhile as a training reference manual, in order to ensure best operating performance of the new machine, please read carefully and operating accord to process in this manual. Please reserve this manual for reference for communicate with other users in the future. If addition copy needed or have questions about this device, please contact our company or authorized distributors.

Information contained in this manual has been confirmed when publish. Product specifications are subject to change without prior notice. The rights of change the product which contains in this manual is reserved by our company, and without prior notice. Sold products does not involve in this change.

Do not copy, retrieve, distribute any chapters of this book by electronic, mechanical, recording or any other means if not written approval by our company.

1. Introduction

Computerized vision tester (hereinafter referred to as vision tester) is used to subjective examination of visual acuity and refractive error of subject's eyes.

1.1 Product features and using range

a) Electric shock protection type: Class I external power supply device
b) Electric shock protection level: BF type
c) liquid inlet protective degree classification: Common device
d) Applied part: forehead rest
e) Power supply type: single phase, net power supply: 100-240V, 60/50Hz
f) Not a AP or APG type device
g) Mode of operation: Continuous operation
h) This machine is a impermanence installation device
i) This machine is not a portable device

1.2 Classify

The mode of this device is CV-7600

This device is constitute by refractor head, tablet and cables, as showing in

Figure 1.1

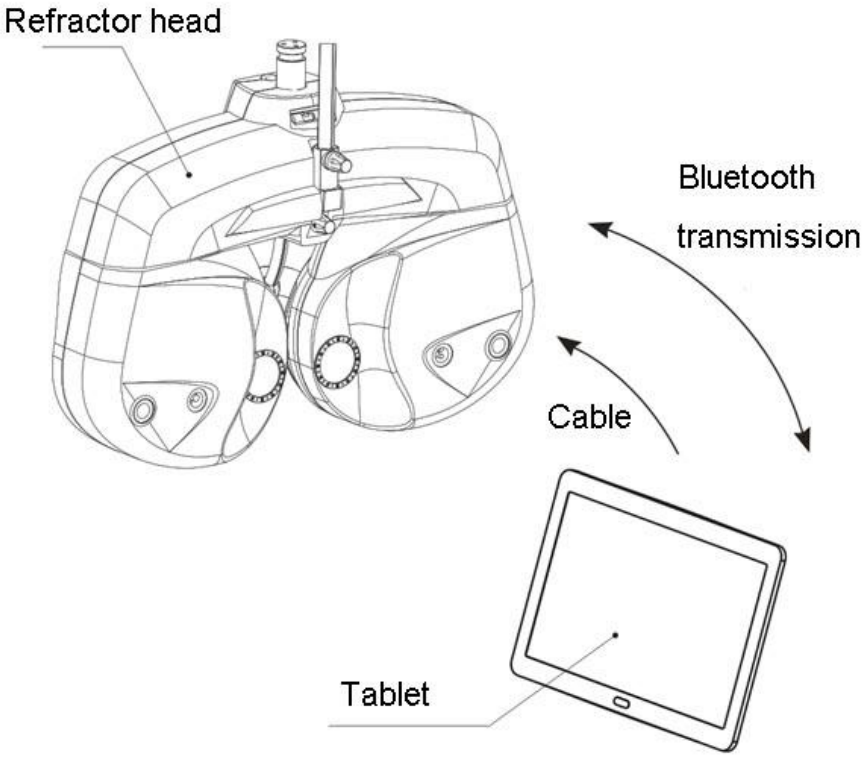


Figure 1.1

Storage and transport environment conditions:

Temperature: -10～55℃
Humidity: 10～85%
Air pressure: 700hPa～1060hPa(transport), 500hPa～1060hPa(storage)

Working environment condition：

a) Temperature : 10℃ - 40℃
b) Humidity ≤80%
c) Air pressure: 800hPa - 1060hPa

Power adapter requirement

a) Input：AC 100-240V～50/60Hz
b) Output：DC 24V 2.5A 60VA

1.3 Main performance index

1.3.1Measurement range

Sphere：+16.75D ～ -19.00D
Cylinder： 0D ～ -6.00D
Axis：0º～ 180º
Prism：0△ ～ 20△
Prism base: 0º— 360º

PD range: 50mm - 80mm（Far mode）、50mm - 76mm（Near mode）

1.3.2 Step

Sphere: 0.25D/0.5D/3.0D
Cylinder: 0.25D/1.0D
Axis: 1º/5º
Prism: 0.1△/0.5△/2.0△
Prism base minimum measure step: 1º
PD: 0.5mm

1.3.3 Tolerance

a) The tolerance of sphere should accord with the requirement table 1.1

Table 1.1 sphere tolerance

Item	Standard request	Tolerance

Sphereφ（D）	0.00≤｜φ｜≤3.00	±0.06	Remnant astigmatic power≤0.03
	3.00＜｜φ｜≤6.00	±0.09	
	6.00＜｜φ｜≤9.00	±0.12	
	9.00＜｜φ｜≤12.00	±0.15	
	12.00＜｜φ｜≤15.00	±0.18	
	15.00＜｜φ｜	±0.25	

b) The tolerance of astigmatic power should accord with the requirement table 1.2

Table 1.2 Astigmatic power tolerance

Meridian direction maximum absolute diopter	Astigmatic power nominal diopter				
	≤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					
>10.00-15.00			0.09	0.12	0.18
>15.00		0.09	0.12	0.18	0.25

c)The optical center tolerance of mechanical system of sphere and cylinder combinative optical system should accord with the requirement table 1.3

Table1.3 optical center tolerance of mechanical system of sphere and cylinder combinative optical system

Nominal diopter（Absolute）D	Tolerance cm/m
0.00	0.12
>0.00-6.00	0.25
>6.00-12.00	0.37
>12.00	0.50

d) Prism tolerance should accord with the requirement of table 1.4

Table1.4 Prism tolerance

Nominal diopter（cm/m）	Tolerance

≤5.00	±0.25 cm/m
>5.00	±5%

e) Cylinder axis and prism base tolerance should accord with the requirement of table 1.5

Table 1.5 Cylinder axis and prism base tolerance

Item	Nominal diopter（Absolute）	Tolerance
Cylinder axis	>0D-0.25D	±5º
	>0.25D-1D	±3º
	>1D	±2º
Prism base	≤1 cm/m	±5º
	>1 cm/m -10 cm/m	±3º
	>10 cm/m	±2º
Remark: the zero position of cylinder axis and prism base is defined as: the direction of the line of centers when the height different of both sides of the device is adjust to zero		

f) PD and the reference range scale should accord with the requirement of table 1.6

Table 1.6 Tolerance of the PD and the reference range

Item	Tolerance mm
VD	±0.5
PD	±0.5

1.3.4 Structure and function

1.3.4.1 The minimum aperture of all the lens of vision tester should be not less than 16mm, for the prism equal to or more than 6cm/m, the aperture can be reduced to 11mm.

1.3.4.2 Manufacturer should indicate the reference plant of vision tester, both sides should have the identify of reference range.

1.3.4.3 The vision tester should have at least one set of mask and dichoptic device, each system should mount a Jackson cross cylinder.

1.3.4.4 Forehead rest adjust range should be at least 10mm.

1.3.4.5 Observational systems should be without reflected light and scattered light.

1.3.4.6 Structure of lens cavity should be not influence the patient examine.

1.3.4.7 The device should be alignment and centered when the lanes and accessory fixed in front of the sightglass.

1.3.4.8 The device should be equipped with auxiliary lens, every auxiliary should be identify corresponding.

1.3.4.9 The device using LCD display, the displayed character, data and curve should be clear.

1.3.4.10 The PD should be able to continuous adjustment, the range is no less than 50mm—75mm.

1.3.4.11 All the lens disks should be installation corresponding lenses as fixed data, the center of lenses and holes should be alignment.

1.3.4.12 All the buttons of the device are identification clearly, function and status should be convert normally when press the keys.

1.3.4.13 This device with testing result print function.

1.3.5 Appearance

1.3.5.1 The surface of vision tester should be smooth, bright and clear, cannot have etch pit, dirt, scratch and front, rags and etc.

1.3.5.2 Effective clear aperture of the vision tester's optical element cannot have bubble, defect, scratch and any macroscopically observable irregular surface defects.

1.3.6 Material biocompatibility

The material which contact with the patient (forehead rest and face shield) should be according to the follow requirement:

a) No cytotoxicity.

b)No delayed type hypersensitivity.

1.3.7 Cleaning and disinfect measure

1.3.7.1 The part and nearby part where contact with the patient or operatives should be liable to clean. No disinfections dead angles should be on the parts which need to disinfect.

1.3.7.2 Please cleaning and disinfect the device according to this user manual, should not

cause device damage or material deteriorate, or affect to the security protection performance.

1.3.8 The environment test of computerized vision tester should be accord with the requirement of climate environment Ⅱ mechanical environment test group Ⅱ in GB/T14710-1993

1.3.9 Safety requirements should accord with stipulates in GB9706.1

2. Security considerations

2.1 Security identity

In this manual, words used to indicate the security alert degree or level are defined as follows:

⚠ **warning**	Warning: indicates a potentially dangerous situation, such as can't be avoided, could result in death or serious injury.
⚠ **attention**	Attention: indicates a potentially dangerous situation, such as can't be avoided, may result in slight or moderate injury or property damage.

Under certain conditions, even if the conditions for attention are also likely to lead to serious damage. So safety precautions must be strictly abided by the moment.

2.2 Safety precautions before use

⚠ **warning**

• Be sure to secure the refractor head to the refractor arm.
If the refractor head is dropped or falls, injury or device failure may result.

⚠ **CAUTION**

• The safety precautions and operating procedures must be thoroughly understood before using the device.
Unintended use may cause unexpected malfunction or adverse experience.

• Do not store the device in an area that is exposed to rain or water, do not put any container which with gas or liquid.

• Do not store the device in dusty, hot, humid places or in direct sunlight.

• When moving the device to another place, do not carry it alone.
Back injury may occur or the device may fall.

• Install the device on a stable and level surface.
If the device falls, injury or device failure may result.

• Never install the device in a place where it is exposed to water.
Contact with liquids may cause electric shock or device failure.

• Install the device in an environment that meets the following conditions.

The following conditions must be maintained during use.
Temperature: 10 to 40 ºC (50 to 104ºF)
Humidity: 30 to 85% (No condensation)
Pressure: 760 to 1060 hPa
Installation place: Interior
No hazardous dust or smoke
A dust-free place
A place free from vibration and shock

• Be sure to level the refractor head before use.
Failure to do so could affect the data accuracy. Level the refractor head by turning the leveling adjustment knob until the bubble is centered in the level.

• Be sure to use a wall outlet which meets the power specification requirements.
If the line voltage is too high or too low, the device may not operate properly. Malfunction or fire may result.

• Connect the power plug to a grounded outlet to avoid electric shock

• Do not overload the electrical outlet.
Or else fire may result.

• Fully insert the power plug into the outlet.
Imperfect connection may cause fire.

• Do not use any power cord other than that equipped. Do not use the equipped power cord for purpose other than as intended.
Or else malfunction or fire may result.

• Do not place heavy objects on the power cord.
A damaged power cord may cause fire or electric shock.

• When installing and operating the device, observe the following instructions about EMC (electromagnetic compatibility):
- Do not use the device simultaneously with other electronic equipment to avoid electromagnetic interference with the operation of the device.
- 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 the patient and results of treatment, or other measurement or treatment equipment that involves small electric current.
- 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.
- 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 resistance of the device to electromagnetic disturbance.

If potential electromagnetic interference between equipment with other equipment,

shielding measures should be taken or change the placement of this equipment, in order to reduce the possibility of interference.

2.3 During Use

⚠ WARNING

• When moving the refractor head, make sure that there are no obstacles in the path. If the arm is swung carelessly, it may bump against someone or something and injury or malfunction may occur.

⚠ CAUTION

• Keep the measuring windows free of fingerprints and smudges.
Failure to do so could affect the data accuracy.

• In the event of smoke or strange odors, immediately turn off the device and disconnect the power plug from the outlet. After you are positive that the smoke has stopped, contact Ningbo Ming Sing or your authorized distributor.
Continued use of the device under such abnormal conditions may cause fire or electric shock.

• When the device is not in use, please turn it off and put the dust cover over it.
If the device is not covered for an extended period, the accumulation of dust may affect the data accuracy.

• Perform the visual and operation checks before using the device. If any abnormality is found, do not use the device.
Continued use of the device under such abnormal conditions may affect the data accuracy. Unexpected malfunction or faulty diagnosis may induce unexpected health hazards.

• Before each patient, always clean the patient's contact area (forehead rest and face shields) using disinfectant alcohol.

• This instrument must be operated by the trained or qualified people, or after their instruction.

2.4 After Use

⚠ CAUTION

• If the device will not be used for the extended period, disconnect the power cable from

the wall outlet.

• Occasionally clean the prongs of the power plug with a dry cloth.
If dust settles between the prongs, it may collect moisture, and short circuit or fire may result.

• Do not yank the power cord to disconnect it from an outlet.
This can damage the metal core of the cord and may result in electric shock, short circuit or fire.

2.5 Maintenance and Check

⚠ **CAUTION**

• Any repair or service to the instrument must be done by Ningbo Ming Sing Optical R & D Co., Ltd or people trained and can be operate correctly with experience or contact with the authorized distributor to do the maintenance.

• Screw out the safe screw may cause the machine separate from the support arm and cause the serious damage.

• Do not open the body cover or try to repair the interior components. Any repair or service to the instrument must be done by experienced staff from Ningbo Ming Sing Optical R & D Co., Ltd or the authorized distributor.

• The adjustment must be done by Ningbo Ming Sing Optical R & D Co., Ltd technician or other authorized staff.

• The refractor head operation must be strictly according to the user manual. If not follow the user manual, the patient safety and the normal work of instrument can not be guaranteed.

⚠ **CAUTION**

• Never use organic solvents or high washing power detergent to clean the exterior of the device.
It may ruin the surface of the device.

• Never put the refractor head into the liquid, otherwise it will broke the machine.

• Avoid touch the optical components to prevent leaving fingerprint or oil stain to decrease the performance.

2.6 Disposal

> ⚠ **CAUTION**
>
> Follow the local ordinances and recycling regulations regarding disposal or recycling of the components.
> It is recommended to commission the disposal to a designated industrial waste disposal contractor.
> When disposing of packing material, follow the local ordinances and recycling regulations.

