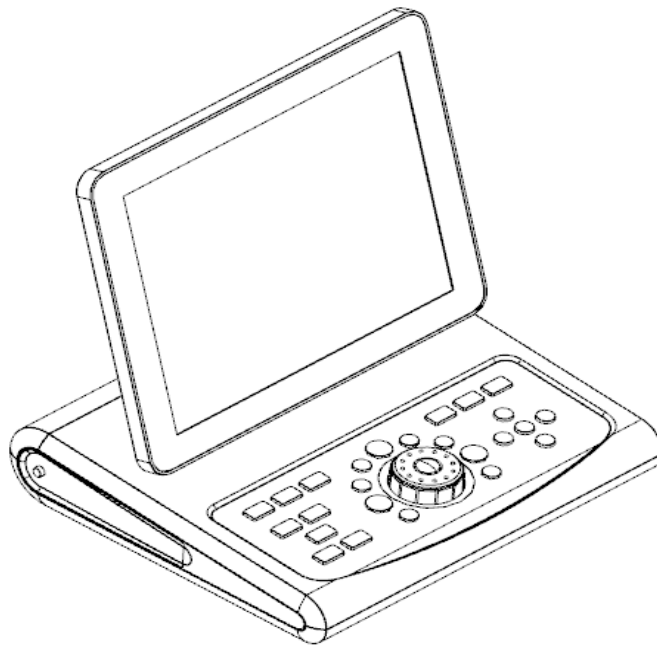
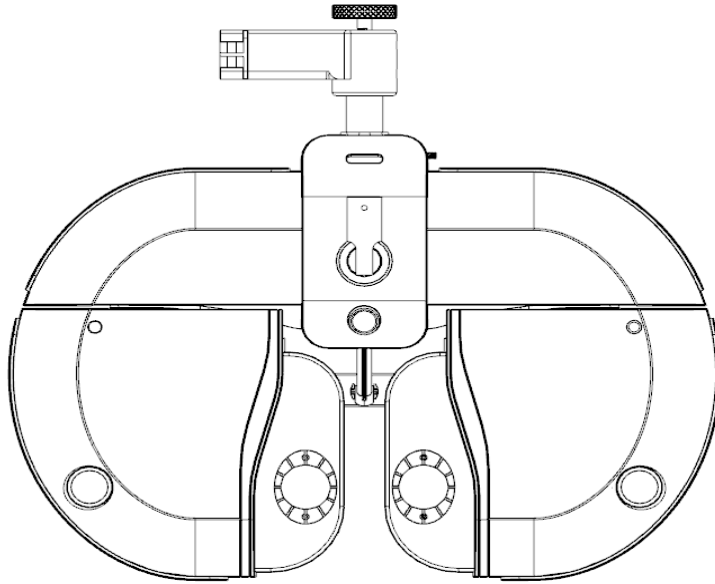


# Operational Manual

## VT-700 Digital Refractor



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Please read this operating manual in prior to the use of this equipment.



## **IMPORTANT NOTICE**

Electromagnetic waves discharged from mobile phones, radiotelegraphs, wireless toys can cause malfunction of this product. Please keep away any device that can influence this digital Refractor.

It is a compulsory obligation to learn the operating manual thoroughly, before install, use, repair, wash or adjust the auxiliary parts of this equipment. For user's safety, please use this equipment only after reading all the instructions included in this manual.

Pay a special attention to the word "WARNING" or "CAUTION," which are on all manuals for users and managers.











All the information in this manual is checked out carefully and discerned as accurate one at the time of publication. However, Co., Ltd., takes no responsibilities of the results caused by default, omission, or misuse of it.

## SAFETY INFORMATION

Accessory equipment connected to the analog and digital interfaces must be certificated according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipments).

Furthermore, all configurations shall comply with the system standard EN 60601-1-2:2001. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system and is therefore responsible that the system complies with the requirements of the system standard EN 60601-1-1:2001.









If in doubt, consult the technical service department or your local representative.








Symbol	Description
	Installation part type B
	Protective earth (ground)
	An altering current
	Warning for safety (look at the attached document)
	Power off (separated with power source)
	Power on (connected with power source)
	Do not throw away the waste to inappropriate place
 Manufacturer	Manufacturer
 MGF. Date	Date of Manufacturer
 Authorized EC representative	Authorized Representative in the European community

## General Safety Information

Follow the safety guidance on this manual when you look at below WARNING or CAUTION marks on the label. If you ignore these signals, it might inflict a wound or cause an accident. An intensive reading and thorough understanding of this manual are needed before use of this product. Please put this manual within your view.

### Warning for Safety

 WARNING	<p>It can strike a mortal blow if you are not careful. Death or a severe wound might occur to you or others.</p>
 CAUTION	<p>You can fall into a dangerous situation if you don't care. It could lead to a slight wound of you or others, or malfunction of this equipment.</p>
<p>NOTE</p>	<p>Significant information about installation, operation, basic safety and management of this equipment. Please read out this information to prevent misuse.</p>
 WARNING	<p>Use the device that meets the standard power requirements on the tablet. Unless, it could end up with a fire or an electric shock.</p>
 WARNING	<p>Please connect or separate the electric cables only after powering off. Besides, don't touch this equipment with wet hands. Unless, it could end up with an electric shock that accompanies death or severe wounds.</p>
 WARNING	<p>Please power the switch down and plug out power cables from the AC socket. And then ask the agent you bought this product about the following phenomenon's.</p> <ul style="list-style-type: none"> <li>● Smoke, smell, or a loud noise</li> <li>● When you spilled a fluid on this product, or when any metal was wedged into an opening</li> <li>● When you drop this product or when the outer case was broken</li> </ul>
 WARNING	<p>You must not disassemble or reconstruct this product. It could lead a fire or an electric shock. Be aware that high-voltage and other dangerous parts are installed in this equipment. To touch these parts can incur serious wounds.</p>
 WARNING	<p>Please keep the temperature at 10°C~40°C and humidity at 30%~75% for normal operation. It must not be exposed to watery a place or where lots of water splashed. Do not put any container or product which contains liquid or gas, around this device.</p>
 CAUTION	<p>Grounding power cables are put in this equipment. Always connect them to the grounded AC socket, to reduce electric shock.</p>

 <b>CAUTION</b>	<p>The Ref. body of VT-700 is heavy, so a strong cable is needed to connect with it. If not, the REF.BODY might be damaged, or the testee might be hurt.</p>
 <b>CAUTION</b>	<p>If a visual acuity test is done in the process of initialization of the Ref. body, the person under vision test might be hurt. Please do a test only after the initialization is finished completely.</p>
 <b>CAUTION</b>	<p>Be careful not to drop any metal or dust inside the equipment. Do not power off with the cable connected.</p>
 <b>CAUTION</b>	<p>Don't weigh excessive power on each junction of cables. In case of any damage of connector or socket, please call the agent to repair it.</p>
 <b>CAUTION</b>	<p>You must not store or install this device in a place where it is dangerous to explode, or where volatile chemicals or combustible things are.</p>
 <b>CAUTION</b>	<p>Please don't put your hand or fingers on REF.BODY. Watch out that the hands or fingers of testees do not touch REF.BODY either, because they might be hurt.</p>
 <b>CAUTION</b>	<p>When attaching VT-700 to the Unit table, the Unit table should be in good condition of ground connection to reduce the risk of electric shock. If attaching VT-700 to the Unit table that is not in good condition of ground connection, remove the cover of the Junction box &amp; Converter box.</p>

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### 1. Special Traits

- All the machines such as ACP-8, RMK-150, and PCs are connected and used by one cable, using RS-485 network method.
- By maximizing compatibility among products, you can deal with the information about Visual Acuity Test easily. S/C/A information tested by RMK-150 automatically comes out, and you can save this information in Digital Refractor body, only by pressing [LOAD] button.
- A wider and clearer screen on 9.7 TFT COLOR LCD improves data recognition, so that allowing more accurate visual test possible.
- Lens operation is speedy, and consecutive operation of jog shuttle does not skip any data, allowing more accurate and prompt vision test possible.
- To minimize control power interruption, an auto-shielding function works, when a lens more than  $\pm 0.5D$  operates.
- You can run complex functions easily with SHIFT and ALT keys, and it is convenient to execute various options for test.
- It supports short distance PD (45 ~ 75mm) and short distance work (35 ~ 70cm) to make a perfect short-distance Convergence Test.
- Help files and real-time guide help a fast and easy unit-test.
- By installing a printer in the operation panel, you can print the test result promptly.
- It inputs eye-test information without lens operation, and offers PRESET function that put in the lenses at once.
- New programs are always available thanks to easy and fast update of the programs, which uses USB and Serial Cables of the PC.

## 2. Directions for Use

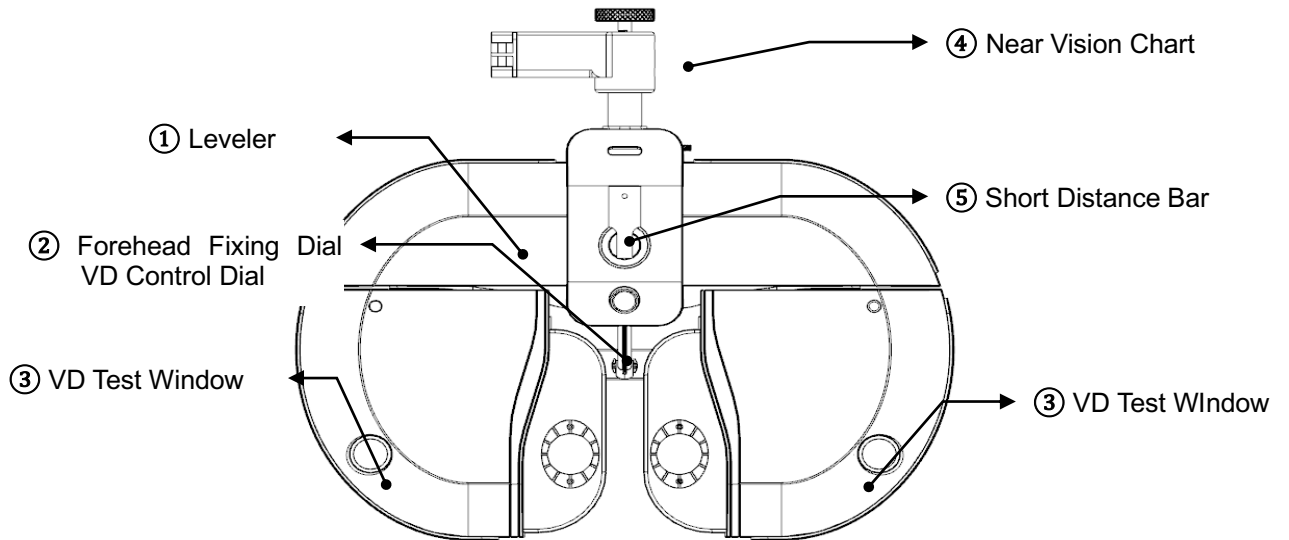
- Electromagnetic waves discharged from mobile phones, radiotelegraphs, wireless toys can cause malfunction of this product. Please keep away any device that can influence this digital Refractor.
- All the information in this manual is checked out carefully and discerned as accurate one at the time of publication. However, Co., Ltd., takes no responsibilities of the results caused by default, omission, or misuse of it.
- Co., Ltd., has rights to modify the product itself or specifications of the product without any prior notice, as well as rights not to renew that modification on this manual.
- Users must operate this device strictly following user's manual or explanations on service manual. More management is available only to service technician, or who is qualified to be in proportion to that position.
- Be careful not to load excessive shock or vibration on this product.
- Please be guided by the agent when you move this product or connect it with others.
- Outer lightening can influence the test result. Use it in a proper test room.
- Keep the lenses clean always, since dirty lenses can influence the test result. Please check the status of lenses essentially before use it.
- A shock can damage the inside and outside of the product. Handle with care, please.
- Please keep the temperature at 10°C~40°C and humidity at 30%~75% for normal operation. It must not be exposed to watery a place or where lots of water splashed. Do not put any container or product which contains liquid or gas, around this device.
- Since REF.BODY of VT-700 is heavy, it must be fixed on a strong unit table. If not, the REF.BODY might be damaged, or the testee might be hurt.
- When attach VT-700 to the Unit table, the Unit table should be in good condition of ground connection for reduce an electric shock. If attach VT-700 to the Unit table that is not good in condition of ground connection, take off the cover of Junction box & Converter box.

