Operation Manual

TSRD-500 DIGITAL REFRACTOR

SCIENCETERA

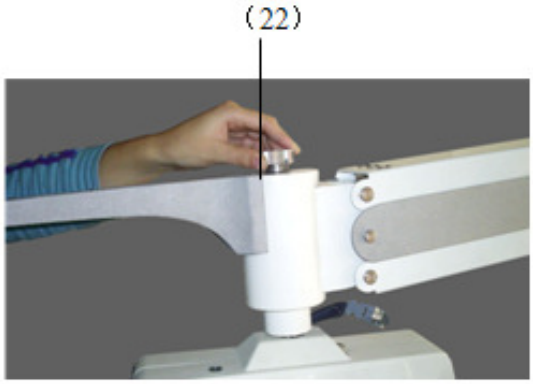
PREFACE

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

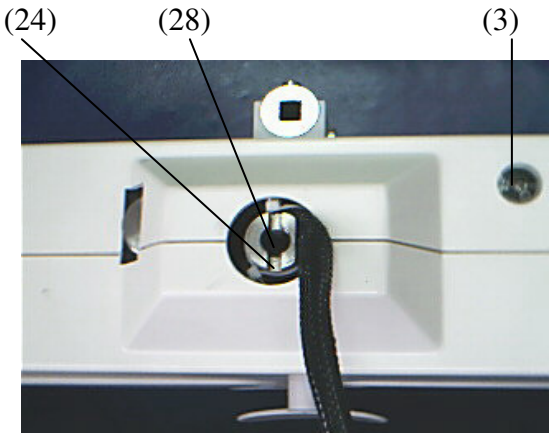
CONTENTS

3. Note for installation

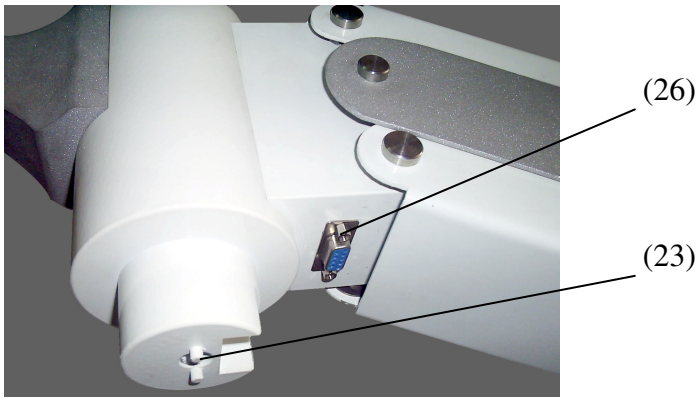
1. Digital Refractor uses DC-12V voltage. Avoid connecting with AC.
   Before installing, the electricity of transformer must be above 6 A.
2. Only operate the device when the electric voltage is steady.
3. The transformer equipment needs to be use solely for the Digital Refractor
4. The Digital Refractor 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)

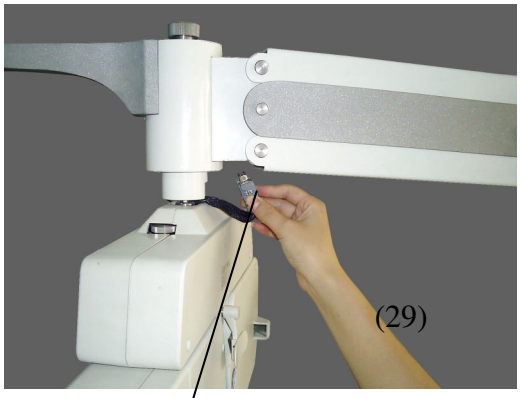


(Fig4)



(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).



(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.

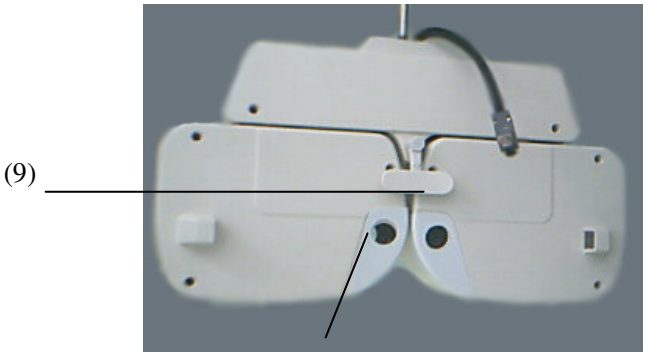
4. Main Body And Keyboard

4.1Main 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

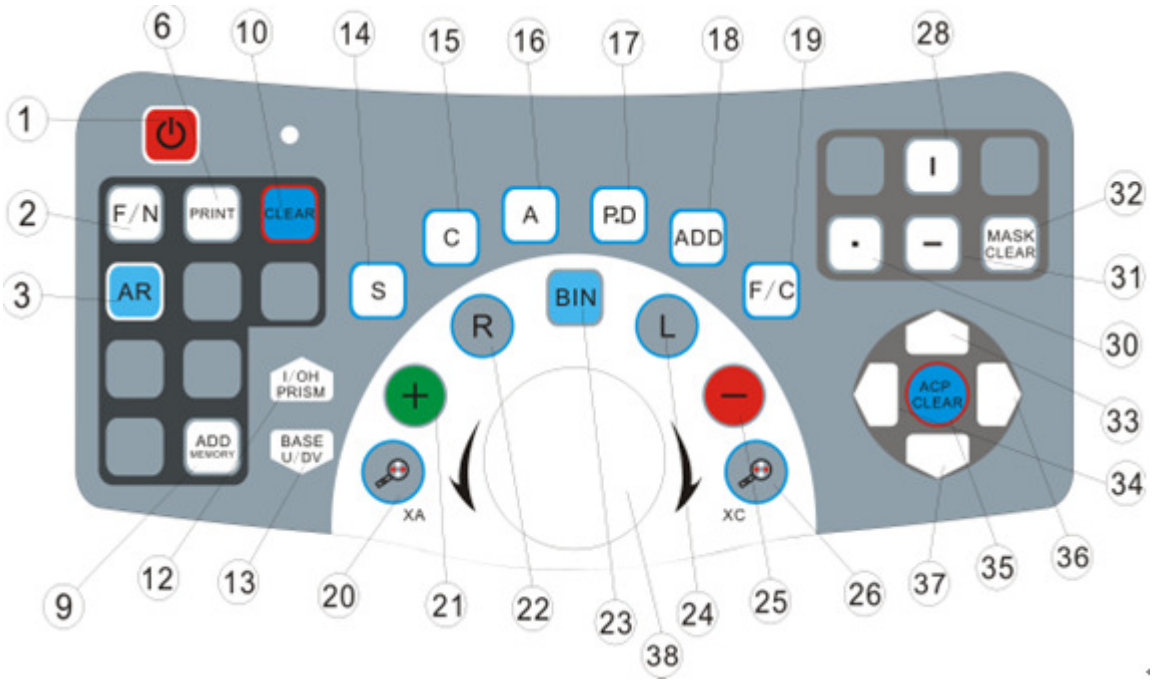
(1) Measuring windows: Patients look at the charts through these windows.
(2) PD Check windows: Used to check patient's VD
(3) Lever knob
(4) Near point card: Use for measuring addition power
(5) Near point rod
(6) Level adjustment knob
(8) Adjust the distance of corneal vertex
(14) Front cover



(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△BU 10△BU
    (6) fixed cross cylinder
    (7) retinoscope

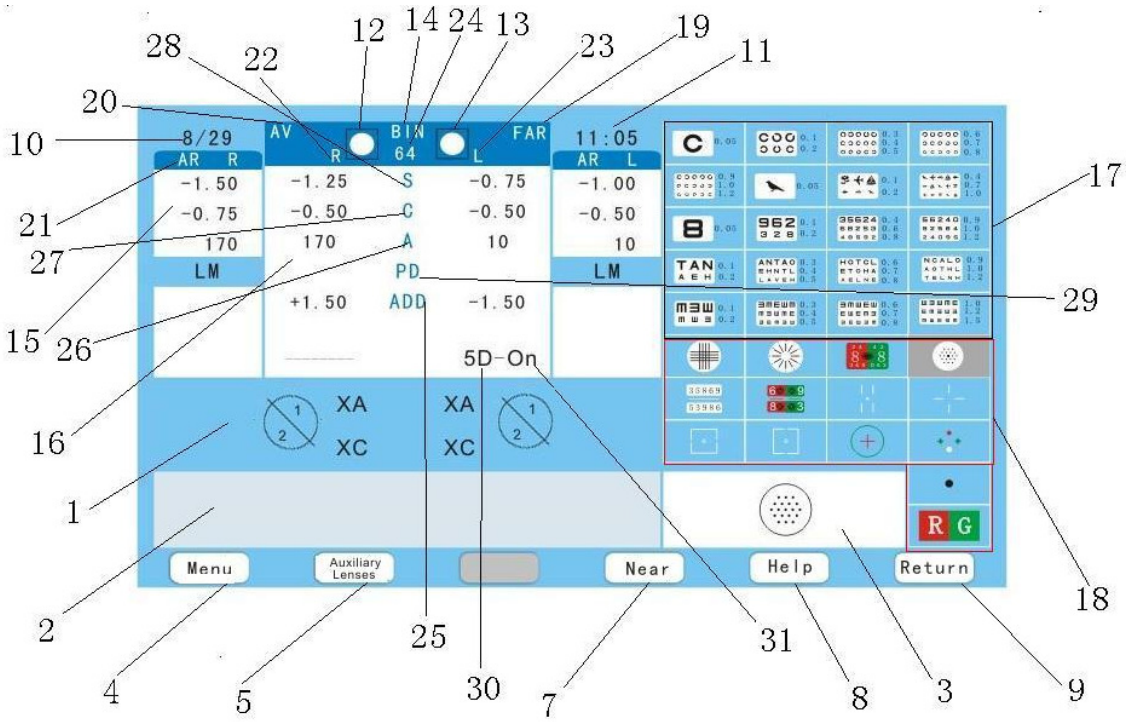
(8) ±cylinder
(9) 1° 5°
(10) prism I/O,U/D
(11) auto cross cylinder XA, XC

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 exame 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

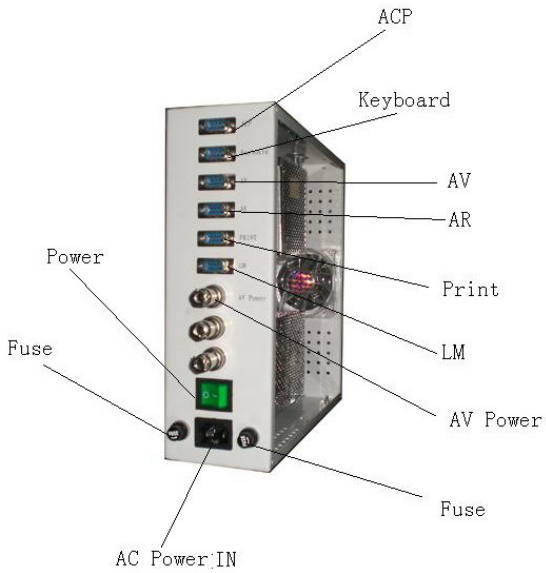
27. Cylinder
28. Spherical
29. P.D
30. 5D=5 degrees (Spherical axis);1D=1degree (cylinder axis)
31. ERR or OFF: Chart projector is not in connection
    ON: Chart projector is in work
    P1: The first memory program in work
    P2: The second memory program in work.

※ Using Digital Refractor with chart projector accordingly

Projector	Auto phoropter
	Fixed cross clylinder
	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 phoropter
	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.

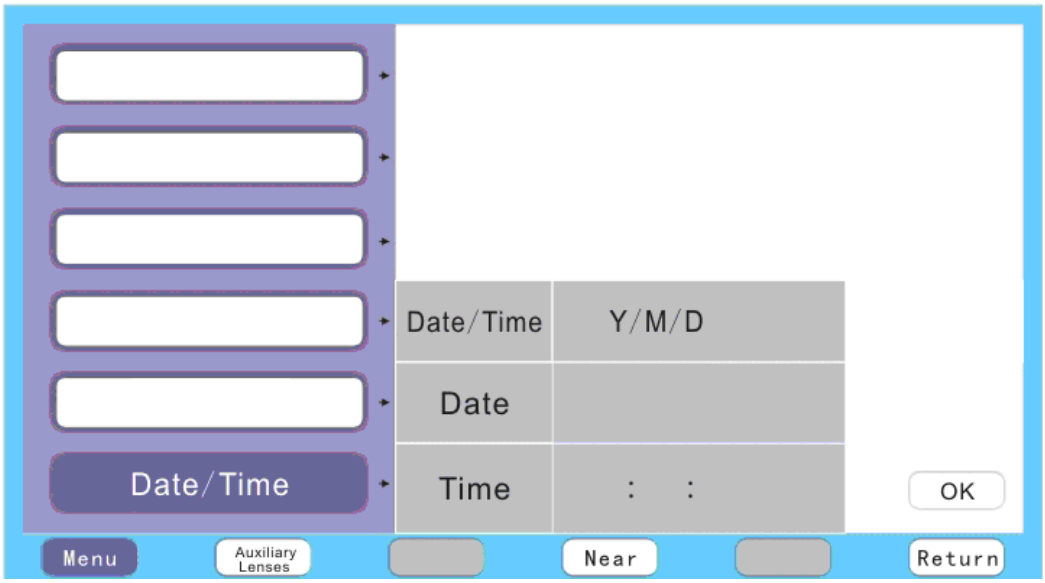


5. LCD Monitor With Touch Control

5.1 Menu

5.1.1 Date/Time

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

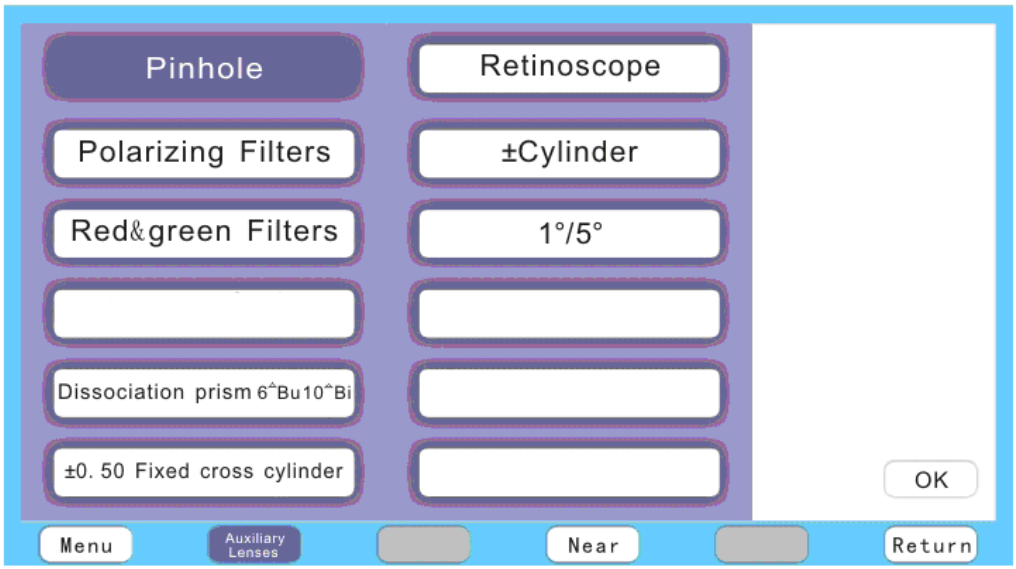


(1) Choose Y(year), and then turn around the big knob to set the right year.\
(2) Choose M(month), and then turn around the big knob to set the right month.
(3) Choose D(day), and then turn around the big knob to set the right day.
(4) Choose H(hour), and then turn around the big knob to set the right 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

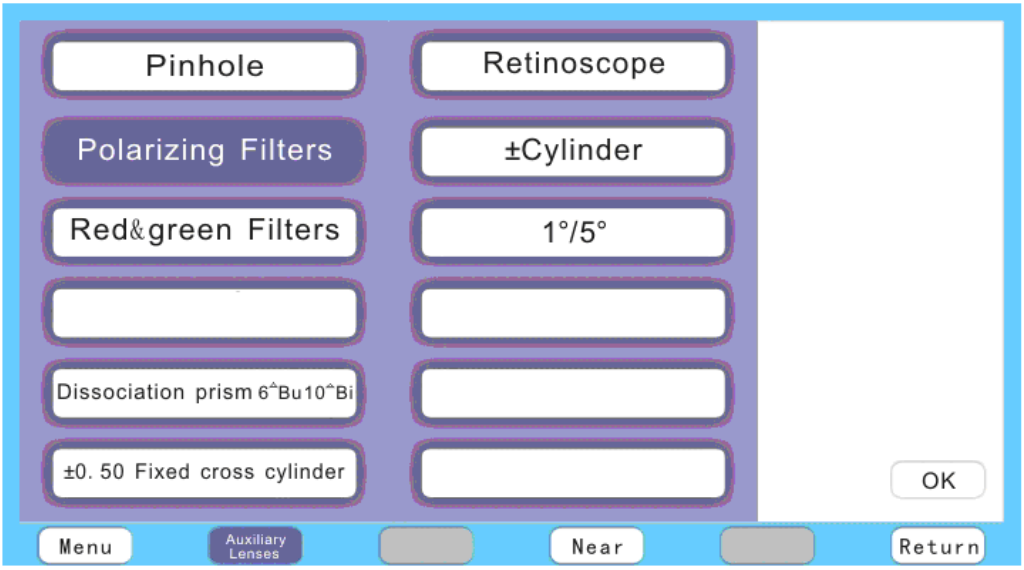


Touch Pinhole→Confirm, press FunctionClose when all gets down.

※ 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△BU10△BU, ±0.50 fixed cross cylinder, retinoscope, ±cylinder and 1°5°), 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.