3. Configuration

3.1 Refractor head configuration

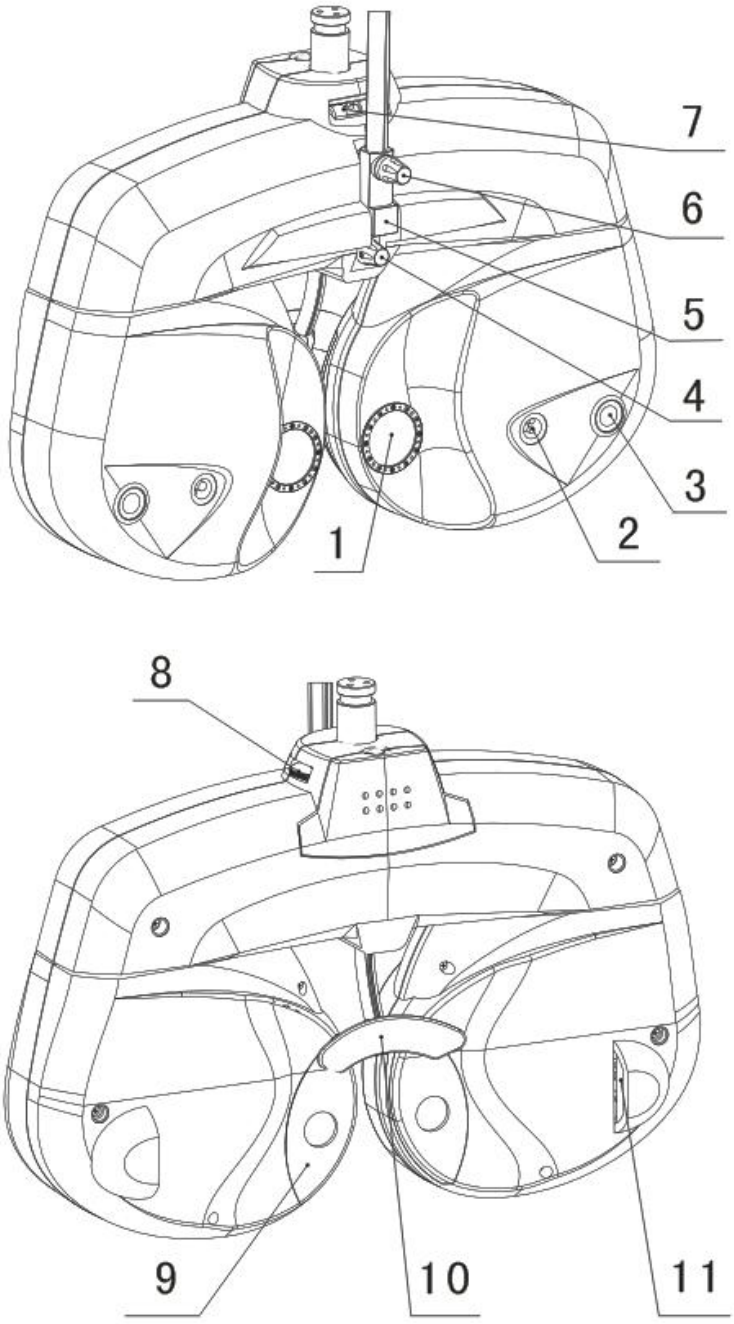


Figure 3.1

1) Examination window……The patient's eyes are observed through the window, and patient observe charts through the window.

2）Near vision illumination……Light up when near vision testing, light off when far vision testing.

3）Corneal aligning windows……The position of patient's cornea can be observed through the window.

4）Forehead rest adjust knob……Moves the forehead rest forward and backward in order to adjust the VD.

5）Near-point rod holder……..The near-point rod is inserted and attached here.

6）Near-point rod clamp screw…..Fix the near-point rod.

7）Spirit level……Used to confirm that the refractor head is level.

8）Leveling knob……..Adjust the level of the refractor head.

9）Forehead rest magnet……..Fix the face shield.

10）Forehead rest……The patient’s forehead rests here when test.

11）Cornea alignment scale……Measures the VD.

3.2 Accessories

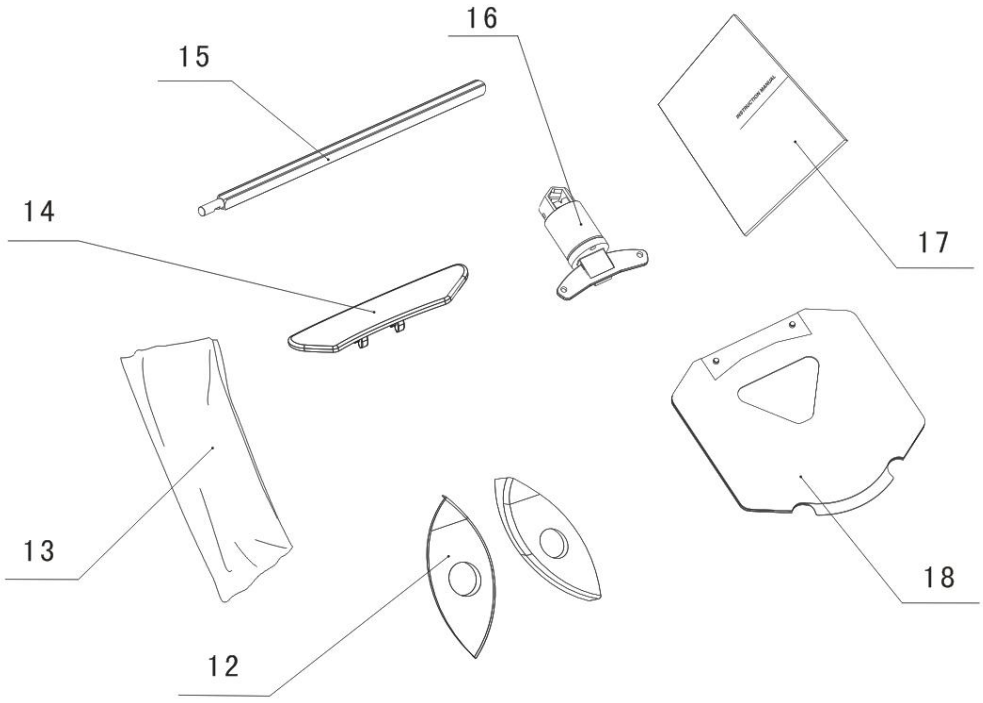


Figure 3.2

12） Face shield (2 sets.)……...Attached to the instrument to put the patient’s face in place, use one while the other is being sterilized.

13）Dust cover……Covers and protects the instrument body from dust and dirt during storage.

14）Forehead rest (2 sets.) ……. The patient’s forehead rests here. Detachable by a touch, use one while the other is being sterilized.

15） Near-point rod……The card holder is attached at the near point examination position.

16）Card holder……The near-point card is attached.

17）Operator’s manual…… Describes instructions about handling the instrument

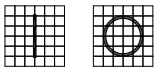
18）Near-point card…….. Contains the near-point charts, for test the near vision.

⚠ **Warning**

The accessory in this device supplied by our company, other supplier's accessory could be use only after verify the safety by our company

3.3 Identification

The following identifications applied on this device

CE 0120	Accord with basis requirement of EU MDD 93/42/EEC
	Moisture proof
	Read operator's manual
	Insulation type BF device
	Electronic electrical equipment scrap disposal requirements
	Manufacturer
EC REP	EU authorized representative
	Production date
	Warning mark, read operator's manual before use
SN	Series number
	"I" and "O" representative power switch（ON）and（OFF）separately
	AC
	Fuse indicate

The place of warning mark

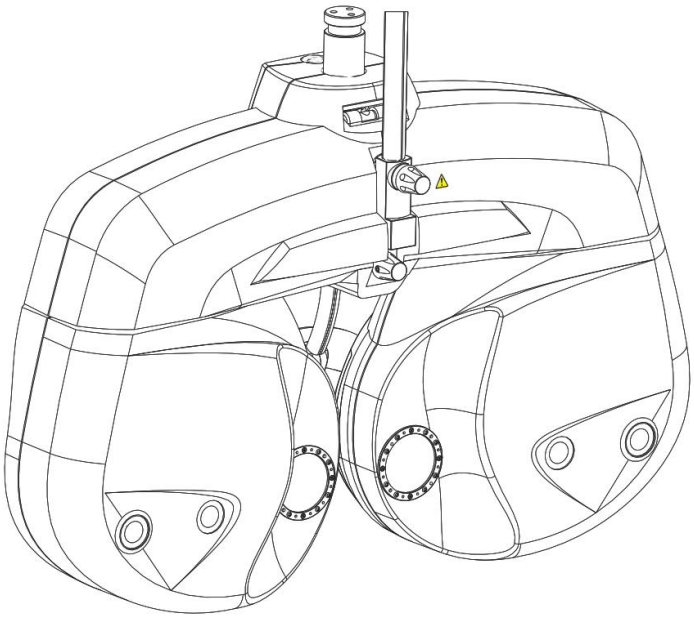


Figure 3.3

There is warning mark in front of device: Do not close to the near point rod, prevent of crushing

4. Ready use

4.1 Setup connection of the device

Profession staff of our company or authorized personnel who have been trained by our company are required on the installing process.

It use with a secure connector if the refractor head install on the stand or ophthalmic unit which from other companies, as showing in figure 4.1. Adjust the leveling knob which is showing in figure 3.1 after connect the refractor head, to make the refractor head at level condition.

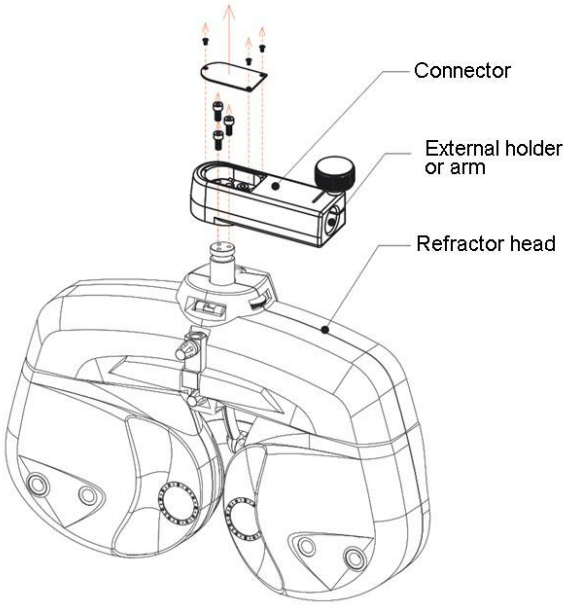


Figure 4.1

If the refractor head install on our ophthalmic unit, it is no need for connector, as show in figure 4.2, it could be install on our ophthalmic unit directly. Power supply unit and cables are fixed in the ophthalmic unit.

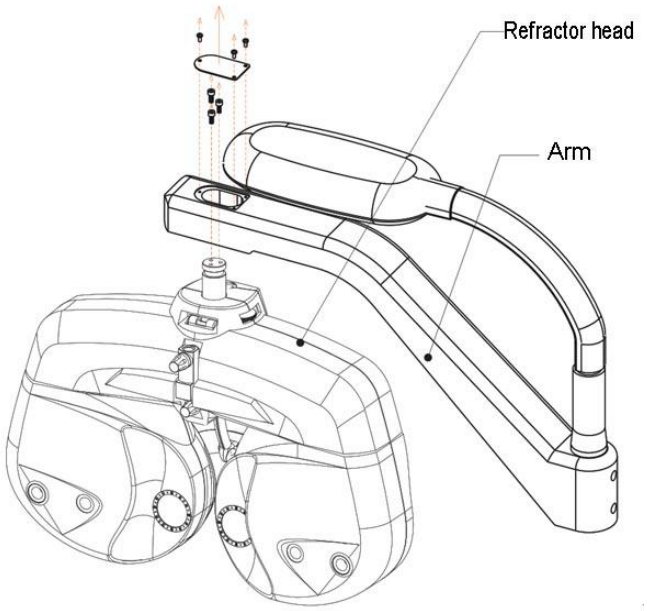


Figure 4.2

4.2 Install near vision chart

Install the near point rod, card holder and near point card before using the device.

Insert the card holder into the top end of the near point rod. The card holder is

designed to slide along the rod. As shown in the Figure 4.3.

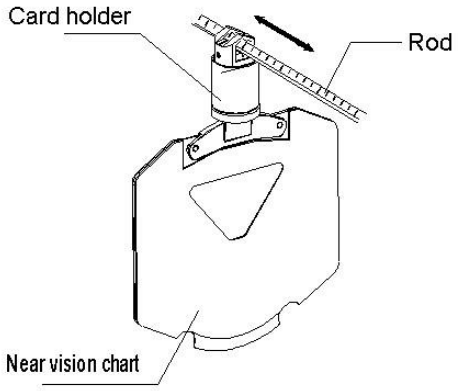


Figure 4.3

Insert the near point card into the spring which is attached in the card holder.
Next, insert the near point rod into the near point rod, fasten with the set screw. When not in use, hold it upright as shown in the next illustration.

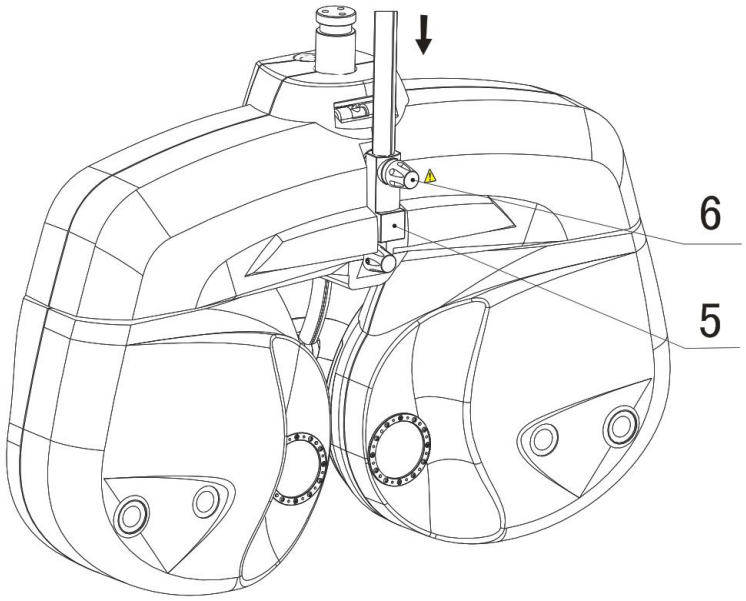


Figure 4.4

> ⚠ **Warning**
>
> To avoid injury due to contact, do not bring the face close to the near point rod.

4.3 Install face shield

As figure 4.5, the face shield is fixed by magnet.