### 3. Nominations and Functions of Each Parts

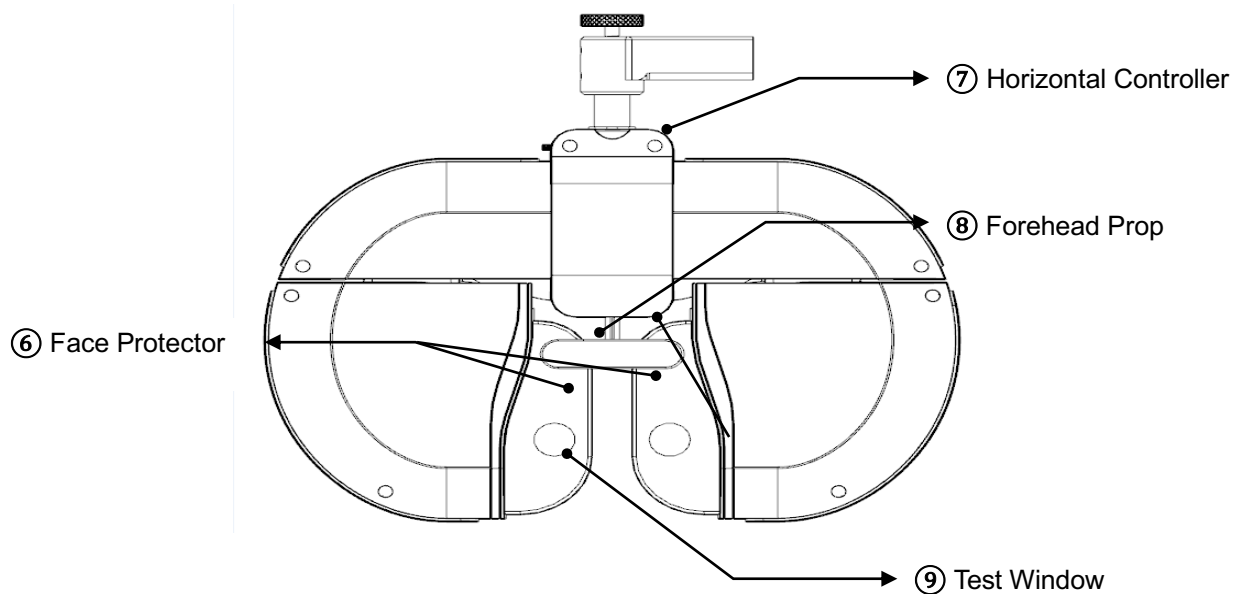
Basic components of VT-700 are 4 parts, Ref.Body, Junction box, Operation Pane, and Converter box. Explanation about each components and functions are following here.

#### 3.1. Body of VT-700 (Ref.Body)

VT-700 body is the most important part of the Digital Refractor, and is installed in the unit table.



[Figure 1] Digital Refractor Ref. Body (For Tester)



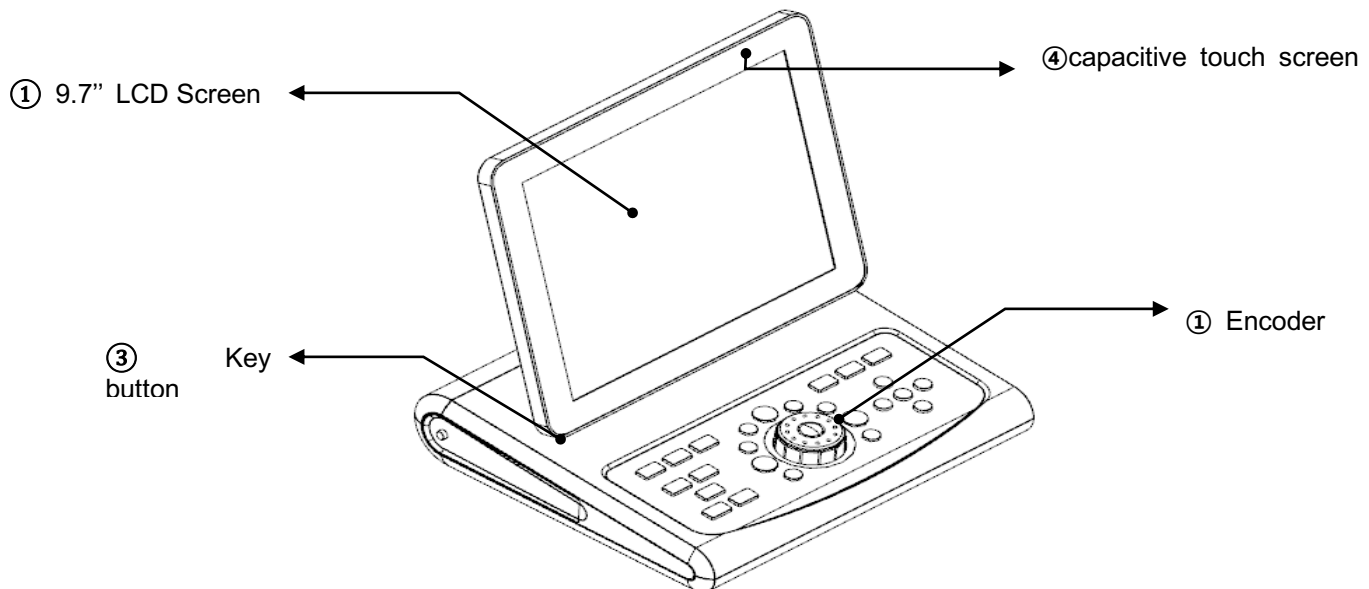
[Figure 2] Digital Refractor Ref.Body (For Patient)

Nomination	Function
① Leveler	Inform whether the digital refractor maintains horizontality.
② Forehead Fixing Dial VD Control Dial	Fasten your forehead to forehead rest, You can adjust VD with dial.
③ VD Test Window	Confirm the patient's VD (Distance: 1mm, Baseline: 12.0mm, Range: 11.0mm~15.0mm)
④ Near Vision Chart	A table for near vision test.
⑤ Short Distance Bar	A bar used for fixing short distance chart.
⑥ Face Protector	Softly touched for a human face. Can be attached or detached.
⑦ Horizontal Controller	Level out the equipment by turning the dial.
⑧ Forehead Prop	A plate to prop the patient's forehead.
⑨ Test Window	The patient can view the chart through the lens.

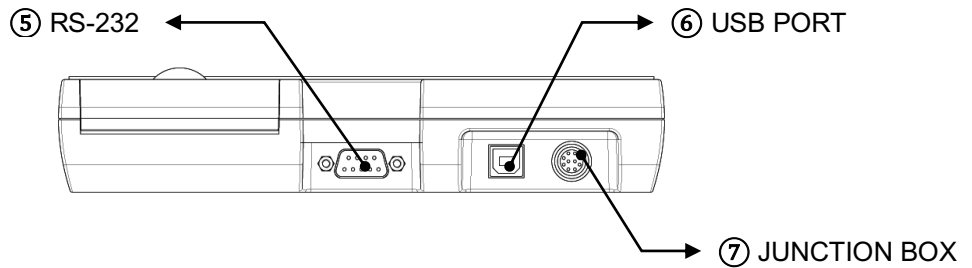
[Table 1] Ref. Body

### 3.2. Operation Panel

Operation Panel controls both products of ACP-6/ ACP-8/ ACP-100 and RMK-150.



[Figure 3] Operation Panel (front side)



[Figure 4] Operation Panel (Back side)

Nomination	Function
① LCD Screen	A screen to show the information required to the tester.
② Mini Printer	Print test results.
③ Key Button	Choose various tests and charts by pressing the key button.
④ Jog Dial	Change the lenses' value by turning it to (+),(-),(Left) and (Right)
⑤ RS-232	Use for upgrading software and communicating with the PC. Please do not use except manufacturer and dealer.
⑥ USB PORT	Use for upgrading the product connecting with PC. Please do not use except manufacturer and dealer.
⑦ Junction Box Connecting Terminal	Connect it with 10pins of the Junction Box.

[Table 2] Operation Panel

### 3.3. Junction Box

Junction Box connects the Ref. Body with the Operation Panel, communicates with panels, and supplies each device with power.

Nomination	Function
① Ref. Body Connecting Terminal	A terminal to connect 8pins cables of Ref.BODY.
② Operation Panel Connecting Terminal	A terminal to connect 10pins cables of the Operation Panel.
③ Converter Connecting Terminal for ACP-8	A terminal to connect the ACP-8 converter and 4 pins cables.
④ AC Power	A terminal to connect outer power with this equipment.
⑤ Power Switch	A switch to power on or off the VT-700.
⑥ Fuse (T2AL, 250V)	A device to protect this equipment from excessive currents.

