

Operation Manual



TSRD-500 DIGITAL REFRACTOR





SCIENCETERA

PREFACE

Welcome to choose SCIENCETERA DIGITAL REFRACTOR.
Read this manual carefully and handle the equipments correctly, thus the equipment will be operated in the best and lasting performance

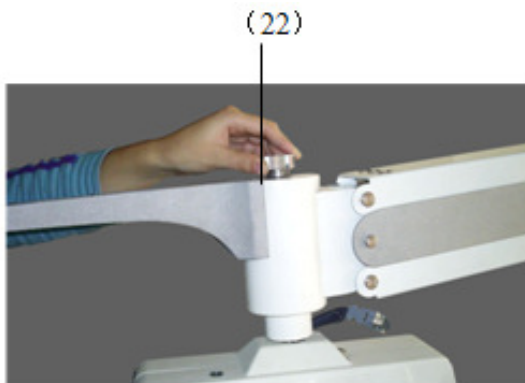
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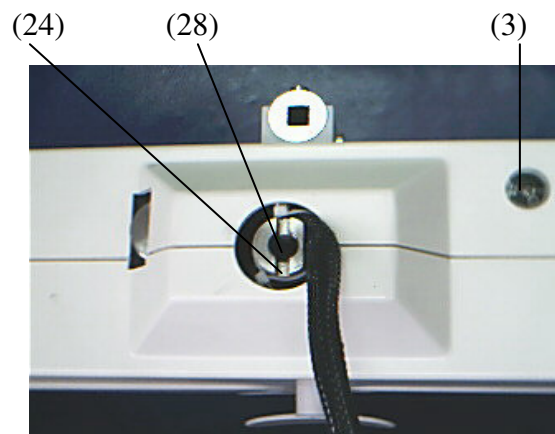
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3. Note for installation

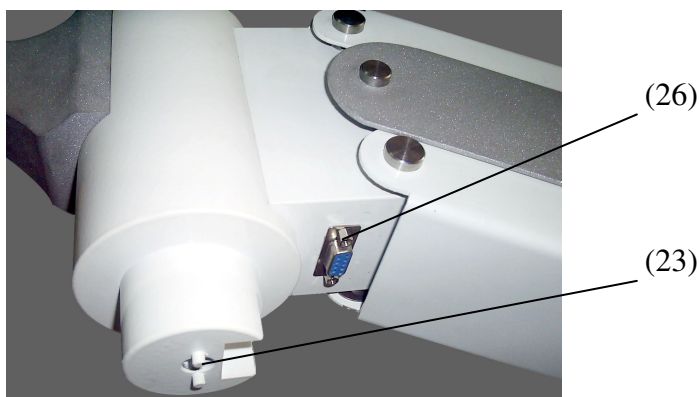
1. Digital Refractor uses DC-12V voltage. Avoid connecting with AC.
Before installing, the electricity of transformer must be above 6 A.
2. Only operate the device when the electric voltage is steady.
3. The transformer equipment needs to be use solely for the Digital Refractor
4. The Digital Refractor has the special function that it can automatically cut off the power, it will extinguish the motor power supply automatically if you don't use within 4 minutes. This economizes the usage of electricity.
5. Turn off the power when the device is not in use, in order to prevent damages to the IC board.
6. Please do not replace the parts of IC board arbitrarily.
7. When you install the instrument, please note as follows:



(Fig3)

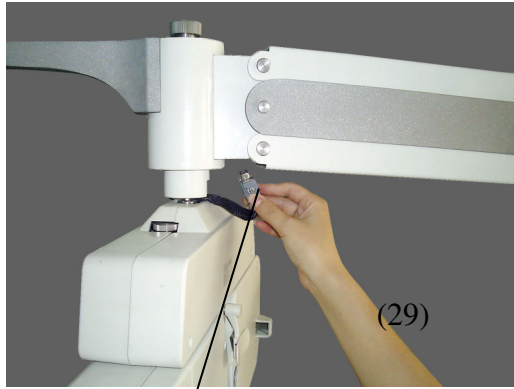


(Fig4)



(Fig5)

- a) Fix the Digital Refractor with screw as shown (22), but pay attention to (23) which contain a PIN, the pin must be lock at the (24).



(26)
(Fig6)

b) Plug the power supply (27) on (26). Show as Fig 6.

Caution: The instrument use DC-12V, avoid using alternate current (AC) or other power source.

c) Adjust the level. (Fig4)

d) Adjust the face shields.



(Fig8)

e) Turn on the power.

Note: While the instrument is returning to zero, avoid shutting down immediately. You should wait until it returns completely.

4. Main Body And Keyboard

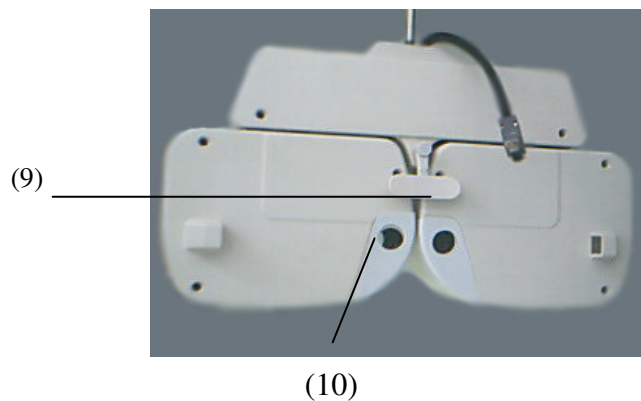
4.1 Main Body

This system is divided into LCD MONITOR and keyboard. Digital Refractor can connect various kinds of optical instruments into a single network. It can be used in conjunction with auto refractometer and auto projector of many different models. One auto refractometer can be linked with 4 Digital Refractor and 4 auto chart projector.



Fig 1

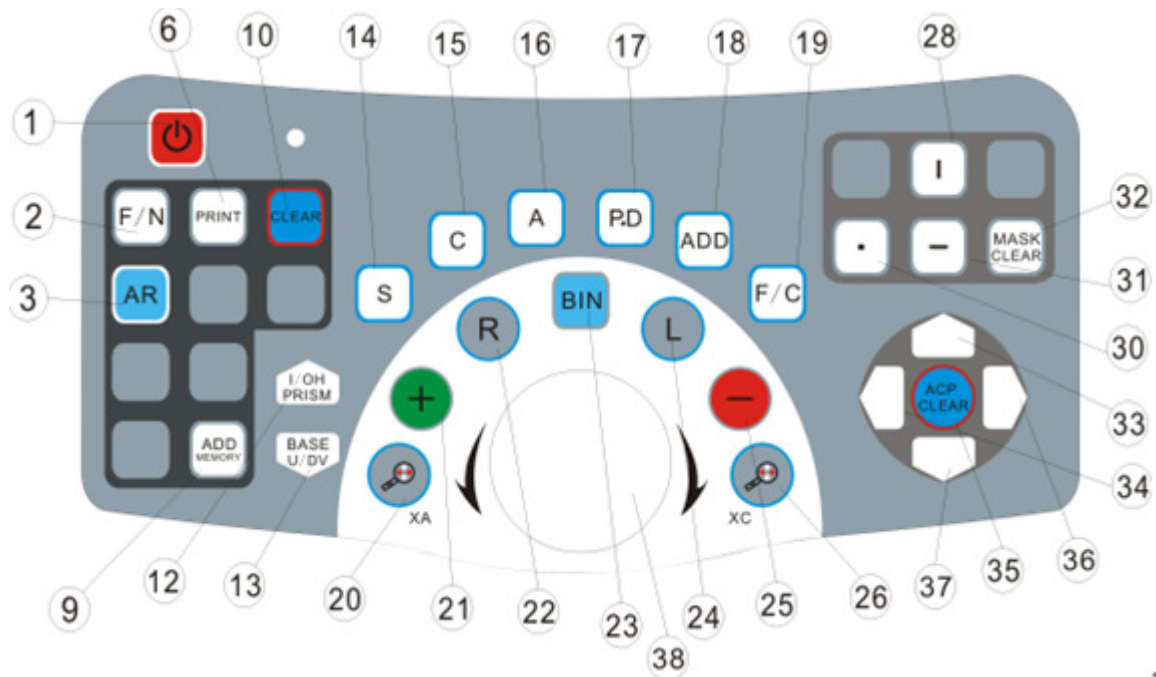
- (1) Measuring windows: Patients look at the charts through these windows.
- (2) PD Check windows: Used to check patient's VD
- (3) Lever knob
- (4) Near point card: Use for measuring addition power
- (5) Near point rod
- (6) Level adjustment knob
- (8) Adjust the distance of corneal vertex
- (14) Front cover



(Fig2)

- (9) Forehead Rest: Patient's forehead should touch the headrest during measurement.
- (10) Face Shields: Patient's face touches the shields during measurement.

4.2 Keyboard



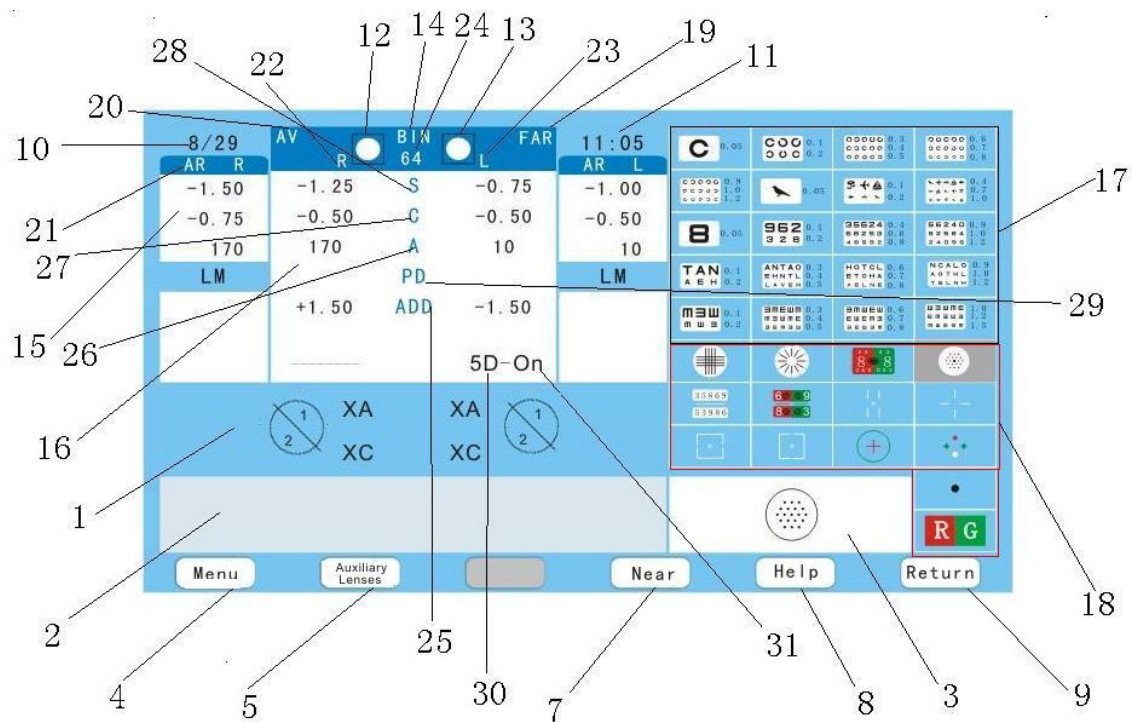
1. Power switch on/off for lamp & motor(chart projector and digital refractor):
Keep pressing the switch for 2 seconds, turn off the keyboard, chart projector and auto vision tester. If need to turn on the devices again, press the switch until it sounds like----BI. (It will be turn off automatically if it hasn't been used for 3 minutes)
2. Far/Near: For testing far point and near point(can work together with ADD)
3. AR: The data will be automatically transferred from auto-refractometer to Digital Refractor and appears on LCD display.
9. ADD Memory: You can get the ADD information again even if it is cleared.
10. Clear
12. Prism I/O: (base-in/base-out, horizontal)
13. Prism U/D: (base-up/base-down, vertical)
14. SPH: Spherical lens
15. CYL: Cylinder lens power
16. Axis: Cylinder lens axis
17. P.D: Pupilar distance
18. ADD
19. Function close: clear key for
 - (1) pinhole
 - (2) polarizing filter
 - (3) red/green filter
 - (4) maddox
 - (5) dissociation prism $6\Delta BU$ $10\Delta BU$
 - (6) fixed cross cylinder
 - (7) retinoscope

- (8) \pm cylinder
- (9) 1° 5°
- (10) prism I/O,U/D
- (11) auto cross cylinder XA, XC
- 20. Cross cylinder axis
- 21. + : Plus power
- 22. Right eye
- 23. Binary
- 24. Left eye
- 25. -: Minus power
- 26. Auto cross cylinder
- 28. | : Projector vertical mask
- 30. □: Projector small mask
- 31. —: Projector horizontal mask
- 32. Occluder
- 33. Projector ↑
- 34. Projector ←
- 36. Projector →
- 37. Projector ↓
- 38. Knob: Clockwise=Increase Counter-clockwise=decrease

※ **Remark:**














1. Touch “Clear” key before examine new customer or patient
2. Finish AR(auto-refractometer) measurement and print out the result, then touch “AR” key, the AR data will appear on the control panel LC display of Digital Refractor
3. If there is no AR data available, use SPH, CYL, AXIS, P.D keys to start examination.
4. Do single eye refraction(spherical lens power cylinder lens power and cylinder lens axis) for the right eye and left eye. Then other test when is needed.