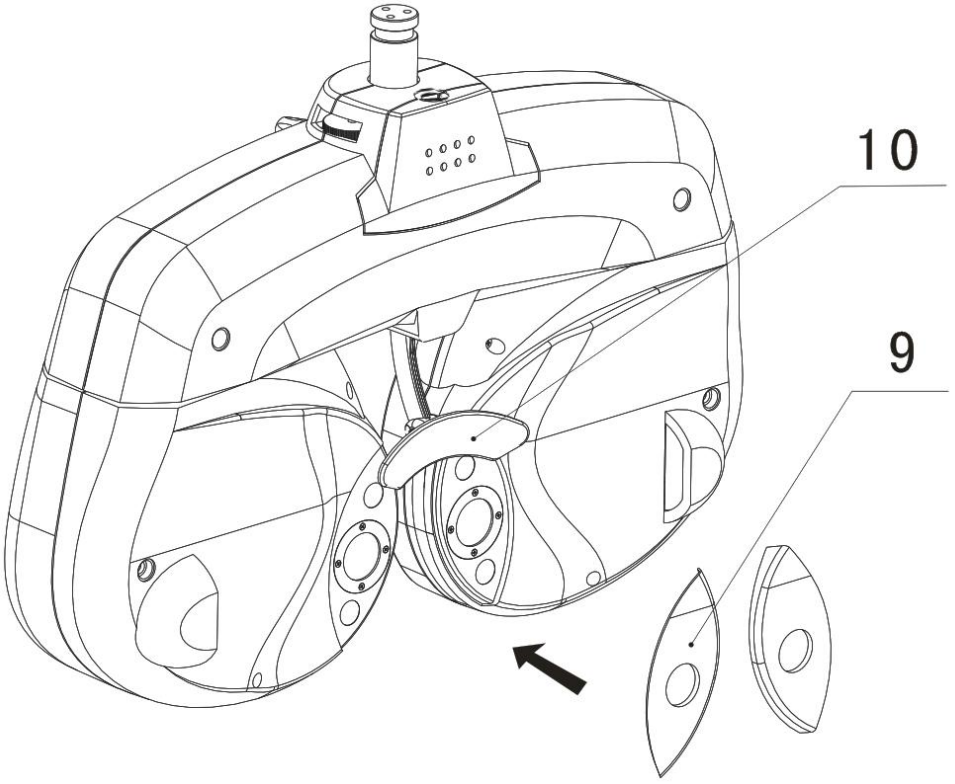


Figure 4.5

4.4 Install and remove the forehead assemble

Remove the forehead rest as Figure 4.6. To mount the forehead rest, reversely follow the remove procedure.

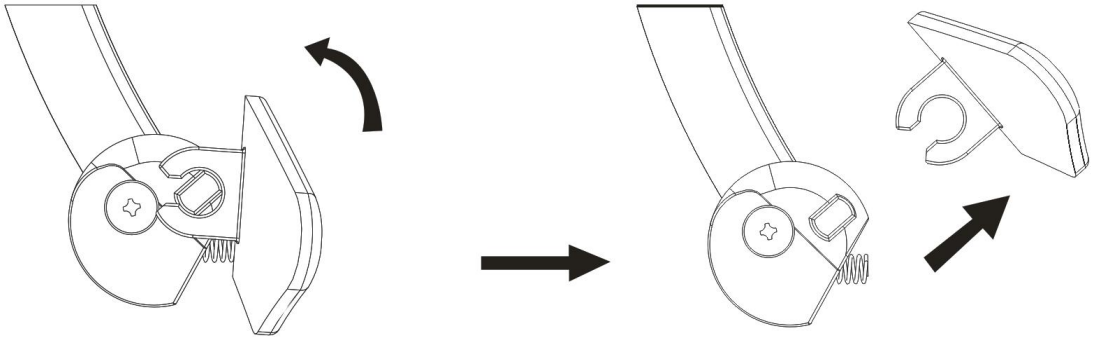


Figure 4.6

4.5 Adjust the level

Before using, make sure the refractor head is level. If the bubble is not between two lines, make it level by operating the leveling knob.

4.6 Alignment cornea

Make the forehead rest move back and forth by turning the forehead rest knob.
With the patient's forehead set to the forehead rest, look through the cornea aligning window from about 25cm apart.

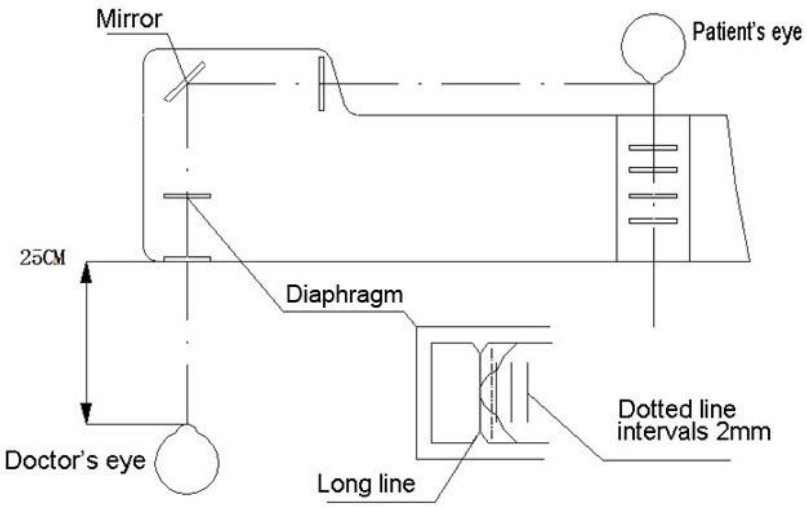


Figure 4.7

Observe the anterior pole of cornea and check it on which line as show in figure 13. If the eye comes on the long line, it means the distance from the eyeglass to the cornea surface is 12mm, short lines are given at 2mm intervals, the dotted line is 13.75mm from the cornea surface. For example, if the cornea surface is 4mm away (on the second short line) from the long line, it means the glasses wearing distance is 12+4=16mm. If the eyeglass wearing distance and the measuring distance is different, correction the "4.Forehead rest adjust knob" as show in Figure 3.1.

4.7 Using near vision chart

When the patient wears multi-focal lenses, detection the diopter when look at the near distance. It needs to install the near point rod, card holder and near point card

Bring down the near point rod，and screw the retaining screw.

The scale of the near point rod is graduated in cm and inch unit.
Value matching the both end lines of the card holder indicates the distance between the eye and the card. (Figure 4.8)

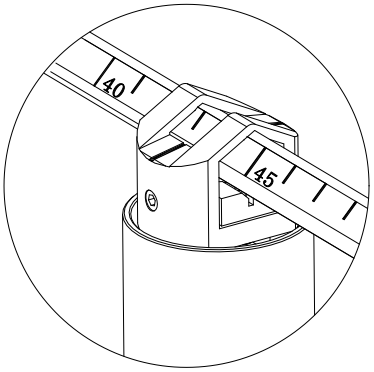


Figure 4.8

Turn the rotary part at the bottom part of the card to select the required chart. The chart will appears in the sight window(Figure 4.9)

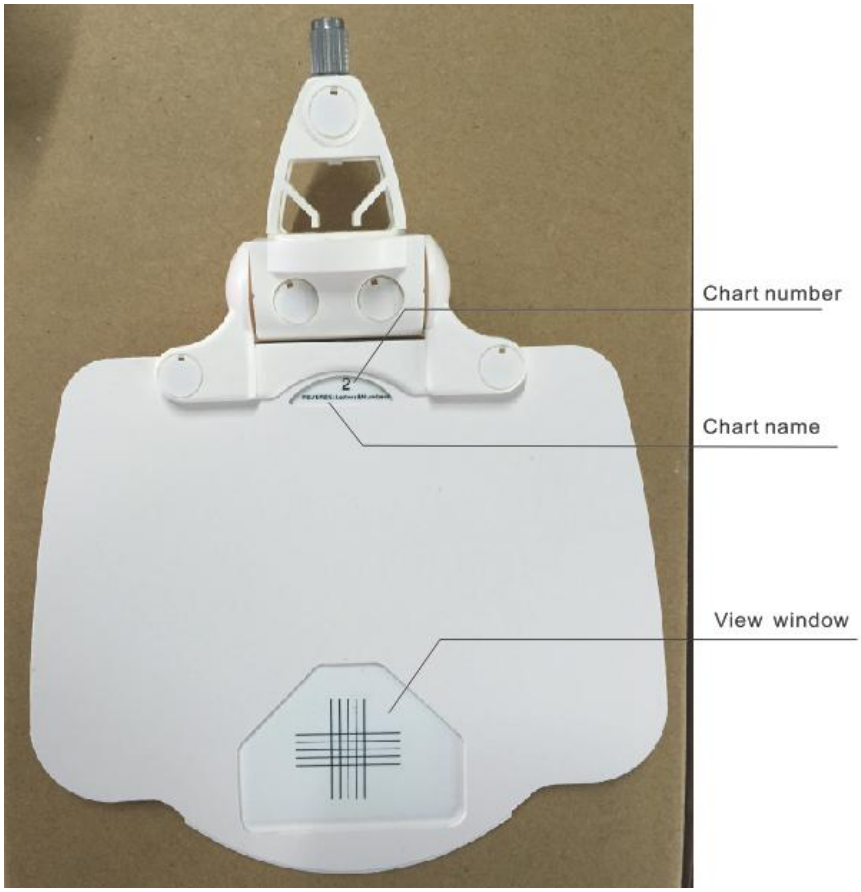


Figure 4.9

Remark: The number and name of the charts which doctor seeing is corresponding with which the patient seeing.

Number and name of the charts is as follows:

1：Letters

2：Letters&Numbers

3：Numbers(V)

4：Astigmatism

5：Letters

6：Cross grid

7：Numbers(H)

8：Landolt’s rings

5. Tablet application interface and function introduction

5.1 Main interface introduction and function description

The main interface of operation program is divides into three parts: refractor head operate and data display area, Monitor chart operate area, system condition and menu area. Main interface layout and the above three areas layout are showing in figure 5.1.

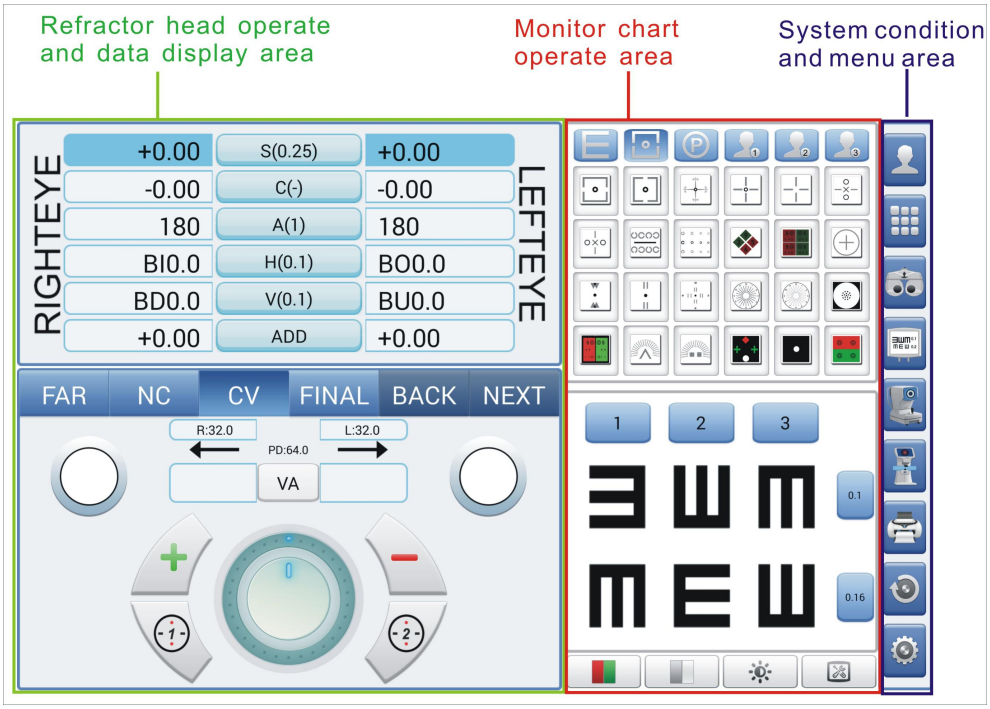


Figure 5.1 Main interface

5.2 Refractor head operate and data display area

Refractor head operate and data display areas are consist of 7 parts, as showing in figure 5.2.

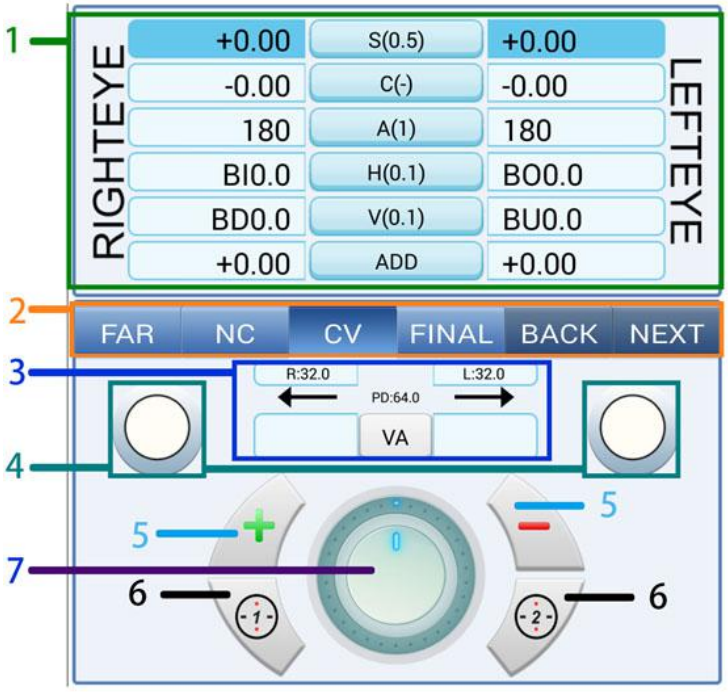


Figure 5.2 **Refractor head operate and data display area division**

1. **Refractor head data display area**
2. Optometry status switching operate area
3. PD and UCVA test area
4. L/R auxiliary lens buttons
5. Optometry items value plus/minus buttons
6. Cross cylinder operate buttons
7. Simulate drive plate

5.2.1 Refractor head data display area

This area realizes three main functions: 1.Auto display the data of the lens of refractor head. 2. Click to select the optometry items. 3. To switch the status and parameter of the optometry items by long press the specified item.

The detailed function block of this area is showing as figure 5.3. If the item changes to blue, for example +0.00, it means the item is selected. If the background is

white,for example 

, it means it's not selected.