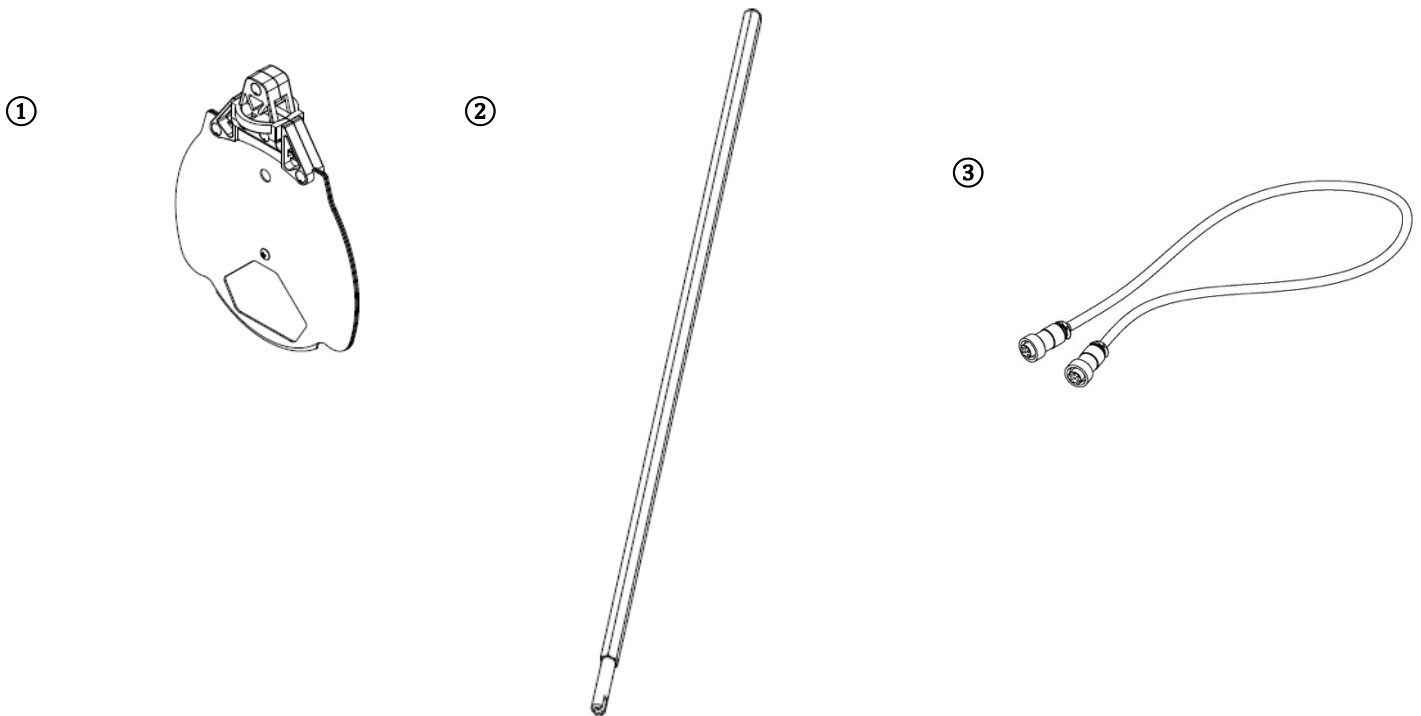
⑦ Connecting Terminal for Others	A terminal to connct this product with other devices.
⑧ Converter Connecting Terminal for RMK-200	A terminal to connect RMK-200 converter and 4 pins cables.

[Table 3] Junction Box

3.4. Accessories

Those are various accessories offered by VT-700.

3.4.1. Ref. Body

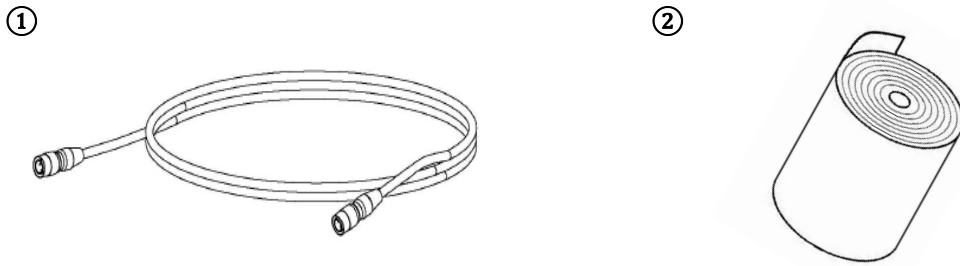


[Figure 5] Ref. Body Accessories

Nomination	Function	Q'ty
① Near Vision Chart	Chart for Near Vision test.	1
② A Bar for Near Vision Chart	A bar to fix Near Vision Chart.	1
③ A Cable to connect with the Junction Box	A cable to connect the Junction Box and the Ref. Body. Cable is manufactured to 1M, 2M, 3 M. Is offered to basis 3 M at product shipping.	1

[Table 4] Ref. Body Accessories

3.4.2. Operation Panel



[Figure 6] Operation Panel Accessories

Nomination	Function	Q'ty
① Interface Cable	A cable to connect Operation Panel and Junction Box. (10 pins) Cable is manufactured to 1M, 2M, 3 M. Is offered to basis 3 M at product shipping.	1
② Print Papers	Print papers in reserve.	1

[Table 5] Operation Panel Accessories

3.4.3. Junction Box

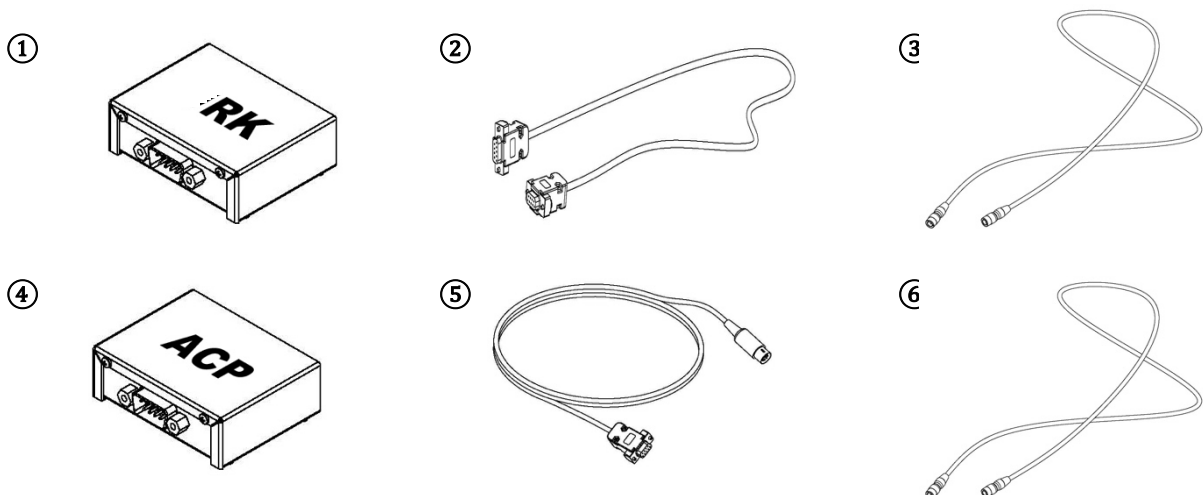


[Figure 7] Junction Box Accessories

Nomination	Function	Q'ty
① Power Cable	A terminal to connect with the outer power.	1
② Fuse (T2AL, 250V)	A device to protect this equipment form excessive currents.	2

[Table 6] Junction Box

3.4.4. Converter Box



[Figure 8] Converter Box Accessories



Nomination	Function	Q'ty
① RMK-150 Converter Box	A Converter Box for RMK-150.	1
② RMK-150 Serial Cable	A cable to connect the Converter Box and RMK-150 Serial Port.	1
③ RMK-150 Serial Cable	A cable to connect the Converter Box and the Junction Box. (4 pins)	1
④ ACP-7 Converter Box	A converter Box for ACP-7.	1
⑤ ACP-7 Serial Cable	A cable to connect the Converter Box and ACP-7 Serial Port.	1
⑥ ACP-7 Serial Cable	A cable to connect the Converter Box and the Junction Box. (4 pins)	1

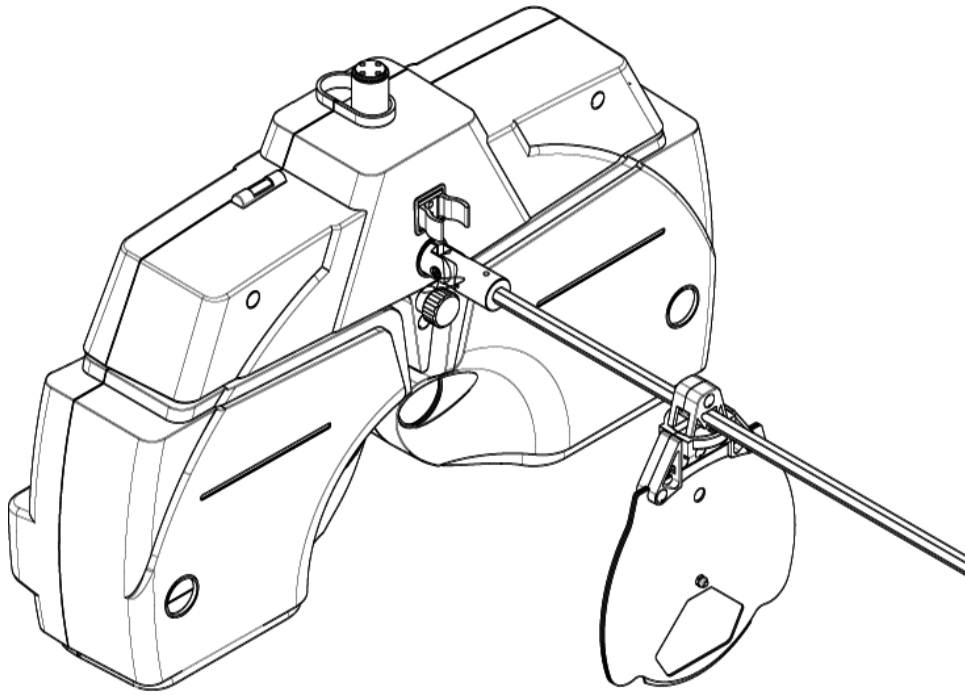
[Table 7] Converter Box

## 3.5. VT-700 Installation

Follow the below directions to install the most basic system.

- 1) Check out whether all the basic components are.
- 2) Connect the Ref. Body to the Junction Box by 8 pins cable. The Junction Box must be powered off.
- 3) Connect the Operation Panel to the Junction Box by 10 pins cable.
- 4) Connctet ACP-7. Refer to the article 5.1 to see the process.
- 5) Connect RMK-150. Refer to the article 5.2 to see the process.
- 6) Connect the power cable of the Junction Box and then check out whether all cables are connected properly.
- 7) Power on ACP-7.
- 8) Power on RMK-150.
- 9) Power on the Junction Box.
- 10) After power on, the Ref. Body gets initialized, and the Logo comes out on the LCD screen of the Operation Panel. And then, the initializing screen appears on time.
- 11) Start vision test after initialization of the Ref. Body and the Operation Panel.
- 12) Please refer to the chapter 7~9 for various options for the test and its applications.