4.3 Monitor



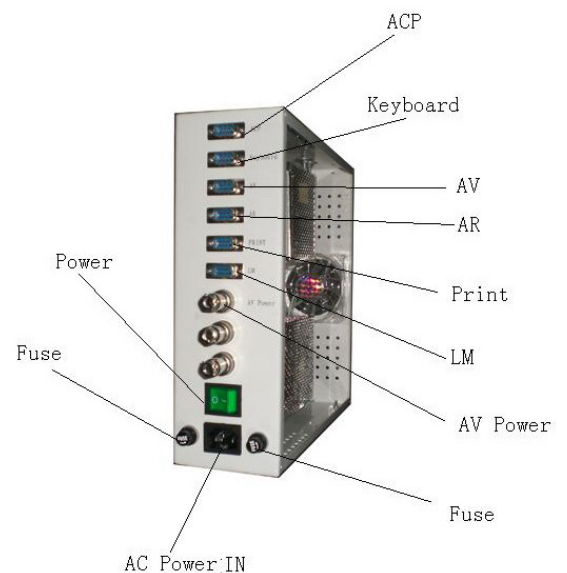
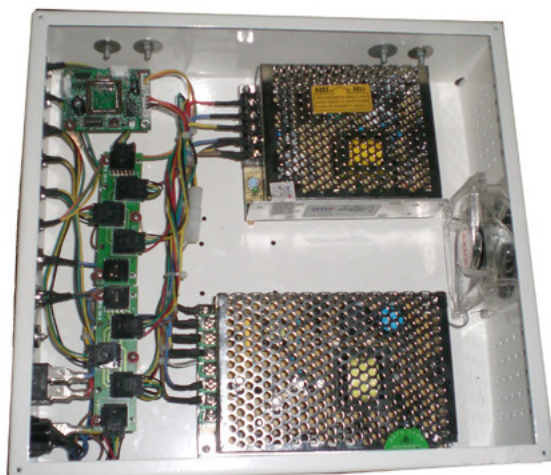
1. To show AR's statement.
2. The detail-explanation of AR
3. Charts in work
4. Adjust date and time
5. Function choose
7. Near
8. Help
9. Return
10. Date
11. Time
12. Right eye closed
13. Left eye closed
14. Both eyes closed/open
15. Power of auto refractometer
16. AR window
17. Touch panel (charts)
18. Touch panel(function)
19. Far/Near
20. TSRD-500 digital refractor
21. Auto refractometer
22. Right eye
23. Left eye
24. P.D
25. ADD
26. Axis

- 27. Cylinder
 - 28. Spherical
 - 29. P.D
 - 30. 5D=5 degrees (Spherical axis);1D=1degree (cylinder axis)
 - 31. ERR or OFF: Chart projector is not in connection
 ON: Chart projector is in work
 P1: The first memory program in work
 P2: The second memory program in work.
- ※ Using Digital Refractor with chart projector accordingly

Projector	Auto phorofter
	Fixed cross cylinder
	Astigmatism clock dial test
	Red&Green filters balance test
	Auto cross cylinder test for axis&cylinder
	Binocular Balance test Polarizing filters
	Dukochrome balace Red&Green filters
	Stereo test Polarizing filters
Projector	Auto phorofter
	Phoria test Polarizing filters
	Coincidence horizontal test polarizing filters
	Coincidence vertical test polarizing filters
	Schober test Red&green filters
	Worth test Red&Green Filters
	Prism&Maddox test

4.4 Power Transformer

Power transformer is to supply power to Digital Refractor and keyboard, and is used to signal for ACP, AR, Digital Refractor , Keyboard and print.



5. LCD Monitor With Touch Control

5.1 Menu

5.1.1 Date/Time

Press the big knob to adjust date and time as following:

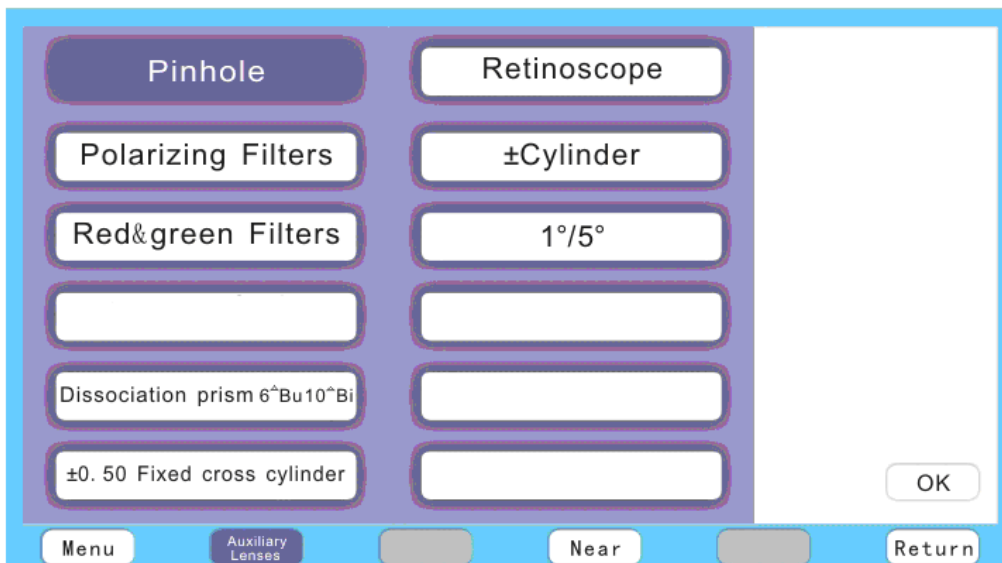


- (1) Choose Y(year), and then turn around the big knob to set the right year.
- (2) Choose M(month), and then turn around the big knob to set the right month.
- (3) Choose D(day), and then turn around the big knob to set the right day.
- (4) Choose H(hour), and then turn around the big knob to set the right hour.
- (5) Choose M(minute), and then turn around the big knob to set the right minute.
- (6) Choose S(second), and then turn around the big knob to set the right seconds.

Press **Confirm** when finish the setting, and then press **Return** to go on the next step.

5.2 Auxiliary

5.2.1 Pinhole



Touch Pinhole→Confirm, press FunctionClose when all gets down.

※ Pinhole is using for testing the “Lazy eyes”.

You can press FunctionClose to clear the following 9 functions(pinhole, polarizing filters, red & green filters, maddox rod, dissociation prism $6\Delta BU10\Delta BU$, ± 0.50 fixed cross cylinder, retinoscope, \pm cylinder and $1^\circ/5^\circ$), and I/OH, U/DV, XA and XC, do not need to use the key Clear. To clear P.D and ADD, just press P.D and ADD again, do not use Clear key either.

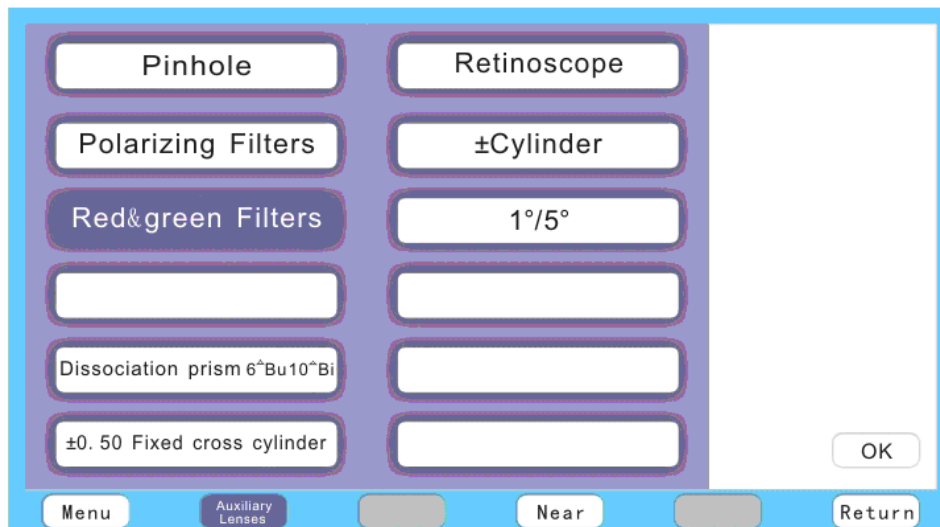
5.2.2 polarizing filters



Touch Polarizing filter→confirm, press FunctionClose when all gets down.

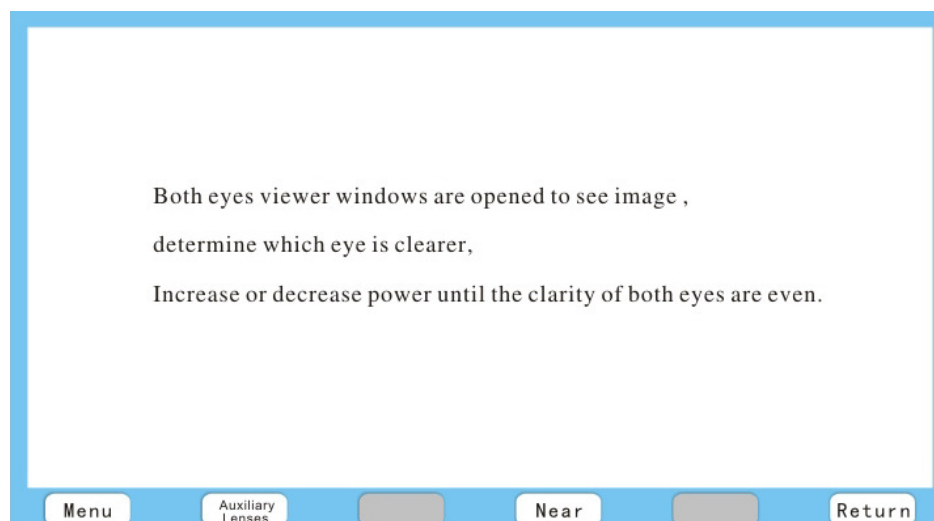
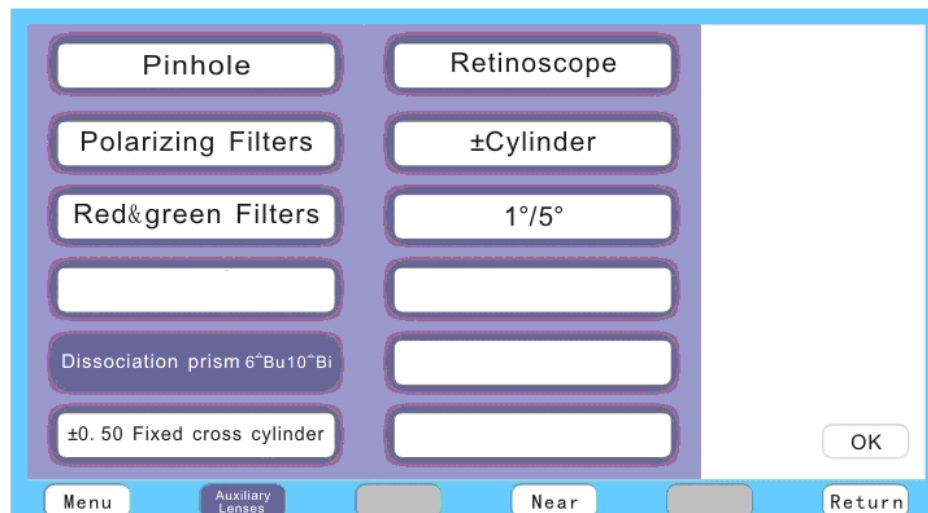
※ The polarizing lens AR need to use together with the polarizing filter of chart projector

5.2.3 red&green filters



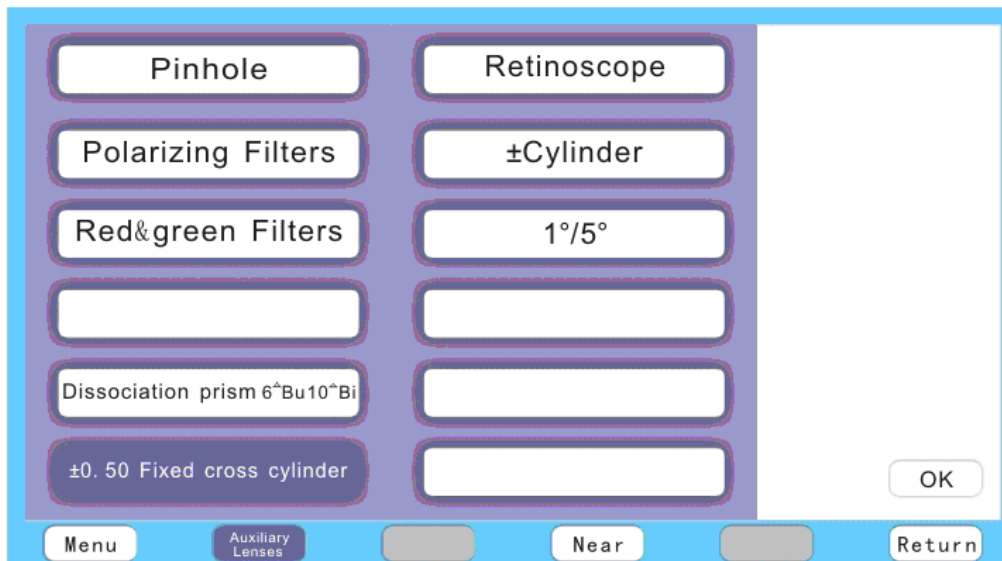
Touch red & green filters → Confirm, press FunctionClose when all gets down.

5.2.4 0.50Dissociation prism 6△BU10△BU



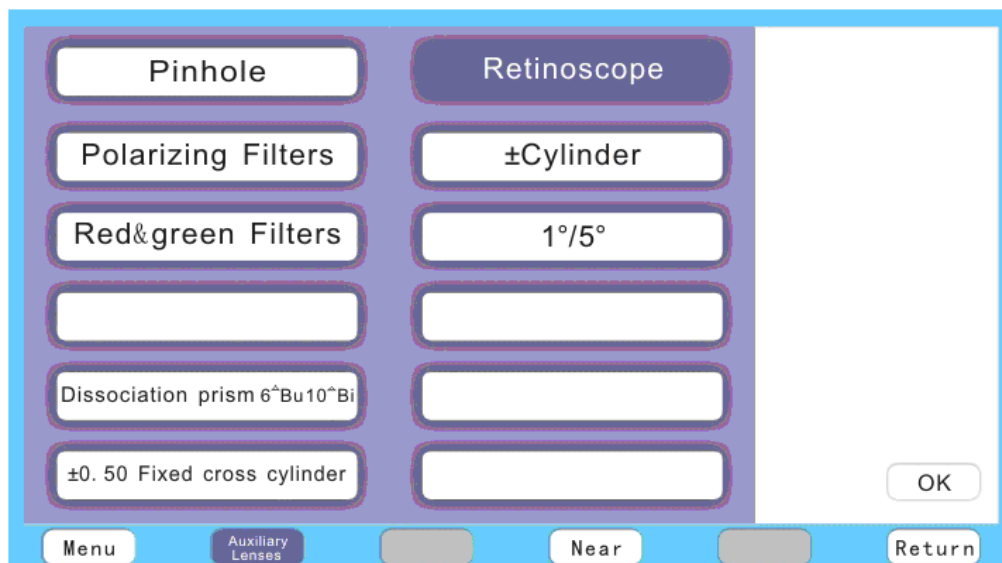
Touch ±0.50Dissociation prism 6△BU10△BU → Confirm, press FunctionClose when all gets down.