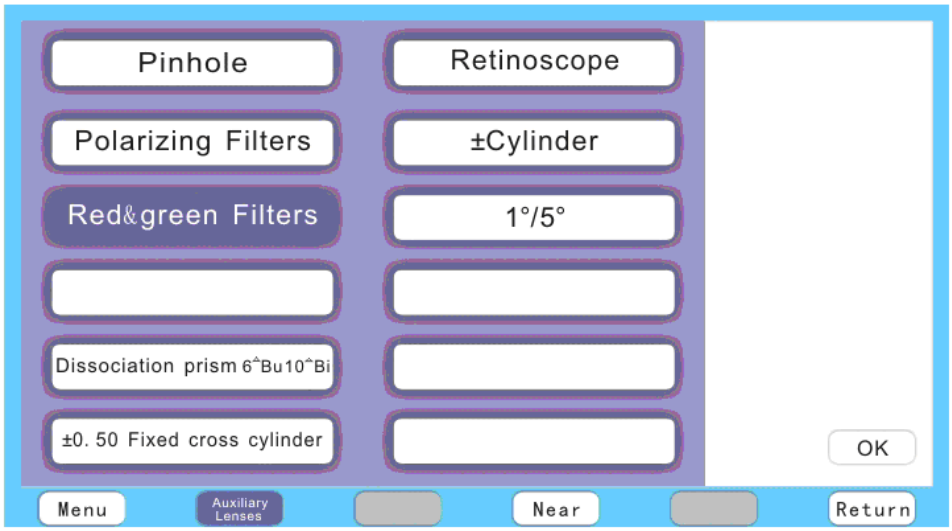
5.2.2 polarizing filters



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

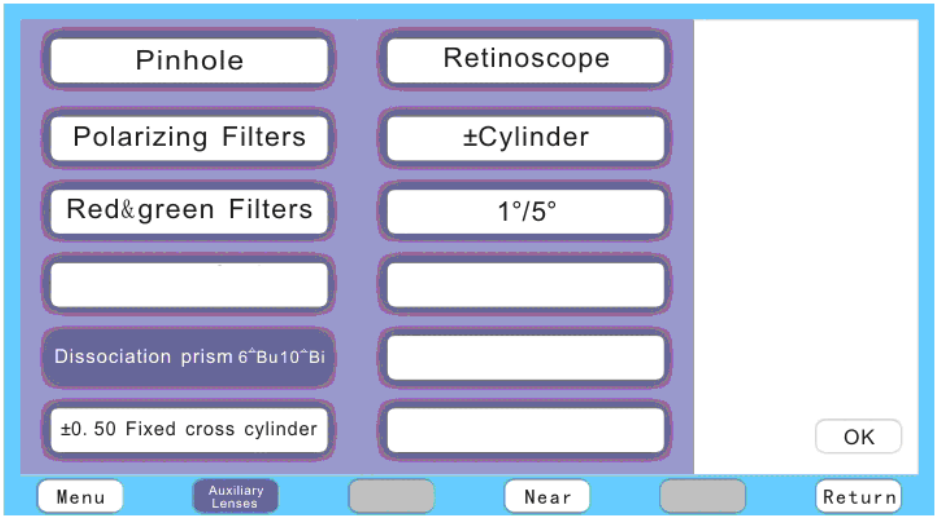
※ The polarizing lens AR need to use together with the polarizing filter of chart projector

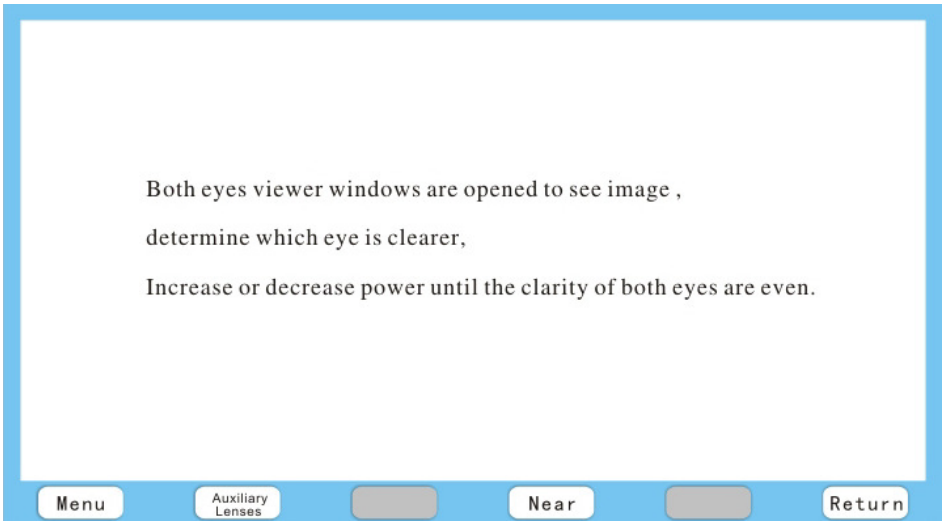
5.2.3 red＆green filters



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

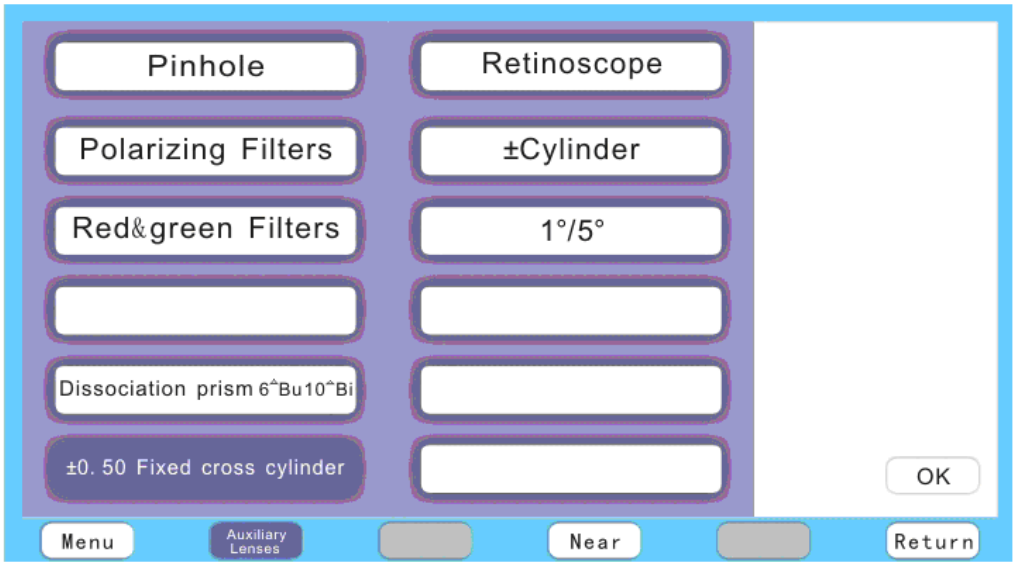
5.2.4 0.50Dissociation prism 6△BU10△BU





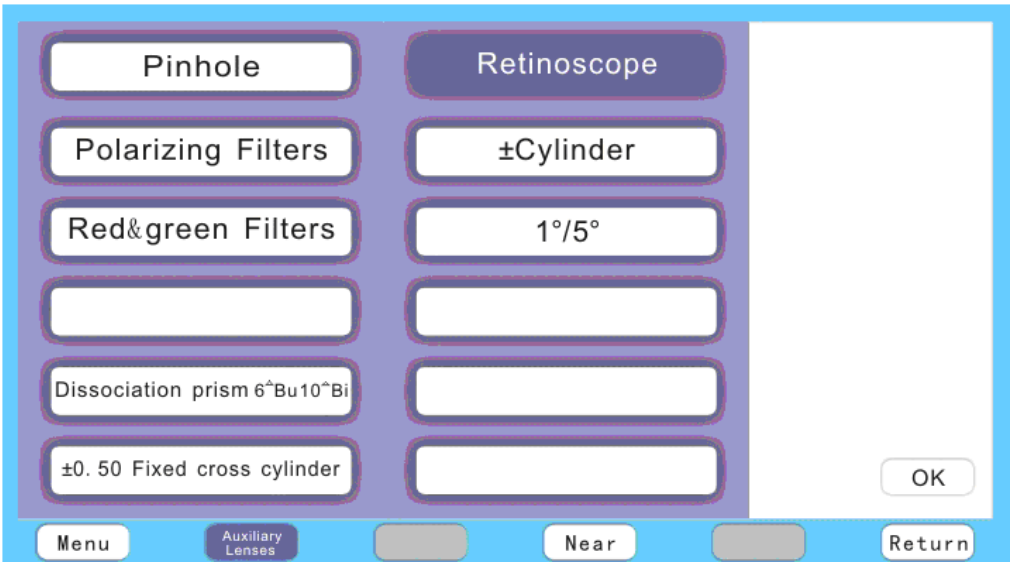
Touch ±0.50Dissociation prism 6△BU10△BU→Confirm, press FunctionClose when all gets down。

5.2.5 Fixed cross cylinder



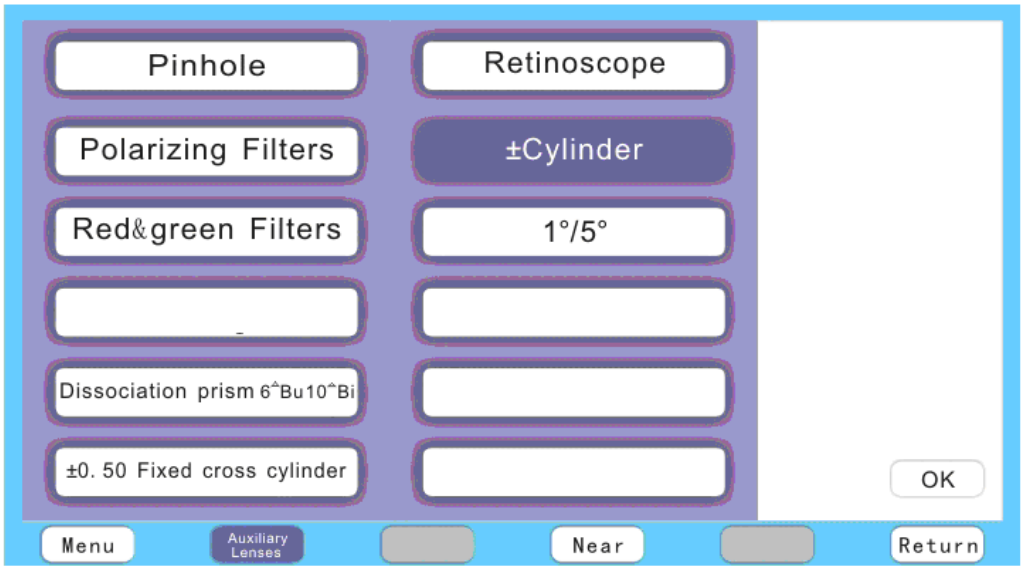
Touch **Fixed cross cylinder**→Confirm, press Function Close when all gets down

5.2.6 Retinoscope



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

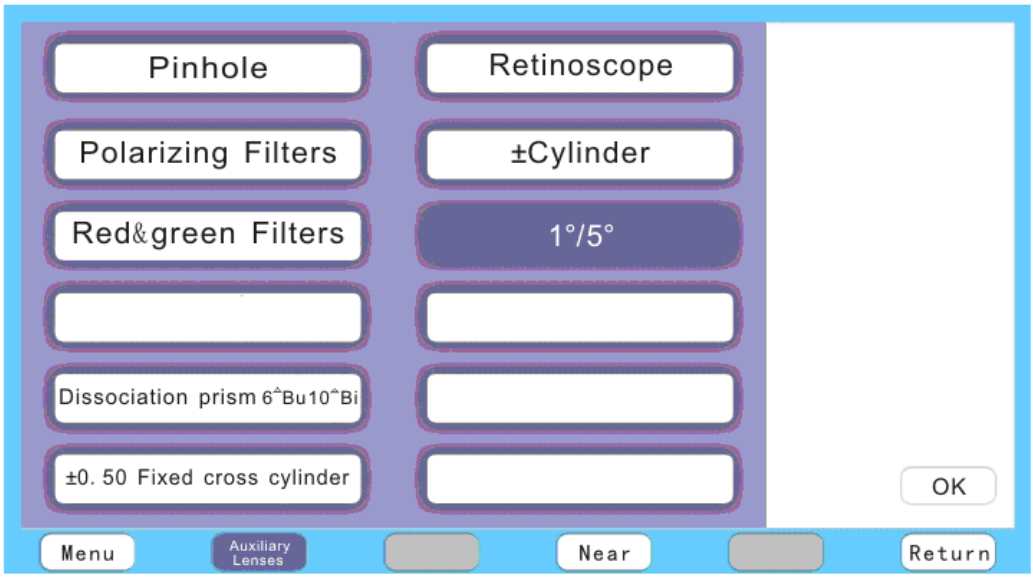
5.2.7 ± Cylinder



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

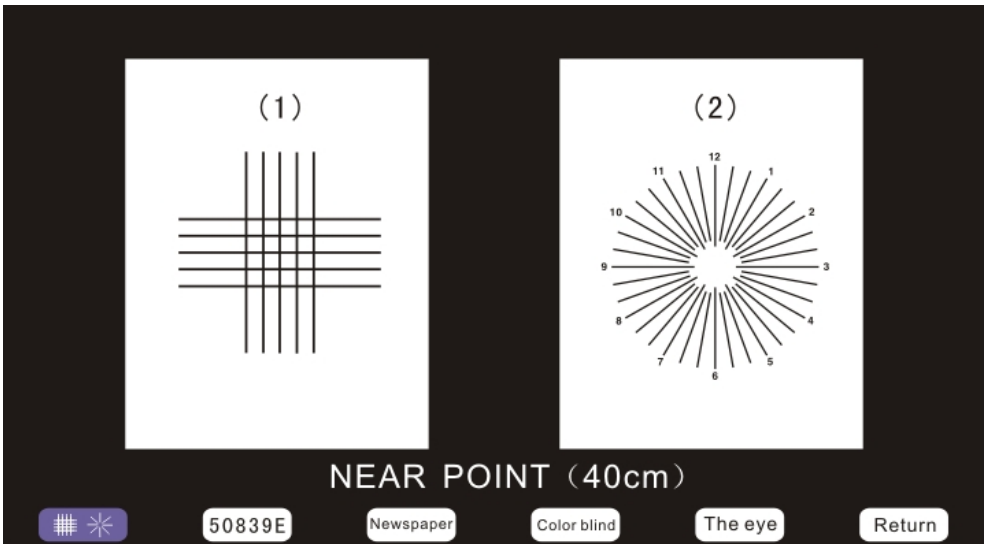
1°5° is to choose the angle of axis, it will usually be 5° without setting, and then 5D will appear on the monitor. If it is set to be 1°, 1D will appear on the monitor.

5.4 Near

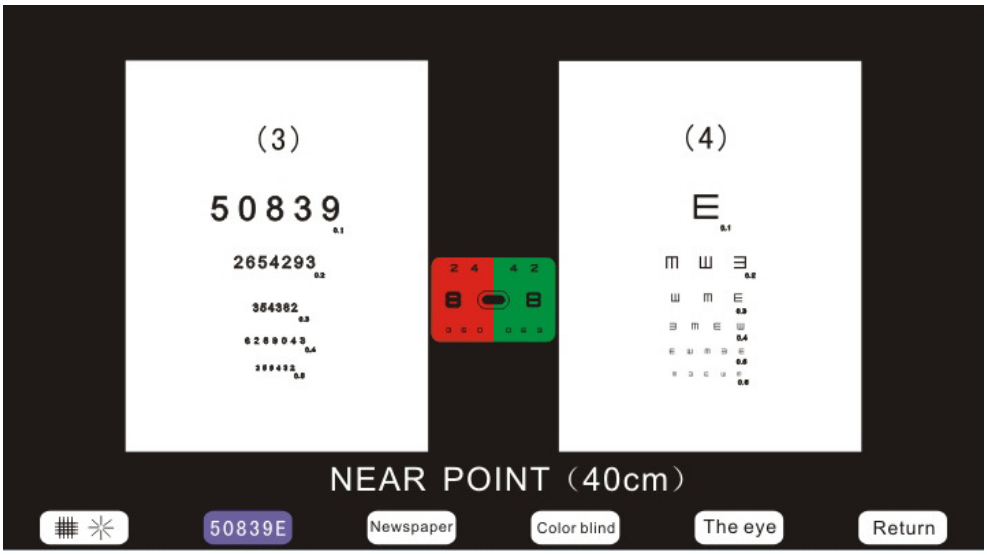
0.4 meters will be the best testing distance.