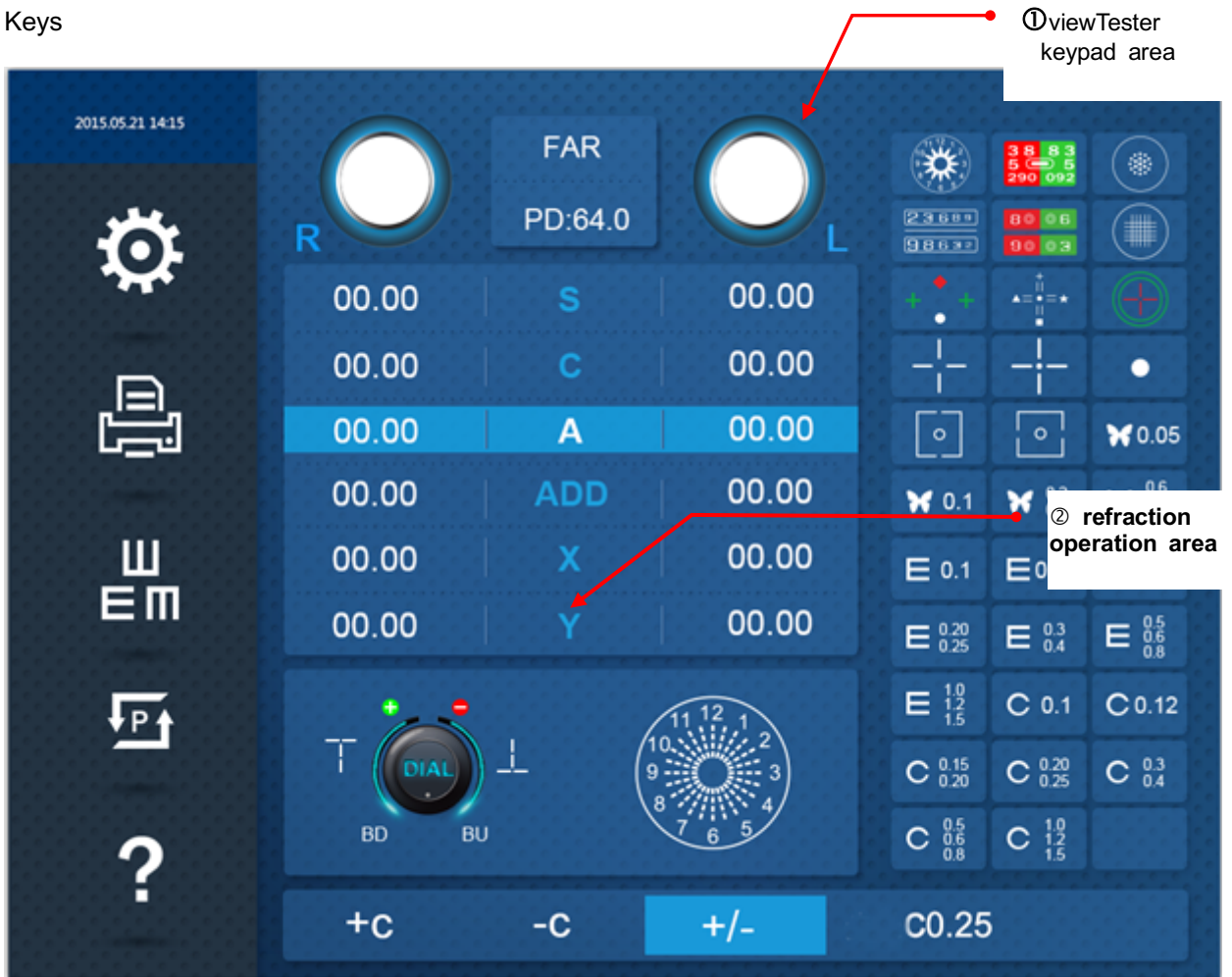
 <b>CAUTION</b>	<p>Please connect or separate the electric cables only after powering off. Besides, don't touch this equipment with wet hands. Unless, it could end up with an electric shock that accompanies death or severe wounds.</p>
 <b>CAUTION</b>	<p>If a visual acuity test is done in In the process of initialization of the Ref. body, the person under vision test might hurt. Please do a test only after the initialization is finished completely.</p>



[Figure 9] Hang up the Near Vision Chart

### 4. Basic Operation

VT-700 automatic optometry head consists of Liquid crystal display touch area, jog wheel and many Keys



[Figure 10]VT-700 LCD touch control area



[Figure 11] Jog Wheel and Many Keys

## 4.1 View Test keypad area

- View test keypad area consists of 32 charts image controls. Once touch the screen around the charts area lightly, the ACP-8 will project the relevant charts. Meanwhile, the VT-700 reacts accordingly to change for the lens needed.

- View test keypad area consists of ordinary optometry keypad area and binocular keypad area. The ordinary optometry keypad area includes Astigmatic Clock Dial, red-green test chart, speckle chart, polarized balance chart, polarized red-green chart. The binocular keypad area consists of polarized cross chart, cross annular chart, gaze discrepancy chart, Aniseikonia chart, Stereo vision test chart, Worth 4 Dots chart, Maddox Rod Test chart.
- Press the chart on the screen. If the background color of the charts turns blue, it means the chart is chosen. As (Figure 12), the astigmatic Clock Dial is chosen.



– 【Figure 12】 Pick up astigmatic Clock Dial

## 4.2 Optometry keypad area

### 4.2.1 The choice of spherical lens 【SPH】

- press the 【S】 displayed at the left side of screen. The colour change means that the SPH of the right eye has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of spherical lens of right eye.

press【S】  
at the left  
side

00.00	S	00.00
00.00	C	00.00
00.00	A	00.00
00.00	ADD	00.00
00.00	X	00.00
00.00	Y	00.00

【figure13】 choose 【SPH】 at right eye

- press the 【S】 displayed at the right side of screen. The color change means that the SPH of the left eye has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of spherical lens of left eye.

00.00	S	00.00
00.00	C	00.00
00.00	A	00.00
00.00	ADD	00.00
00.00	X	00.00
00.00	Y	00.00

press【S】  
at the right  
side

【figure14】 choose 【SPH】 at left eye

- press the 【S】 displayed in the middle of screen. The colour change means that the SPH of the binoculus has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of spherical lens of binoculus.

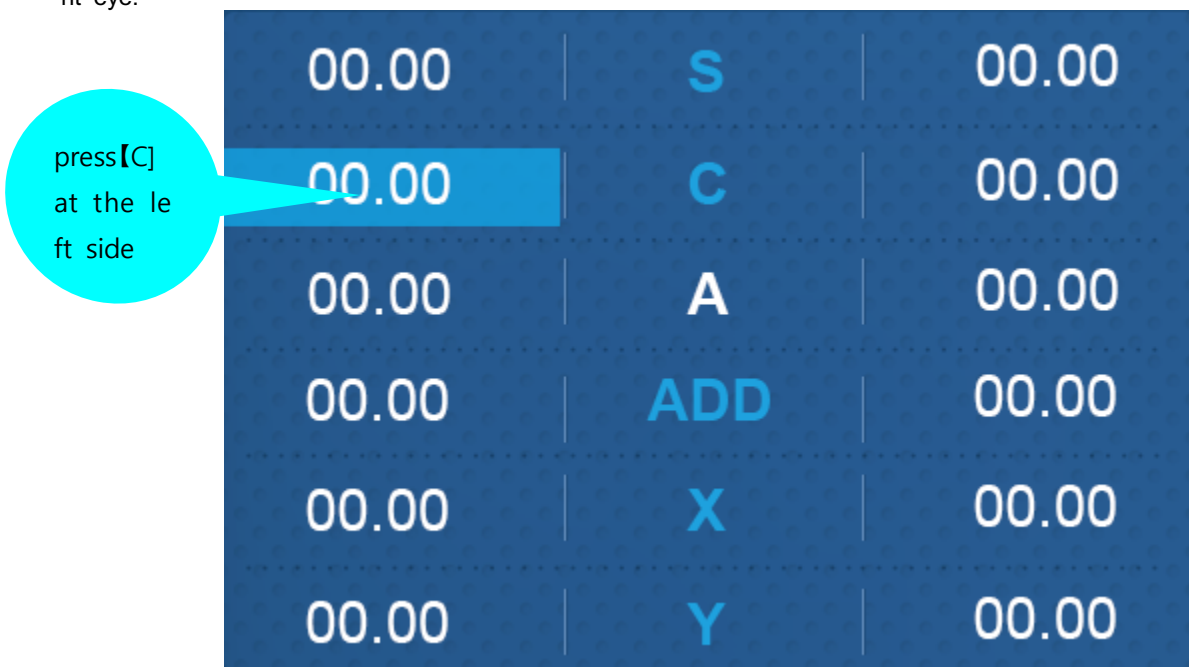


【figure15】 choose 【SPH】 at binoculus.

- The choice of sphere 【S】 , press S0.25 and there pop-up a menu where there are 6 different choice S 0.12、 S0.25、 S0.50、 S1.00、 S2.00、 S3.00. pick up anyone of them and you can adjust the sphese 【S】 by jog wheel or 【+】 、 【-】

#### 4.2.2 The choice of Cylinder 【CYL】

- press 【C】 to display the left side like figure 17, The colour change means that the CYL of the right eye has been chosen. Then adjust the jog wheel or keypad 【+】、 [-] to change the diopter of cylinder lens of right eye.



【figure17】 pick up CYL right eye

- press **【C】** to display the right side like figure 17, The colour change means that the CYL of the left eye has been chosen. Then adjust the jog wheel or keypad **【+】**、**【-】** to change the diopter of cylinder lens of left eye.



press**【C】**  
at the right  
side

figure **【18】** pick up **【CYL】** left eye

- press the **【C】** displayed in the middle of screen. The colour change means that the CYL of the binoculus has been chosen. Then adjust the jog wheel or keypad **【+】**、**【-】** to change the diopter of CYL lens of binoculus.