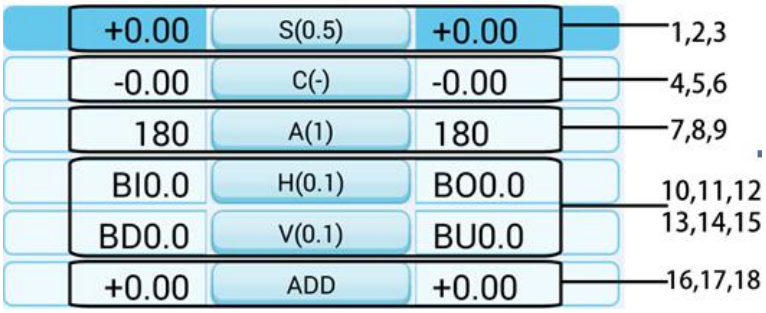


Figure5.3 **Refractor head data display area**

1) Right eye spherical power display area and right eye spherical power test mode select button.

2) Binoculus spherical power test mode select button, display the current step-length of sphere.

3) Left eye spherical power display area and right eye spherical power test mode select button.

*Long press any button of the 1,2,3 for at least one second, the sphere step-length select menu will appear, click to select the needed sphere step-length. Sphere step-length menu is showing in figure 5.4, button functions are as below:

Button display	0.25D	0.5D	1D	3D
Button function	sphere step-length 0.25D	sphere step-length 0.5D	sphere step-length 1D	sphere step-length 3D

Figure 5.4 Sphere step-length menu

4) Right eye cylinder power display area and right eye cylinder power test mode select button.

5) Binoculus cylinder power test mode select button, display the current -/+ mode of cylinder.

6) Left eye cylinder power display area and left eye cylinder power test mode select button.

*Long press any key of the 4,5,6 for at least one second, the cylinder mode select menu will appear, click to switch the cylinder mode. Cylinder mode menu is showing in figure 5.5, button functions are as below:

Button display	-	+
Button function	Negative cylinder mode	Positive cylinder mode

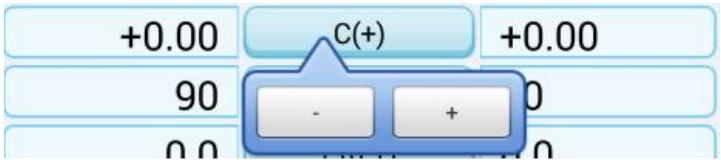


Figure 5.5 cylinder mode menu

7) Right eye axis display area and right eye axis test mode select button.

8) Binoculus axis test mode select button, display the current axis step-length.

9) Left eye axis display area and left eye axis test mode select button.

*Long press any key of the 7,8,9 for at least one second, the axial step and power select menu will appear, click to select the axial step(1°or 5°) or specified axial power （180°/135°/90°/ 45°）. Axial setting menu is showing in figure 5.6, button functions are as below:

Button display	1	5		
Button function	Axial step 1°	Axial step 5°		
Button	180	135	90	45

display				
Button function	Cylinder axial 180°	Cylinder axial 135°	Cylinder axial 90°	Cylinder axial 45°

Figure 5.6 Axial setup menu

10,11,12,13,14,15 is corresponds to prism item, the display mode is different according to rectangular coordinate mode or Polar Coordinates mode as showing in figure 5.7 and 5.8.

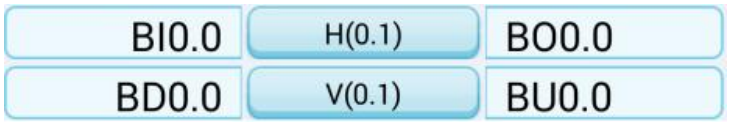


Figure 5.7 Rectangular coordinate mode

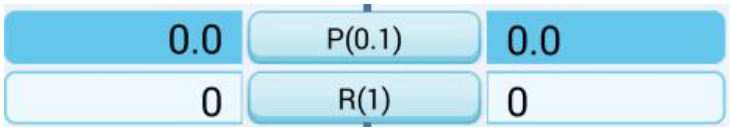


Figure 5.8 Polar Coordinates mode

10) Right eye horizontal prism power display area and horizontal prism test mode select/right eye data display area and test mode select under polar Coordinates mode.

11) Binoculus horizontal prism power test mode select/ test mode select under binoculus polar Coordinates mode, display prism step in corresponding mode.

12) Left eye horizontal prism power display area and horizontal prism test mode select/ left eye data display area and test mode select under polar Coordinates mode.

13) Right eye vertical prism power display area and vertical prism test mode select/ right eye data display area and test mode select under Rectangular coordinate mode.

14) Binoculus vertical prism power test mode select/ test mode select under binoculus rectangular coordinate mode, display the prism step in corresponding mode.

15) Left eye vertical prism power display area and vertical prism test mode select/ left eye data display area and test mode select under Rectangular coordinate mode.

*Long press any key of the 10,11,12,13,14,15 for at least one second, the prism step and mode select menu will appear, click to select the needed prism step（axial 1°or 5°，

0.1△ or 0.5△）. Prism menu is showing in figure 5.9 under Rectangular coordinate mode, button functions are as below:

Button display	0.1	0.5	P-R	0
Button function	Prism step 0.1△	Prism step 0.5△	Switch to **polar Coordinates mode**	Clear

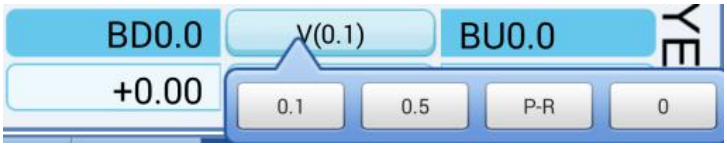


Figure 5.9 Prism menu under Rectangular coordinate mode

Axial test mode setting menu is showing in figure 5.10 under polar Coordinates mode, button functions are as below:

Button display	1	5	X-Y	0
Button function	Prism axial step 1°	Prism axial step 5°	Switch to Rectangular coordinate mode	Clear

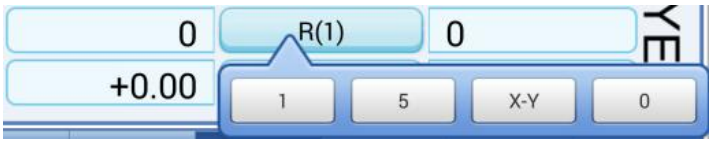


Figure 5.10 Prism axial menu under polar Coordinates mode

Test mode setting menu is showing in figure 5.11 under polar Coordinates mode, button functions are as below:

Button display	0.1	0.5	X-Y	0
Button	Prism step 0.1△	Prism step 0.5△	Switch to	Clear

function			Rectangular coordinate mode	

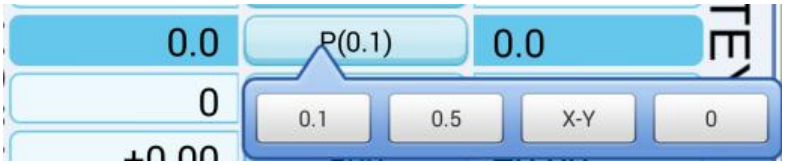


Figure 5.11 Prism menu under polar Coordinates mode

16) Right eye ADD power display area and ADD test mode select

17) Binoculus ADD power test mode select

18) Left eye ADD power display area and ADD test mode select

*ADD step is fixed at 0.25D

5.2.2 Optometry condition switch operating area

This area has 6 buttons, as showing in figure 5.12:

Figure 5.12 Optometry condition switch key

5.2.2.1 Near/far switching buttom

This button realizes two functions: switch the near/far test mode and display current near, far point test mode.

Select the far or near point test mode. Far point test mode will be selected automatic when the data is clear.

Near point test mode display： 

Far point test mode display： 

*If current is far point test mode, when switch to near point test mode, if have not process near point test, it will automatic copy the S+ADD，C，A power of far point test

to the S,C,A power of near point test mode. It will not copy if near point test have been taken.

*If current is far point test mode, when switch to near point test mode, if have not adjust the PD value of near point test mode, the PD value of near point will calculate according the far point PD value. If near point PD value have been adjusted, then it will not related.

* The light will turn on default if switch the far point condition to near point condition, the light could be turn off by long press 

for two seconds if no need near point light,

5.2.2.2 Optometry data area switch button

There are three buttons corresponding with NC, CV and Final switching. The functions are as follow:

NC: Uncorrected visual acuity test mode, in this mode, all lens will withdraw, input VA value.

CV: Callout refractor head data

Final: The final prescription. Cope the data of refractor head to Final, could adjust the final prescription according to demand and experience.

5.2.2.3 Preset-program switch button

The rightmost two buttons are program step switch buttons after load the custom program or standard program. There are two display conditions:

Finish load program condition: 

, with response when clich these two buttons.

Do not load program condition： 

, without response when clich these two buttons.

5.2.3 PD test and NC test area

This area realizes the PD test and input NC data operate. It’s showing in Figure 5.13

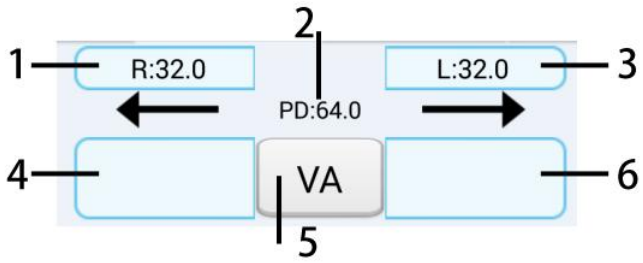


Figure 5.13 PD and NC test area

1. Right eye PD data display and Pd adjust and select button
2. Binoculos PD data display and binoculos Pd adjust and select button
3. Left eye PD data display and Pd adjust and select button

*Cross lens will put in as well as cornea light turn on automatic when click 1,2,3. To turn on /turn off the cornea light by long press button 2.

*It will exit PD test mode automatic as well as withdrwa corss lens when click S,C,A,H,V,P,R,ADD,VA buttons under PD test condition.

4. Right eye VA display and right eye VA input and select button
5. Binoculus VA display and binoculus VA input and select button
6. Left eye VA display and left eye VA input and select button

*When click 4,5,6, it will pop up the select box according to the sight of current vision chart, when click the target sight, the data will copy to corresponding VA data area of this eye. The choice box will not pop up if the currenty vision chart is not belong to general used vision charts.

5.2.4 Right/ Left eye auxiliary lens operate buttons

This area realize the display of current put in auxiliary lens, and auxiliary lens select box callout function.

Click the left and right auxiliary lens operate button, it will pop up the left auxiliary lens select box (Figure 5.14) and right auxiliary lens select box (Figure 5.15) respectively. When click the corresponding auxiliary, the lens will be put in automatic, and will back to the main interface automatic.

*Click anywhere except the auxiliary lens, the select box will disappeared automatic, it as well as the cancel operator of auxiliary lens select.

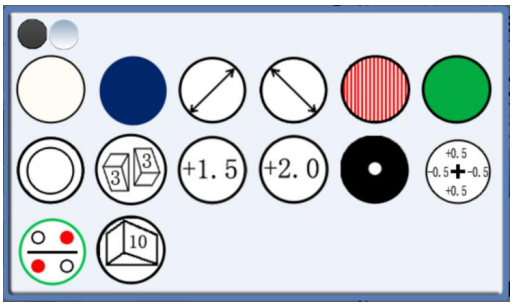


Figure 5.14 Left eye auxiliary lens select box

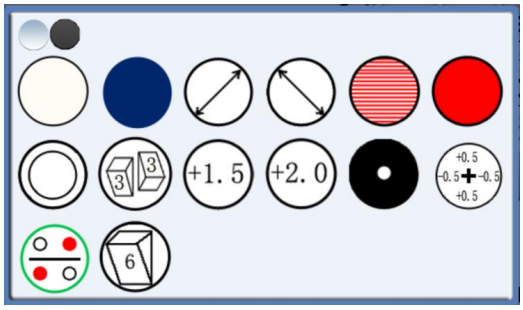


Figure 5.15 Right eye auxiliary lens select box

5.2.5 Optometry item data plus or minus button and simulate plate

 or ratate the plate clockwise：Plus the data of current test item.

 or ratate the plate counterclockwise：Minus the data of current test item.

5.2.6 Crossed cylinders operate button

 ：In the screen of main testing interface, if not insert cross cylinder and under binoculus or right eye test mode, it will cover the left eye automatically, and then insert right cross cylinder, set the dial of right eye testing, and set cross cylinder as side [1] .

In the screen of main testing interface, if not insert cross cylinder and under left eye test mode, it will cover the right eye automatically, and then insert left cross cylinder, set the dial of left eye testing, and set cross cylinder as side [1] .

In the screen of main testing interface, if the cross cylinder insert already, then the cross cylinder will be at side [1] .

 ：In the screen of main testing interface, if not insert cross cylinder and under binoculus or left eye test mode, it will cover the right eye automatically, and then insert left cross cylinder, set the dial of left eye testing, and set cross cylinder as side [1] .

In the screen of main testing interface, if not insert cross cylinder and under right eye test mode, it will cover the left eye automatically, and then insert right cross cylinder, set the dial of right eye testing, and set cross cylinder as side [1] .

In the screen of main testing interface, if the cross cylinder insert already, then the cross cylinder will be at side [2] .

5.3 Monitor chart operate area

This area realizes the management, callout, display of the built-in vision charts and operate of the monitor chart. It is showing in Figure 5.16 and contains 4 parts:

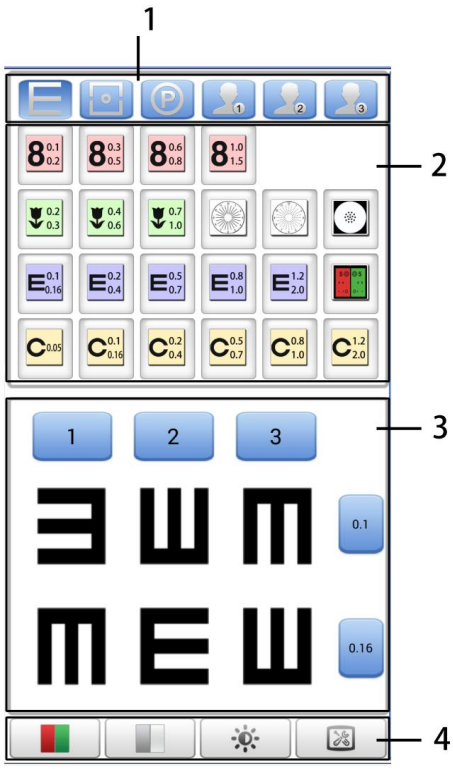


Figure 5.16 Monitor chart operate area

1.vision charts type switch area

2.vision charts select area

3.vision charts display and mask operate area

4. vision charts condition and work mode switch area

5.3.1 Vision chart type switching area

The current visual chart has three types: visual functional examination type, general letter chart type and color blindness type. Six types of key functions in Program is as follows,:

Button	Function
	Choose general letter type chart, through the short press can switch the content of the visual figure in the vision chart selection area.
	Choose general visual function type chart, through the short press can switch the content of the visual figure in the vision chart selection area.
	Choose color blindness type chart, through the short press can switch the content of the visual figure in the vision chart selection area.
	User-defined vision charts 1, through the long press can turn out the user-defined vision atlas 1 editor interface, through the short press can switch to the user custom visual atlas 1
	User-defined vision charts 2, through the long press can turn out the user-defined vision atlas 2 editor interface, through the short press can switch to the user custom visual atlas 2
	User-defined vision charts 3, through the long press can turn out the user-defined vision atlas 3 editor interface, through the short press can switch to the user custom visual atlas 3

*  The icon style shows the currently selected type  The icon style show that the type is not selected

* All kinds of corresponding vision atlas content see 5.3.2.