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)

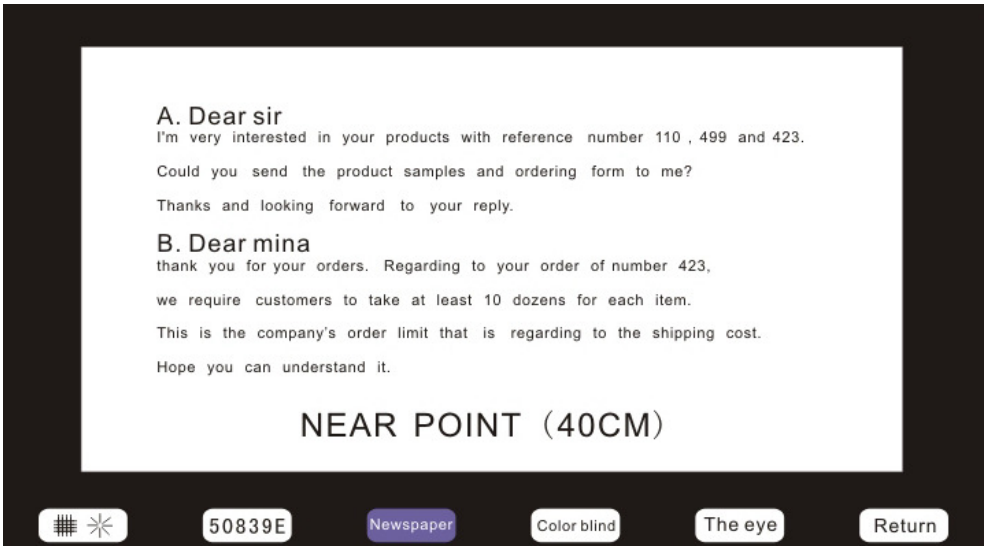
5.4.1



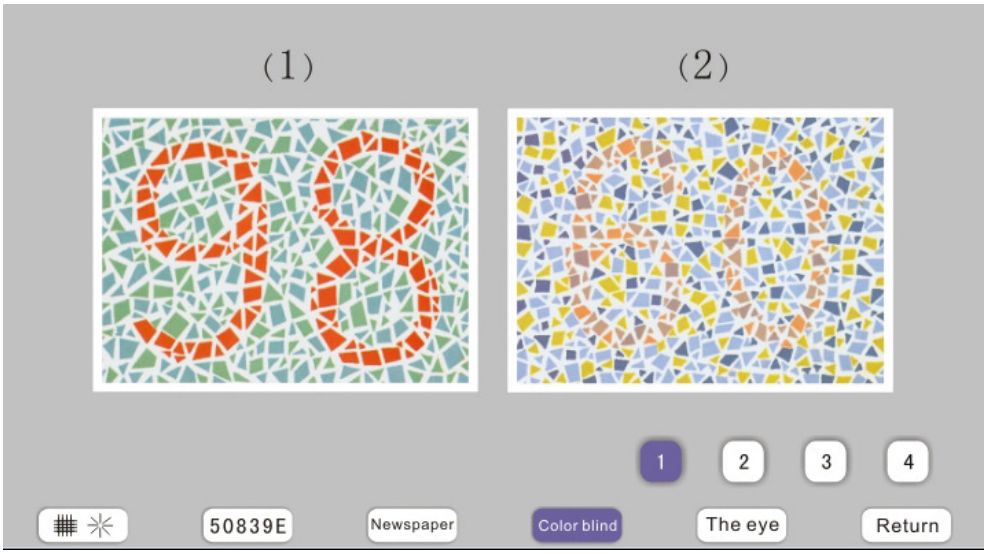
5.4.2 50839 E

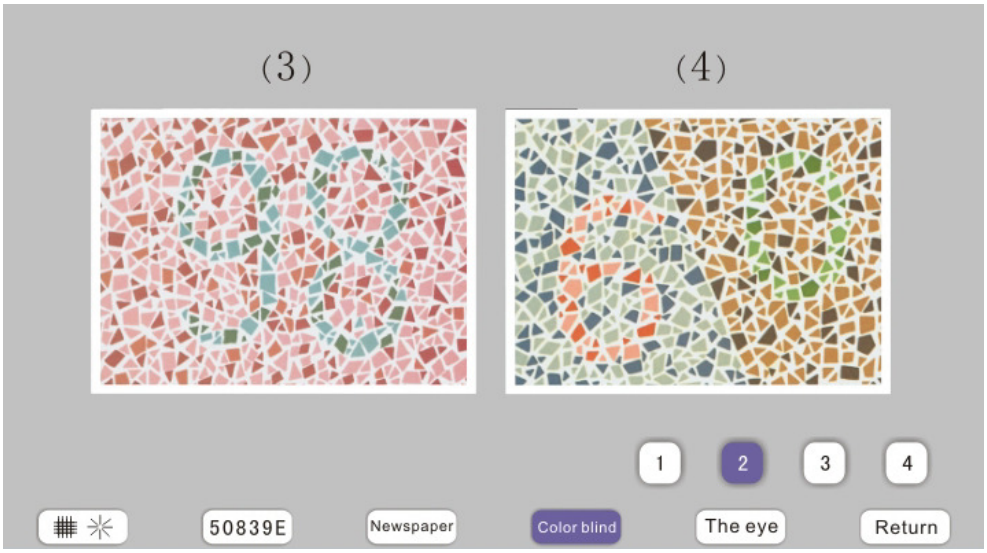


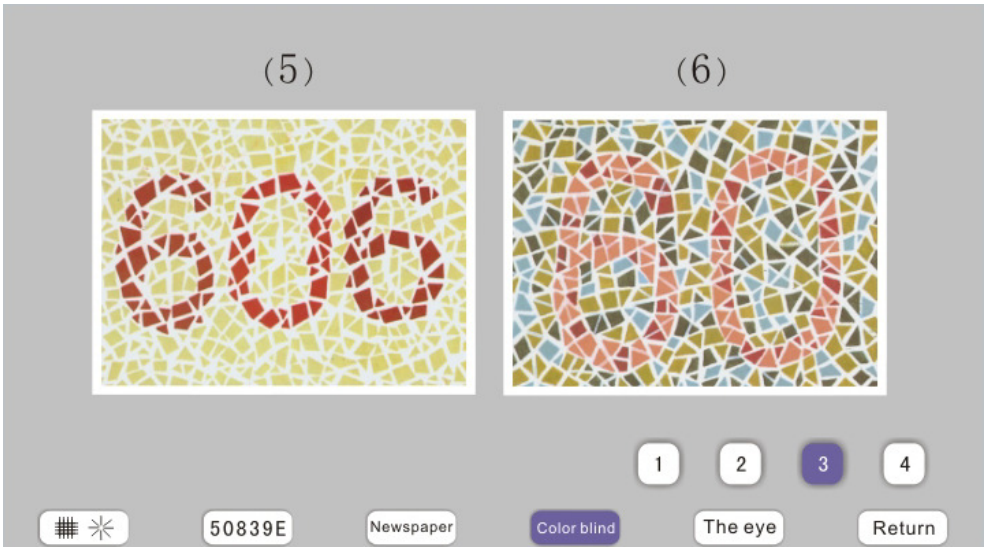
5.4.3 Newspaper

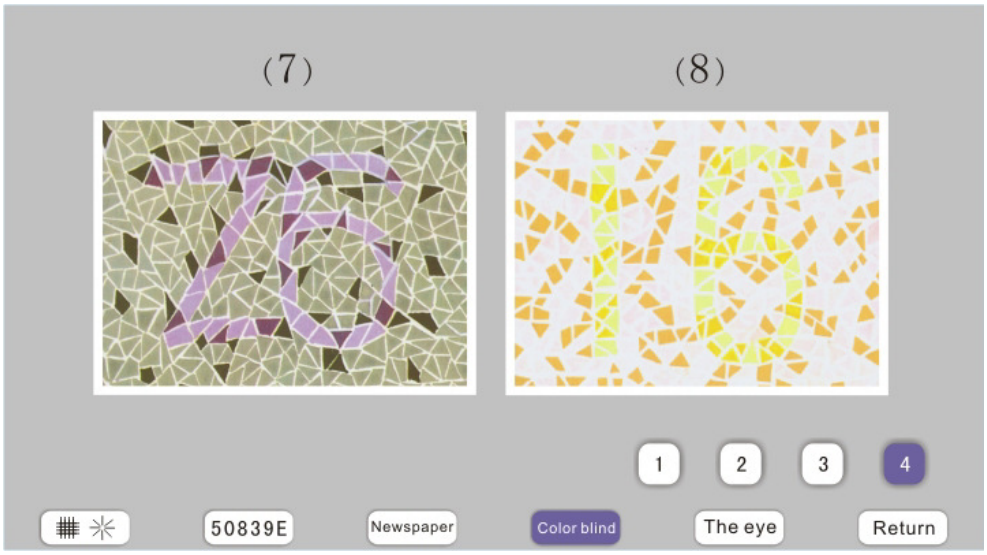


5.4.5 Color Blind

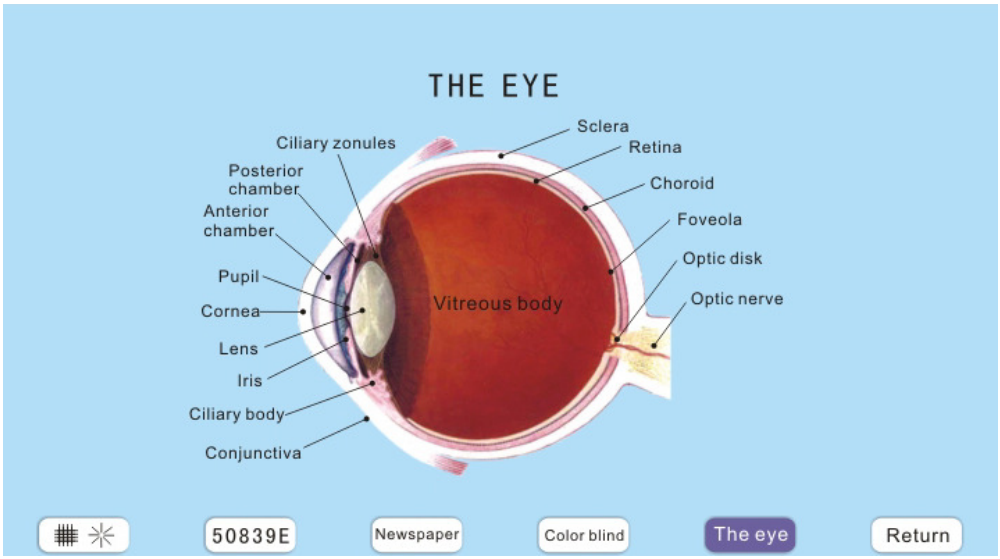








5.4.5 The eye



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

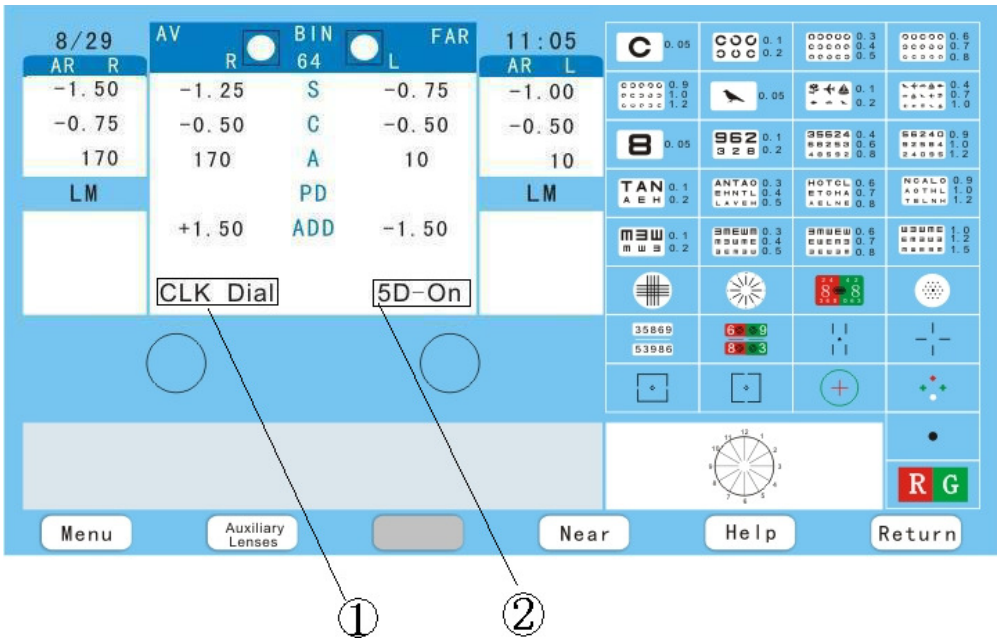
(1) Turn on the power (Digital Refractor, chart projector and keyboard)

(2) Two kinds of insert modes:

①Press 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..

②Insert 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.



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

②5D 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

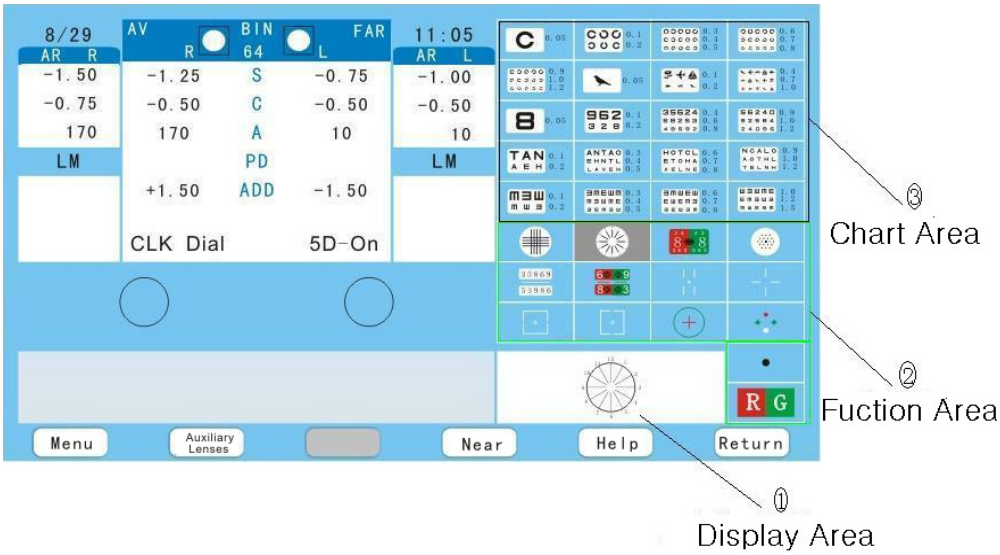
When finish the normal tests, press ADD, P.D will reduce automatically, and vergence lever will also automatically turn to the right eye(single eye test). Turn down the near card, dial the big knob or press ⊕, ⊖ to adjust the degree. When it is clear it will be the right degree of ADD. For example:

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

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.

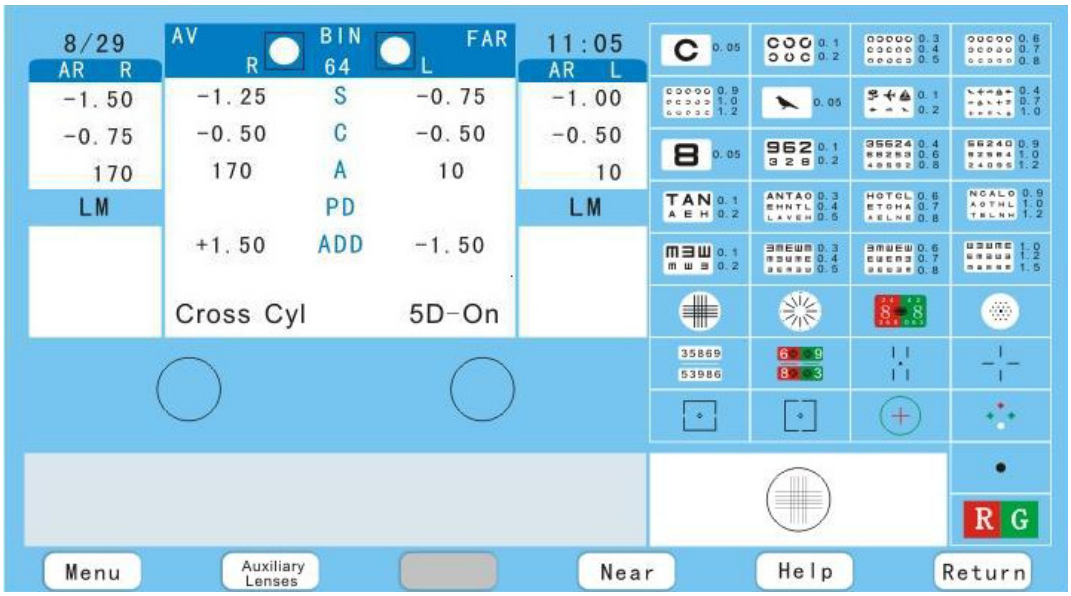
②Function Area: There are 14 types of functions for you to choose.

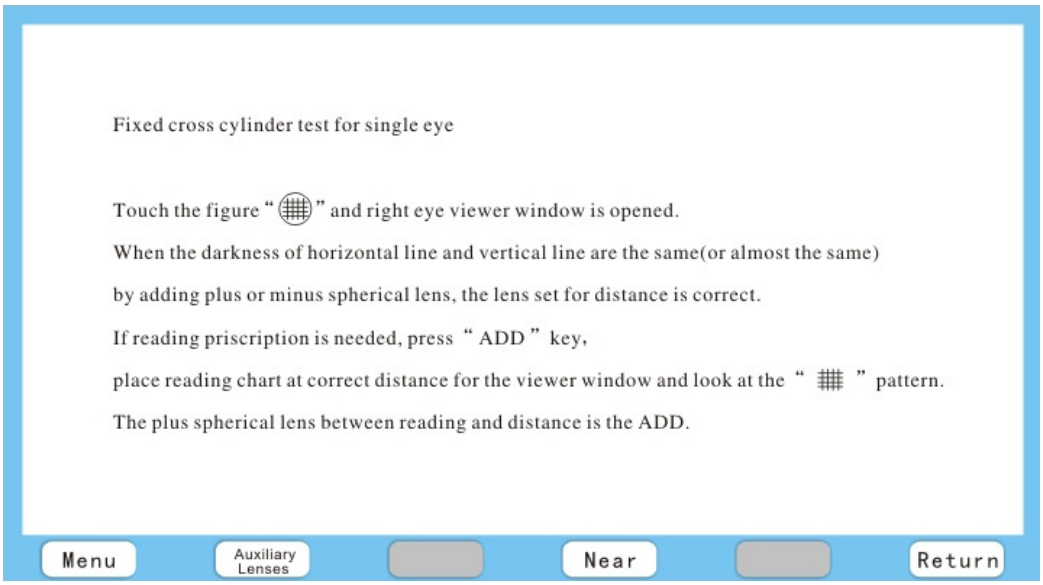
Ⓐ For the former 13 functions, just touch the panel, phoropter and chart projector will automatically be in the right position without press any other keys. If C 0.05 appears in ①Display Area, touch Help key, explanations will appear. However, if it is other charts but not C 0.05 appears in ①, Help key 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 in① Display Area whenever you open the device. The chart in function in ③Chart Area will appear in ①Display Area.