Press **【C】** i  
n the mid

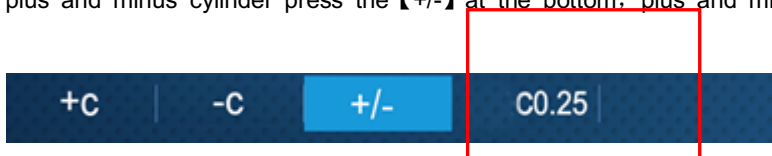
【figure 19】 pick up 【CYL】 binoculus

- The choice of cylinder 【C】 , press C0.25 and there pop-up a menu where there are 5 different choice C0.25、C0.50、C1.00、C2.00、C3.00. pick up anyone of them and you can adjust the cylinder 【S】 by jog wheel or 【+】、【-】



【figure 20】 choice of step 【CYL】

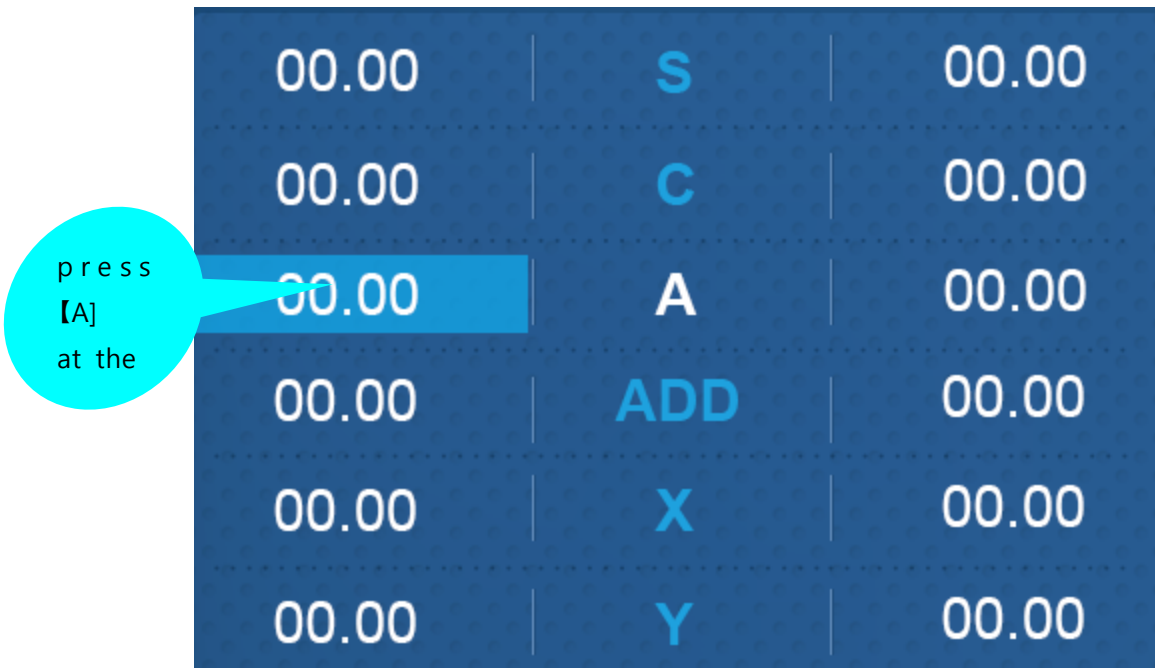
- exchange of plus and minus cylinder press the 【+/-】 at the bottom. plus and minus cylinder can be exchanged



【figure 21】 exchange of plus or minus step 【CYL】

### 4.2.3 The choice of Cylinder AXIAL 【AXS】

- press 【A】 to display the left side like figure 22, The colour change means that the AXS of the right eye has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of cylinder axial lens of right eye.



【figure 22】 pick up AXSL right eye

- press 【A】 to display the right side like figure 23, The colour change means that the AXS of the left eye has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of cylinder Axial lens of left eye.

left eye.



figure 【23】 pick up 【AXS】 left eye

- press the 【A】 displayed in the middle of screen. The colour change means that the AXS of the binoculus has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of AXS lens of binoculus.



【figure 24】 pick up 【AXS】 binoculus

- The choice of axis 【A】 , press A5 and there pop-up a menu where there are 5 different choice A

1、A2、A3、A4、A5. pick up anyone of them and you can adjust the axis **【A】** by jog wheel or **【+】**、**【-】**



【figure 20】 choice of step **【AXS】**

#### 4.2.4 The choice of Horizontal Prism **【X▲】**

- press **【X▲】** to display the left side like figure 26, The colour change means that the **X▲** of the right eye has been chosen. Then adjust the jog wheel or keypad **【+】**、**【-】** to change the diopter of Horizontal Prism lens of right eye.



【figure 26】 pick up Horizontal Prism **【X▲】** right eye

- press **【X▲】** to display the right side like figure 27, The colour change means that the **X▲** of the left eye has been chosen. Then adjust the jog wheel or keypad **【+】**、**【-】** to change the diopter of Horizontal Prism lens of left eye.



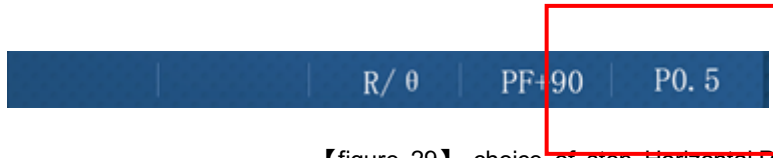
figure 【27】 pick up Horizontal Prism 【X▲】 left eye

- press the 【X▲】 displayed in the middle of screen. The colour change means that the 【X▲】 of the binoculus has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of Horizontal Prism lens of binoculus.



【figure 28】 pick up Horizontal Prism 【X▲】 binoculus

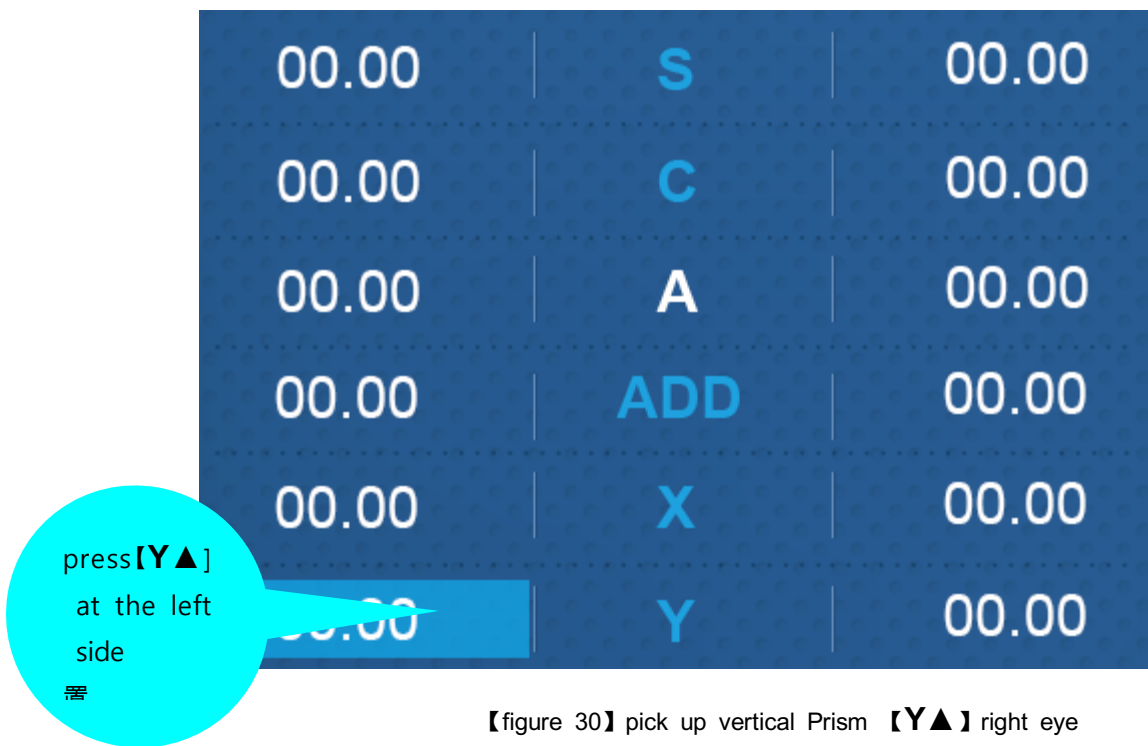
- The choice of Horizontal Prism **【X▲】**, press P0.5 and there pop-up a menu where there are 5 different choice P0.1、P0.2、P0.5、P1.0、P2.0. pick up anyone of them and you can adjust the Horizontal Prism **【A】** by jog wheel or **【+】**、**【-】**



【figure 29】 choice of step Horizontal Prism **【X▲】**

#### 4.2.5 The choice of Vertical Prism **【Y▲】**

- press **【Y▲】** to display the left side like figure 30, The colour change means that the **Y▲** of the right eye has been chosen. Then adjust the jog wheel or keypad **【+】**、**【-】** to change the diopter of vertical Prism lens of right eye.



【figure 30】 pick up vertical Prism **【Y▲】** right eye

- press **【Y▲】** to display the right side like figure 31, The colour change means that the **Y▲** of the left eye has been chosen. Then adjust the jog wheel or keypad **【+】**、**【-】** to change the diopter of Vertical Prism lens of left eye.



figure 【31】 pick up Vertical Prism 【Y▲】 left eye

- press the 【Y▲】 displayed in the middle of screen. The colour change means that the 【Y▲】 of the binoculars has been chosen. Then adjust the jog wheel or keypad 【+】、【-】 to change the diopter of Vertical Prism lens of binoculars.



【figure 32】 pick up Vertical Prism 【Y▲】 binoculars

- The choice of Vertical Prism **【Y▲】**, press P0.5 and there pop-up a menu where there are 5 different choice P0.1、P0.2、P0.5、P1.0、P2.0. pick up anyone of them and you can adjust the Vertical Prism **【A】** by jog wheel or **【+】**、**【-】**




【figure 33】 choice of step Vertical Prism **【Y▲】**

## 4.2 Main Menu Area



figure 【34】 main menu area


### 4.3.1 System Menu

- Press  there will pop-up system menu


### 4.3.2 Prescription Data Preview Menu

- Press  there will pop-up Prescription data preview menu

### 4.3.3 Mode Optometry Menu

- Press , there will optometry steps which include standard optometry procedure and 11 kinds of custom user-defined optometry procedure










### 4.3.4 The Optometry Knowledge Help Menu







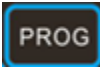







- Press  , there will be conclusion of Conventional optometry procedure and detailed each step of optometry