* User-defined vision chart editor interface see 5.3.5.

5.3.2 Vision chart selection area

Vision chart choose area, a page at most shows 24 thumbnail images of vision chart,

by clicking on the thumbnail, automatically control LCD chart display the specified vision chart, and control the refractor head switch to the corresponding state .

* User-defined chart atlas 1, 2, 3 is including in 24 figures, can complete display in one page. Color-blind figure, general letter and visual function check types need more pages to display, such as 5.3.1 described, through the short press can realize content switch, also can realize the flip over switch by horizontal stroke screen operation in vision chart select area.

* Specific type corresponding vision in atlas content is describe in 5.3.5

* Long press the binocular visual function chart , will show the vision chart simple instructions on the vision chart display area.

5.3.3 Vision chart display and occlusion operation area

Vision chart display area has two types, corresponding the general letter vision chart and general visual function test vision chart respectively. For example, figure 5.17 is a general letter vision chart, figure 5.18 is a general visual function test figure.

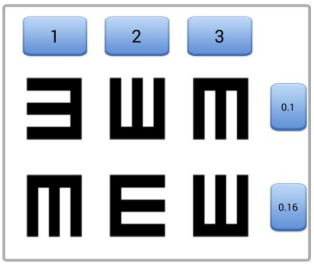


Figure5.17 general letter vision chart

* General letter type, according to the chart 5.17, for example, with the blue button 1, 2, 3, by clicking on, can realize single block or cancel block. Button marked with 0.1, 0.16, shows the sight values of this line, by clicking on, can realize single block or cancel a single block.

* Directly click on the specified chart, can realize single letter block or cancel a single letter block.

* When vision chart under block condition, swiping the screen on the vision chart display area for horizontal and vertical operation, can realize the block up, down, left, right four

directions of movement.

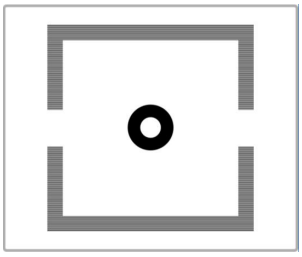


Figure 5.18 general visual function test vision chart

* General visual function check vision chart display，see 5.18 for example.

5.3.4 Vision chart state and vision chart working mode switching area

The toolbar to realize the function as shown below：

button	Realize the function
	Realize genera letter enter into/exit red and green contrast mode
	Realize the vision chart inverted mode switching function
	Can make general letter and Logmar table contrast mode
	Proceed LCD Monitor chart working mode setting

5.3.5 User-defined vision atlas editing interface

Through long press user-defined atlas, will enter to the user-defined instance atlas editing interface.This interface is made up of four parts altogether, as shown in figure 5.19

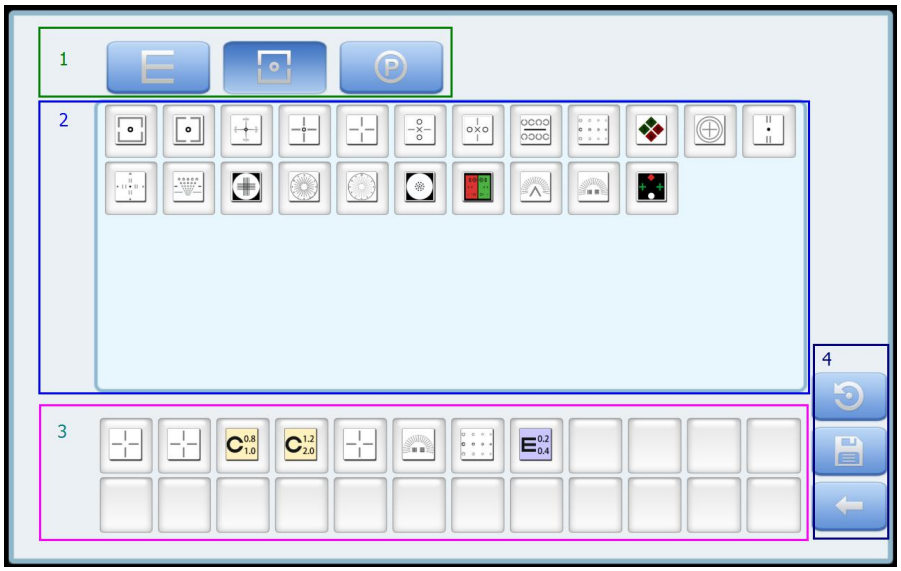


Figure 5.19 user-defined instance atlas editing interface

1.Built in vision chart type switch button area

2. Built-in vision chart display area

3. User-defined vision chart display area

4.funcitonal button area

5.3.5.1 Built-in vision chart type switch button area

The definition of the button type is consistent in 5.3.1. Click on the button, will display the corresponding all vision chart in the built-in vision chart area.

5.3.5.2 Built-in vision chart display area

Show all the built-in vision charts of the specified type. There are three types: the current general letter vision chart, visual function test vision chart and color blindness charts. Specific content as shown in figure 5.20 ,5.21and 5.22：

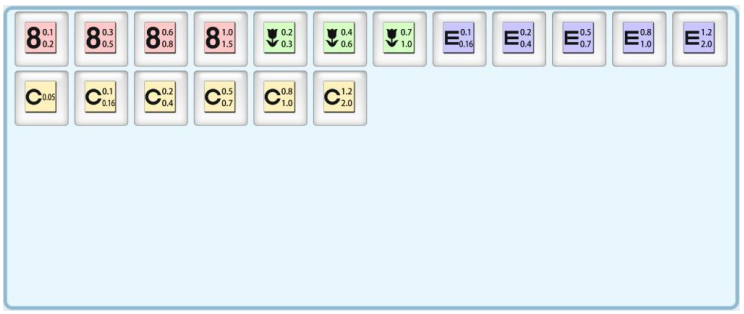


Figure 5.20 General letter vision chart

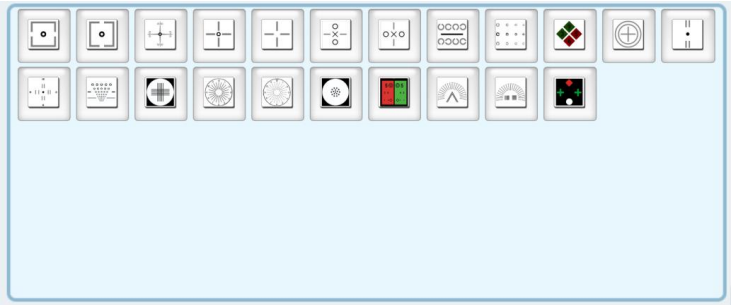


Figure 5.21 visual function testing vision chart

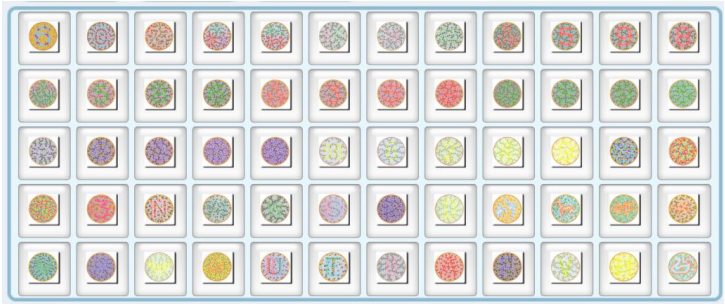


Figure 5.22 color blindness chart

5.3.5.3 User-defined vision chart display area

Show the content of current edit user custom atlas

A single user-defined atlas can accommodate 24 vision charts.

5.3.5.4 Function button area

Key functions are described as below:

Button icon	Funcitonal description
	Reload button. Don’t save the current state of editing, reload the last saved edit status.
	Save the edit button. To save the current edit content to user-defined atlas, will cover the previous user-defined atlas.
	Exit the edit button. Don’t save the current state of editing, directly back to the main measurement interface.

5.3.5.5 Add new vision chart to user-defined atlas

Add one or more new vision charts to define atlas, or replace with a new vision chart instead of original vision figure, need to make the following three steps:

1. If add the needed vision charts in the built-in visual figure display area, to drag into the user-define display area, cannot release in the process .Can see a small chart move with finger, display content is the new vision chart which need to added.
2. Drag the vision chart to the specified location of user-defined visual figure shows area. If moved to the location can be placed, will display a larger vision chart in the upper left corner. Placed in empty vision chart position, it means add in the empty position. If placed in the vision chart already exist, then it will replace with new vision chart instead of original vision chart.
3. Click the edit button to save.

5.3.5.6 Delete the original user-defined atlas vision charts

Remove specified visual figure from the original user-defined images, need to make the following two steps operation:

1. Press on the figure which needs to delete in the user-defined vision chart display area for 2 seconds, the specified vision chart will become empty state.
2. Click the edit button to save.

5.4 The system state and menu area

Button in this area has realized the basic function of initialize program loading, the user information loading, equipment connection, printing, the system Settings. Keys function is briefly described as follows:

Button	Functional description

	Customer information management key. Showing the customer information loading condition, and customer management module callout function.
	User-defined program management key. Display user-defined program loading state, and the user-defined program callout function, user-defined editing functions.
	The refractor head management button. Show the connection state of refractor head, and refractor head management interface callout function.
	LCD Monitor chart management keys. Showing the connection state of monitor chart and monitor chart management interface callout function.
	Auto refractometer management keys. Display auto refractometer connection status, management interface and data browsing interface callout function.
	Lensmeter management keys. Display lensmeter connection status, management interface and the data browsing interface callout function.
	The printer management keys. Display the connection state, the management interface and print data browsing interface callout functions.
	Quick reset button . Rapid reset the measurement interface data, fast reset of the refractor head function.
	System Settings button. Callout the system parameter setting interface.

5.4.1 The use of customer information management module

Customer information management button has two display status：

Display status	Status description
	Customer information not loaded, click the button, will enter into the customer information loading confirm interface, confirm the new user

	registration or the old users searching.
	Customer information loaded, if click the button, will directly enter into the current loaded customer information page.

5.4.1.1 New user registration

Click on the customer information management button, as shown in figure 5.23 interface:

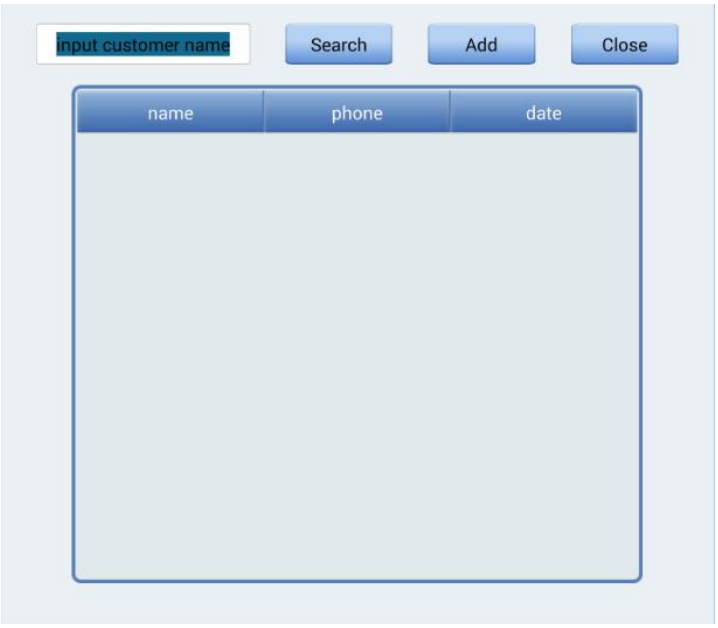


Figure 5.23 the initial interface of customer management

Click on the [Add] button. Switch to the new customer information input interface, as shown in figure 5.24 interface:

Figure 5.24 Customer information input interface

Customer name and phone number should be fill in, other content is optional, can be modified in the future. After confirmed, click on the [confirm] button, if the construction of the new customer profiles successfully filed, it will jump directly to the customer optometry history interface as shown in figure 5.25:

Figure 5.25 customer optometry history interface

Under this interface, it will display the current client's name, phone number and optometry historical information. The history list as below is briefly shows the final prescription for the power of sphere and cylinder and the corresponding date.

5.4.1.2 The modification of the basic information of the registered users

Click on [modify] button in figure 5.25, will callout the interface as shown in figure 5.24.

Resume load the customer information need to modify and click on the confirm button, it will update the basic information of the customer.

5.4.1.3 The exit of the registered users

Click on the[login out] button in figure 5.25 ,will exit the current loaded customers and return to the initial interface as shown in figure 5.23.

5.4.1.4 Registered customer enquiries and loading

If the current client loaded, click login out to return to the interface as shown in figure 5.23. If no current customers loaded, click on the user management key, to enter into the interface is shown in figure 5.23.