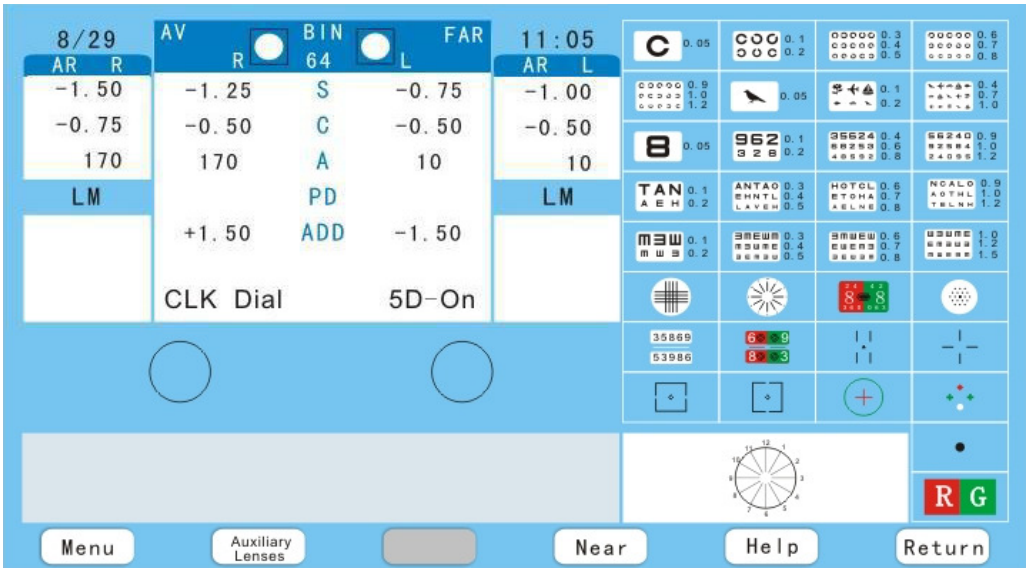
6.3 Fixed Cross Cylinder Test for Single Eye

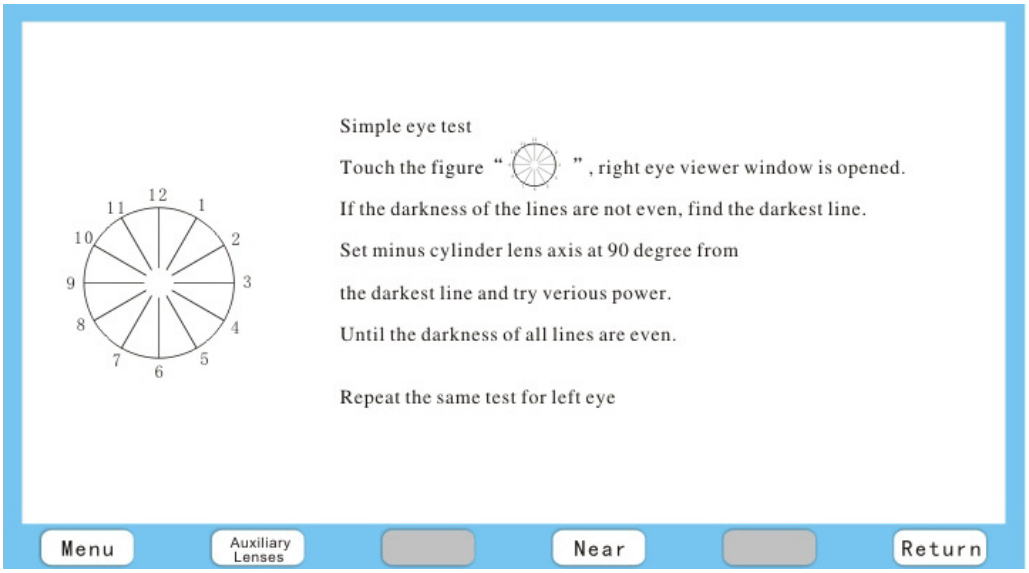




Touch , ±0.50 (Digital Refractor) will automatically turn to the right aperture of Spherical, and the of chart projector will also be in the right position automatically, and then you can start the tests.

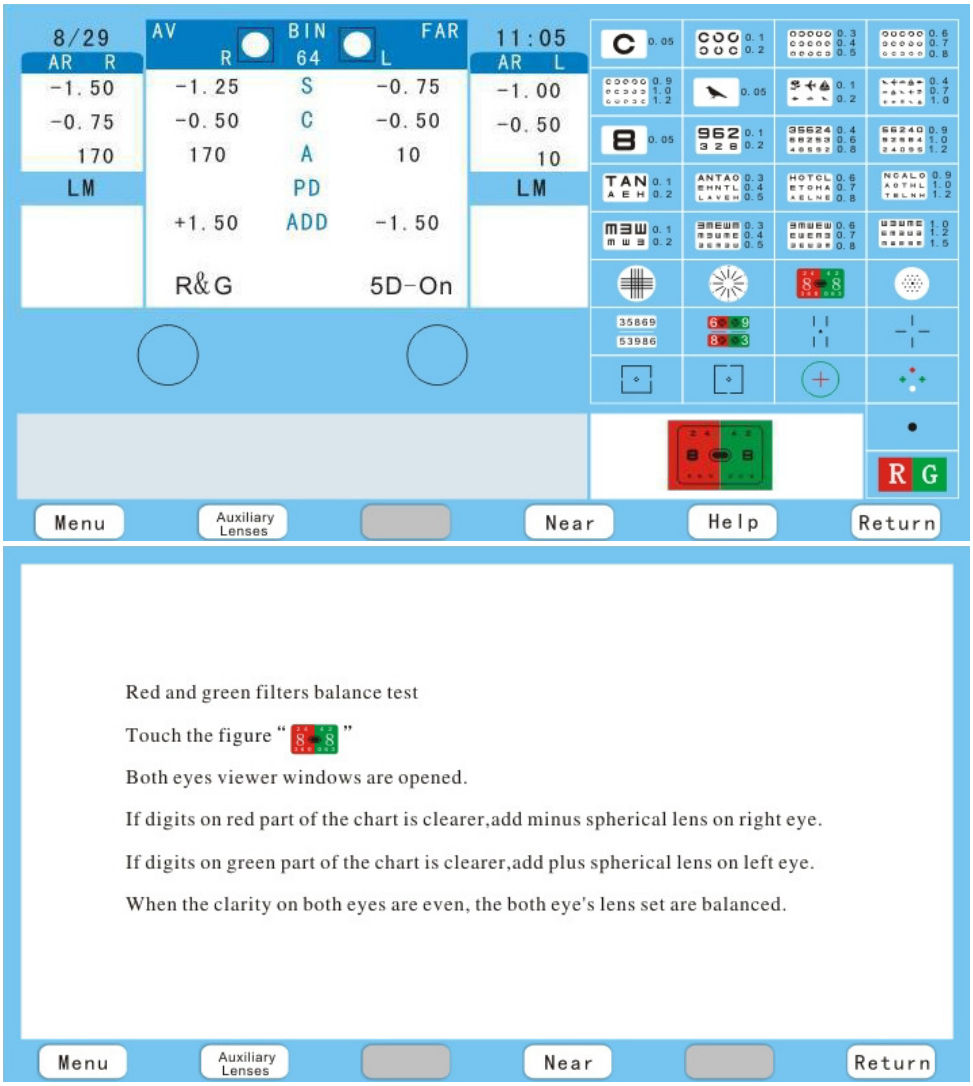
6.4 Simple Eye Test



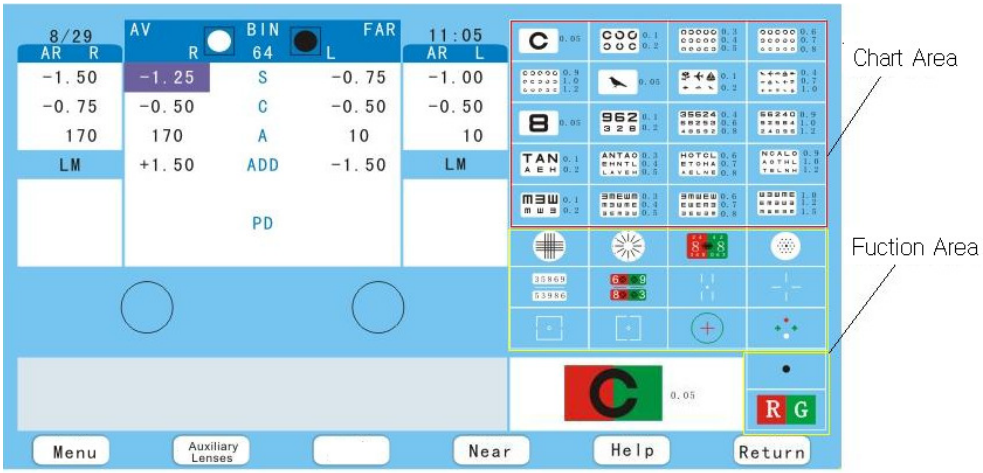


Touch , Digital Refractor will change to Axis, and chart projector will also be in the right position automatically.

6.5 Red and Green Filters Balance Test

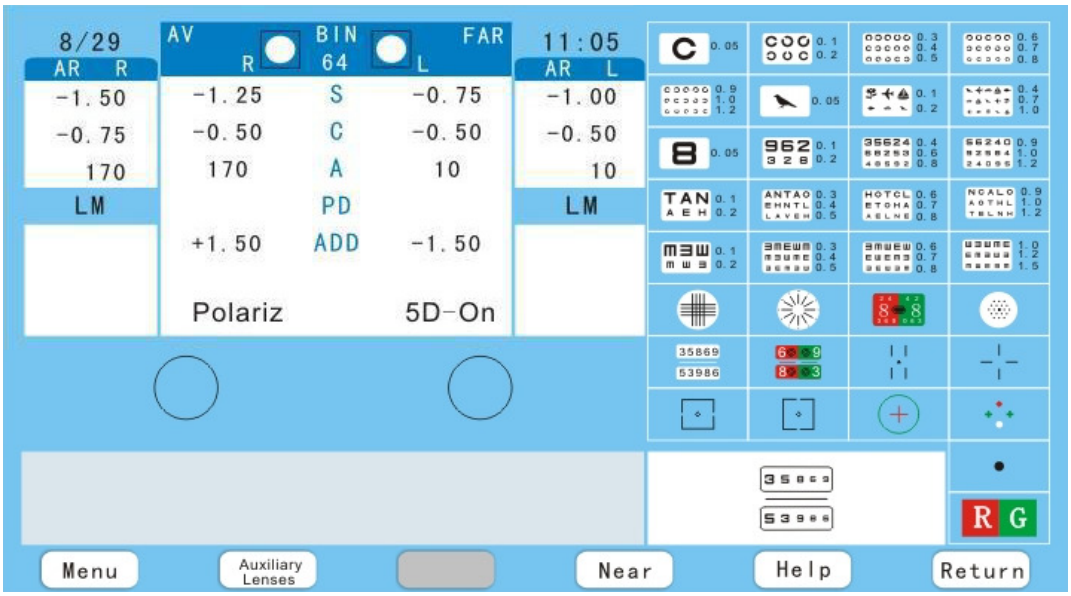


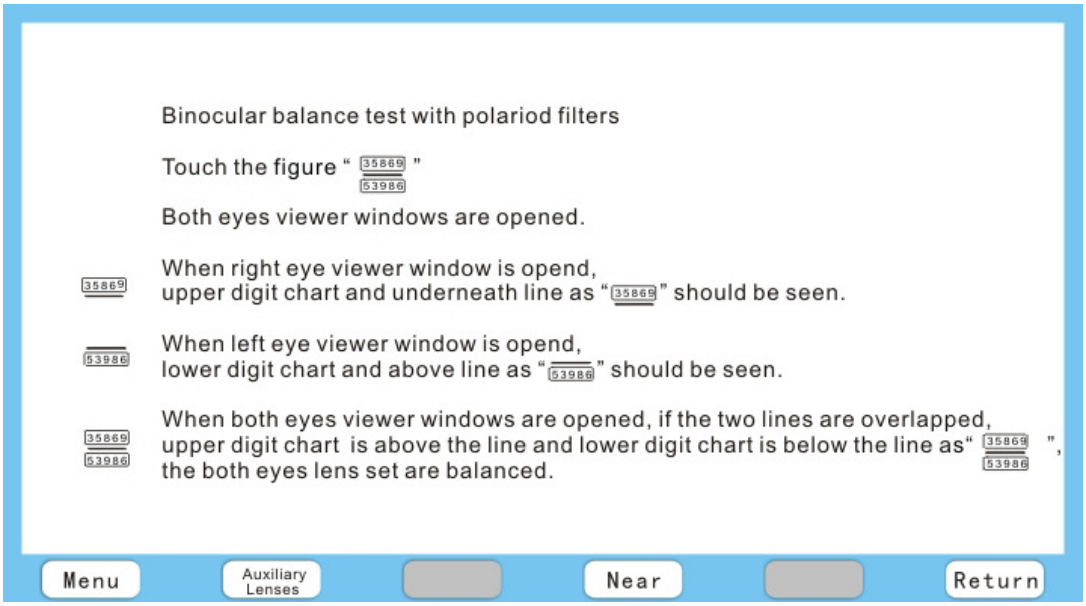
Touch , of chart projector will appear on the screen.



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

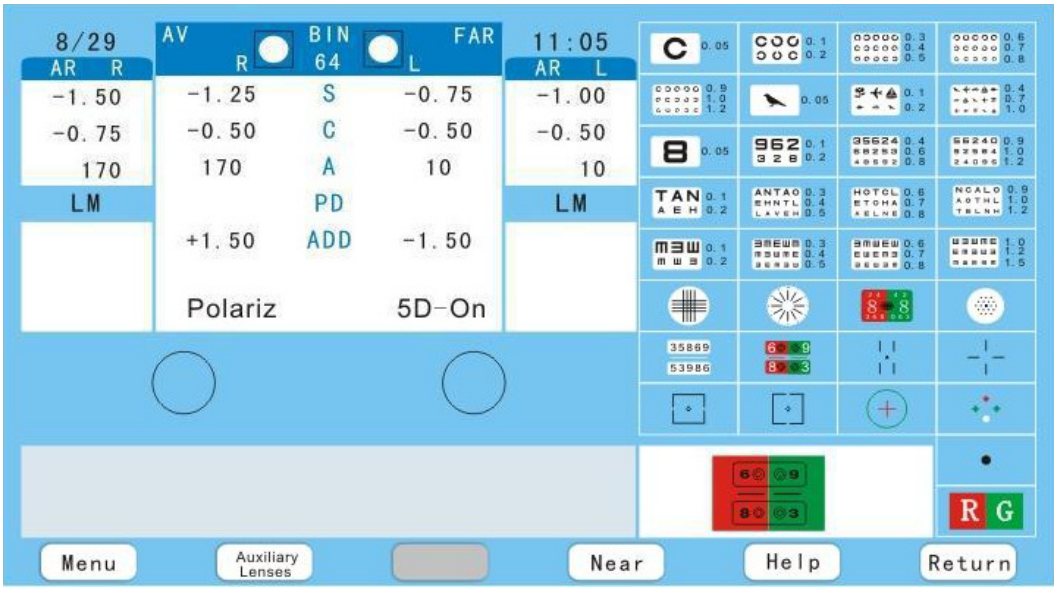
6.6 Binocular Balance Test with Polarized Filters

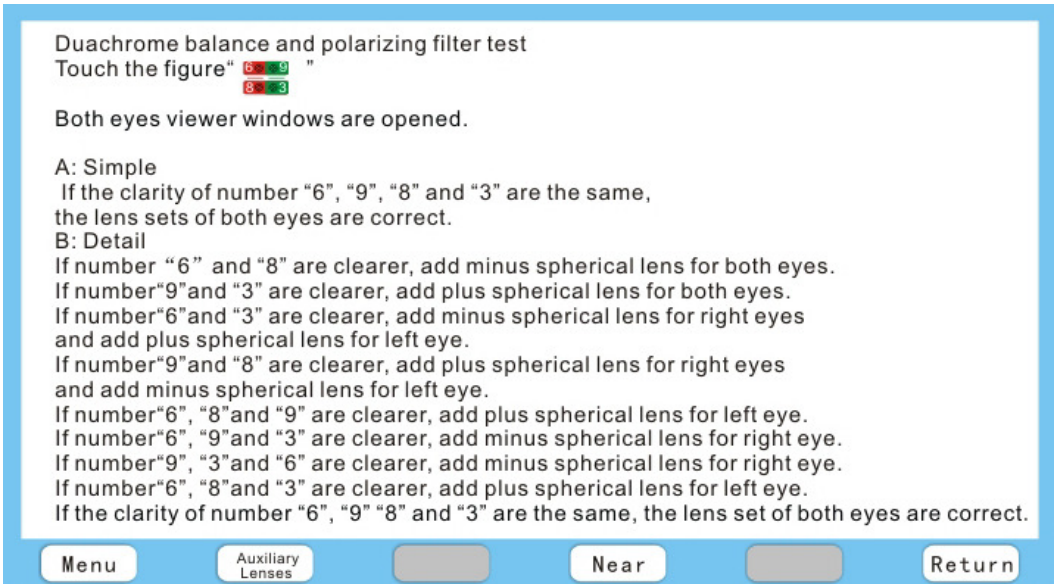




Touch , it will be in the right position automatically, and the polarizing filters will be 135 ° for the right eye and 45° for the left eye.