5.2.5 Fixed cross cylinder



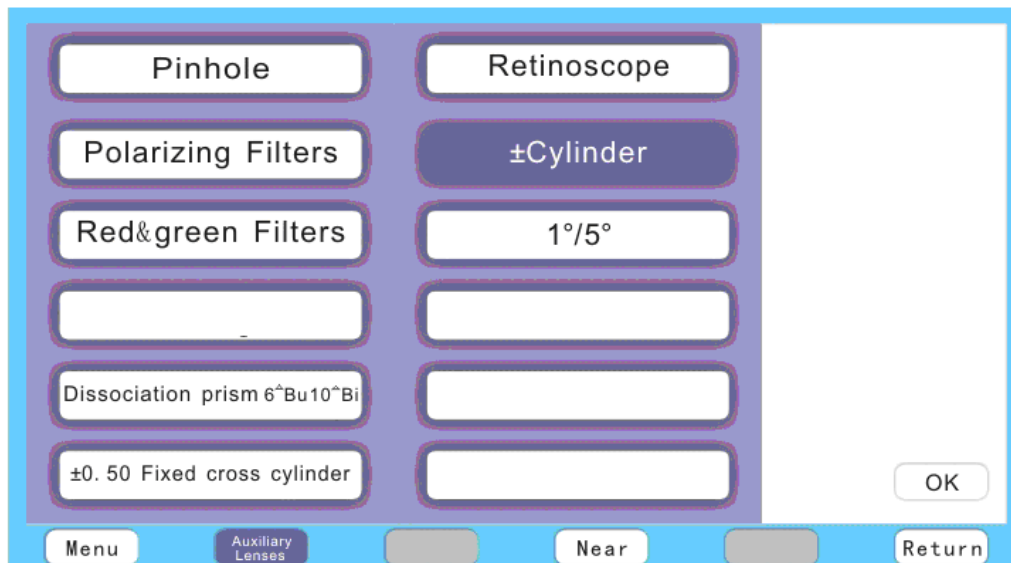
Touch **Fixed cross cylinder** → Confirm, press Function Close when all gets down

5.2.6 Retinoscope



Touch **Retinoscope** → Confirm, press FunctionClose when all gets down.
The retinoscope of vision tester is +1.50

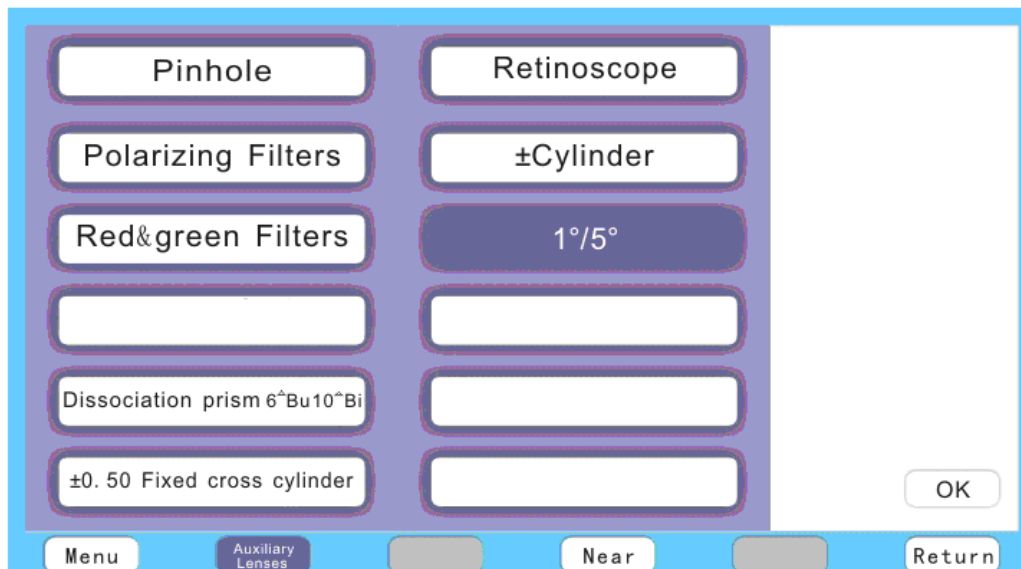
5.2.7 ± Cylinder



Touch **± Cylinder** → Confirm, press **FunctionClose** when all gets down

※ In this function, it can change the degree of ⊖ prism into the degree of ⊕ prism, it can also change the axis (angle), press **FunctionClose** when finish.

5.2.8 1°/5°



Touch **1°/5°** → Confirm, press **FunctionClose** when all gets down

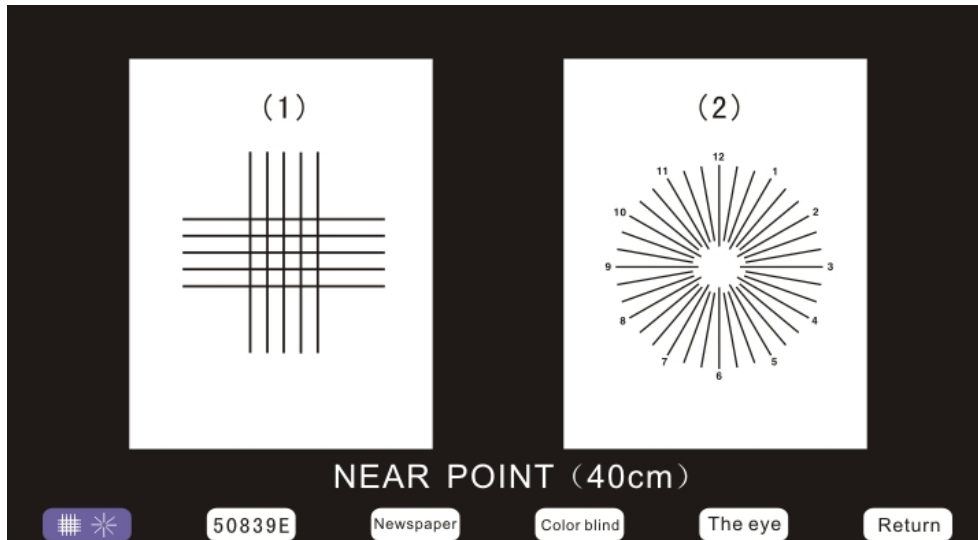
1°/5° is to choose the angle of axis, it will usually be 5° without setting, and then 5D will appear on the monitor. If it is set to be 1°, 1D will appear on the monitor.

5.4 Near

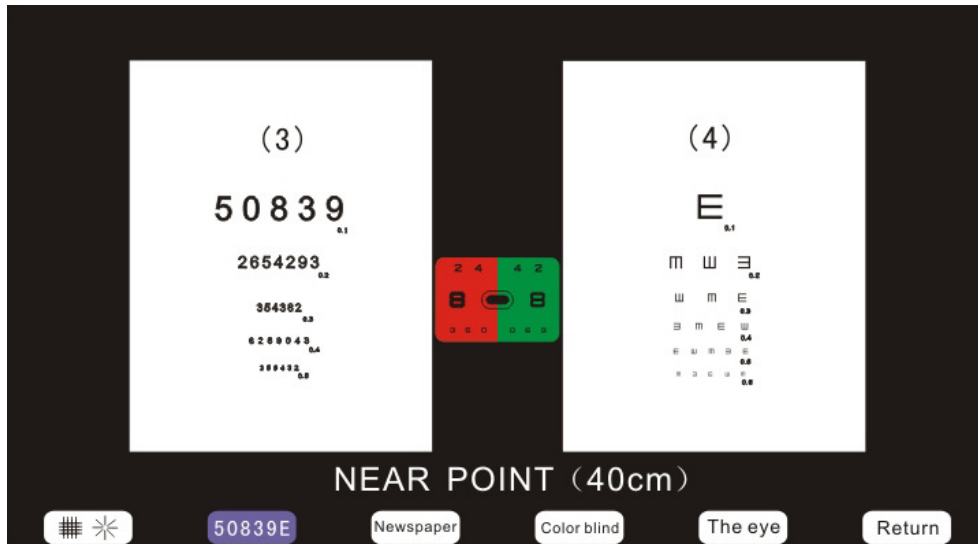
0.4 meters will be the best testing distance.

When turn to the reversed direction, it can be controlled by the keyboard (using the up and down key to change Near, while using right and left key to change the eye blind)

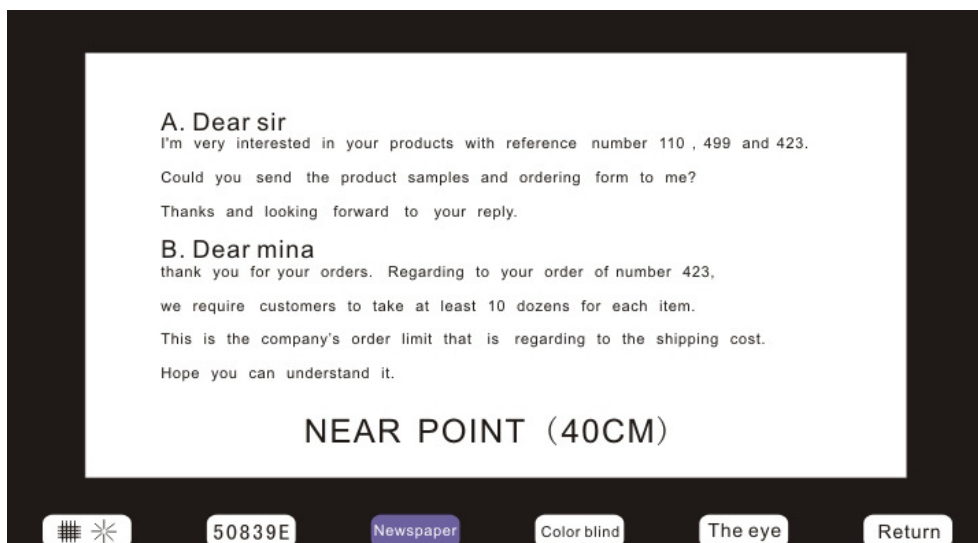
5.4.1



5.4.2 50839 E

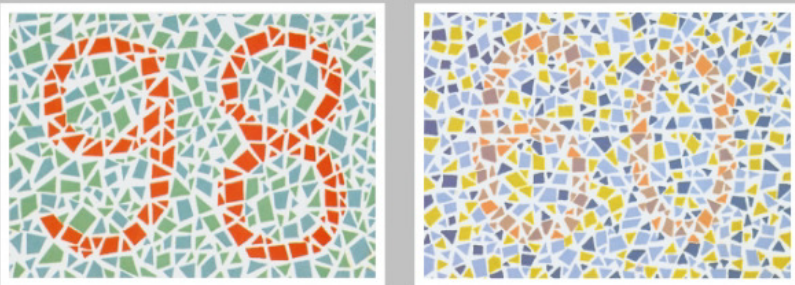


5.4.3 Newspaper



5.4.5 Color Blind

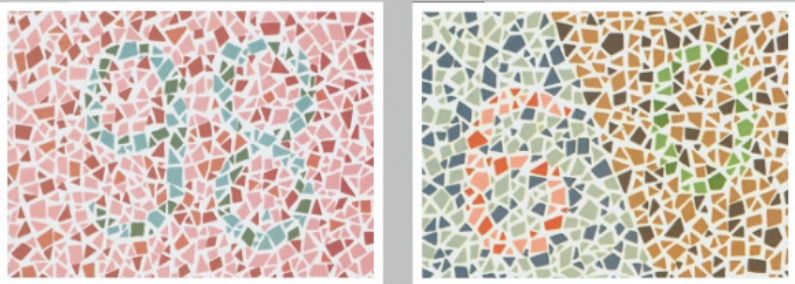
(1) (2)



1 2 3 4

⌘ * 50839E Newspaper Color blind The eye Return

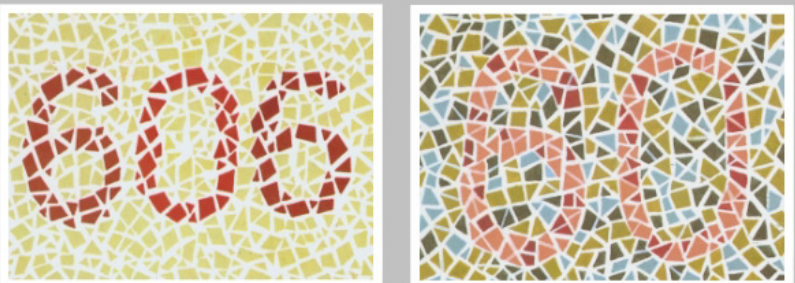
(3) (4)



1 2 3 4

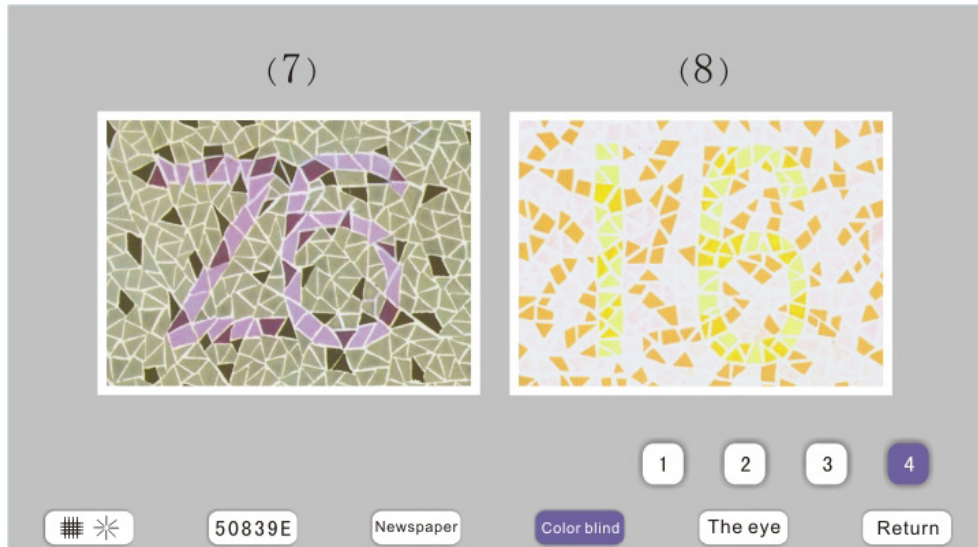
⌘ * 50839E Newspaper Color blind The eye Return

(5) (6)

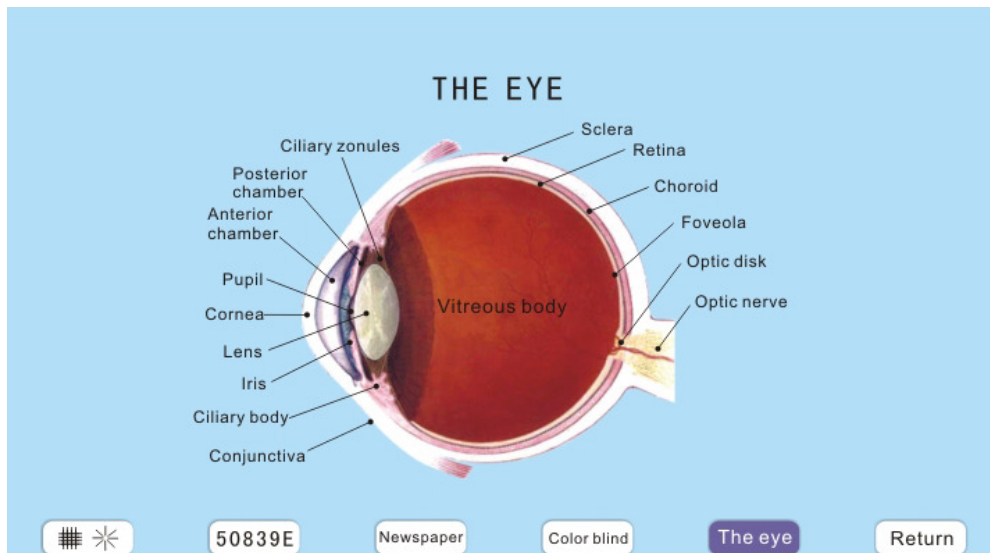


1 2 3 4

⌘ * 50839E Newspaper Color blind The eye Return



5.4.5 The eye



5.5 Help

When you do not know how to use, touch **Help** key, and all the details that show you how to operate, how to test eye and explain the meaning of all charts will appear on the monitor. However, all about this is just for reference.