### 4.3 Keyboard instructions

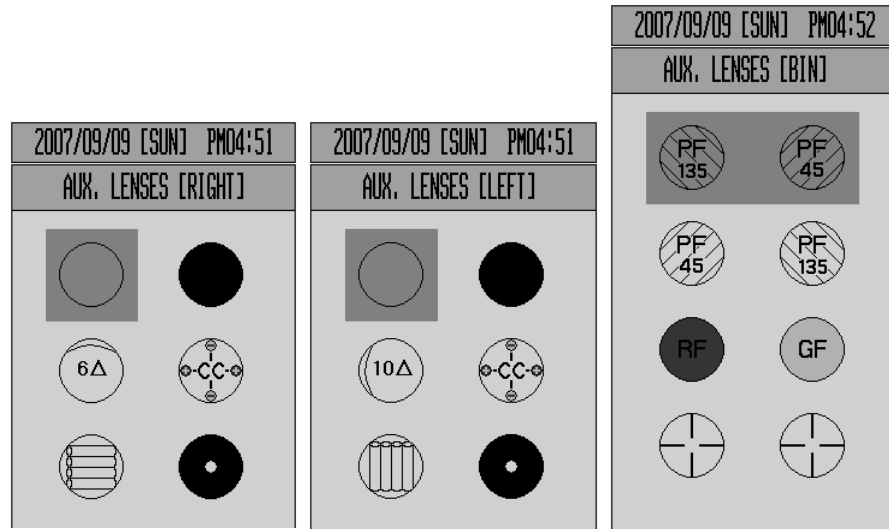


【Figure35】 Keyboard

- Press  , there will be system menu
- Press  , reset the optometry data and machine
- Press  , turn off project of ACP-9
- Press  , load the Objective optometry data of auto refractometer
- Press  , print the data of optometry scrip
- Press  , choose anyone of [S]、 [C]、 [A]、 [ADD]、 [X▲]、 [Y ▲] , press[ALT] , to clear the current data
- Press  , open right eye, close left eye and test right eye
- Press  , open left eye, close right eye and test left eye
- Press  , open and test binoculus

- Press  , right eye open. TASK SWITCHER close
- Press  , left eye open. TASK SWITCHER close
- Press  , to add value same as left rotating the jog wheel
- Press  to decrease value same as right rotating the jog wheel
- Press  , to combine with procedure of Jackson Cross Cylinders [1]
- Press  , to combine with procedure of Jackson Cross Cylinders [2]
- Press  , to choose the optometry program
- Press  , to choose the last step of optometry program
- Press  , to choose the last step of optometry program
- Press  , press the icon of projector. After target it, press it again and it will be horizontal display . If you press again, it will be Point-mode Display. The two display will alternates.
- Press  or  , press the icon of projector. , After target it, press it , again and it will be vertical display. If you press again, it will be choice of left and right.
- Press  or  , to choose up or down

### 4.5 The auxiliary lens



【figure 36】 auxiliary lens of right eye /left eye /binoculus

[VT-700 auxiliary lens list third layer]

Lens	Apply	Description	Lens	Apply	Description
	left/Right	Open test window		left/Right	Open test window
	left/Right	polarize 45 degree		left/Right	polarize 135 degree
	Right	10Δ BI		left	6Δ BU
	Right	Vertical Maddox Rod sheet		left	Horizontal Maddox Rod sheet
	left/Right	pinhole		left/Right	cross cylinder
	Right	Red Filter Lens		left	Green Filter Lens
	left/Right	PD test			

【table 8】 list of auxiliary lens

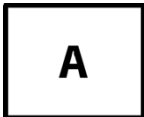
### 5. Unit Test

5.1. Cylinder Axis Test

- Purpose: Obtain maximum revised circumference degrees by 30 degrees' unit for Monocular, using Clock Dial, Subjective test.
- Chart: Clock Dial
- Auxiliary Lens: None
- Target: All the lines must be seen as eaully.
- Way of Test



1. Press Clock Dial button to change it into distorted vision test mode. It will automatically be associated to right eye ( like figure 37)



2. Question the patient like, 'In which hour direction line is seen the thickest and the darkest?'

3. When the patient says all the lines are seen equally, he is determined not to have distorted vision. If a certain bar is seen thicker, multiply 30 by the number seen by that bar, and press [A] to fix the distorted vision axis.






[Figure 37] Test of Cylinder Axis

#### 5.2. Cylinder Power Test


- Purpose: Obtain maximum revised circumference degrees for monocular, using Clock Dial, Subjective test.
- Chart: Clock Dial
- Auxiliary Lens: None
- Target: All the lines must be seen as equally.
- Way of Test



1. This test must be performed only after fixing the cylinder axis.

2. Press (C) to change it into distorted vision test mode.

4. Turn the dial in (-) direction, until all the lines are seen equally..

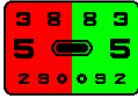
  


[Figure38] Cylinder Power Test

5.3. (Monocular) Red/Green Test

- Purpose: Check the maximum revised Spherical Refractive Power for Monocular by Red/Green Test Chart, using the principle of chromatic aberration, Subjective test.
- Chart: Red/Green Chart
- Auxiliary Lens: None
- Target: Letters on Red and Green Charts must be seen equally and clearly.
- Way of Test





1. Press Red/Green Chart button to change it into Red/Green Test Mode.

2. Question the patient that which of green and red is seen more clearly or more thickly, and check whether both of them are seen equally.
4. If red one is seen more clearly or both of them are seen clearly, try to add -0.25D.
5. If green one is seen more clearly, try to add +0.25D.
6. Repeat the above 3 and 4 until the green one is seen more clearly with minimum (-) refractive power, or add until both are seen equally.
7. Remove Red/Green Chart and check the visual acuity again.
  - ▶ If the red letter is seen clearly, turn the dial clockwise (in - direction.)
  - ▶ If the green letter is seen clearly, turn the dial counterclockwise (in + direction.)

※ Attention

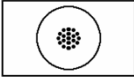
- In case of distorted vision, this test is not available for the normal visual acuity above 1.0 or an accurate visual acuity test.
- Sometimes a patient does not respond to this test. In some cases, a patient cannot compare the black letters in red and green background respectively, and cannot react following his preference.
- If a corrected vision of a patient is 1.0, you must ask him whether he is able to see well “29 in red and 92 in green.” In case a corrected vision is low, ask him to read the bigger letter on the upper side.





[Figure 9] (Monocular) Red/Green Test

5.4. Jackson Cross Cylinder Test

- Purpose: Subjective test, revise maximum circumference refractive power and axis for Monocular, using Jackson Cross Cylinder.
- Chart: Dot-Group Chart
- Auxiliary Lens: Cross Cylinder Lens (0.25 / 0.50)
- Target: The Dot-Group Chart must be seen as same, although the Cross Cylinder is crossed.
- Way of Test




1. Press Dot-Group Chart to move on to Cross Cylinder Test Mode.


2. Press  (CC 0.25) or  (CC 0.50) button to change it into Jackson Cross Cylinder Mode.

1

2

3. While pressing number (1) and number (2), ask the patient which side letter is seen more clearly.


 If number 1 is seen clearly, turn the dial counterclockwise(+ direction).

 If number 2 is seen clearly, turn the dial clockwise(- direction).

C

A

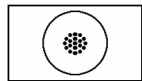
5. To estimate the distorted vision axis, press [A]. To estimate circumference power, press [C].



[Figure 40] Jackson Cross Cylinder Test (Distorted Vision Axis Test)

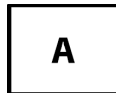
5.5. Dual Cross Cylinder Test

- Purpose: Subjective test, revise maximum circumference refractive power and axis for Monocular, using Dual Cross Cylinder.
- Chart: Dot-Group Chart
- Auxiliary Lens: Dual Cross Cylinder Lens (DUAL)
- Target: Separated two Dot-Group Chart must be seen samely.
- Way of Test



1. Press Dot-Group Chart to move on to Cross Cylinder Mode.
2. Press (CC dual) to change it into Dual Cross Cylinder Mode.
3. From the patient's view, the Dot-Group Chart is separately shown divided as two.

- ▶ If the left one is seen clearly, turn the dial counterclockwise (+ direction.)
- ▶ If the right one is seen clearly, turn the dial clockwise (- direction.)
- ▶ If the patient says there is no difference, finish the test.



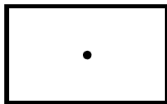
5. Press [A] button to estimate the distorted vision axis. Press [C] button to estimate the circumference power.



[Figure 41] Dual Cross Cylinder Test (Distorted Vision Axis Test)

5.6. Horizontal Maddox Rod Test

- Purpose: In self conscious test do Horizontal Heterophoria in the way of Maddox Rod.
- Chart: Maddox Chart
- Auxiliary Lens: Horizontal Maddox for right eye, Rotating Prism for left eye.
- Target: The vertical bar seen from the right eye and the Maddox Chart seen from the left eye must be united.
- Way of Test



1. Press Maddox Chart to choose Horizontal Maddox Rod Test Mode. At this time, a guide and prism change window appear on the upper left and lower part of the screen, respectively.

2. Turn the dial until the line and the dot unite as one.

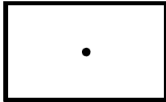
- ▶ If the line locates on the right side of the dot, turn the dial clockwise. (- direction.) (Esophoria)
- ▶ If the line locates on the left side of the dot, turn the dial counterclockwise (+ direction.) (Exophoria)
- ▶ If the line and the dot are seen unitedly, that is an orthophoria.



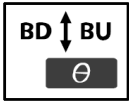
[Figure 42] Horizontal Maddox Rod Test

5.7. Vertical Maddox Rod Test

- Purpose: Subjective test, to the Vertical Heterophoria in the way of Maddox Rod.
- Chart: Maddox Chart
- Auxiliary Lens: Rotating Prism for right eye, Vertical Maddox for left eye.
- Target: The horizontal bar seen with the left eye and the Maddox Chart seen with the right eye must be united.
- Way of Test




1. Press Maddox Chart to choose the Horizontal Maddox Rod Test Mode At this time, a guide and prism change window appear on the upper left and lower part of the screen, respectively.



2. At this time, press Vertical Prism button Y▲, to change it into Vertical Maddox Rod Test Mode.

3. Turn the dial until the line and the dot are united as one.

- If the line locates over the dot, turn the dial clockwise (- direction.) (Hypophoria)
- If the line locates under the dot, turn the dial counterclockwise (+ direction.) (Hyperphoria)
- If the line and the dot are seen as united, that is an orthophoria.



[Figure 43] Vertical Maddox Rod Test

5.8. Binocular Balance Test at Polarized Light

- Purpose: Subjective test, keep the binocular balance against maximum revised value of Monocular
- Chart: Binocular Balance Chart at Polarized Light
- Auxiliary Lens: Polarized Light Filter with 135 degrees for right eye, and with 45 degrees for left eye.
- Target: The upper line seen with the right eye and the lower line seen with the left eye must be seen equal clearly.
- Way of Test



1. Press the Chart of Binocular Balance Test at Polarized Light, to enter the Binocular Balance Test at Polarized Light Mode.