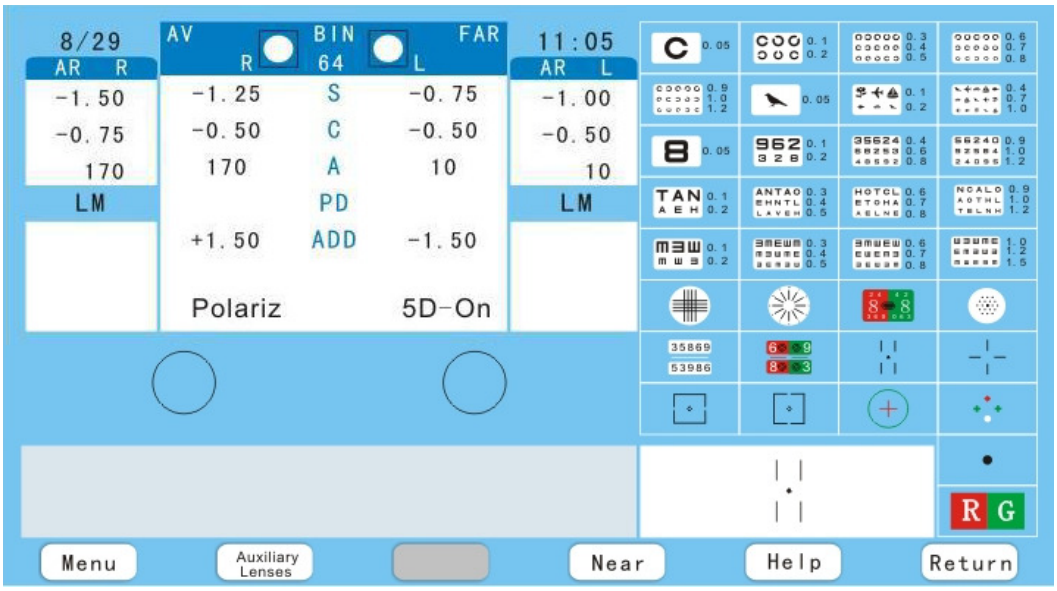
6.7 Duachrome Balance and Polarizing Filter Test

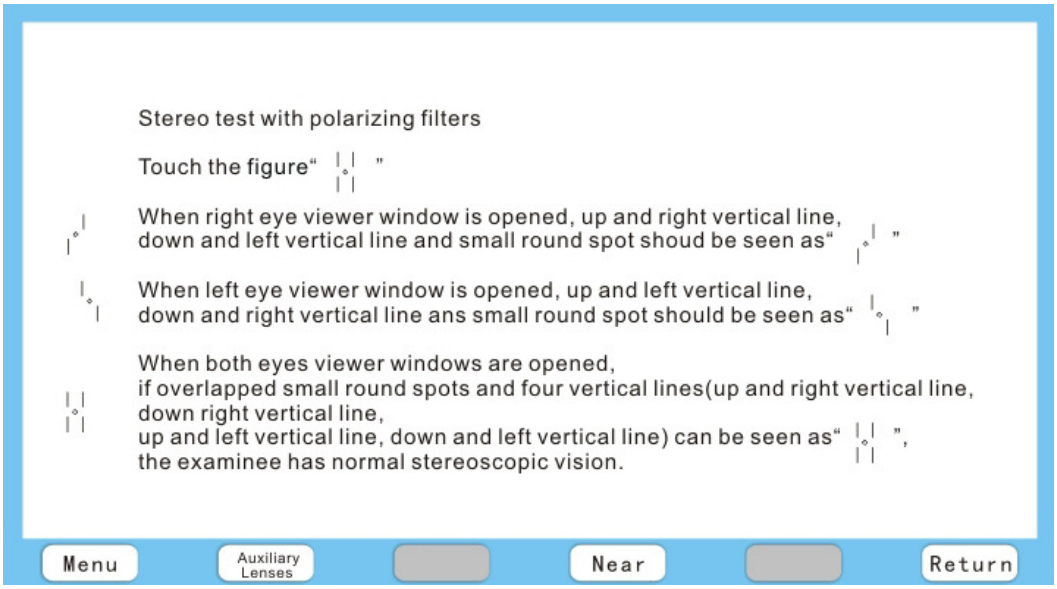




Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters (of Digital Refractor) will be 135 °（for the right eye) and 45°（for the left eye) will automatically be in the right position of both eye.

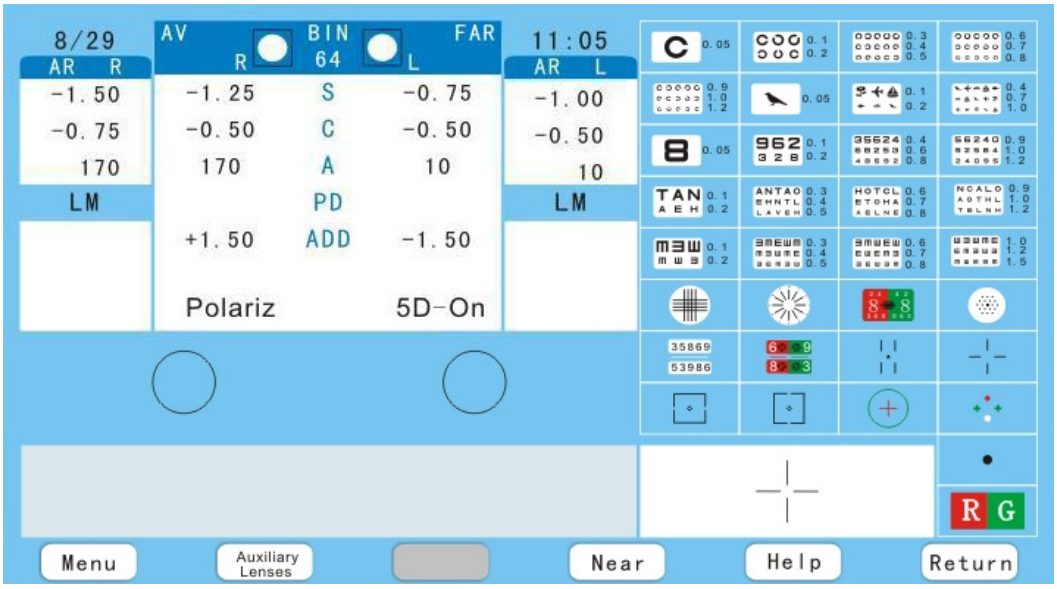
6.8 Stereo Test with Polarizing Filters

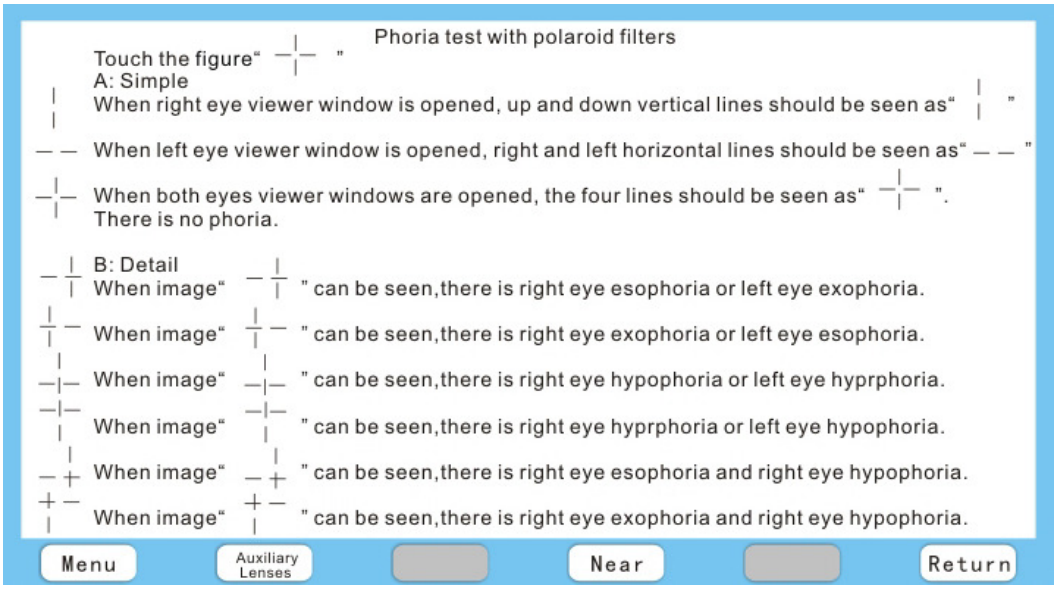




Touch (of chart projector), it will be in the right position automatically, and the polarizing filters（of Digital Refractor) will automatically be in the right position of both eye.

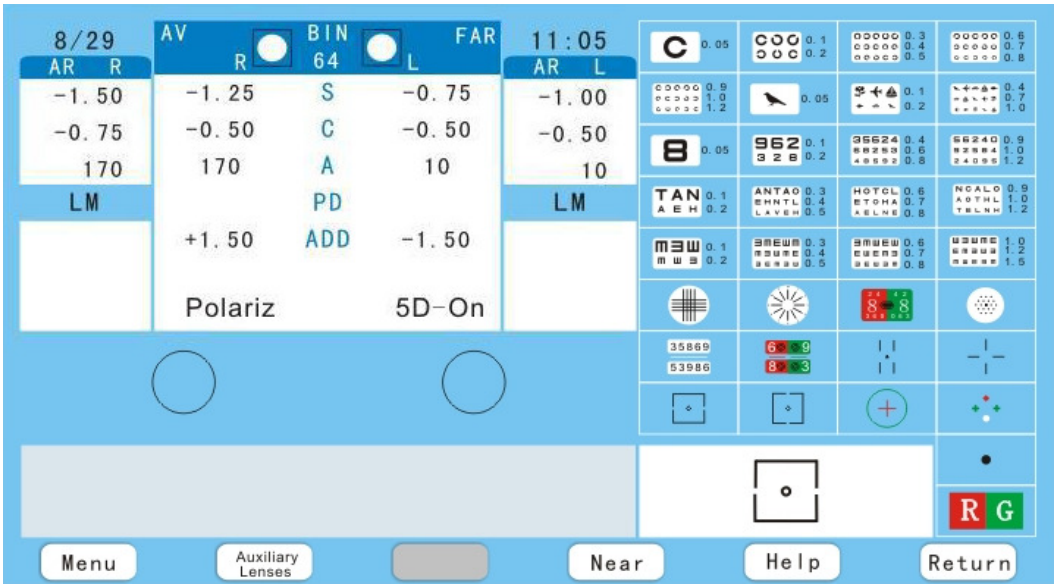
6.9 Phoria Test with Polaroid Filters

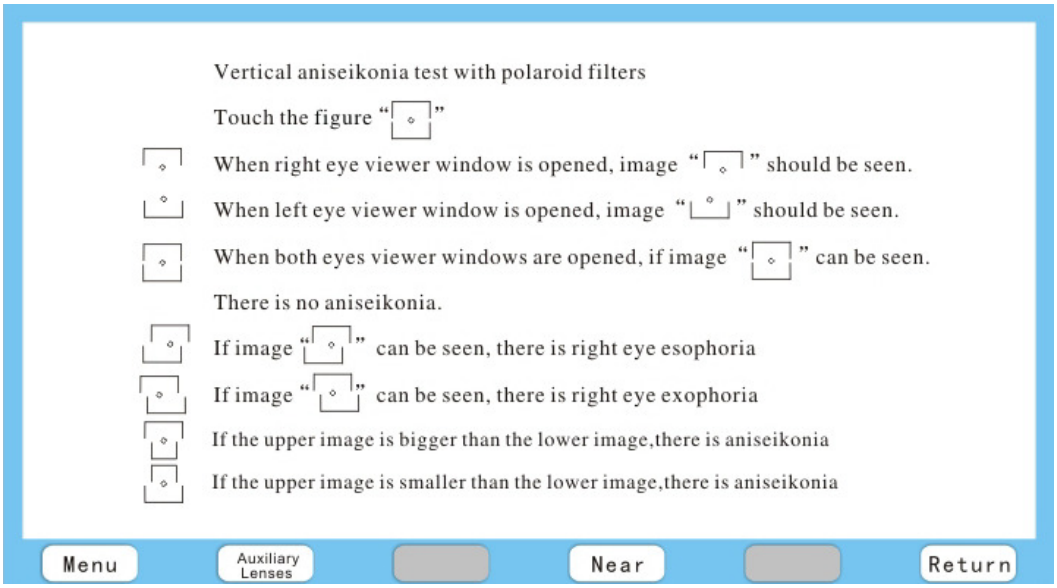




Touch (of chart projector), it will be in the right position automatically, and the polarizing filters（of Digital Refractor) will automatically be in the right position of both eye.

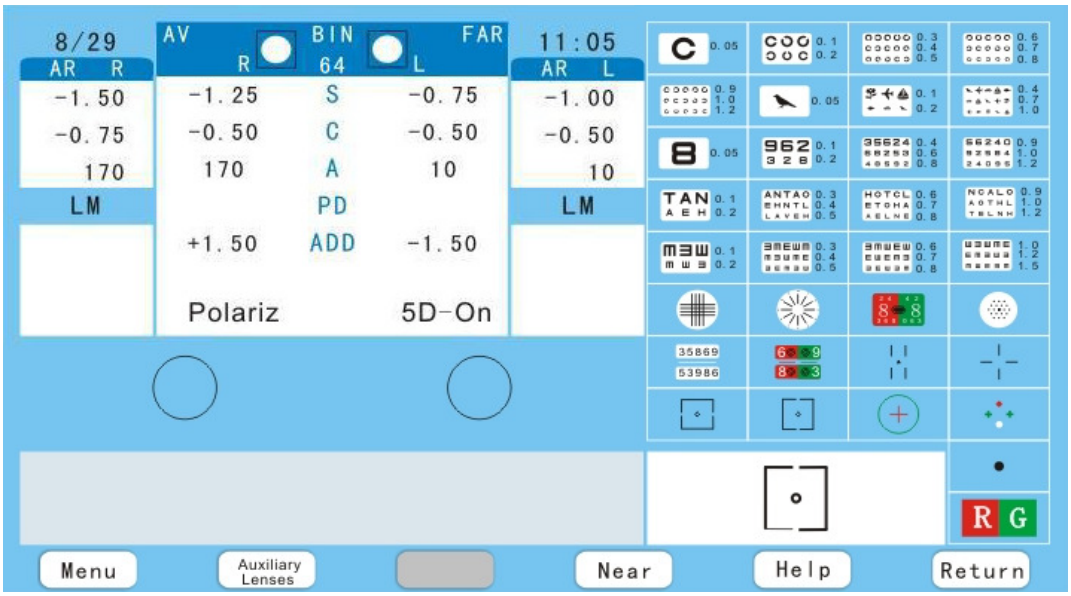
6.10 Horizontal Aniseikonia Test with Polaroid Filters

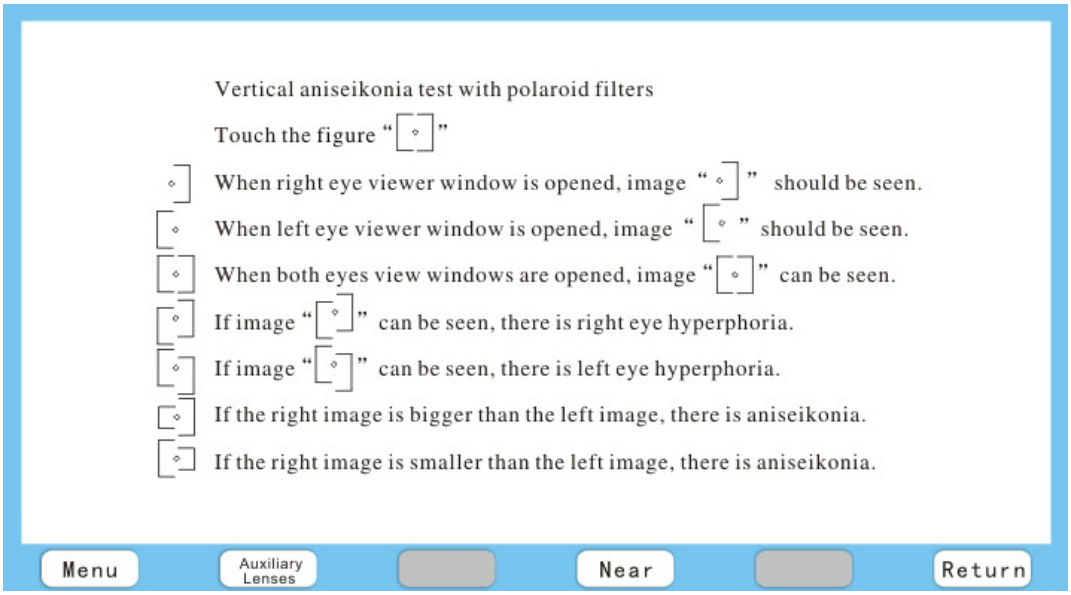




Touch  (of chart projector), it will be in the right position automatically, and the polarizing filters（of Digital Refractor) will automatically be in the right position of both eye.

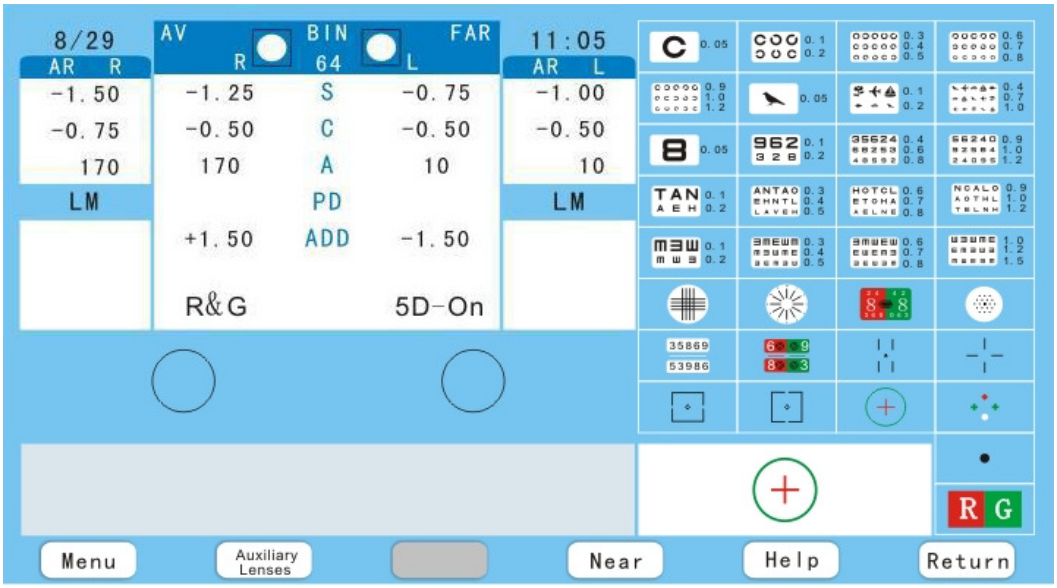
6.11 Vertical Aniseikonia Test with Polaroid Filters

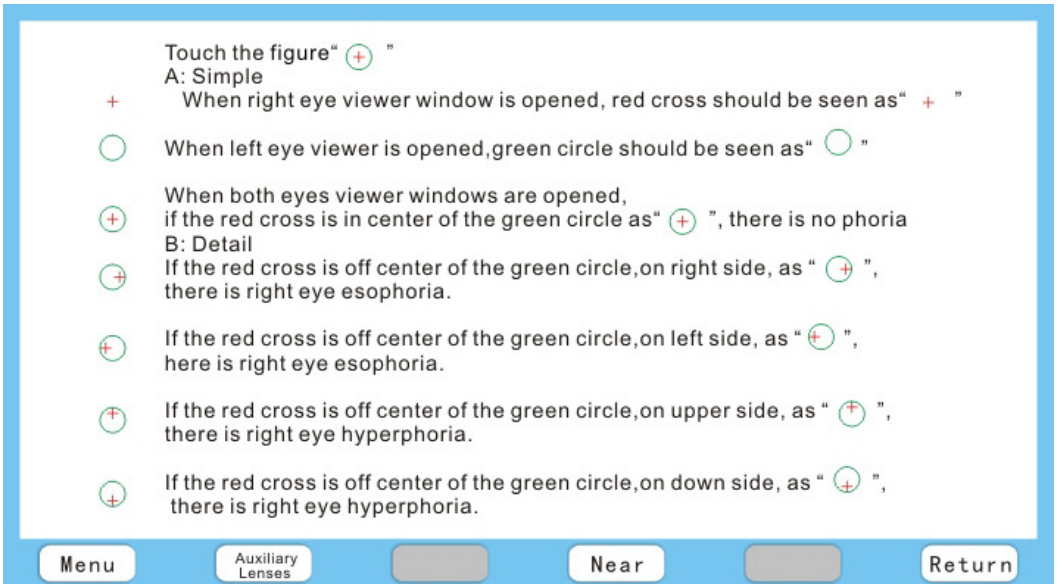




Touch [ ] (of chart projector), it will be in the right position automatically, and the polarizing filters（of Digital Refractor) will automatically be in the right position of both eye.