5.6 Return

When you want to have a look at the charts that used before, just touch **Return** will do.

6. Control Digital Refractor and Chart Projector by Keyboard and Touch Panel

6.1 Controlled by Keyboard

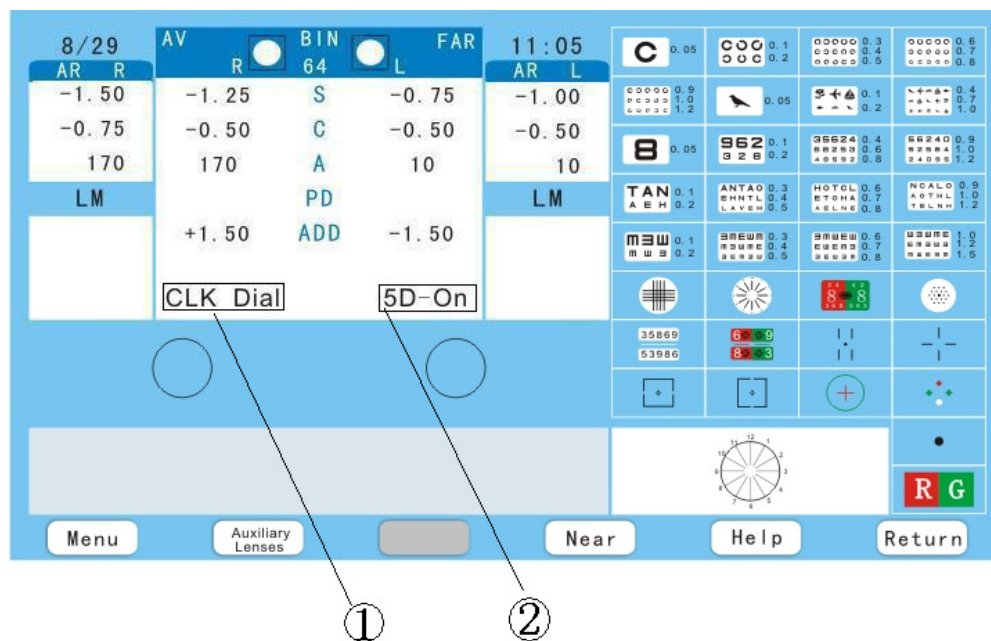
(1) Turn on the power (Digital Refractor, chart projector and keyboard)

(2) Two kinds of insert modes:

① Press **Print** when Auto refractometer finishes test, then press the key **AR** on the keyboard, so all information will be automatically transferred to the Digital Refractor. It will also automatically turn to the Spherical (right eye) and start the test..

② Insert information manually (have no computer in connection), first choose one among Spherical, cylinder and axis, press it directly. Turn around the big knob (right: +, left: -) to adjust the degree, or you can also use + and - to adjust the degree.

(3) Look at the following picture.



① For example: **CLK Dial** means Auxiliary Lenses are in work.

② 5D ON:

5D: Axis, it turns 5 degrees when dial the knob once; 1D: it will be 1 degree a time. Both can be set by **Auxiliary Lenses**.

ON: Chart projector in connection

OFF: Chart projector off

ERR: Chart projector out of connection

※ Whenever C 0.05 appears on the touch panel, touch **Help**, the details appears (when other charts appears, the **Help** is not in function).

(4) P.D test: Press P.D to start the test, press it again to return when finish the test

(5) You can use both big knob and ⊕, ⊖ to control Spherical, cylinder and P.D.

(6) ADD: near and far point test, and ADD will be the sums

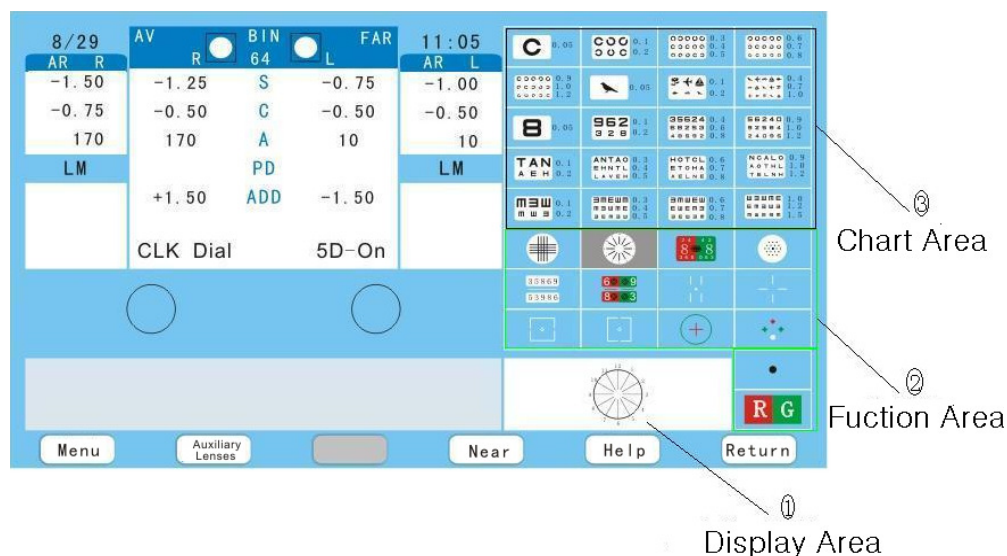
When finish the normal tests, press ADD, P.D will reduce automatically, and vergence lever will also automatically turn to the right eye(single eye test). Turn down the near card, dial the big knob or press ⊕, ⊖ to adjust the degree. When it is clear it will be the right degree of ADD. For example:

$$R \frac{+250-0.50 \times 180^\circ}{\text{ADD}+200} = \frac{+250-0.50 \times 180^\circ \text{ Far}}{+450-0.50 \times 180^\circ \text{ Near}}$$

After tests, press ADD to return. If it is necessary to read the ADD information again, press ADD Memory, all the information will appear. Then press the key again to return.

- (7) Pinhole
- (8) Polarizing filter
- (9) Red/Green filter
- (10) Maddox
- (11) Dissociation prism 6△BU 10△BU
- (12) Fixed cross cylinder
- (13) Retinoscope
- (14) ±Cylinder
- (15) 1°5°
- (16) Rotating cross cylinder XA, XC
- (17) Prism
- (18) Date/Time setting

6.2 Charts Function



The function of touch panel:

The touch panel is composed of three parts: ③Chart Area, ②Function Area and ①Display Area.

③Chart Area: There are 20 kinds of charts in this area, you can choose anyone you need and touch it, and then it is in work.

②Function Area: There are 14 types of functions for you to choose.

Ⓐ For the former 13 functions, just touch the panel, phoropter and chart projector will automatically be in the right position without press any other keys. If C 0.05 appears in ①Display Area, touch **Help** key, explanations will appear. However, if it is other charts but not C 0.05 appears in ①, **Help** key won't help, in other words it does not work.

Ⓑ **R G**: You can touch **R G** to add red/green filter to any charts and touch it again to return.


①Display Area: It always will be C 0.05 in ① Display Area whenever you open the device. The chart in function in ③Chart Area will appear in ①Display Area.

6.3 Fixed Cross Cylinder Test for Single Eye

8/29		AV		BIN		FAR		11:05	
AR	R	R	L	64	L	AR	L	AR	L
-1.50		-1.25		S		-0.75		-1.00	
-0.75		-0.50		C		-0.50		-0.50	
170		170		A		10		10	
LM				PD		LM			
		+1.50		ADD		-1.50			
		Cross Cyl		5D-On					


The interface also features a grid of test charts on the right, including various patterns like 'C', 'B', 'TAN', 'M3W', and '35889/53986'. A bottom navigation bar contains buttons for 'Menu', 'Auxiliary Lenses', 'Near', 'Help', and 'Return'.

Fixed cross cylinder test for single eye

Touch the figure “” and right eye viewer window is opened.



When the darkness of horizontal line and vertical line are the same (or almost the same) by adding plus or minus spherical lens, the lens set for distance is correct.

If reading prescription is needed, press “ADD” key,

place reading chart at correct distance for the viewer window and look at the “” pattern.

The plus spherical lens between reading and distance is the ADD.

Menu Auxiliary Lenses Near Return

Touch , ±0.50 (Digital Refractor) will automatically turn to the right aperture of Spherical, and the  of chart projector will also be in the right position automatically, and then you can start the tests.

6.4 Simple Eye Test

8/29	AV	<input type="checkbox"/> R	<input type="checkbox"/> BIN	<input type="checkbox"/> L	FAR	11:05
AR R	R	64	L	AR L		
-1.50	-1.25	S	-0.75	-1.00		
-0.75	-0.50	C	-0.50	-0.50		
170	170	A	10	10		
LM		PD		LM		
	+1.50	ADD	-1.50			
	CLK Dial		5D-On			

Menu
Auxiliary Lenses
Near
Help
Return

Simple eye test

Touch the figure “”, right eye viewer window is opened.

If the darkness of the lines are not even, find the darkest line.

Set minus cylinder lens axis at 90 degree from the darkest line and try various power.

Until the darkness of all lines are even.

Repeat the same test for left eye

Menu
Auxiliary Lenses
Near
Return

Touch , Digital Refractor will change to Axis, and chart projector will also be in the right position automatically.

6.5 Red and Green Filters Balance Test

8/29 AV BIN FAR 11:05
 AR R R 64 L AR L
 -1.50 -1.25 S -0.75 -1.00
 -0.75 -0.50 C -0.50 -0.50
 170 170 A 10 10
 LM PD LM
 +1.50 ADD -1.50
 R&G 5D-On

Menu Auxiliary Lenses Near Help Return

Red and green filters balance test
 Touch the figure "R G"
 Both eyes viewer windows are opened.
 If digits on red part of the chart is clearer, add minus spherical lens on right eye.
 If digits on green part of the chart is clearer, add plus spherical lens on left eye.
 When the clarity on both eyes are even, the both eye's lens set are balanced.

Menu Auxiliary Lenses Near Return


Touch ,  of chart projector will appear on the screen.

8/29 AV BIN FAR 11:05
 AR R R 64 L AR L
 -1.50 -1.25 S -0.75 -1.00
 -0.75 -0.50 C -0.50 -0.50
 170 170 A 10 10
 LM PD LM
 +1.50 ADD -1.50

Menu Auxiliary Lenses Near Help Return

Chart Area


Fuction Area

In the Chart Area, whichever chart you touch, and then touch , the chart will appear red and green for balance tests.



6.6 Binocular Balance Test with Polarized Filters



AR	R	R	S	L	AR	L
-1.50	-1.25	-1.25	-0.75	-0.75	-1.00	-1.00
-0.75	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50
170	170	170	10	10	10	10
LM			PD		LM	
	+1.50		ADD	-1.50		
	Polariz			5D-On		



Binocular balance test with polaroid filters


Touch the figure "  "

Both eyes viewer windows are opened.

 When right eye viewer window is opened, upper digit chart and underneath line as "  " should be seen.

 When left eye viewer window is opened, lower digit chart and above line as "  " should be seen.

 When both eyes viewer windows are opened, if the two lines are overlapped, upper digit chart is above the line and lower digit chart is below the line as "  ", the both eyes lens set are balanced.

Touch  , it will be in the right position automatically, and the polarizing filters will be 135° for the right eye and 45° for the left eye.

6.7 Duachrome Balance and Polarizing Filter Test


The screenshot shows a digital refractor interface with the following data:

8/29		AV		BIN		FAR		11:05	
AR	R	R	L	64	L	AR	L	AR	L
-1.50		-1.25		S		-0.75		-1.00	
-0.75		-0.50		C		-0.50		-0.50	
170		170		A		10		10	
LM				PD				LM	
		+1.50		ADD		-1.50			
				Polariz		5D-On			

The chart projector grid on the right contains various patterns and numbers for testing, including:

- Patterns: C, B, TAN, M, W, and various geometric shapes.
- Numbers: 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2.
- Color-coded numbers: 6, 9, 8, 3.

At the bottom, there are buttons for Menu, Auxiliary Lenses, Near, Help, and Return.


Duachrome balance and polarizing filter test
 Touch the figure "  "

Both eyes viewer windows are opened.

A: Simple
 If the clarity of number "6", "9", "8" and "3" are the same, the lens sets of both eyes are correct.