Input the customer's name (or last name) in the textbox in figure 5.23 and click search. For example two customers have registered "Lucy" and "Linda", only need to input “L” in the textbox, When click search, the list will show all the name with "L" + XX (for one or more words) combination of the customer, as shown in figure 5.26:

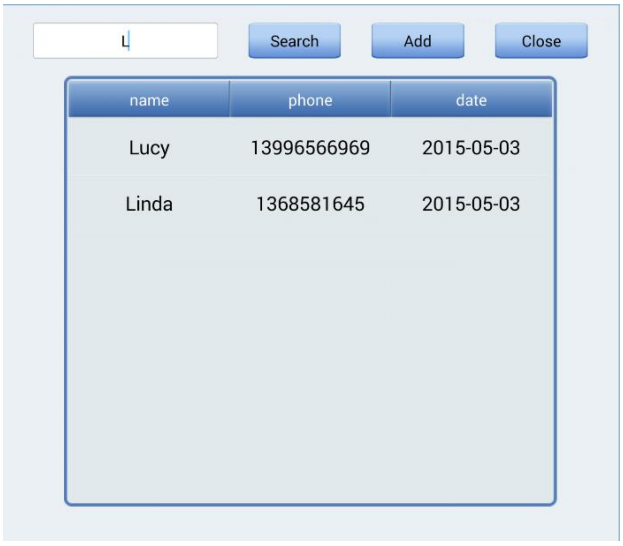


Figure 5.26 Search the customer results

If we need to load current customer is the "Lucy", directly click on the list of Lucy, it will automatic loading this customers, and jump to a customer optometry history is shown in figure 5.25 interface

5.4.1.5 Customer optometry historical data loading

Under customer optometry historical display as shown in figure 5.25, if have content in the list below, It means the historical optometry data is exist, according to the date display, select the optometry history data and click once, it will jump out optometry data of the specified user and the specified date interface, as shown in figure 5.27:

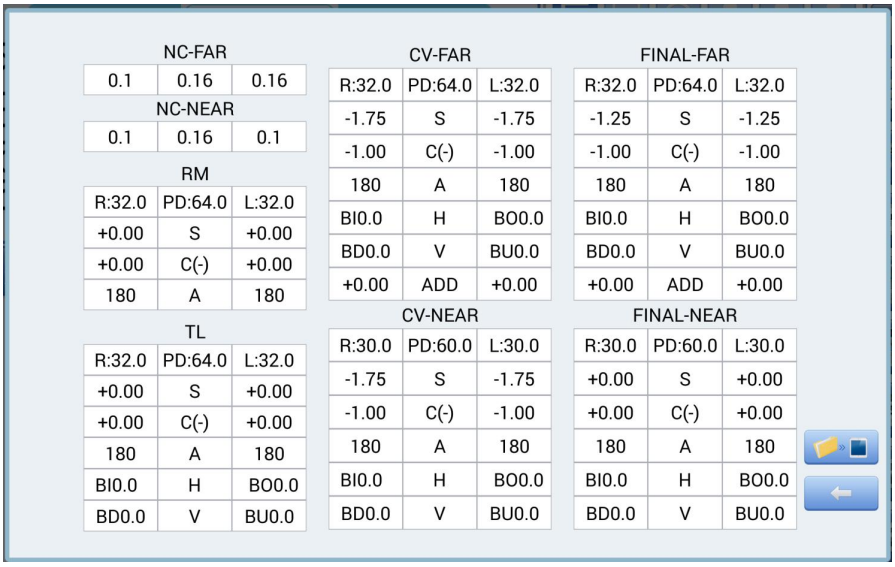


Figure 5.27 Customer optometry history list

The interfaces in detail show the naked eye, Auto ref-keratometer data, lensmeter data, refractor head data and finally prescription records.

 Corresponding function: read the display data from the file, and loaded into the current measuring interface

 Corresponding function: not load data, returns to the historical records list to reselect.

5.4.2 The use of custom program module

Custom program management button has two display statuses:

Display status	Status description
	Custom procedure not load, click on the button, will enter into custom program choose interface. Long press button for 2 seconds, will enter

	the custom program editing interface.
	Custom procedure loaded, click on the button, will enter into custom program choose interface. Long press button for 2 seconds, will enter into the custom program editing interface.

5.4.2.1 Custom program selection interface

There is one default standard procedures and six user-defined procedures in the program. Selection interface loaded in user-defined program as shown in figure 5.28, click on the corresponding button to load the corresponding preset program.

Figure 5.28 Preset program selection interface

5.4.2.2 Custom program editing interface

Custom program editing interface as shown in figure 5.29:

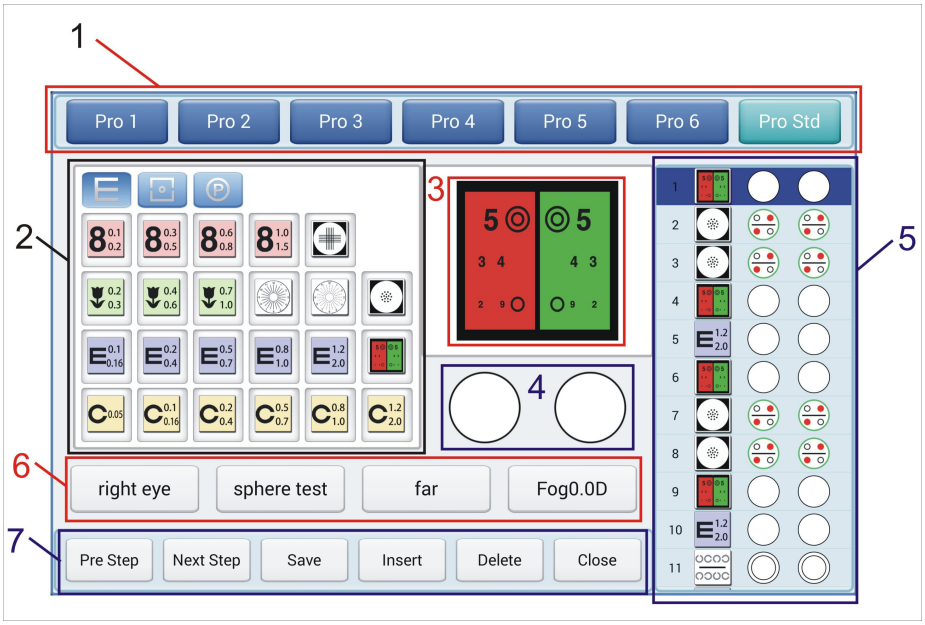


Figure 5.29 custom program editing interface

1. The program selection key area
2. The vision chart selection area
3. The currently selected vision chart display area
4. The auxiliary lens operation area
5. The single step program list
6. The optometry options area
7. The basic function menu area

5.4.2.2.1 Program selection button area

Clicking to select target edit program. The standard procedure is protected and cannot be edited.

5.4.2.2.2 The vision chart selection area

It is consistent with the vision chart selection area of 5.3.1. Do not keep three user-defined vision atlas, click on the specified vision chart in 3 (The currently selected vision chart display area) and insert the specified vision chart, shows the default auxiliary lenses in 4 (auxiliary lens operation area), update the contents of 6 (optometry options area) to the default optometry options of this vision chart.

5.4.2.2.3 The currently selected vision chart display area

Display the current step selected vision chart

5.4.2.2.4 The auxiliary lens operation area

Display the current step auxiliary lenses. The same use with 5.2.4 right/left eye auxiliary lens buttons.

5.4.2.2.5 Single step program list

Display the current selected program step list. There is the step number, vision chart selection and left/right eye auxiliary lens selection in display content .Currently selected steps will become dark blue background, steps which not selected is light blue.

Click on the specified steps, will automatically load the specified steps vision chart, auxiliary lenses and optometry options.

The steps of the current single program better no more than 32 steps. Too long may seriously reduce the applicability of the custom procedures.

5.4.2.2.6 The optometry selection area

The area is used to control the basic condition of refractor head in the process of the optometry. Buttons from left to right is content：

Seriel No.	Function description	Control content
1	Specify measuring eye	Right eye, left eye, left first than right, binoculus
2	Specify the measuring item	Sphere, cylinder, axis, Horizontal prisms, vertical prism
3	Specify near/far state	Near ,far
4	Specify additional	0.0D-2.0D, 0.25D/step

	fog degree	

5.4.2.2.7 The basic function menu area

Implement save, delete, insert and steps of switching and exit and other operations in the process of program editing. Buttons from left to right function is described below:

Button display	Operation content
Pre step	Save the current page changes, and return to previous page content, update the list of steps
Next step	Save the current page changes, and display the content of next step, update the list of steps
save	Save the current page modify settings, update step list
insert	To save the current page content, as a new step into the next step, update step list
delete	Delete the current step, display the next step, update step list
Close	Dot save the current page changes, exit the program editing interface

5.4.2.2.8 Establishing custom optometry program

The function of the custom optometry program block is introduced in the previous details. Next we will illustrate the specific steps of last optometry case.

For example, in the process of accurate measurment on cylinder, will use Cross Cylinder and fog, we can set as following：

First choose point cloud icon, click on the specified measuring project button, switch to the "cylinder", In general, the cloud point figure insert automatically join with crossed cylindrical lens, if you are not careful operation to cancel it by mistake, you can insert again cloud point figure, and it will automatically to join. Click to specify additional fog cloud button to add a certain value, the final screen display as shown in figure 5.30:

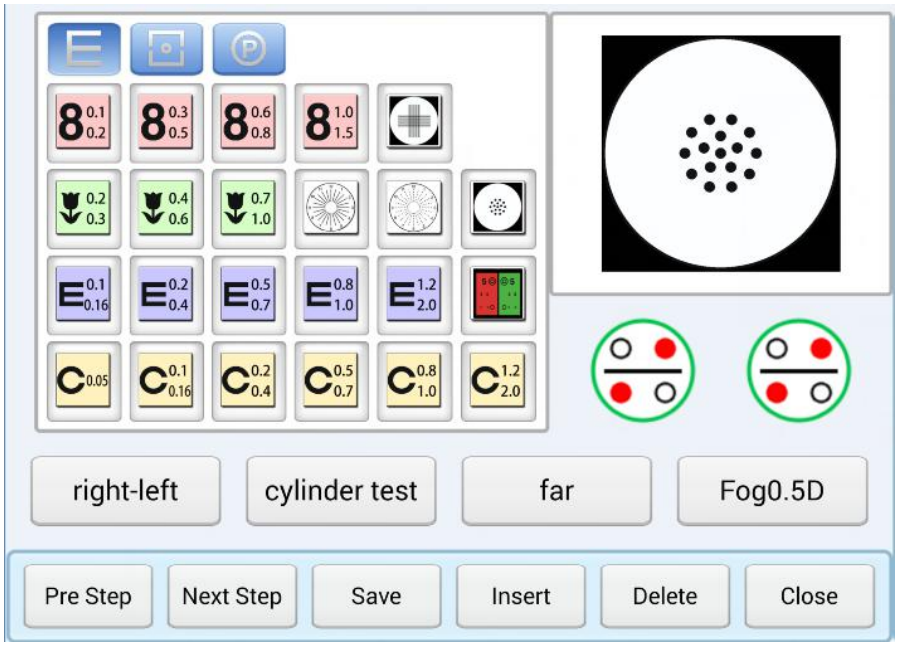


Figure 5.30 Insert point cloud figure in custom edit program

In the process of measuring heterophoria with Maddox, it can be set like this.

First select point light source, then click the right eye auxiliary lens operation button, will appear the auxiliary lens selection interface in figure 5.31:

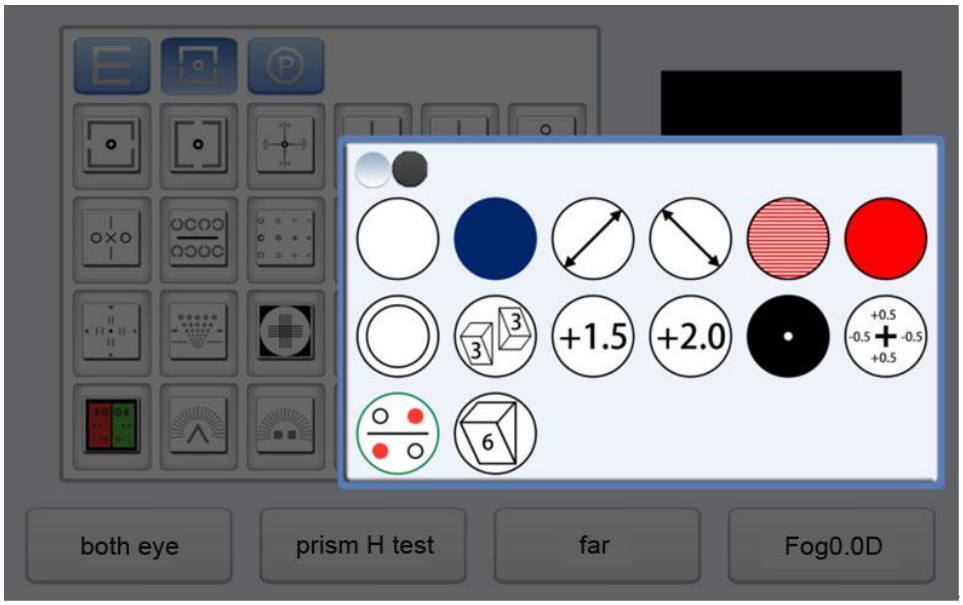


Figure 5.31 choose horizontal Maddox

Click  , will automatically return to the program editor interface, set the test project as " horizontal prism", measured the eye as the "binoculus ".The final screen display as shown in figure 5.32：

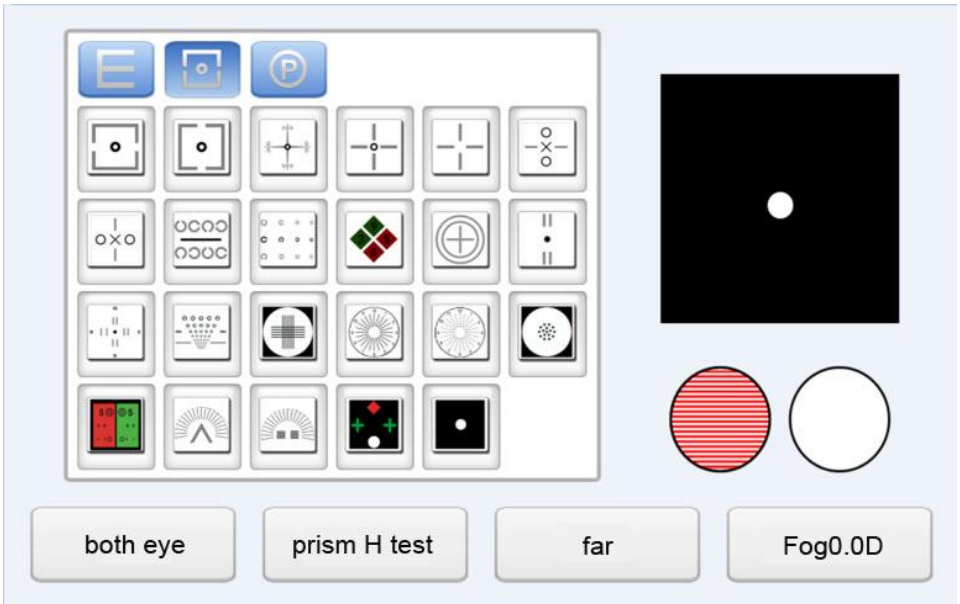


Figure 5.32 Heterophoria test program editing interface

Similarly, optometrists can be input every optometry steps in the program, if use the program next time, can call out the preset program selection menu inside the main testing interface, select the corresponding procedure.

In the process of program operation, performed each optometry steps, click NEXT button，The instrument will automatically perform the next program (click BACK can return to the previous optometry step) set projection icon or select auxiliary lenses will greatly improve the efficiency.