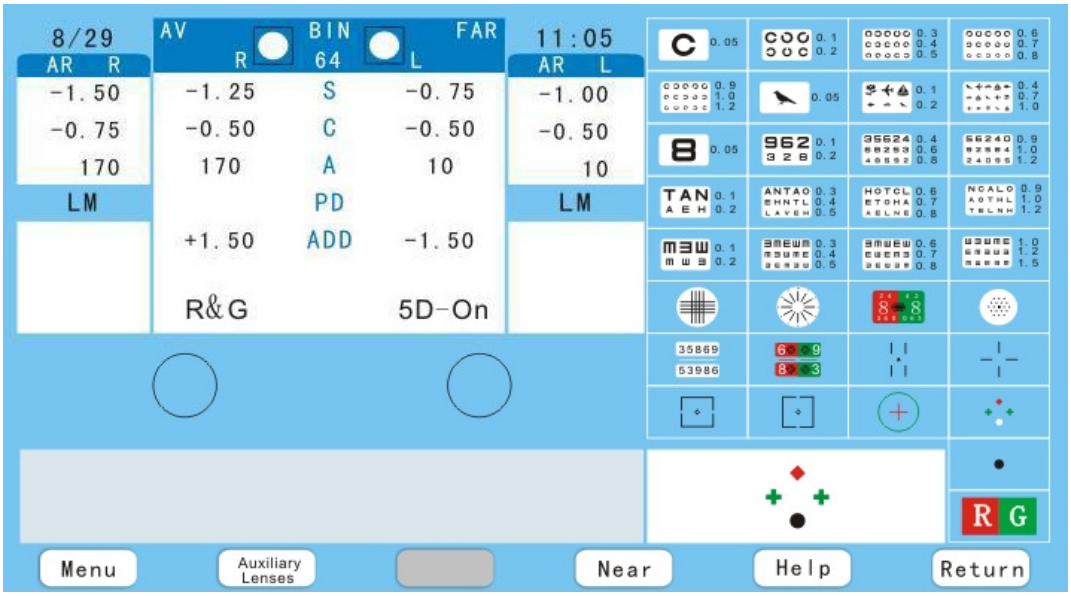
6.12 Phoria Test

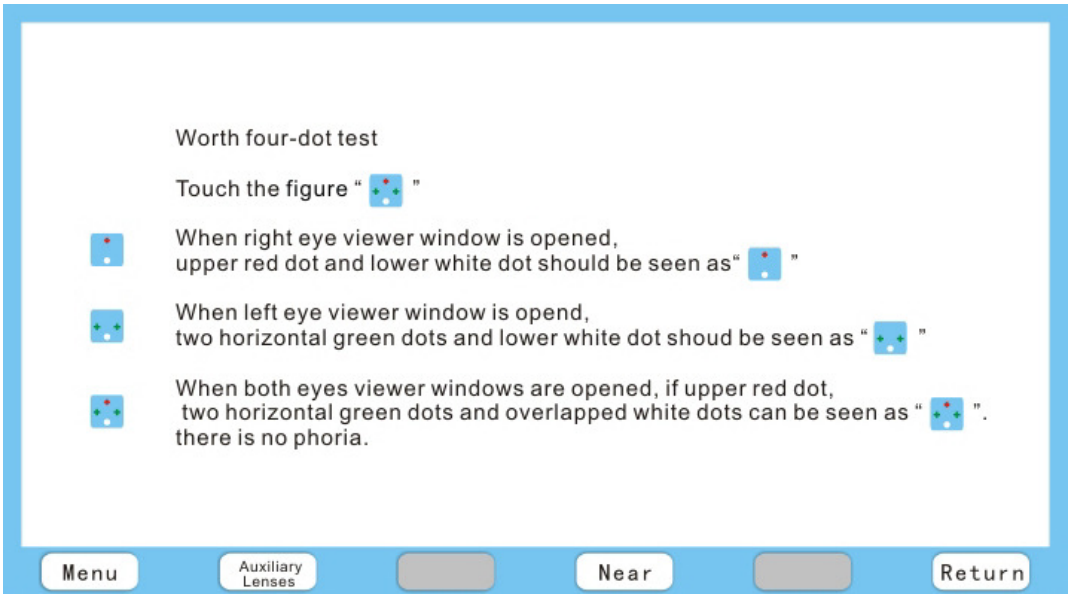




Touch ⊕ (of chart projector), it will be in the right position automatically, and the red/green filters（of Digital Refractor) will automatically be in the right position of both eye.

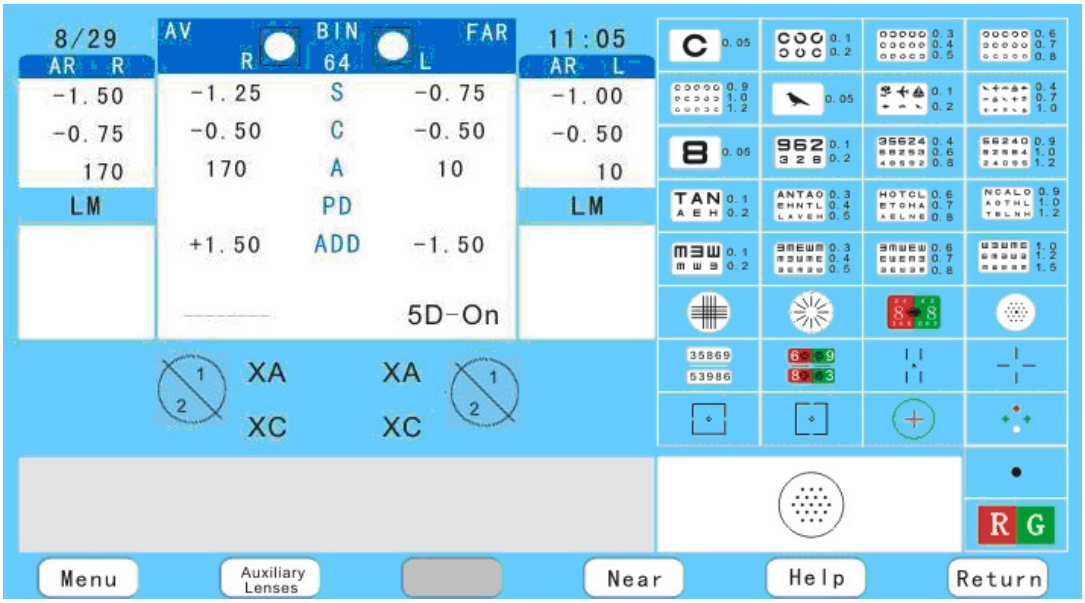
6.13 Worth Four-dot Test

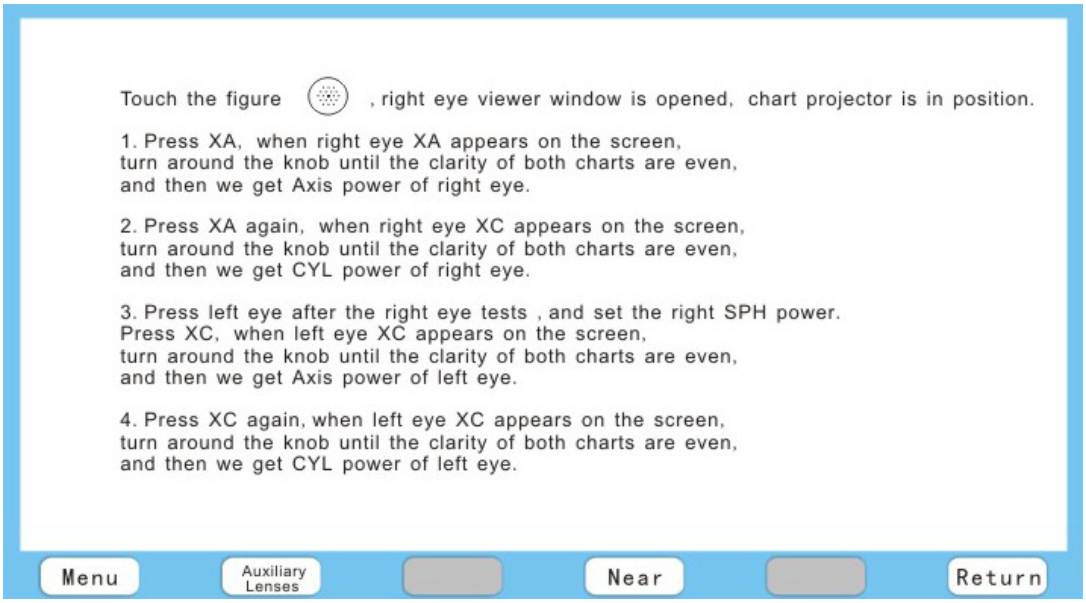




Touch  (of chart projector), it will be in the right position automatically, and the red/green filters（of Digital Refractor) will automatically be in the right position of both eye.

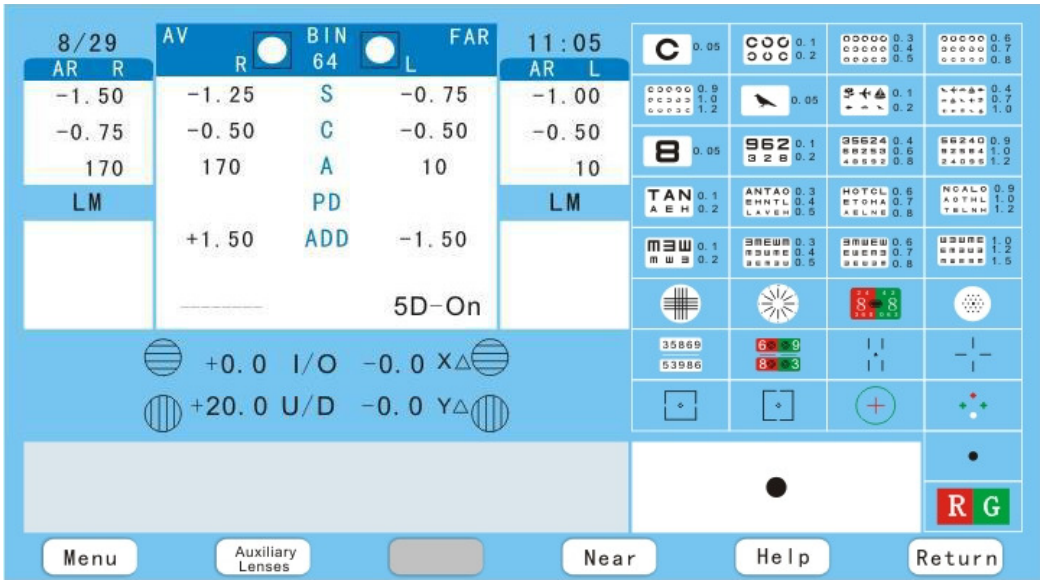
6.14 Auto Cross Cylinder Power Test

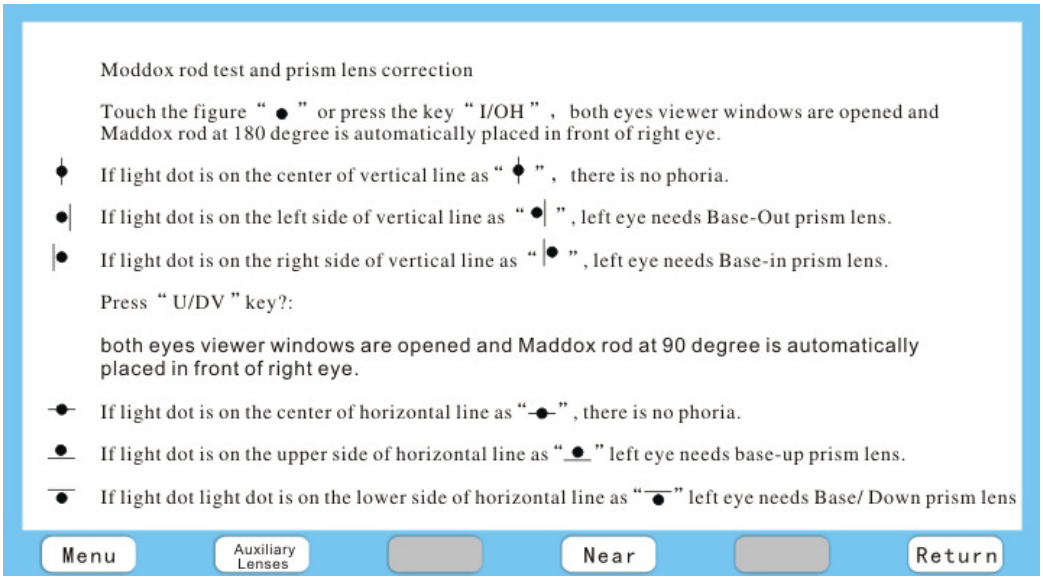




Touch (of chart projector), it will be in the right position automatically, and ±0.25 will turn to the right eye of Axis.

6.15 Maddox Rod Test and Prism Lens Correction

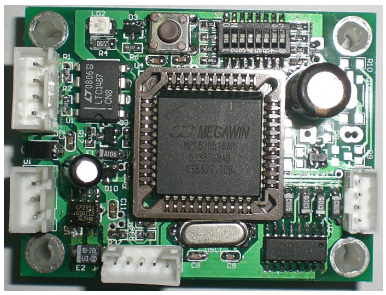


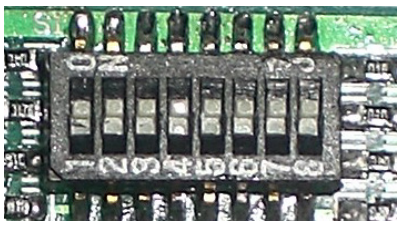


7. CO-operation with other Auto Refractometer

Automatic transmission: Press AR after Auto refractometer finishing print, and all the information in Auto refractometer will automatically transmite to phoropter, at the same time, the right window will open, the left close, press Left when need.

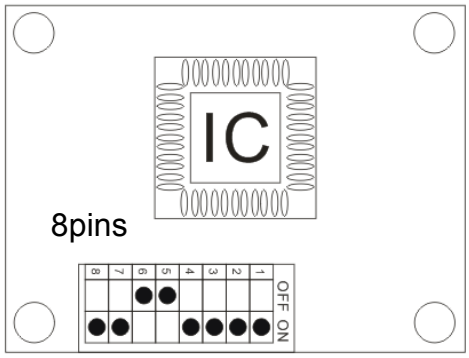
※ SCIENCETERA Digital Refractor can be connected to many other AUTO refractometer, and pay enough attention to the switch codes show as below:





Switch 1	Switch 2	Switch 3	Switch 4	Co-operation with other instrument （B-3）				
				Switch / 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

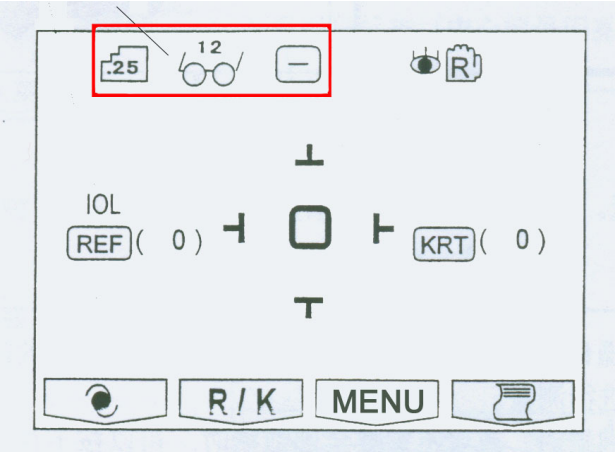
Caution: Each time you must turn off the instrument if you change the code on the IC board, or it would not be effective.