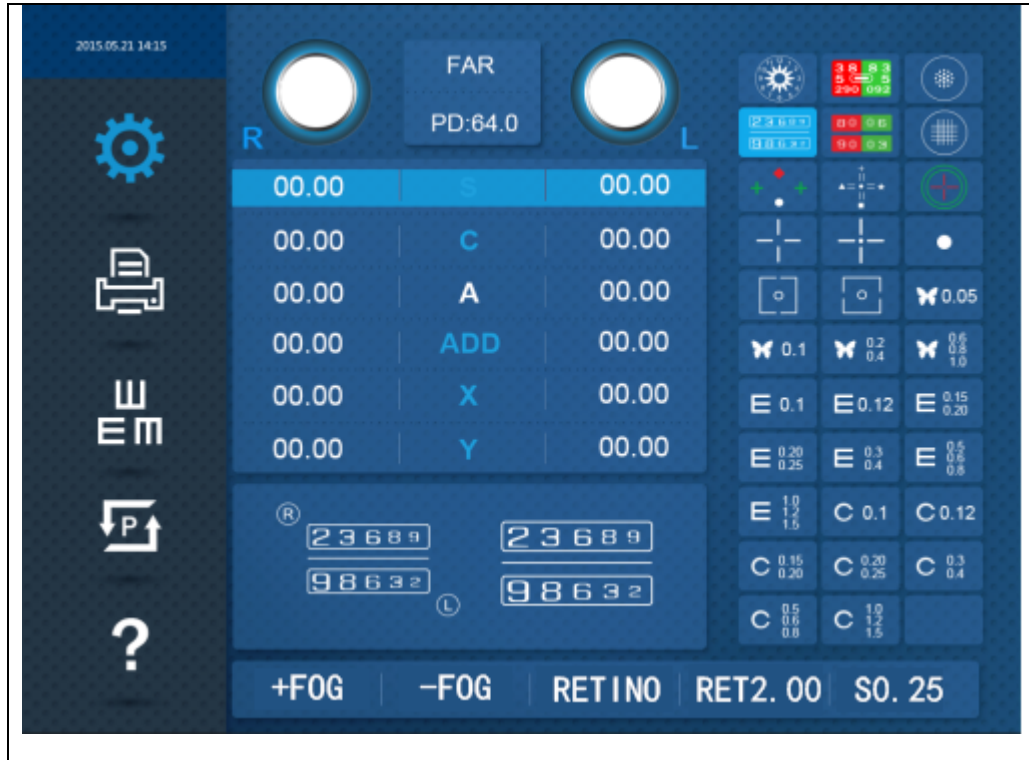
2. Press Binocular [BIN] button to open Binocular field, and add Fogging to about 0.5D, and then loosen the interrupted accommodation.

3. Ask the patient which of the upper and lower one is clearer.

- ▶ If the upper line is seen clearly, press [R] button and turn the dial counterclockwise, to increase the right side SPH value.
- ▶ If the lower line is seen clearly, press [L] button and turn the dial clockwise, to increase the left side SPH value.
- ▶ When both of upper and lower sheet are seen as samely clear, finish the test.

※ Attention


- If a corrected vision is below 0.4, sometimes it is hard to discern because the Chart is seen blurred. At this time, cover the more blurry side firstly, and then open it again. If there is any difference in the patient's vision, his Binocular have function, while no difference no function.
- If a patient has a dominant eye and the difference is more than 0.25D, the dominant eye sees well. Therefore, you can skip this test.



[Figure 44 ] Binocular Balance Test at Polarized Light


5.9. Polarized Light Red/Green Test

- Purpose: Subjective test, keep the balance of Monocular and Binocular simultaneously against the maximum revised value for single.
- Chart: Polarized Light Red / Green Chart
- Auxiliary Lens: Polarized Filter with 135 degrees for right eye, and with 45 degrees for left eye
- Target: The upper line seen with the right eye and the lower line seen with the left eye must be seen equally well. In addition to, in the upper line seen with the right eye, the letters in red and green background respectively, must be seen as samely, as well as the letters in the red and green backgrounds in the lower line seen with the left eye.
- Way of Test




1. Enter to the test mode by pressing Polarized Red / Green Test Chart.

2. Question the patient which one he sees more clearly, between the red letter and green letter upside.



3. Press [R] and turn the dial in clockwise (- direction,) if the left letter is clear, while in counterclockwise (+ direction) in case of right one.



4. Press [L] and turn the dial in clockwise (- direction,) if the left letter is clear, while in counterclockwise (+ direction) in case of right one.

**R**  
RIGHT

**L**  
LEFT

**R**  
RIGHT

**L**  
LEFT

5. Question the patient which one he sees more clearly, between the red letter downside and the green letter upside.
6. Press [R] and turn the dial in clockwise (- direction,) if the left letter is clear, while in counterclockwise (+ direction) in case of right one.
7. Press [L] and turn the dial in clockwise (- direction,) if the left letter is clear, while in counterclockwise (+ direction) in case of right one.
8. Balance Binocular.
9. If the upper line is seen clearly, press [R] and turn the dial counterclockwise (+ direction) to increase the value of the right side SPH.
10. If the lower line is seen clearly, press [L] and turn the dial counterclockwise (+ direction) to increase the value of the left side SPH.
11. Repeat this until both of upper and lower lines are seen clearly.

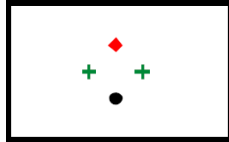
  

[Figure 45] Red / Green Test at Polarized Light

5.10. Worth For Dots Test (Worth 4 dots)

- Purpose: Find out repression Subjective test. You can check out whether there is any

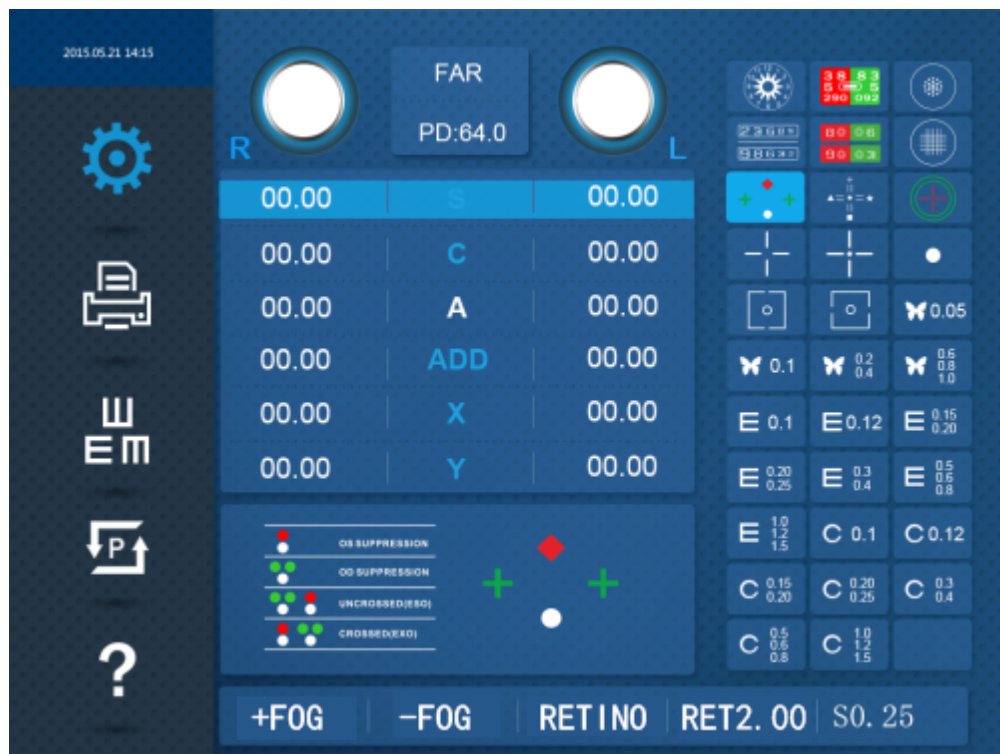
- internal/external Heterophoria.
- Chart: Worth 4 Dot Chart
- Auxiliary Lens: Red Filter for right eye, and Green Filter for left eye.
- Target: Check up as how many the dots are seen. In normal case, it is 4..
- Way of Test



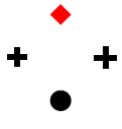
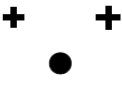

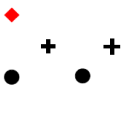
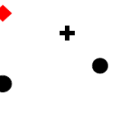
1. Press Worth 4 Dot Chart to enter the Repression Test Mode.

2. Question the patient how many lights he sees.

- ▶ If he says 4 dots, the patient's fusio is normal.
- ▶ If he says 2 red dots, the patient is using right eye only, and the Repression is occurring in his left eye.
- ▶ If he says 3 green dots, the patient is using left eye only, and the Repression is occurring in his right eye.
- ▶ If he sees 5 dots, it is Diplophia. If the red dot is right side of the green dot, the patient has internal Strabismus/internal Heterophoria, while the red dot on the left side of the green dot, he has external Strabismus/external Heterophoria.
- ▶ While he see 5 dots and 3 dots and 2 dots appears continuously alternately, it is an Alternate Repression of right/left eyes.



[Figure 46] Repression Test

Chart Shape	Meaning	Description
	Fusion	2 green dots on left and right side, a red dot upside, and the downside dot are seen alternatively, or as white, or seen as 4 dots in light red, these cases are normal.
	Right Eye Suppression	Seen 3 green dots only, it is Right Eye Suppression.
	Left Eye Suppression	Seen 2 red dots only, it is Left Eye Suppression.
	Heterophoria	Seen 2 red dots and 3 green dots, it is Heterophoria.
	Alternative Suppression	What the patient sees is unstable and 2 red dots and 3 green dots appear alternatively, it is Alternative Repression.

[Table 8] Interpretation of Suppression Test Result

5.11.Schober Test

- Purpose: Subjective test, process Heterophoria in a way of Schober.
- Chart: Schober Chart
- Auxiliary Lens: Red Filter for right eye, Green Filter for left eye, and Rotating Prism for binocular.
- Target: The cross seen with the right eye must be in the middle of the circle seen with the left eye.
- Way of Test



1. Subjective test, process Heterophoria in a way of Schober.

2. Question the patient like this. "Is the red cross inside the green circle?" If the answer is "Yes," no Heterophoria. If the answer is "No," it is Heterophoria, so go on to the next test.

3. Question the patient like this.

"Is the cross on the left side or on the right side of the circle?"

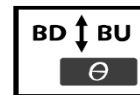
▶ On left side: External Heterophoria. Turn the dial counterclockwise (+ direction) to increase the value of BI prism, until the cross locates in the middle of the circle.

▶ On right side: Internal Heterophoria. Turn the dial clockwise (- direction) to increase the value of BO prism, until the cross locates in the middle of the circle.

4. Question the patient like this.

"Is the cross upside or downside the circle?"

▶ Upside: Upside Heterophoria for left eye. Press Vertical Prism button and turn the dial clockwise (- direction) until the cross locates in the middle of the circle.