B: Detail
 If number "6" and "8" are clearer, add minus spherical lens for both eyes.
 If number "9" and "3" are clearer, add plus spherical lens for both eyes.
 If number "6" and "3" are clearer, add minus spherical lens for right eyes and add plus spherical lens for left eye.
 If number "9" and "8" are clearer, add plus spherical lens for right eyes and add minus spherical lens for left eye.
 If number "6", "8" and "9" are clearer, add plus spherical lens for left eye.
 If number "6", "9" and "3" are clearer, add minus spherical lens for right eye.
 If number "9", "3" and "6" are clearer, add minus spherical lens for right eye.
 If number "6", "8" and "3" are clearer, add plus spherical lens for left eye.
 If the clarity of number "6", "9", "8" and "3" are the same, the lens set of both eyes are correct.

At the bottom, there are buttons for Menu, Auxiliary Lenses, Near, and Return.


Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters (of Digital Refractor) will be 135 ° (for the right eye) and 45° (for the left eye) will automatically be in the right position of both eye.



6.8 Stereo Test with Polarizing Filters



8/29		AV	BIN	FAR	11:05	
AR	R	R	64	L	AR	L
-1.50		-1.25	S	-0.75	-1.00	
-0.75		-0.50	C	-0.50	-0.50	
170		170	A	10	10	
LM			PD		LM	
		+1.50	ADD	-1.50		
		Polariz		5D-On		



The interface also features a grid of test patterns on the right, including various symbols and numbers, and a bottom navigation bar with buttons for Menu, Auxiliary Lenses, Near, Help, and Return.

Stereo test with polarizing filters


Touch the figure "  "

 When right eye viewer window is opened, up and right vertical line, down and left vertical line and small round spot should be seen as "  "

 When left eye viewer window is opened, up and left vertical line, down and right vertical line and small round spot should be seen as "  "

 When both eyes viewer windows are opened, if overlapped small round spots and four vertical lines (up and right vertical line, down right vertical line, up and left vertical line, down and left vertical line) can be seen as "  ", the examinee has normal stereoscopic vision.

The interface also features a bottom navigation bar with buttons for Menu, Auxiliary Lenses, Near, and Return.

Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters (of Digital Refractor) will automatically be in the right position of both eye.


6.9 Phoria Test with Polaroid Filters

8/29 AV R 64 L FAR 11:05


AR	R			AR	L
-1.50	-1.25	S	-0.75	-1.00	
-0.75	-0.50	C	-0.50	-0.50	
170	170	A	10	10	
LM		PD		LM	
	+1.50	ADD	-1.50		
	Polariz		5D-On		


Menu Auxiliary Lenses Near Help Return


Phoria test with polaroid filters

Touch the figure "  "


A: Simple


When right eye viewer window is opened, up and down vertical lines should be seen as "  "


When left eye viewer window is opened, right and left horizontal lines should be seen as "  "


When both eyes viewer windows are opened, the four lines should be seen as "  ". There is no phoria.


B: Detail


When image "  " can be seen, there is right eye esophoria or left eye exophoria.

When image "  " can be seen, there is right eye exophoria or left eye esophoria.


When image "  " can be seen, there is right eye hypophoria or left eye hyperphoria.

When image "  " can be seen, there is right eye hyperphoria or left eye hypophoria.

When image "  " can be seen, there is right eye esophoria and right eye hypophoria.

When image "  " can be seen, there is right eye exophoria and right eye hypophoria.

Menu Auxiliary Lenses Near Return


Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters (of Digital Refractor) will automatically be in the right position of both eye.













6.10 Horizontal Aniseikonia Test with Polaroid Filters

8/29		AV	BIN	FAR	11:05	
AR	R	R	64	L	AR	L
-1.50		-1.25	S	-0.75	-1.00	
-0.75		-0.50	C	-0.50	-0.50	
170		170	A	10	10	
LM			PD		LM	
		+1.50	ADD	-1.50		
		Polariz		5D-On		


The interface also features a grid of test charts on the right, including various patterns and numbers for visual acuity and aniseikonia testing. At the bottom, there are navigation buttons: Menu, Auxiliary Lenses, Near, Help, and Return.

Vertical aniseikonia test with polaroid filters

Touch the figure “”

-  When right eye viewer window is opened, image “” should be seen.
-  When left eye viewer window is opened, image “” should be seen.
-  When both eyes viewer windows are opened, if image “” can be seen. There is no aniseikonia.
-  If image “” can be seen, there is right eye esophoria
-  If image “” can be seen, there is right eye exophoria
-  If the upper image is bigger than the lower image, there is aniseikonia
-  If the upper image is smaller than the lower image, there is aniseikonia


At the bottom, there are navigation buttons: Menu, Auxiliary Lenses, Near, and Return.













Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters (of Digital Refractor) will automatically be in the right position of both eye.


6.11 Vertical Aniseikonia Test with Polaroid Filters

8/29		AV		BIN		FAR		11:05	
AR	R	R	L	R	L	AR	L	AR	L
-1.50	-1.25	S	-0.75	-1.00	-1.00	-1.50	-0.75	-1.00	-1.00
-0.75	-0.50	C	-0.50	-0.50	-0.50	-0.75	-0.50	-0.50	-0.50
170	170	A	10	10	10	170	10	10	10
LM		PD		LM		LM		LM	
	+1.50	ADD	-1.50						
	Polariz		5D-On						

Vertical aniseikonia test with polaroid filters

Touch the figure “”

-  When right eye viewer window is opened, image “” should be seen.
-  When left eye viewer window is opened, image “” should be seen.
-  When both eyes view windows are opened, image “” can be seen.
-  If image “” can be seen, there is right eye hyperphoria.
-  If image “” can be seen, there is left eye hyperphoria.
-  If the right image is bigger than the left image, there is aniseikonia.
-  If the right image is smaller than the left image, there is aniseikonia.

Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters (of Digital Refractor) will automatically be in the right position of both eye.

6.12 Phoria Test

8/29 11:05

AR	R	R	BIN	L	FAR	AR	L
-1.50	-1.25	S	-0.75	-1.00			
-0.75	-0.50	C	-0.50	-0.50			
170	170	A	10	10			
LM		PD		LM			
	+1.50	ADD	-1.50				
	R&G		5D-On				

Menu Auxiliary Lenses Near Help Return

Touch the figure " + " (of chart projector), it will be in the right position automatically, and the red/green filters (of Digital Refractor) will automatically be in the right position of both eye.

A: Simple


- When right eye viewer window is opened, red cross should be seen as " + " (of chart projector)
- When left eye viewer is opened, green circle should be seen as " ○ " (of chart projector)

When both eyes viewer windows are opened, if the red cross is in center of the green circle as " + " (of chart projector), there is no phoria

B: Detail

- If the red cross is off center of the green circle, on right side, as " + " (of chart projector), there is right eye esophoria.
- If the red cross is off center of the green circle, on left side, as " + " (of chart projector), there is right eye esophoria.
- If the red cross is off center of the green circle, on upper side, as " + " (of chart projector), there is right eye hyperphoria.
- If the red cross is off center of the green circle, on down side, as " + " (of chart projector), there is right eye hyperphoria.

Menu Auxiliary Lenses Near Return


Touch  (of chart projector), it will be in the right position automatically, and the red/green filters (of Digital Refractor) will automatically be in the right position of both eye.







6.13 Worth Four-dot Test

8/29		AV		BIN		FAR		11:05	
AR	R	R	L	64	L	AR	L	AR	L
-1.50		-1.25		S		-0.75		-1.00	
-0.75		-0.50		C		-0.50		-0.50	
170		170		A		10		10	
LM				PD				LM	
		+1.50		ADD		-1.50			
		R&G				5D-On			


Menu Auxiliary Lenses Near Help Return

Worth four-dot test

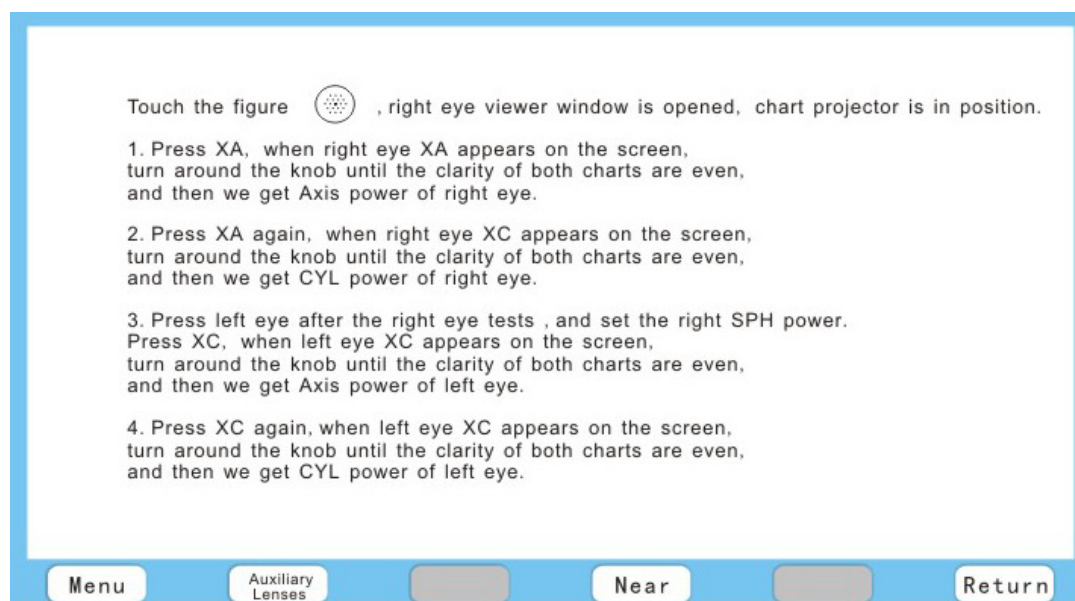
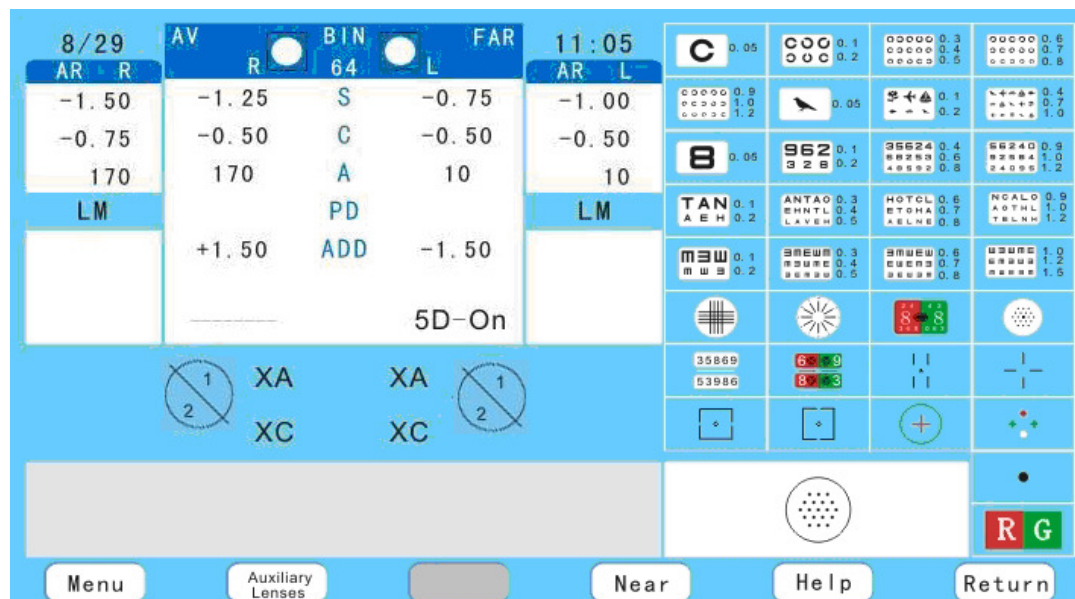
Touch the figure "  "


-  When right eye viewer window is opened, upper red dot and lower white dot should be seen as "  "
-  When left eye viewer window is opened, two horizontal green dots and lower white dot should be seen as "  "
-  When both eyes viewer windows are opened, if upper red dot, two horizontal green dots and overlapped white dots can be seen as "  ". there is no phoria.

Menu Auxiliary Lenses Near Return

Touch  (of chart projector), it will be in the right position automatically, and the red/green filters (of Digital Refractor) will automatically be in the right position of both eye.

6.14 Auto Cross Cylinder Power Test



Touch  (of chart projector), it will be in the right position automatically, and ± 0.25 will turn to the right eye of Axis.

6.15 Maddox Rod Test and Prism Lens Correction

8/29	AV	BIN	FAR	11:05
AR R	R	64	L	AR L
-1.50	-1.25	S	-0.75	-1.00
-0.75	-0.50	C	-0.50	-0.50
170	170	A	10	10
LM		PD		LM
	+1.50	ADD	-1.50	
			5D-On	

+0.0 I/O -0.0 XΔ
 +20.0 U/D -0.0 YΔ

Menu Auxiliary Lenses Near Help Return

Moddox rod test and prism lens correction

Touch the figure “●” or press the key “I/OH”, both eyes viewer windows are opened and Maddox rod at 180 degree is automatically placed in front of right eye.

- If light dot is on the center of vertical line as “”, there is no phoria.
- If light dot is on the left side of vertical line as “”, left eye needs Base-Out prism lens.
- If light dot is on the right side of vertical line as “”, left eye needs Base-in prism lens.

Press “U/DV” key?:

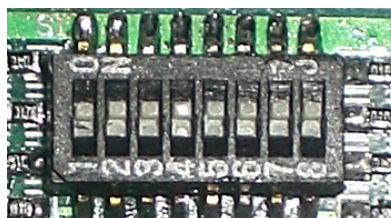
both eyes viewer windows are opened and Maddox rod at 90 degree is automatically placed in front of right eye.

- If light dot is on the center of horizontal line as “”, there is no phoria.
- If light dot is on the upper side of horizontal line as “” left eye needs base-up prism lens.
- If light dot is on the lower side of horizontal line as “” left eye needs Base/ Down prism lens.