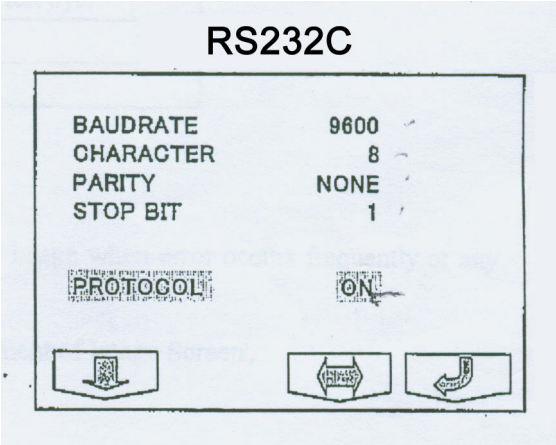


7.1 Co-operation with DONGYANG

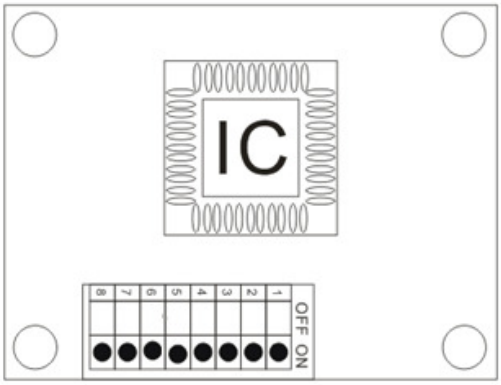
The way of DONGYANG auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

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





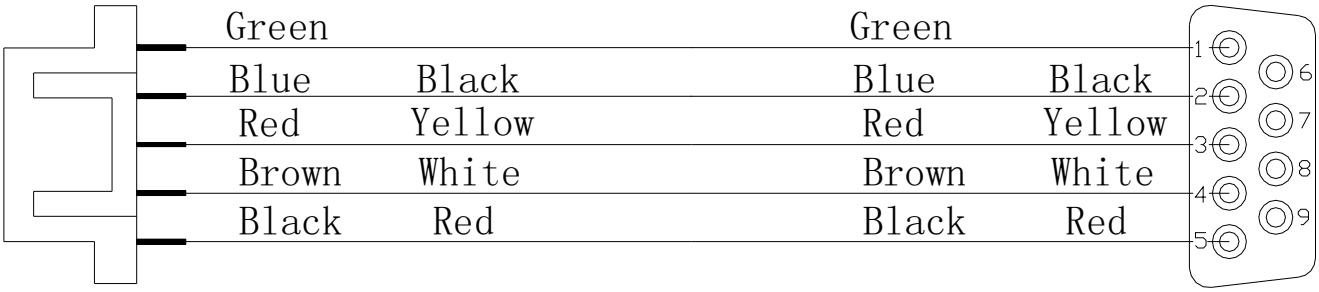
2. The 8 pins on IC board should be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(DONGYANG)



9 PIN

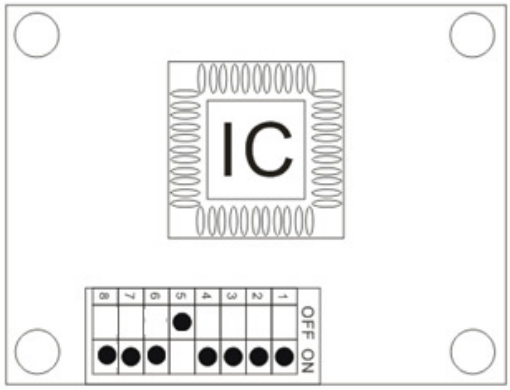
7.2 Co-operation with HUVITZ MRK-3100

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:	(—)	(+)	Mix	
A-PRT	OFF	**ON**		
D-SET	**0.00**			
BPS:	**9600**	57600	115200	
RS232	OFF	**PC-OLD**	PC-V2	NKKE
FOCUS:	OFF	**ON**		
mm/D:	**mm**	D	AVE	
INC-R:	0.05	0.12	**0.25**	
INDEX:	**1.3375**	1.332	1.336	

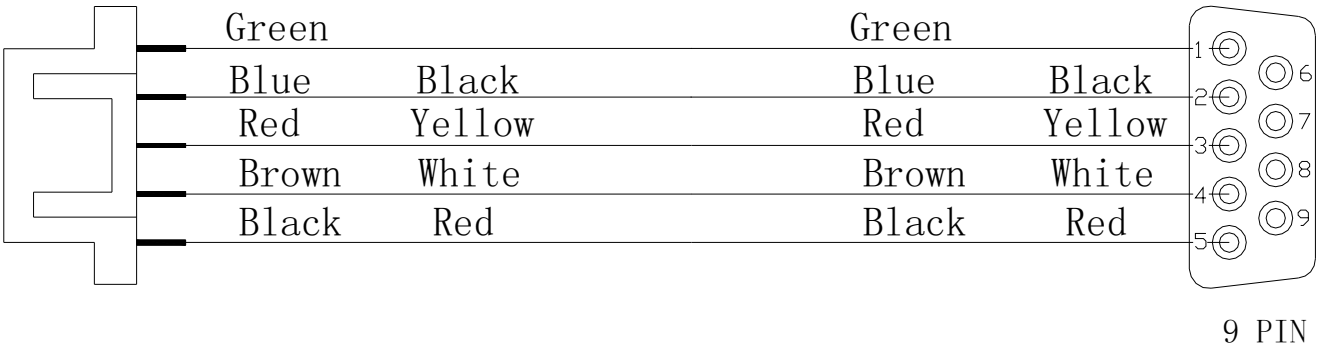
2. The 8 pins on the IC board should be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(HUVITZ)



9 PIN

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	

COMMUNITCATION

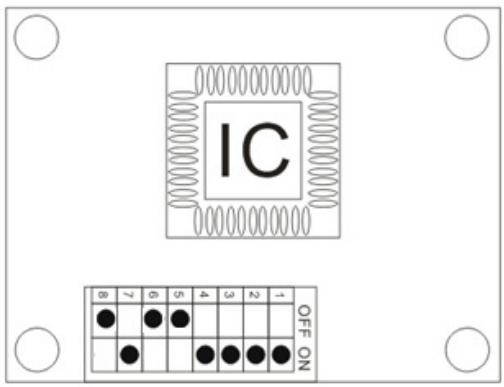
BPS:	**9600**	57600	115200
RS232:	OFF	**PC(old)**	PC(new)

PRINT

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

END: SAVE & EXIT

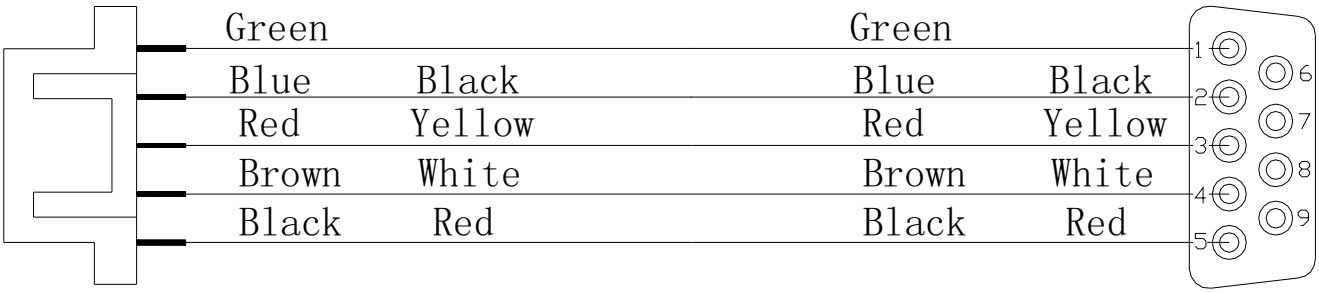
2. The 8 pins on IC board should be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(CHAROPS CRK-7000)



9 PIN

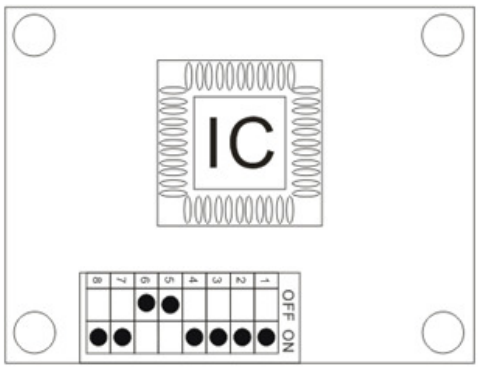
7.4 Co-operation with GRAND SEIKO 2100

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**			

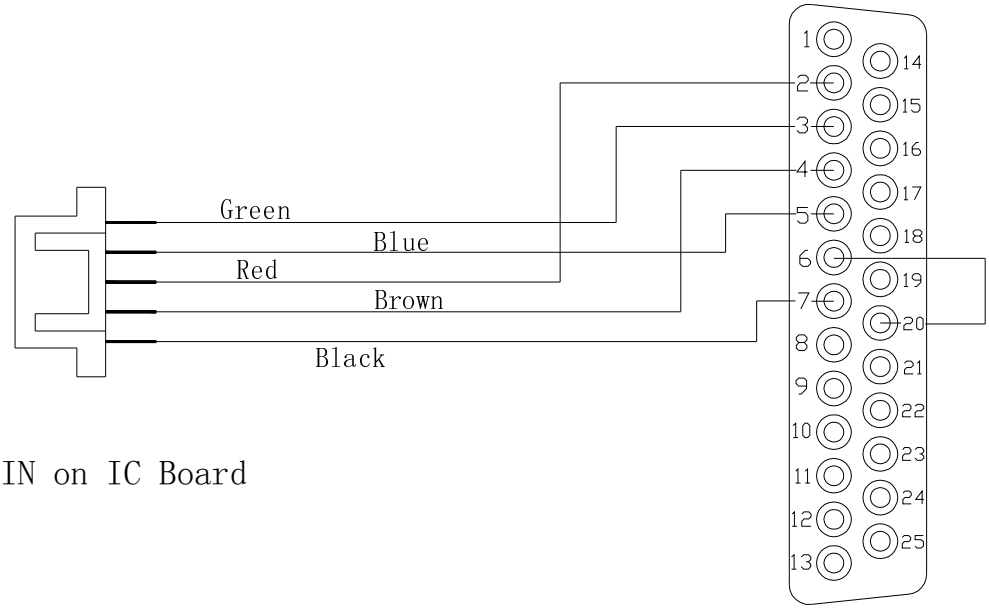
2. The 8 pins on IC board should e set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(Grand Seiko GR2100)



5 PIN on IC Board

25 PIN

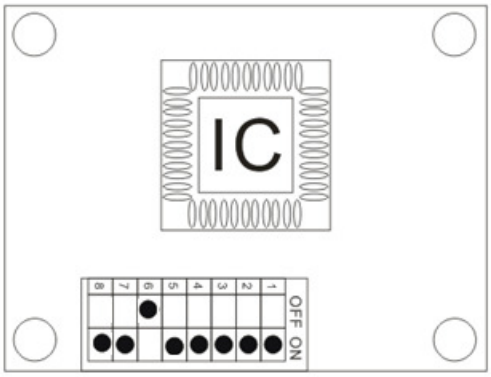
7.5 Co-operation with GRAND SEIKO GRK-1

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**			

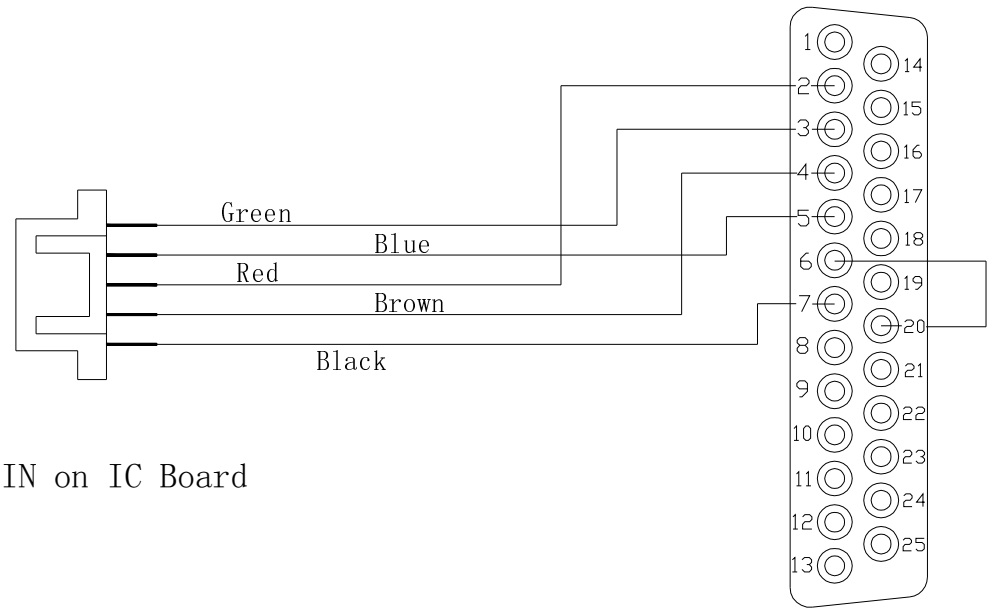
2. The 8 pins on IC board shoud be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(Grand SEIKO GRK-1)



5 PIN on IC Board

25 PIN

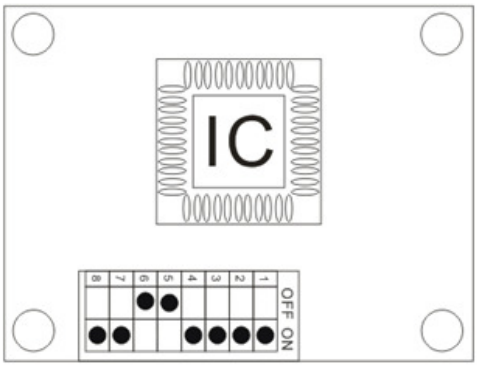
7.6 Co-operation with GRAND SEIKO 3100K

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**			

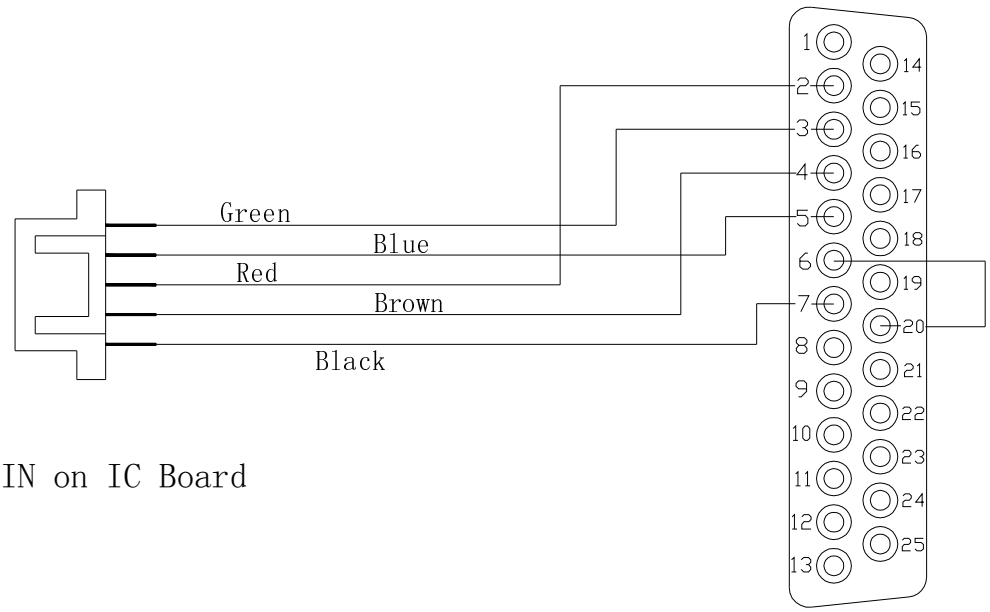
3. The 8 pins on IC board shoud be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(Grand Seiko GR3100K)



5 PIN on IC Board

25 PIN

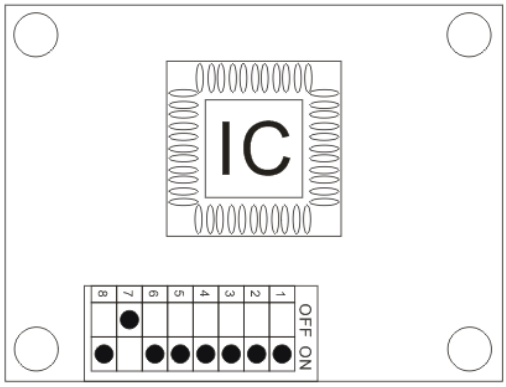
7.7 Co-operation with SHIN-NIPPON 9001K

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

1. The MENU of SHINNIPPON AUTO REFRACTOMETER 9001Kshould 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**			

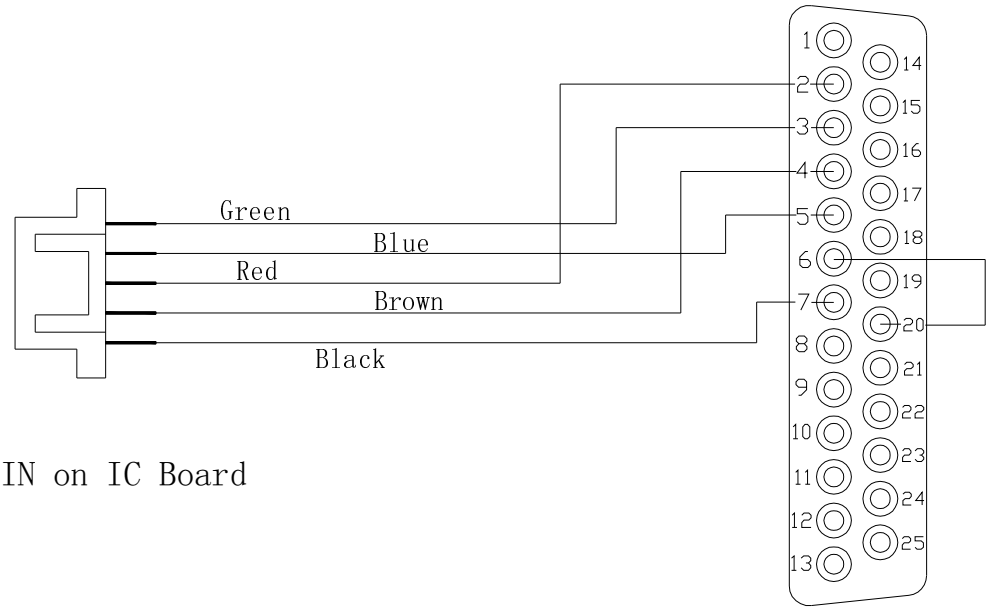
2. The 8 pins on IC board should be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA AV-1P)

AUTO REFRACTOMETER
(SHIN-NIPPON 9001K)



5 PIN on IC Board

25 PIN

7.8 Co-operation with NIDEK AR-610

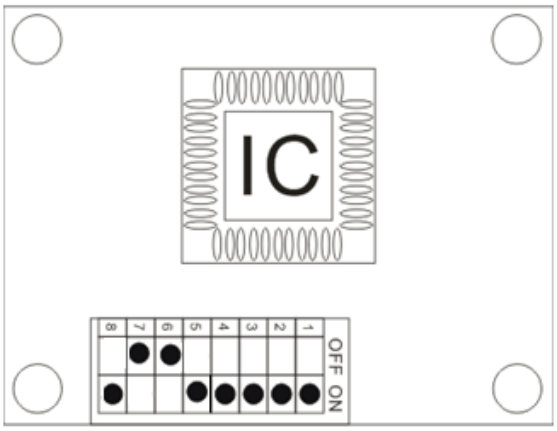
The way of NIDEK 610 auto refractometer connect with TSRD-500 DIGITAL REFRACTOR and CHART PROJECTOR.