5.4.3 External connection equipment management

Refractor head, Auto refractometer, Monitor Chart, printer, lensmeter are communicated by wireless Bluetooth. Button state is described below

Button	Connect	Not connect	New data
Refractor head management			no

Monitor chart management			no
Auto Refractometer management			
Lensmeter management			
Printer management			no

Keys operation is described below:

Button	Long press	Short press
Refractor head management	The refractor head connection interface	no
Monitor chart management	Monitor chart connection interface	no
Auto refractometer management	Auto refractoemeter connection interface	Auto refractoemeter data preview
Lensmeter management	none	none
Printer management	printer connection interface	Printer data preview and printer operation interface

5.4.3.1 Equipment connection

The operation way of Optometry head, chart monitor, lensmeter printer and refractometer is the same. Next make the optometry head device as an example, introduces the connection status and the equipment connection operation.

Long press the refractor head management keys for 2 seconds, turn out the refractor

head connection management interface, as shown in figure 5.33:

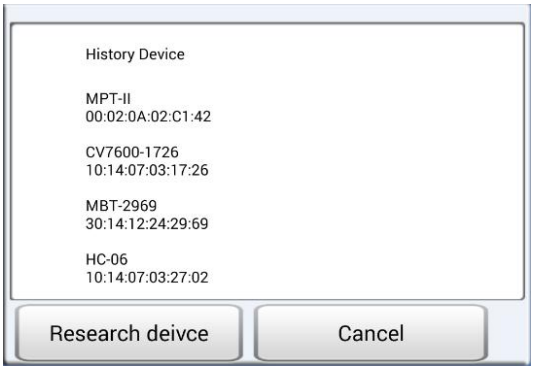


Figure 5.33 refractor head connection management interface

Device list is divided into two parts, one is the current established head connected, the other part is the equipment record which has set up a connection records with control site before (No matter whether these devices are real), is referred to as the device history.

The current connection has been established, will show optometry icon  to identify. When the connection has been established, click on the equipment records in any of the records, whether to disconnect, as shown in figure 5.34:

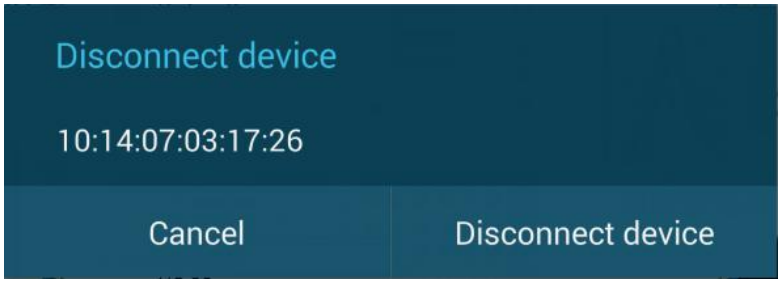


Figure 5.34 disconnect dialog box

If the current device not connected, click on the equipment records in any of the records, it will reminder whether to connect, as shown in figure 5.35:

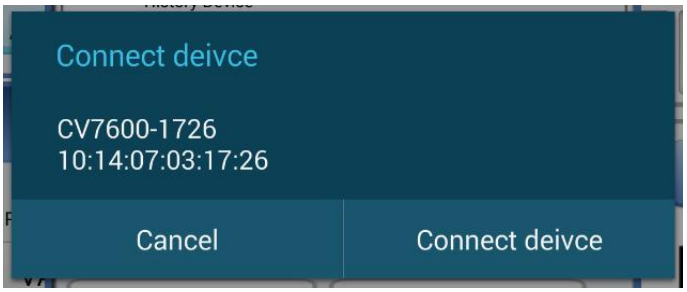


Figure 5.35connect dialog box

Click [connected devices], will automatically return to the main interface, connection work with refractor head will be carried out in the background, when

the connection is successful, the refractor head management buttons in the right menu will switch to connected state.

5.4.3.2 Auto refractometer data browsing and transmit

After the success connection with auto refractometer by Bluetooth, control site will monitor message from the auto refractometer. When the auto refractometer has the optometry data transfer action, the control site will remind the user by changing control button of auto refractometer .

Short click the auto refractometer management button will turn out the auto refractometer data browsing and operation interface, by clicking  can fast loading auto refractometer data to refractor head. As shown in figure 5.36:

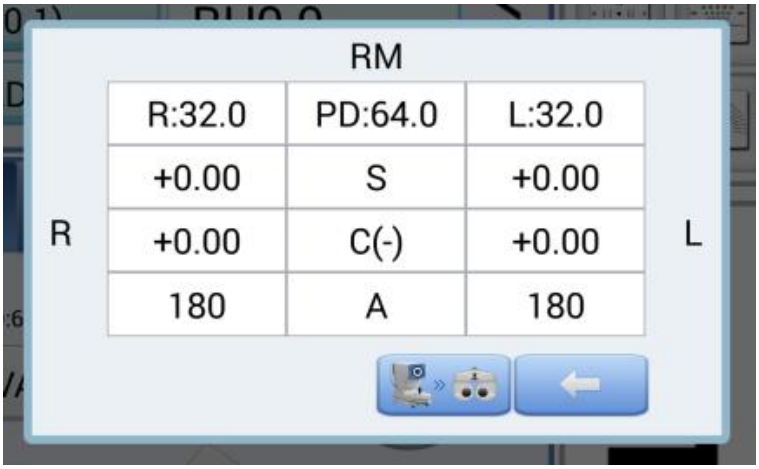


Figure 5.36 auto refractometer data browsing interface

 ：loading auto refractometer data to refractor head

 ：Close the interface, not load data, to return to the interface of measurement

5.4.3.3 Print data preview and printer operation

Short click the printer management button will turn out the print preview and print operation interface.As shown in figure 5.37.

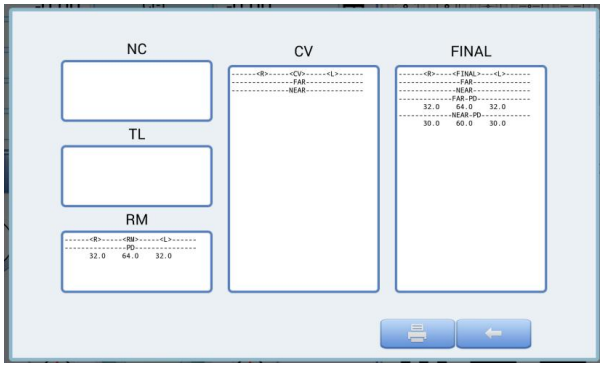


Figure 5.37 print preview interface

It is divided into five parts according to the optometry item. Each part can be custom to add t print function or not .Just click the specified print part, will change whether to join the print. As shown in figure 5.37, the five parts of the content is selected to print, if do not need CV data, then click the print content of CV can remove it. The results are shown in figure 5.38:

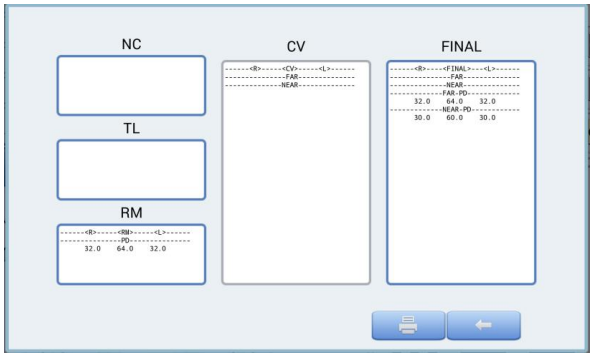


Figure 5.38 cancel CV data printing

Contrast figure 5.37 and figure 5.38, the color of the wire frame on behalf of its whether to print

 ：For printing operations, if any customer information load, to save the current optometry data to the corresponding customer files at the same time.

 ：Not for printing, directly back to the main interface.

5.5 Fast reset and basic Settings

Click reset button will pop up prompt box as shown in figure 5.39:

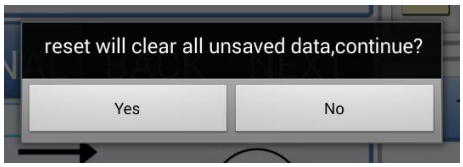


Figure 5.39 reset dialog box

Fast reset function will empty the current naked eye, auto refracotmeter, refractor head and print data. General suggest printing operations, first to save data to the customer file, and reset in the end.

When device is in abnormal status, for example, refractor head chuck or dislocation, you can try to reset in reset state.

Click the system settings button, will turn out the basic attribute setting of the system. Including related to measuring step set, the relevant content of output printing and the program default load after reset and so on. As shown in figure 5.4.

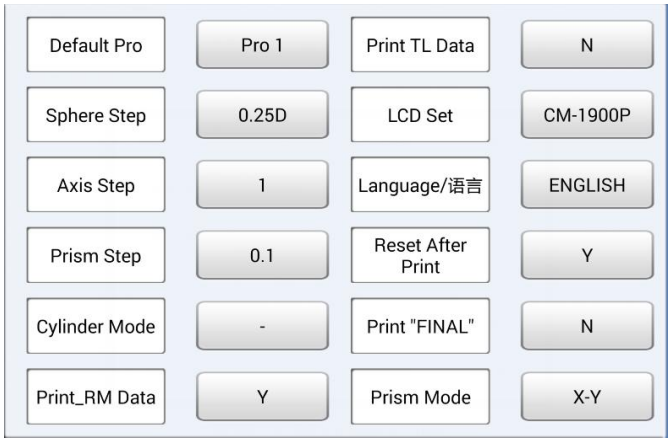


Figure 5.40 system Settings menu

5.5.1 Change the system Settings

For example, to change the default sphere lens step length from 0.25 D to 0.5 D:

Click [sphere step] button on the right, the menu will pop up as shown in figure 5.41, directly click [0.5 D] button, the default sphere lens step length is changed to 0.5 D

Figure 5.41 sphere step length selection menu

6. Instrument operation

This section will combine a specific case, demonstrates the use of conventional optometry.

A customer wearing glasses, always complain of poor vision

first check his original eyeglasses with lensmeter

R：-1.00DS/-0.50DC X 90°

L：-1.25DS/0-0.50DC X 180°

PD=65mm

Vision correction only about 0.7, may be the original degree is not enough lead to poor vision, now is required to draw a better glasses prescription

6.1 Checking with fog

1、sphere power of Right eye manual set in higher + 3.00 D than the real power. Because the right eye of the customer is -1.00 D, plus + 3.00 D, become + 2.00 D.

2、At this time, the vision value should be lower than 0.1, manual cast a vision icon, and then gradually adjust the degree, to reduce the sphere for - 0.25 D one step, from +2.00D to + 1.75 D and then to + 1.50 D, until his vision value about 0.5.

3、turn out radiation vision chart:

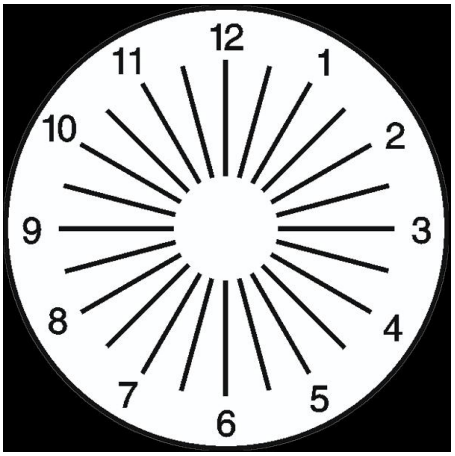


Figure 6.1 radiation vision chart

Ask the customer "can you see some of the line particularly clear?”

If the customer answers "all look the same," it shows this custom have no astigmatism, measuring end.

If the customer answer “one line seems particularly clear "", then multiply small number of the most clear line by 30 °, the value is negative correction .

For example: The third line is the most clear, it is 3X30°=90°

Adjust astigmatism axis, and then adjust the astigmatism degree, from 0.00 to -0.25, then to -0.50, until every line is clear all the same.

4、change sphere degree by -0.25D one step

The customer has myopia, the sphere degree of -1.75 D, after inspection, his degree value as shown in figure 6.2:

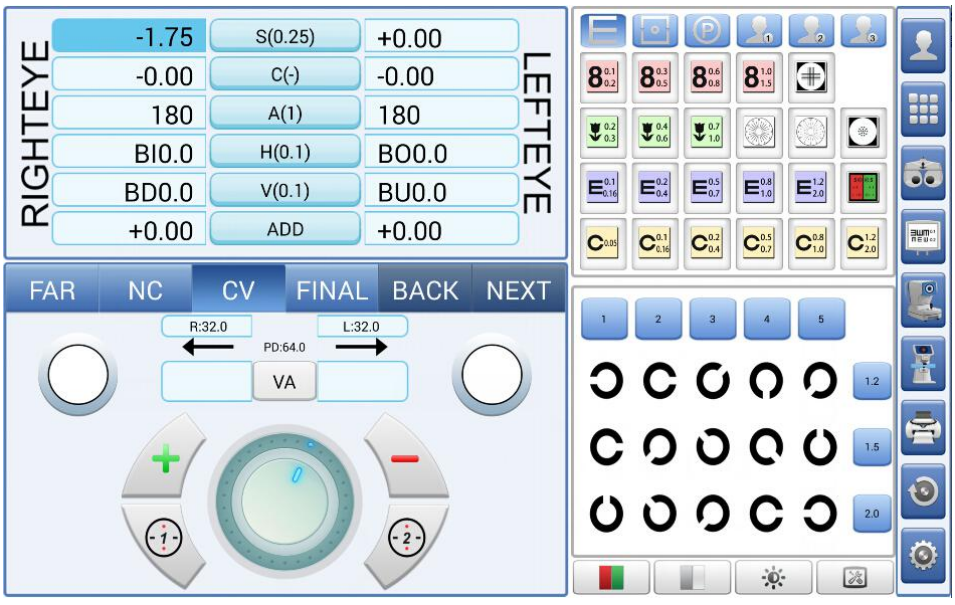


Figure 6.2 Customer vision inspection situation

6.2 Precise inspection astigmatism axis and degree

1. Manual option dot chart, crossed cylinder lens automatically applied in the right eye. Or from the auxiliary lens take crossed cylinder lens to be supplemented single chart, or direct click  or  to input the crossed cylinder lens. Automatically jump to A, first take the precise measurement of the astigmatism axis position.