Menu Auxiliary Lenses Near Return

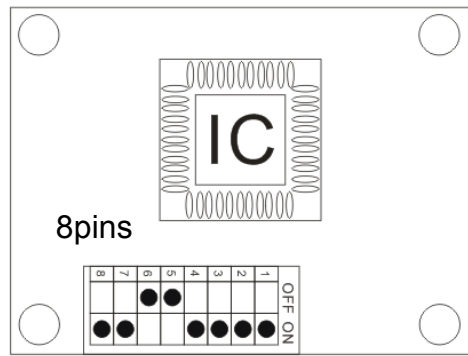
7. CO-operation with other Auto Refractometer

Automatic transmission: Press **AR** after Auto refractometer finishing print, and all the information in Auto refractometer will automatically transmit to phoropter, at the same time, the right window will open, the left close, press **Left** when need.
 ※ SCIENCETERA Digital Refractor can be connected to many other AUTO refractometer, and pay enough attention to the switch codes show as below:



Switch 1	Switch 2	Switch 3	Switch 4	Co-operation with other instrument (B-3)				
				Brand	Switch 5	Switch 6	Switch 7	Switch 8
ON	ON	ON	ON	DONGYANG	ON	ON	ON	ON
ON	ON	ON	ON	HUVITZ (MRK3100)	OFF	ON	ON	ON
ON	ON	ON	ON	CHAROPS (CRK-7000)	OFF	OFF	ON	OFF
ON	ON	ON	ON	GRAND SEIKO (GR2100)	OFF	OFF	ON	ON
ON	ON	ON	ON	JUSTICE (AR-800)	OFF	ON	OFF	OFF
ON	ON	ON	ON	GRAND SEIKO (GR3100K)	OFF	OFF	ON	ON
ON	ON	ON	ON	SHIN-NIPPON (9001)	ON	ON	OFF	ON
ON	ON	ON	ON	NIDEK (AR-610)	ON	OFF	OFF	ON
ON	ON	ON	ON	NIDEK (AR-310A)	ON	OFF	ON	OFF
ON	ON	ON	ON	CANON (R-F10/ RK-F1)	OFF	OFF	OFF	ON
ON	ON	ON	ON	AXIS (TSRK-1000)	ON	ON	ON	OFF
ON	ON	ON	ON	SCIENCETERA (ARK700)	ON	ON	OFF	OFF
ON	ON	ON	ON	CHINA-RT3000	OFF	ON	ON	OFF

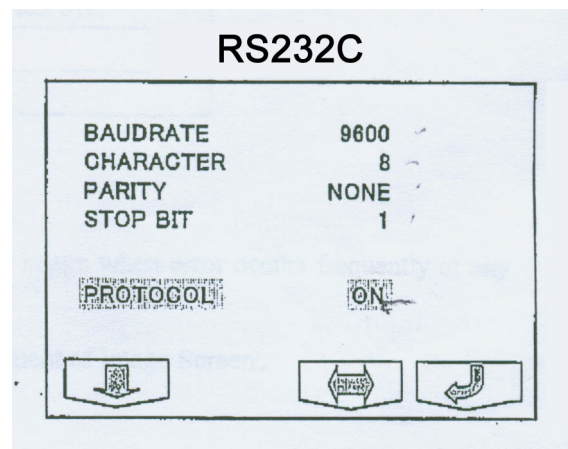
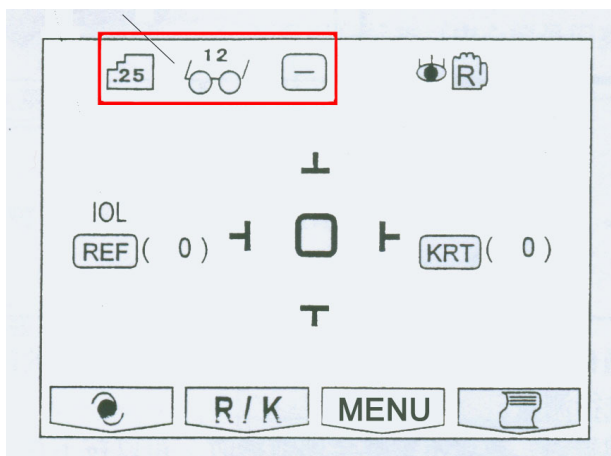
Caution: Each time you must turn off the instrument if you change the code on the IC board, or it would not be effective.



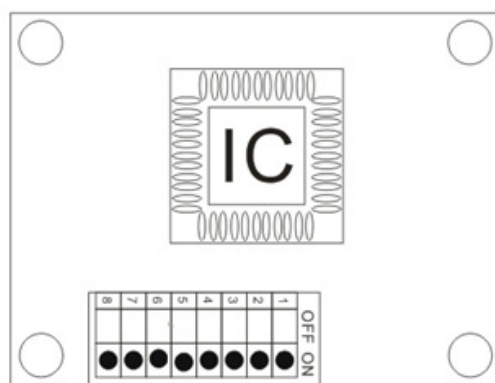
7.1 Co-operation with DONGYANG

The way of DONGYANG auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of DONGYANG AUTO REFRACTOMETER should be place as follows:



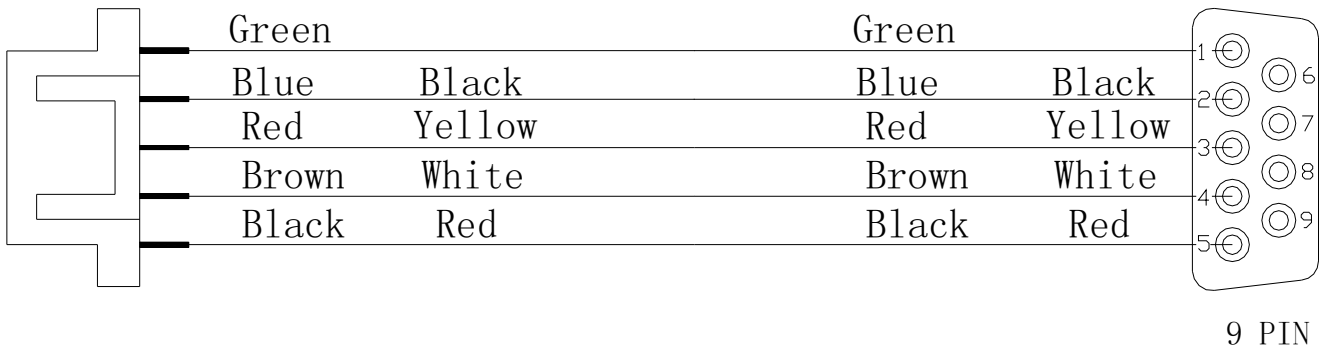
2. The 8 pins on IC board should be set as following:



3. How to connect the connector between 5PIN and 9 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(DONGYANG)



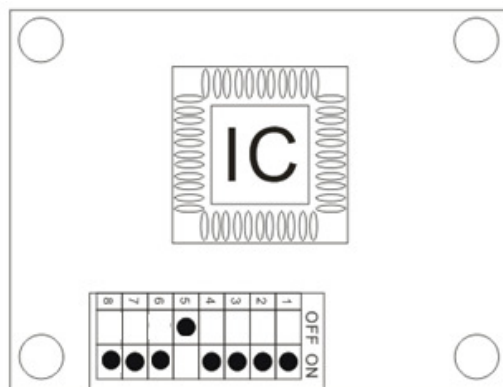
7.2 Co-operation with HUVITZ MRK-3100

The way of HUVITZ auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of HUVITZ AUTO REFRACTOMETER should be place as follows:

REF				
VD:	0.0	12	13.5	15.0
CYL:	<u>(-)</u>	(+)	Mix	
A-PRT	OFF	<u>ON</u>		
D-SET	<u>0.00</u>			
BPS:	<u>9600</u>	57600	115200	
RS232	OFF	<u>PC-OLD</u>	PC-V2	NKKE
FOCUS:	OFF	<u>ON</u>		
mm/D:	<u>mm</u>	D	AVE	
INC-R:	0.05	0.12	<u>0.25</u>	
INDEX:	<u>1.3375</u>	1.332	1.336	

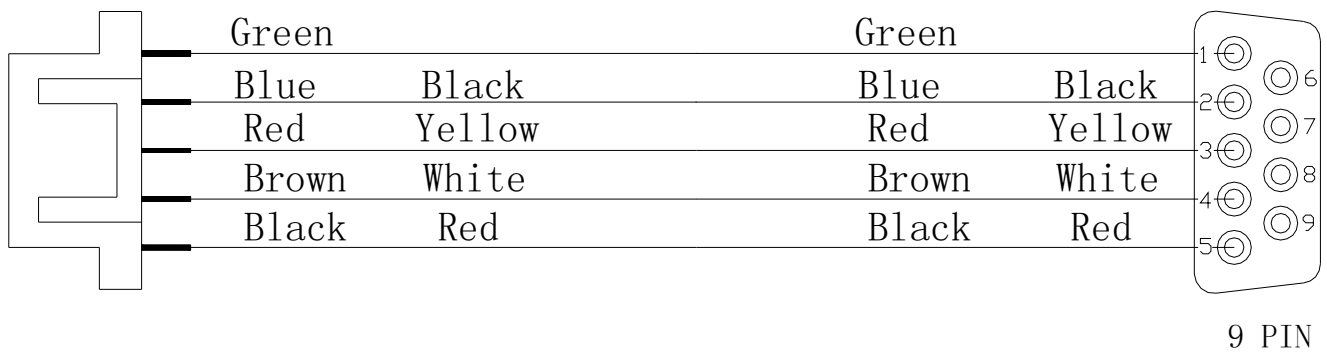
2. The 8 pins on the IC board should be set as following:



3. How to connect the connector between 5PIN and 9 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(HUVITZ)



7.3 Co-operation with CHAROPS CRK-7000

The way of CHAROPS CRK-7000 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of AUTO REFRACTOMETER GRK-1 should be place as follows:

REF

VD:	0.0	12	13.5	15.0
CYL:	(-)	(+)	Mix	
INC-R	0.12	0.25		
D-SET	0.00			

PATIENT NUMBER

COUNT	OFF	ON
NO.	00002	

AUTO START

MOOD:	OFF	ON	
TYPE:	ON(3)	ON(5)	ON(A)
FOGG:	ALWAYS	1Time	

COMMUNICATION

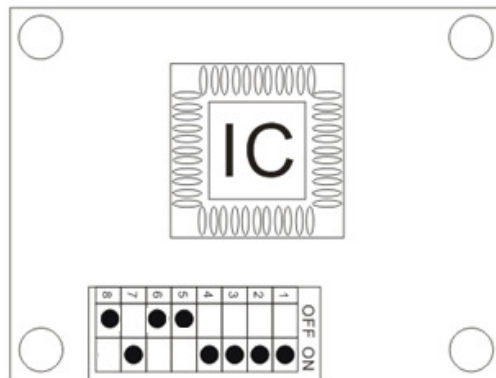
BPS:	9600	57600	115200
RS232:	OFF	PC(olD)	PC(new)

PRINT

A-PRT:	OFF	ON	
EYE:	OFF	ON	
R-PRT:	Std	Avg	OFF
K-PRT:	Std	Avg	OFF

END: SAVE & EXIT

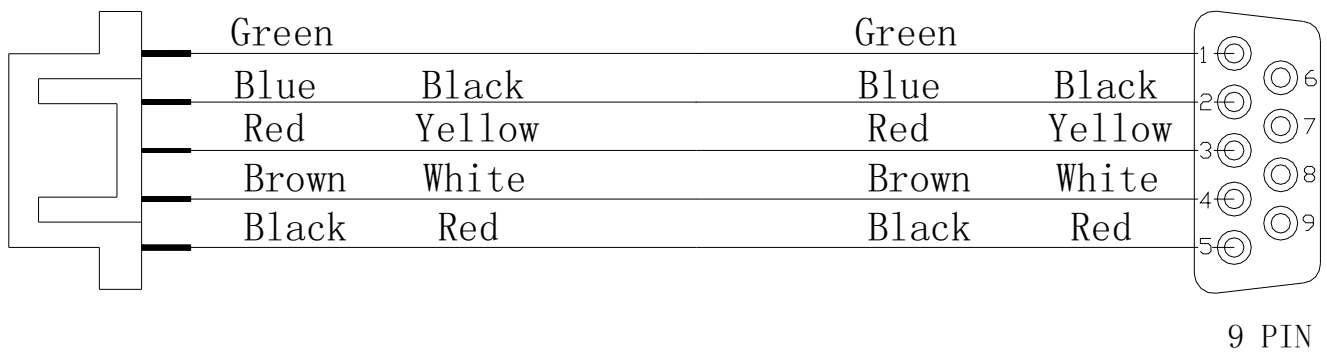
2. The 8 pins on IC board should be set as following:



3. How to connect the connector between 5PIN and 9 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(CHAROPS CRK-7000)



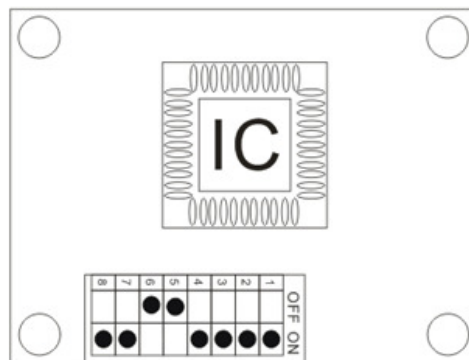
7.4 Co-operation with GRAND SEIKO 2100

The way of GRAND SEIKO 2100 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of AUTO REFRACTOMETER should be place as follows:

STEP	0.25	0.12	0.01		
VD (mm)	10	12	13.5	15.0	
CYL	(-)	(+)	±		
START	MAN. N	MAN. E	AUTO (5)		
FOCUS	PRECISION	NORMAL			
REF	NORMAL	QUICK (3)			
PRINT FORM	ALL	ECOND	OFF		
DATA SCREEN	ON	OFF			
W-D (cm)	OFF	30	35	40	45
TAGGET	LIGHT	BRIGHT	NORMAL	DARK	
SAVE (min)	OFF	3	5	10	
PD CENTER	ON	OFF			
BUUZER	HIGH	LOW	OFF		
OPTION	MESSAGE NO.	RS232C			
	BAUDRATE	9600			
	CHARACTER	8			
	PARITY	NONE			
	STOP BIT	1			