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

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

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

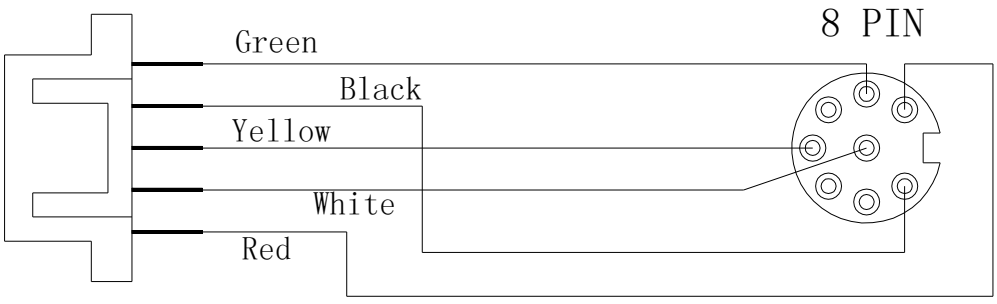
2. The 8 pins on the IC board should be set as following:



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

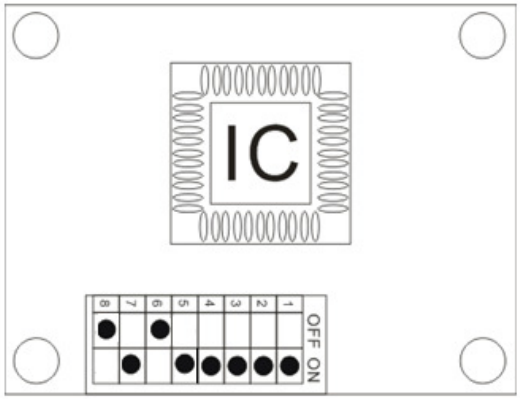
7.9 Co-operation with NIDEK AR-310A

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

1. 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**				

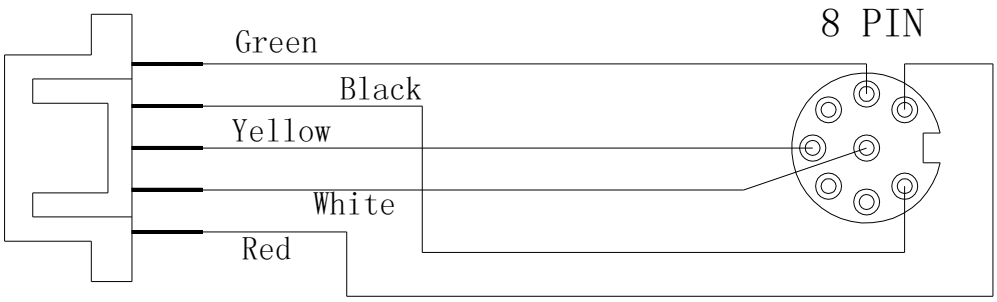
2. The 8 pins on the IC board should be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(NIDEK 310A)

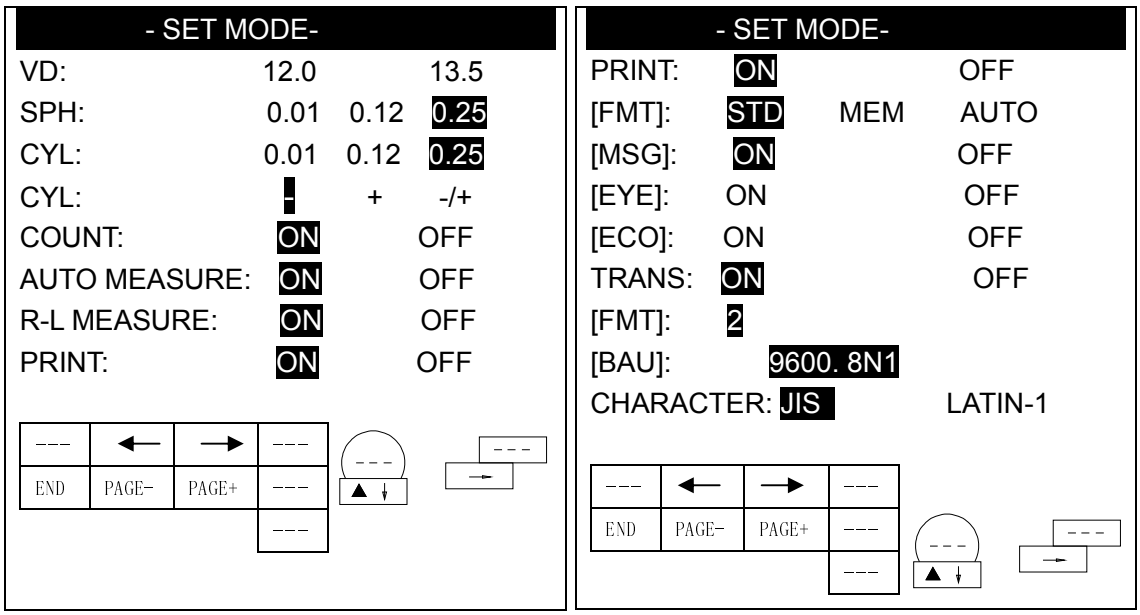


5 PIN on IC Board

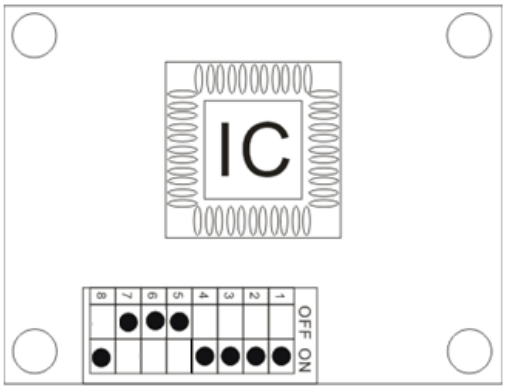
7.10 Co-operation with CANON R-F10

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:



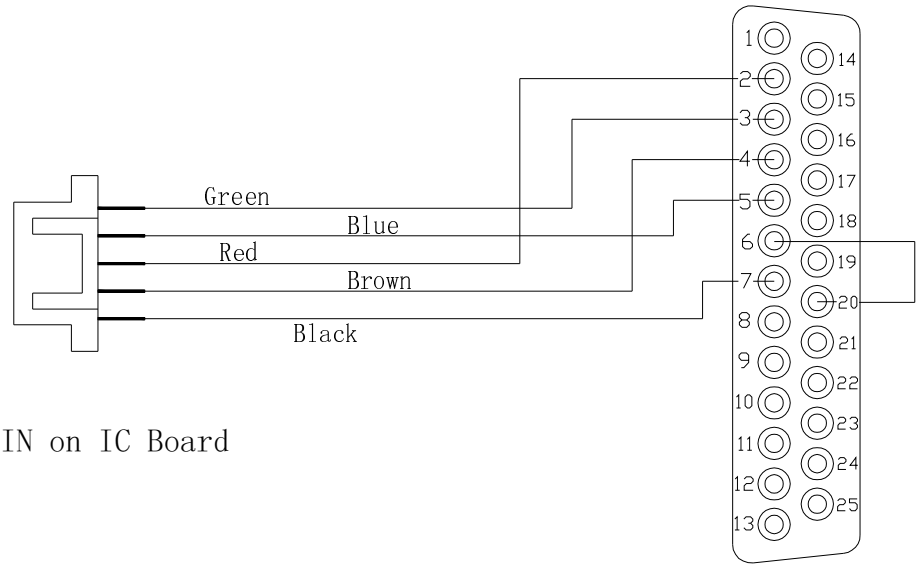
2. The 8 pins on the IC board should be set as following:



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

DIGITAL REFRACTOR
(SCIENCETERA TSRD-500)

AUTO REFRACTOMETER
(CANON R-F10)

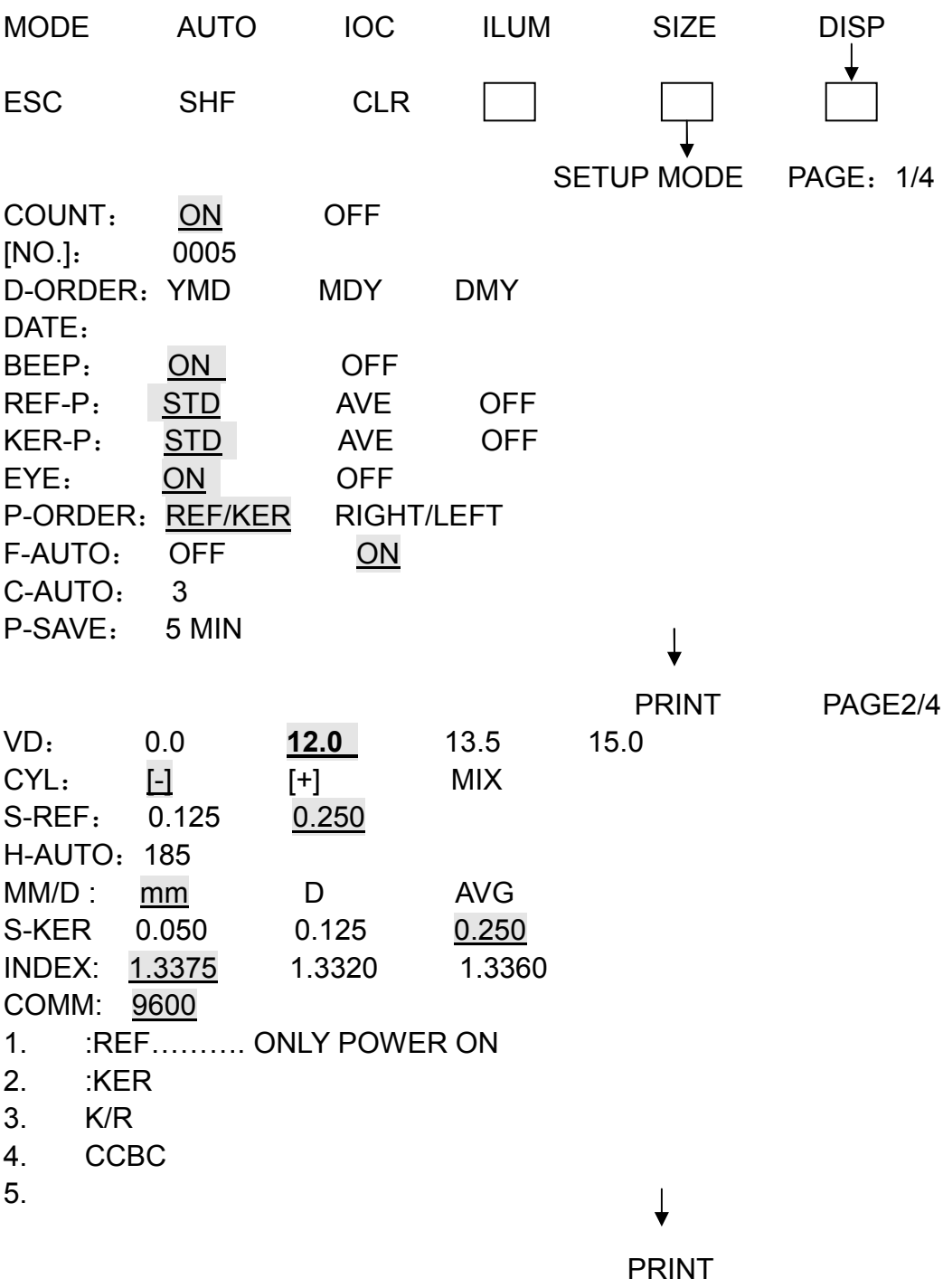


5 PIN on IC Board

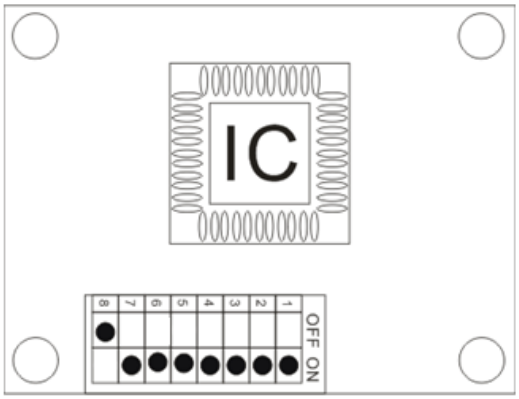
25 PIN

7.11 Co-operation with AXIS TSRK-1000

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



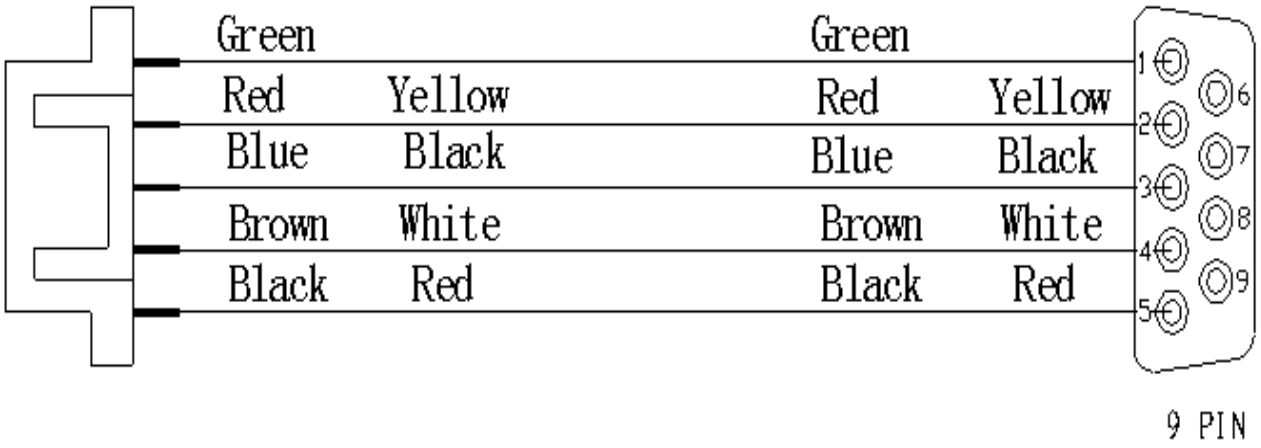
2. If you would like connect with CHART PROJECTOR, eight codes on IC BOARD of CHART PROJECTOR as follows:



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

DIGITAL REFRACTOR (SCIENCETERA TSRD-500)

AUTO REFRACTOMETER AXIS TSRK-1000

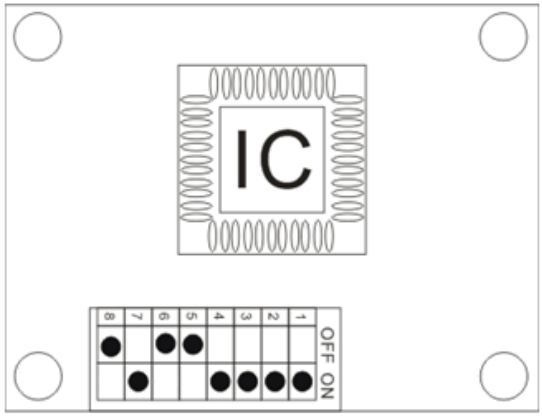


7. 12 Co-operation with PICHINA PRK-9000

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.

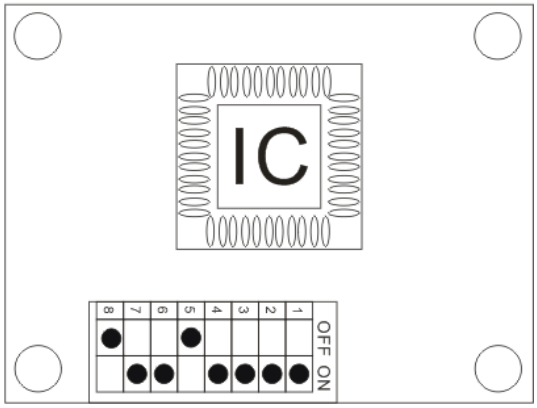
1. The MENU of HUVITZ AUTO REFRACTOMETER should be place as follows:

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

RS232C：

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

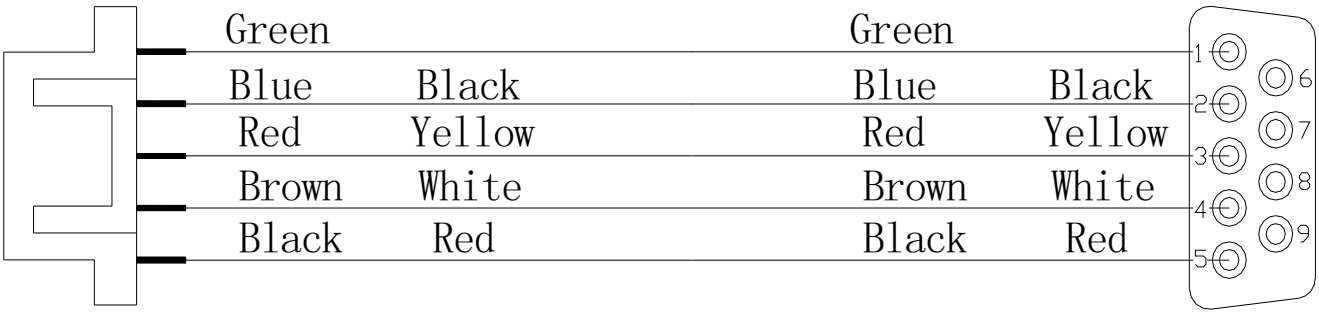
2. The 8 pins on the IC board should be set as following:



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

DIGITAL REFRACTOR (SCIENCETERA TSRD-500)

AUTO REFRACTOMETER RT-3000



9 PIN