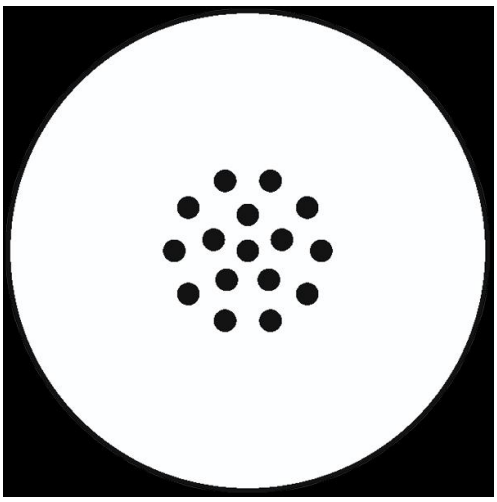
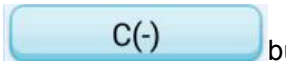


Figure 6.3 dot group vision chart

2. Precise astigmatism axis: click  or  button, to switching cross cylinder on both sides, ask customer which side is more clear, for example, if  is more clear, it should to click the upward button  , if  is more clear, it should to click the upward button  , device will automatically change the astigmatism axis. After then press  and  repeat the aboved steps, until the both sides is similar clear then definite the precise astigmatism axis.

3. Precise astigmatism degree： after precise astigmatism axis then click 

button to make precision of astigmatism degree（crossed cylinder

lens status shall be maintained）. Click  or  to change the two sides of crossed cylinder lens, ask customer which side is more clear. if  is more clear, it should to click the upward button  ， if  is more clear, it should to click the upward button  , the device will automatically change the astigmatism degree. After then click  and  repeat the above steps, until the both sides is similar clear then definite the precise astigmatism degree. under the condition of changes astigmatism degree, device can automatically change sphere and cylinder linkage. It means： If cynlinder change ±0.50DC， sphere will automatically change±0.25DS.

The result is ：-0.50DC×100°

4. After the accurate measurement of astigmatism axis and astigmatism degree, click any of the chart or  , the crossed cylinder lens will automatically removed.

6.3 Accurately measure sphere degree if there is a deviation

（Test with red and green filter, if a customer shall not apply to the red and green test can determine whether there is deviation according to the vision situation directly）

Project red and green chart  ，ask the customer which chart is the more clear，if the customer says green is more clear, it means that myopia is overcorrection, should add sphere degree+0.25D。or directly enter the green button  ， device can automatically add the degree.

Then ask the customer again, if he says red is more clear, it means that myopia is undercorection，add-0.25D，or directly enter the red button  ，device can

automatically decrease the degree. It indicates that the degree of customers should be between-1.50D and -1.75D, according to the requirement of the customer to choose high or low power. Screen will display like this:

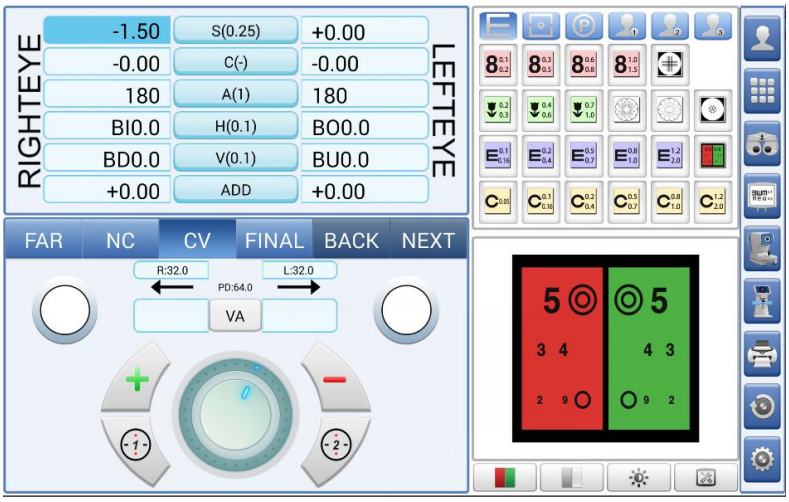


Figure 6.4 Precise measurement sphere size interface

Conclusion：right eye： -1.50DS/-0.50DC×100°

Next，check left eye. Cover the right eye, left eye cancel to cover. With the samestep as the right eye, the result is： -2.00DS/0.50DC×170°

In order to make the customers obtain the better eyesight condition, we need to do binocular balance test.

6.4 Binocular balance test

（Test with polarization separation chart, also can according to need to use single chart match up with prism to do balance test）

1. Project binocular picture, as shown in figure 6.5

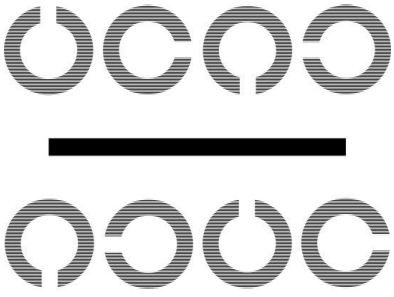


Figure 6.5 Binocular balance test chart

2. Customer look at the upper of the picture with right eye, see the lower of the picture with the left eye. If it is same clear or fuzzy with the two lines, it means that binocular vision is balance. if not，add sphere +0.25D on the eye which can see more clear，supposed left eye add +0.25D，it will become -1.75DS.
3. Next, select the binocular mode, do binocular fog, add +1.00D sphere for both eyes on the basis of the data measured before.

   At this time, the lens degree of this customer is:

   Right eye： -0.50DS/-0.50DC×100°

   Left eye： -0.75DS/-0.50DC×170°
4. Add -0.25D for both eye every time，Until reach to the desire vision value.
5. cancel binocular cover. And the final display is as below:

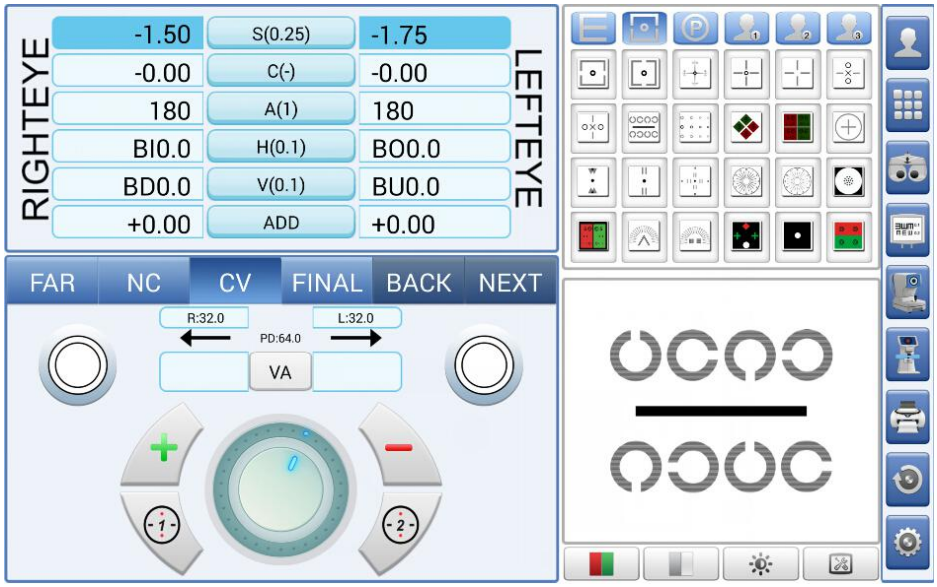


Figure **6.6** binocular balance test final display

Right eye： -1.50DS/-0.50DC×100°

Left eye： -1.75DS/-0.50DC×170°

6.5 Heterophoria measurement

First test horizontal heterophoria, select binocular mode, use the right eye lens option buttons, add red Maddox on the right eye.

Projector dot chart, the customer see one red vertical line（42a）with right eye，see a lighting point with left eye（42b）。Blending image of both eyes shown as the picture 42c or 42d. If the picture is shown like 42d，There is no or low strabismus with melt image by itself , no need to adjust prism degree. If it shown as in picture 42c, use left prism degree button BI or BO, move left and right lighting point, remind the customer, if see the picture as shown in 42d then means stop, repeatedly measured to get an average value.

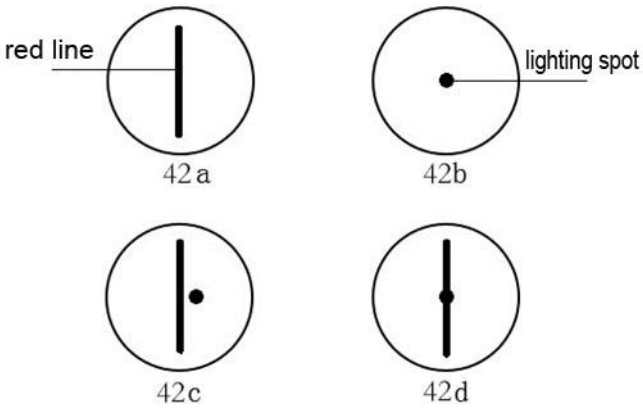


Figure 6.6 Heterophoria measurement process diagram

Next to test the vertical heterophoria. Select binocular mode, use the left eye lens option buttons, add red Maddox on the left eye, cancel the cover with right eye.

the customer see one red horizontal line with left eye，see a lighting point with right eye. ,use right prism degree button BU or BD, move left and right lighting point, remind the customer, when see horizontal line and lighting point then stop measure, repeatedly measured to get an average value

Until now, the result is coming out.

If the heterophoria degree is bigger, it needs to make correction when fitting glasses. in this case the customer is not very serious, so no need to correct, the final result is:

Right eye： -1.50DS/-0.50DC×100°

Left eye： -1.75DS/-0.50DC×170°

7. Printer using

7.1 Basic function of the printer

7.1.1 Turn on

Under printer shutdown state, press [POWER] for one second, the printer will start to work, the power light (red) turn on.

Attention: If the paper indicator light (blue) of printer is flashing but paper is enough, it means the power of the printer will use up, please change the battery or charging.

7.1.2 Shutdown

Under printer work state, press [POWER] for one second, printer turn off and all lights turn off.

7.1.3 Self-inspection

When customer found the printer abnormal working, can perform self-test of th e printer and checking the current settings and state.

Shutdown and keep pressing [FEED], then press [POWER] to turn on, when h ear the sound drops ”DI”, release the [POWER], the printer will print the self-test p aper, including the current situation of the printer, printer setup, the printer examp le, such as electronic quantities detection, Bluetooth ID etc.

7.1.4 Battery Charging

After the printer used for a period, the battery will run down ,when the battery close to use up ,the sending paper indicator light (blue) will flash and with a alarm sound at the same time, the customer need to prepare charging .If the printer auto shut off during the printing, customer need to charge before continue using.

Insert the charge plug to 220 V,50 HZ power socket first , than put charge plug to printer DC socket, the printer will in charge state .During the charging, if printer working, the paper indicator light (blue) is flashing ,till the battery power full, charge indicator light is on for a long time. In the process of charging, can normal use the printer.

7.2 Printing mode

After Printer startup, search the printer by program on the tablet, select the corresponding printer to connect, if it is the first time to connection, you need to enter the password "0000", generally within 10 seconds, the connection is successfully established. If the connection failed to establish within 10 seconds, check that the Bluetooth on the tablet is on or not, try to connect it again.

7.3 Printer indicator and buzzer signal introduction

Power light（red）	paper indicator light (blue)	state	buzzer
Put out	Quick flashing	Battery low	
Put out	Quick flashing	charging	
Put out	On for a long time	Battery charging finished	
Long on turn to slow flashing	Put out	Start state	Bleat 2 sounds
slow flashing	slow flashing	Paper lack	
slow flashing	Put out	No data state	
Put out	Put out	Shut down	Bleat 2 sounds
On for a long time	Put out	Bluetooth connection state	

8. Self diagnosis and maintenance

8.1 Troubleshooting

When the CV - 7600 is working abnormal, please try to troubleshoot according to the following form.

symptom	treatment
When the switch is in the on position, the head without any response	·Confirm the power plug in the socket ·Confirm the power switch is open on the table
The tablet could not be opened	·Confirm whether the tablet battery running

	down of battery
The printer could not be opened	· Confirm the printer battery running down of battery
Printing function no response	·Please replace the printing paper ·Confirm the printing paper installed correctly

If there is no troubleshooting way according to the inside of the form, please contact the dealer.

8.2 Clean and disinfect

Cleaning：

1. Keep products clean ordinary, cannot use strong volatile solvent, diluent and benzene to clean.
2. With a soft cloth dipped in soapy water which after dry to wipe the product part.
3. Wipe the lenses and mirrors, blowing off foreign object on the surface, then with a soft dry cloth to wipe.

Window cleaning: When fingerprint, oil of eyelashes or dust is sticky on the inspection window, accuracy of result will be influenced. Make sure that the inspection window is clean before inspection. If there has stain, please using soft and clean cloth to clean it. Before each test, must make the Windows clean. If Windows have besmirch, with a clean soft cloth to clean.

If there is water vapor condensation, please unload the mask, then unload the protection glass, clean it carefully. When unloading the protecting glass you have to use special screwdriver to unfix four screws.

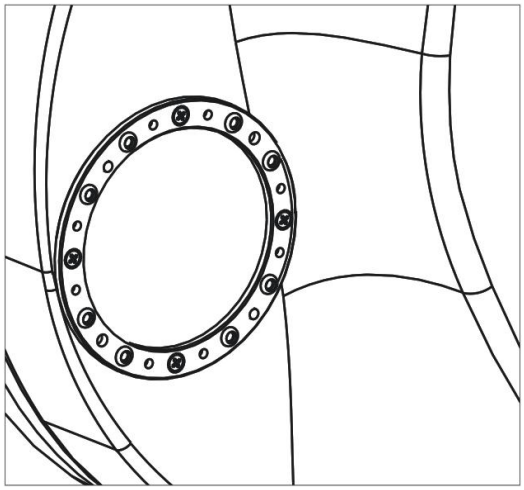


Figure 8.1

Disinfect：

After the completion of each patient, please disinfect face shields and forehead.

Methods: with a soft cloth dipped in 75% concentration of medical alcohol to wipe,

8.3 Scrapping

Discarded products, accessories and spare parts, in accordance with the local government about accessories and spare parts discarded laws and regulations and recycle relevant laws and regulations, especially lithium battery can cause pollution to the environment.

When discarded packaging materials, should also be in accordance with the local government of relevant laws and regulations about packing material waste or recycling laws and regulations.

9. Dimensions and other specifications

9.1 Appearance specifications, contraindicati

·Appearance specifications

Main machine	365mm×280mm×110mm(PD=64mm)	net weight3.8kg
tablet	243mm×171mm×8mm	net weight0.45kg

power 125mm×50mm×31.5mm net weight 0.32kg

·Contraindications：none

9.2 use age

5 years

9.3 disclaimer statement

Manufacturer takes responsibility of the product safety, reliability and performance if the following conditions possess:

（1）Install accord with operator’s manual

（2）Operation and maintenance accord with operator’s manual and service manual.

Manufacturer disclaims all responsibility if problems caused by changes without permission, changed products is beyond the scope of manufacturers committed to service.