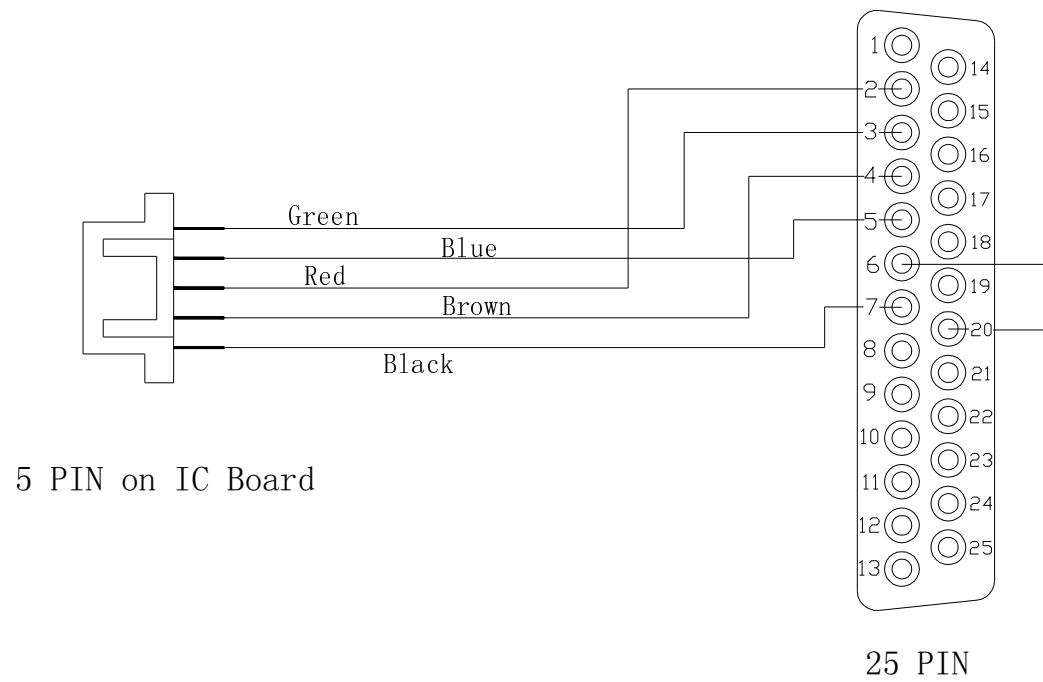
2. The 8 pins on IC board should e set as following:



3. How to connect the connector between 5PIN and 25 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(Grand Seiko GR2100)



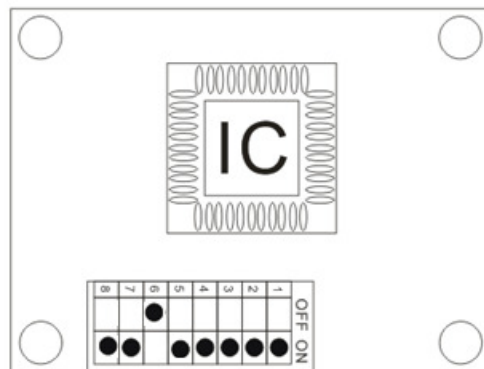
7.5 Co-operation with GRAND SEIKO GRK-1

The way of GRAND SEIKO GRK-1 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of AUTO REFRACTOMETER should be place as follows:

STEP	0.25	0.12	0.01		
VD (mm)	10	12	13.5	15.0	
CYL	(-)	(+)	±		
START	MAN. N	MAN. E	AUTO (5)		
FOCUS	PRECISION	NORMAL			
REF	NORMAL	QUICK (3)			
PRINT FORM	ALL	ECOND	OFF		
DATA SCREEN	ON	OFF			
W-D (cm)	OFF	30	35	40	45
TAGGET	LIGHT	BRIGHT	NORMAL	DARK	
SAVE (min)	OFF	3	5	10	
PD CENTER	ON	OFF			
BUUZER	HIGH	LOW	OFF		
OPTION	MESSAGE NO.	RS232C			
	BAUDRATE	9600			
	CHARACTER	8			
	PARITY	NONE			
	STOP BIT	1			

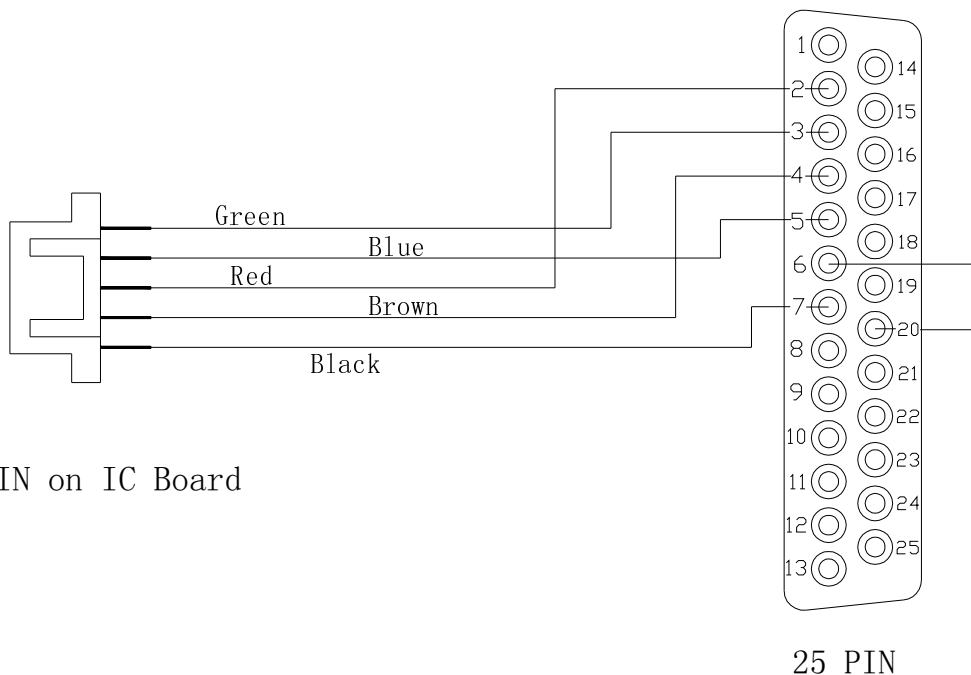
2. The 8 pins on IC board should be set as following:



3. How to connect the connector between 5PIN and 25 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(Grand SEIKO GRK-1)



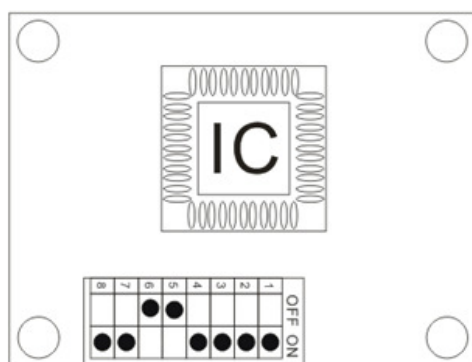
7.6 Co-operation with GRAND SEIKO 3100K

The way of GRAND SEIKO 3100K auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of AUTO REFRACTOMETER should be place as follows:

STEP	0.25	0.12	0.01		
VD (mm)	10	12	13.5	15.0	
CYL	(-)	(+)	±		
START	MAN. N	MAN. E	AUTO (5)		
FOCUS	PRECISION	NORMAL			
REF	NORMAL	QUICK (3)			
PRINT FORM	ALL	ECOND	OFF		
DATA SCREEN	ON	OFF			
W-D (cm)	OFF	30	35	40	45
TAGGET	LIGHT	BRIGHT	NORMAL	DARK	
SAVE (min)	OFF	3	5	10	
PD CENTER	ON	OFF			
BUUZER	HIGH	LOW	OFF		
OPTION	MESSAGE NO.	RS232C			
	BAUDRATE	9600			
	CHARACTER	8			
	PARITY	NONE			
	STOP BIT	1			

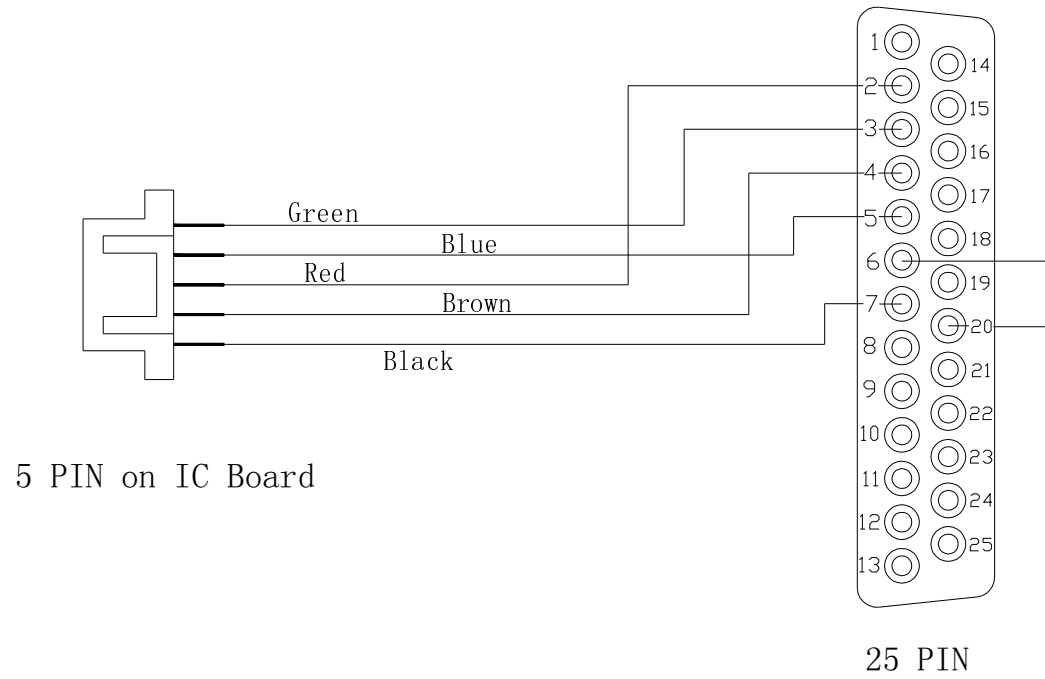
3. The 8 pins on IC board should be set as following:



3. How to connect the connector between 5PIN and 25 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(Grand Seiko GR3100K)



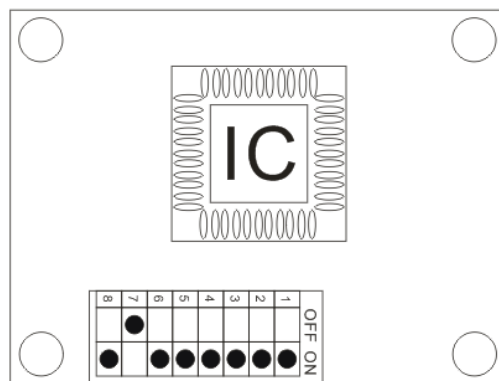
7.7 Co-operation with SHIN-NIPPON 9001K

The way of SHIN-NIPPON9001K auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of SHINNIPPON AUTO REFRACTOMETER 9001K should be place as follows:

STEP	0.25	0.12	0.01		
VD (mm)	10	12	13.5	15.0	
CYL	(-)	(+)	±		
START	MAN. N	MAN. E	AUTO (5)		
FOCUS	PRECISION	NORMAL			
REF	NORMAL	QUICK (3)			
PRINT FORM	ALL	ECOND	OFF		
DATA SCREEN	ON	OFF			
W-D (cm)	OFF	30	35	40	45
TAGGET	LIGHT	BRIGHT	NORMAL	DARK	
SAVE (min)	OFF	3	5	10	
PD CENTER	ON	OFF			
BUUZER	HIGH	LOW	OFF		
OPTION	MESSAGE NO.	RS232C			
	BAUDRATE	9600			
	CHARACTER	8			
	PARITY	NONE			
	STOP BIT	1			

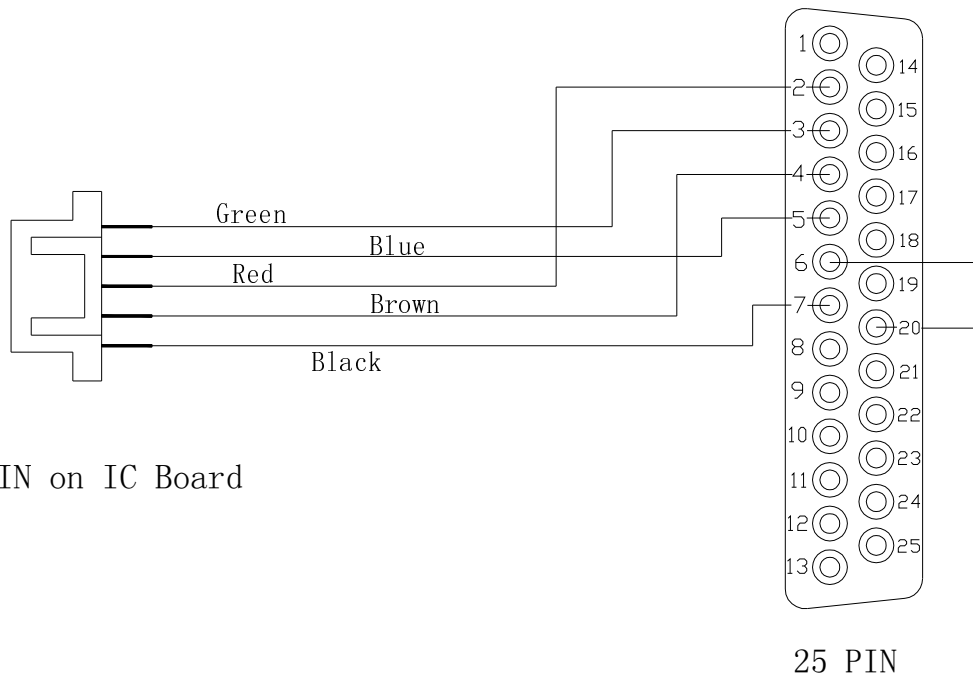
2. The 8 pins on IC board should be set as following:



3. How to connect the connector between 5PIN and 25 PIN.

DIGITAL REFRACTOR
(SCIENCETERA AV-1P)

AUTO REFRACTOMETER
(SHIN-NIPPON 9001K)



7.8 Co-operation with NIDEK AR-610

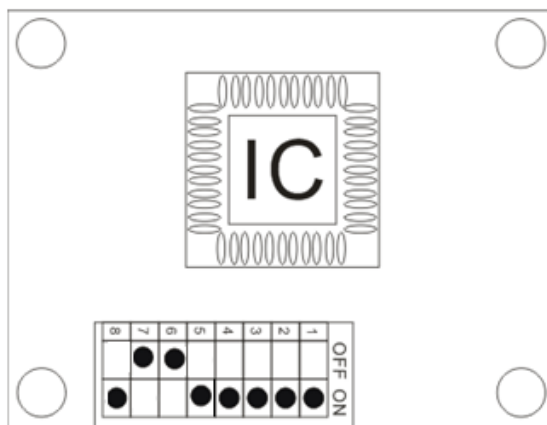
The way of NIDEK 610 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of NIDEK AUTO REFRACTOMETER 610 should be setting as follows:

No.	Parameter name	Setting option
41	1/F Mode	NIDEK/ <u>NCP10</u>
42	1/F Format	All/ <u>Short</u>
43	Baud-Rate	<u>9600</u> /4800/2400/1200
44	Bit Length	7/ <u>8</u>
45	CR Code	YES/ <u>NO</u>
46	IN Port Sel.	<u>LM</u> / Barcode
47	LM Data Prt	YES/ <u>NO</u>
48		
49		
50		

No.	Parameter name	Setting option
1	Step	0.01D/0.12D/ <u>0.25D</u>
2	Vertex D.	0mm/10.5mm/ <u>12mm</u> 13.75mm/15mm/16.5mm
3	Axis Step	<u>1°</u> /5°
4	Meas.Mode	<u>Con.</u> /Nor.
5	AI Mode	<u>YES</u> /NO
6	CYL	-0.25
7		
8		
9		
10		

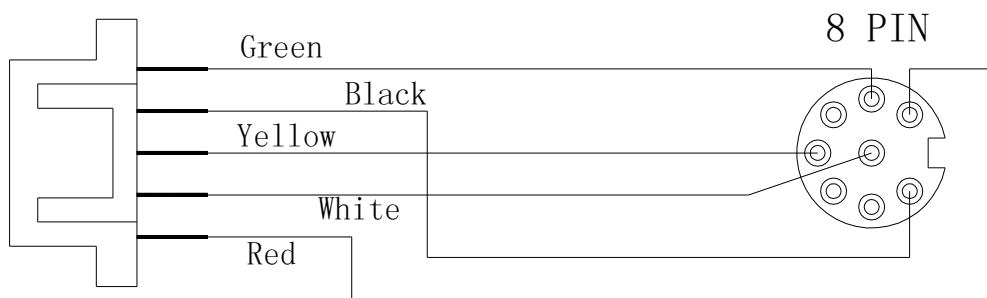
2. The 8 pins on the IC board should be set as following:



3. How to connect the connector between 5PIN and 8 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(NIDEK 610)



5 PIN on IC Board

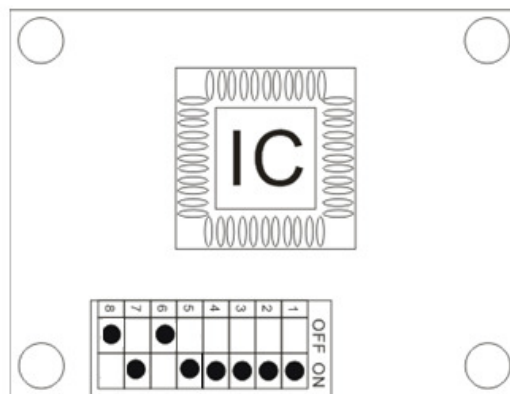
7.9 Co-operation with NIDEK AR-310A

The way of NIDEK AR-310A auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

- The MENU of NIDEK AUTO REFRACTOMETER 310A should be setting as follows:

STEP	0. 01D	0. 12D	0. 25D			
VERTEXD	0. 00mm	10. 50mm	12. 00mm	13. 75m	15. 00mm	16. 50mm
AXIS STEP	1°	5°				
PRINT	MANUAL	AUTO	HIGH			
I/F Mode	NIDEK	NCP10				
I/F Format	ALL	SHORT				
BAUD-RATE	1200	2400	4800		9600	
BIT LENGTH	7	8				
CR CODE	YES	NO				
LM DATA PRINT	YES	NO				

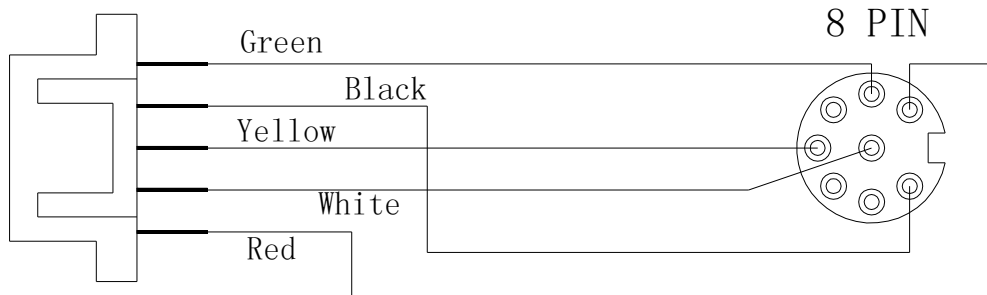
- The 8 pins on the IC board should be set as following:



3. How to connect the connector between 5PIN and 8 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(NIDEK 310A)



5 PIN on IC Board

7.10 Co-operation with CANON R-F10

The way of CANON R-F10 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of CANON AUTO REFRACTOMETER R-F10 should be setting as following:

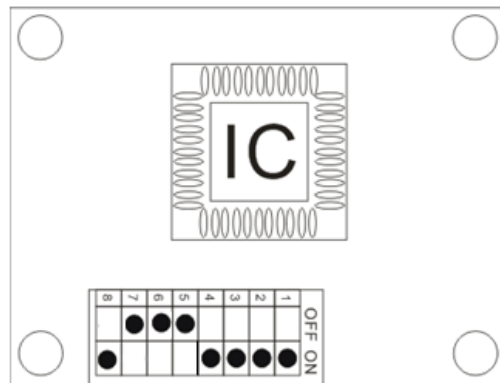
- SET MODE-			
VD:	12.0		13.5
SPH:	0.01	0.12	0.25
CYL:	0.01	0.12	0.25
CYL:	 	+	-/+
COUNT:	ON		OFF
AUTO MEASURE:	ON		OFF
R-L MEASURE:	ON		OFF
PRINT:	ON		OFF

---	←	→	---
END	PAGE-	PAGE+	---

- SET MODE-			
PRINT:	ON		OFF
[FMT]:	STD	MEM	AUTO
[MSG]:	ON		OFF
[EYE]:	ON		OFF
[ECO]:	ON		OFF
TRANS:	ON		OFF
[FMT]:	2		
[BAU]:	9600. 8N1		
CHARACTER:	JIS		LATIN-1

---	←	→	---
END	PAGE-	PAGE+	---

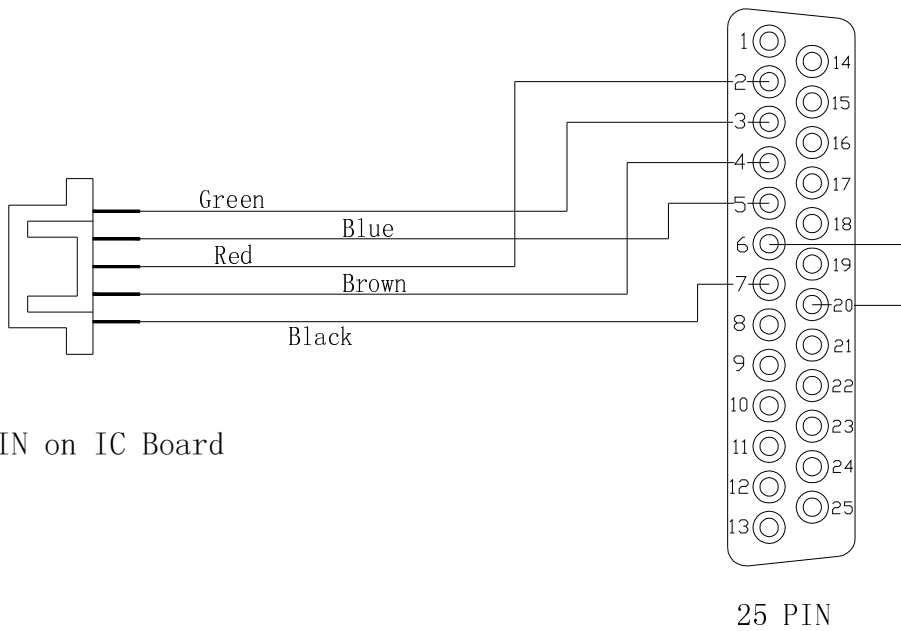
2. The 8 pins on the IC board should be set as following:



3. How to connect the connector between 5PIN and 25 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(CANON R-F10)



7.11 Co-operation with AXIS TSRK-1000

1. The MENU of AXIS TSRK-1000 should be setting as following:

MODE	AUTO	IOC	ILUM	SIZE	DISP
ESC	SHF	CLR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				↓	↓
				SETUP MODE	PAGE: 1/4

COUNT:	<u>ON</u>	OFF			
[NO.]:	0005				
D-ORDER:	YMD	MDY	DMY		
DATE:					
BEEP:	<u>ON</u>	OFF			
REF-P:	<u>STD</u>	AVE	OFF		
KER-P:	<u>STD</u>	AVE	OFF		
EYE:	<u>ON</u>	OFF			
P-ORDER:	<u>REF/KER</u>	RIGHT/LEFT			
F-AUTO:	OFF	<u>ON</u>			
C-AUTO:	3				
P-SAVE:	5 MIN				

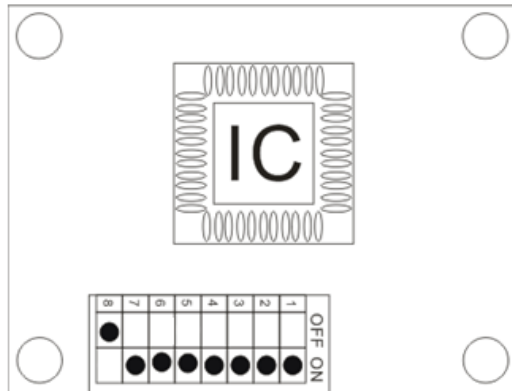
				↓	
				PRINT	PAGE2/4

VD:	0.0	<u>12.0</u>	13.5	15.0	
CYL:	<u>[-]</u>	[+]	MIX		
S-REF:	0.125	<u>0.250</u>			
H-AUTO:	185				
MM/D :	<u>mm</u>	D	AVG		
S-KER	0.050	0.125	<u>0.250</u>		
INDEX:	<u>1.3375</u>	1.3320	1.3360		
COMM:	<u>9600</u>				

1. :REF..... ONLY POWER ON
2. :KER
3. K/R
4. CCBC
- 5.

				↓	
				PRINT	

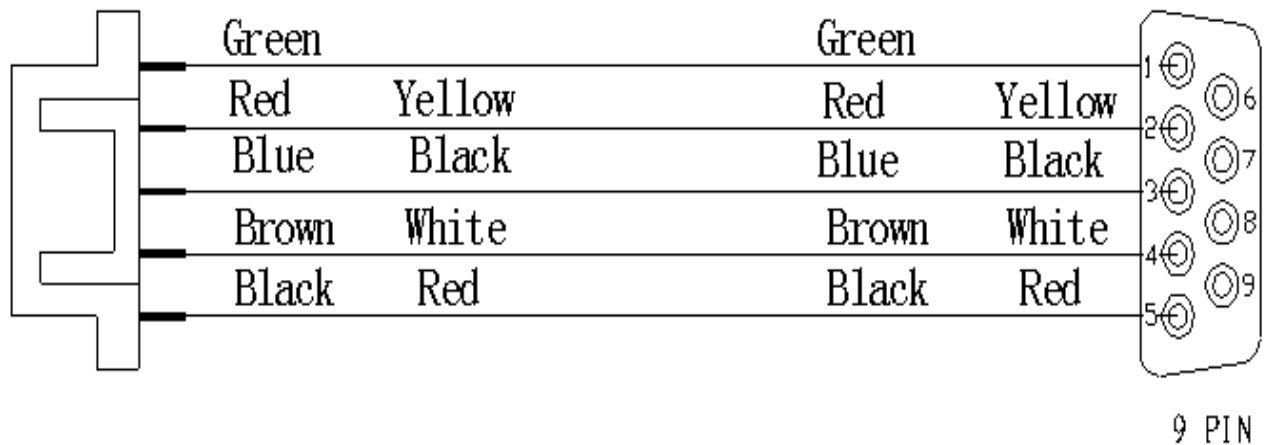
2. If you would like connect with CHART PROJECTOR, eight codes on IC BOARD of CHART PROJECTOR as follows:



3. How to connect the connector between 5PIN and 9 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
AXIS TSRK-1000

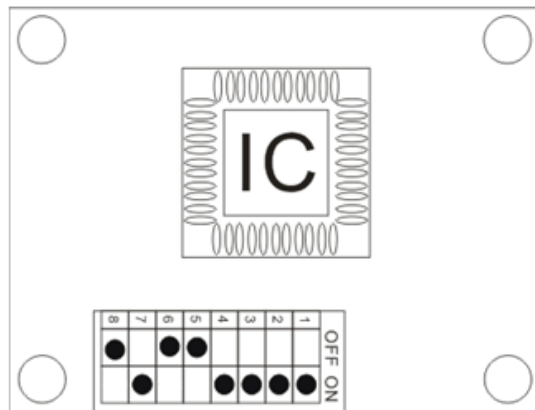


7. 12 Co-operation with PICHINA PRK-9000

The way of PICHINA PRK-9000 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

1. The MENU of HUVITZ AUTO REFRACTOMETER should be place as follows:

2. The 8 pins on the IC board should be set as following:



7.13 Co-operation with CHINA-AT3000

The way of CHINA-AT300 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

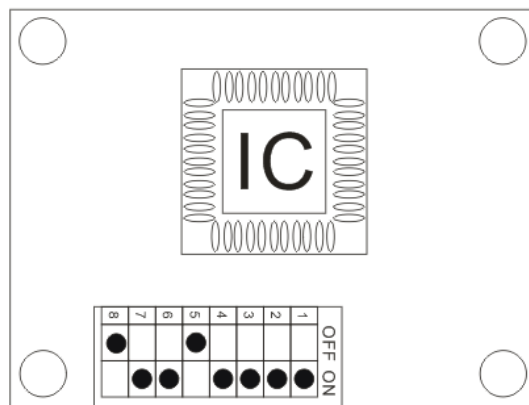
1. The MENU of HUVITZ AUTO REFRACTOMETER should be place as follows:

VD:	0.0	12	13.5
SPH:	0.0	0.12	<u>0.25</u>
CYL:		0.12	<u>0.25</u>
CYL:	<u>(-)</u>	(+)	(+/-)
PRINT:	<u>ON</u>	OFF	

RS232C:

BAUDRATE: 9600
CHARACTER: 8
PARITY: NONE
STOP BIT: 1

2. The 8 pins on the IC board should be set as following:



3. How to connect the connector between 5PIN and 9 PIN.

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
RT-3000