▶ Downside: Upside Heterophoria for right eye. Press Vertical Prism button and turn the dial counterclockwise (- direction) until the cross locates in the middle of the circle.



5. To save the test result after the test is over, press [F6] button. Heterophoria is saved automatically so that you can check it out separately. When you press [F7], the result is deleted.



[Figure 47] Schober Test

Chart Shape	Heterophoria Type	Correction of Heterophoria
	Esophoria	Turn the dial clockwise (- direction) to increase the value of BO prism, until the cross locates in the middle of the circle.
	Exophoria	Turn the dial counterclockwise (+ direction) to increase the value of BI prism, until the cross locates in the middle of the circle.
	Left Hyperphoria	Press Vertical Prism button and turn the dial clockwise (- direction) until the cross locates in the middle of the circle.
	Right Hyperphoria	Press Vertical Prism button and turn the dial counterclockwise (+ direction) until the cross locates in the middle of the circle.

[Table 9] Interpretation of Schober Test Result

5.12. Horizontal Von Graefe Test

- Purpose: Subjective test, process Heterophoria in a way of Von Graefe.
- Chart: Numbers Chart
- Auxiliary Lens: 6ΔBU prism for right eye, and Rotating Prism for left eye
- Target: Be a state in which the upper vertical line and the lower vertical line are arranged in a row.
- Way of Test

TEST

F3

1. To process Vertical Von Graefe Test, press [TEST] button followed by [F3], and turn the dial to choose the Von Graefe Mode, which is in the third place.
  
2. After getting in the Horizontal Heterophoria Mode, ask the patient if the vertical bars are located on one straight line.
  - "Yes," no Heterophoria.
  - "No," it's Heterophoria.
  
3. In case of Heterophoria, question him again, "On the left side, does the upside vertical bar exist or does the downside vertical bar exist?"
  - In case of upside vertical bar on left side: Turn the "Esophoria" dial clockwise to add BO prism, until the vertical bars are arranged on one straight line.
  - In case of downside vertical bar on left side: Turn the "Exophoria" dial counter clockwise to add BI prism, until the vertical bars are arranged on one straight line.
  
4. When the test is over, press [F6] to save the result. If you don't need the result, press [F7] button.

### 5.13. Vertical Von Graefe Test

- Purpose: Subjective test, process Heterophoria in a way of Von Graefe.
- Chart: Numbers Chart
- Auxiliary Lens: Rotating Prism for right eye, and 10ΔBI Prism for left eye
- Target: Be the state in which the left horizontal line and the right horizontal line are arranged on one straight line in the middle.
- Way of Test

TEST

F3

1. To process vertical Von Graefe Test, press [TEST] followed by [F3], and turn the dial to choose Von Graefe Mode which is located on the 4<sup>th</sup> place. Or, press [BDBU] button on Horizontal Heterophoria Mode to execute Heterophoria Mode.
  
2. After getting in Vertical Heterophoria Mode, ask the patient if the vertical bars are located on one straight line.
  - "Yes," no Heterophoria.
  - "No," it's Heterophoria.
  
3. In case of Heterophoria, ask the patient again. "On upside, does the left bar exist or does the right bar exist?"

- ▶ In case of right bar on downside: Turn the “R.Hyperphoria” dial counter clockwise to add BD prism, until the 2 horizontal bars are arranged on one straight line.
- ▶ In case of left bar on downside: Turn the “L.Hyperphoria” dial clockwise to add BU prism, until the 2 horizontal bars are arranged on one straight line.

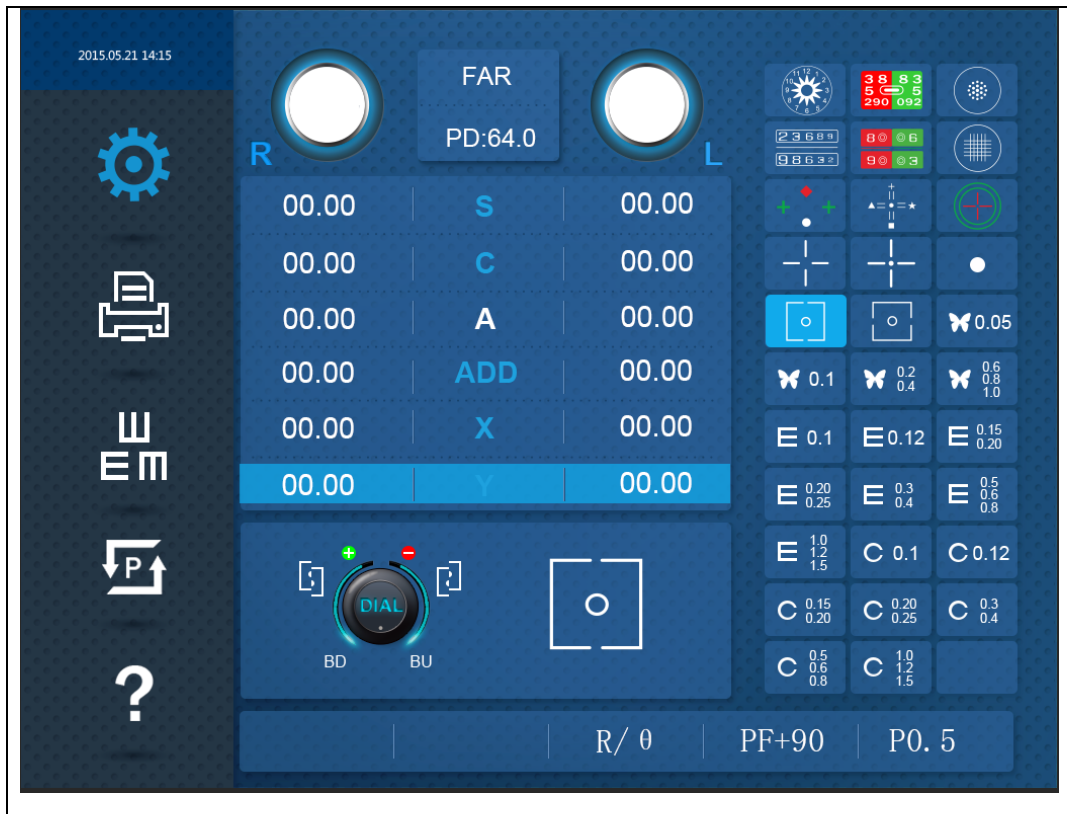
4. When the test is over, press [F6] to save the result. If you don't want the result, press [F7].

#### 5.14. Vertical Coincidence(Aniseikonia) Test

- Purpose: Subjective test, process Aniseikonia and Vertical Heterophoria by Coincidence (Aniseikonia) Chart.
- Chart: Vertical Coincidence(Aniseikonia) Chart
- Auxiliary Lens: Polarized Filter with 135 degrees for right eye, and 45 degrees for left eye.
- Target: The right half of the square seen with the right eye and the left half of the square seen with the left eye must be arranged as a regular square, with a standard of Fixation.
- Way of Test




1. Go into Horizontal Heterophoria Mode by pressing Coincidence (Aniseikonia) Chart.
2. Ask the patient if he sees the square chart, if yes, ask if that square chart is tilted toward up and down, or is arranged straight.
  - ▶ When the left half square chart is tilted upside: “Upside Heterophoria of right eye.” Turn the dial counterclockwise to increase BD prism, until the left and right half square are arranged straight.
  - ▶ When the right half square chart is tilted toward upside: “Upside Heterophoria of left eye.” Turn the dial clockwise to increase BU prism, until the left and right half square are arranged straight.
3. As a final check, ask the patient if he sees the dot in the middle and the square chart, and whether the sizes of upper and lower square are of same.
  - ▶ If the sizes of the left square sheet and the right square sheet are same, there is no Aniseikonia. Press [SHIFT]+[F1] and choose OK.
  - ▶ If the sizes of the left half square sheet and the right half square sheet are different, there is Aniseikonia. Press [SHIFT]+ [F2] and choose NG.



[Figure 49] Vertical Coincidence(Aniseikonia) Test

5.15. Phoria Test without Fixation

- Purpose: Subjective test, progress Heterophoria test in a way of Pola Cross without Fixation.
- Chart: Polarized Cross Chart without Fixation
- Auxiliary Lens: Polarized Filter with 135 degrees for right eye, and 45 degrees for left eye.
- Target: The vertical seen with the right eye and the horizon seen with the left eye are united and seen as cross.
- Way of Test



1. Enter Heterophoria Mode by pressing Pola Cross Chart without Fixation.

2. Ask the patient, "Does it seem like a cross?"



- If the answer is "Yes," there is no Heterophoria. Test done.
- If the answer is "No," it is Heterophoria. Go on to the next test.

3. Start with Horizontal Heterophoria. Ask the patient as following.

4. "Does the letter ( **I** ) locate on the left side of the letter ( **—** ), or the right side of it?"





- Located on left: " Exophoria." Turn the dial counterclockwise to increase BI prism. When the cross is seen well, finish the test.
- Located on right: "Esophoria." Turn the dial clockwise to increase BO prism. When the cross is seen well, finish the test.



5. When Horizontal Heterophoria test is over, start with Vertical Heterophoria. Ask the patient as following.

6. "Does the letter (  ) locate upside of the letter (  ), or downside of it?"
- Located upside: "Left Hyperphoria." Turn the dial clockwise to increase BU prism. When the cross is seen well, finish the test.
  - Located downside: "Right Hyperphoria." Turn the dial counterclockwise to increase BD prism. When the cross is seen well, finish the test.



[Figure 50] Phoria Test without Fixation

Chart Shape	Heterophoria Type	Description
	Esophoria	1) Turn the dial clockwise until the Vertical Chart of the Cross becomes a cross shape, to increase BO prism.
	Exophoria	2) Turn the dial clockwise until the Vertical Chart of the Cross becomes a cross shape, to increase BI prism.
	Left.Hyperphoria Right.Hypophoria	3) Press [BDBU]. Turn the dial clockwise until the Horizontal Cross Chart becomes a cross shape.
	Right.Hyperphoria Left.hypophoria	4) Press [BDBU]. Turn the dial counterclockwise until the Horizontal Cross Chart becomes a cross shape.

	<p>Exophoria + Right.Hyperphoria</p>	<p>5) Correct the Horizontal Heterophoria like (2), and correct the Vertical Heterophoria like (4).</p>
	<p>Esophoria + Left.Hyperphoria</p>	<p>6) Correct the Horizontal Heterophoria like (1), and correct the Vertical Heterophoria like (4).</p>

[Table 10] Interpretation of Phoria Test

5.16. Phoria Test with Fixation

- Purpose: Subjective test, progress Heterophoria in a way of Pola Cross with Fixation.
- Chart: Polarized Cross Chart with Fixation
- Auxiliary Lens: Polarized Filter with 135 degrees for right eye, and 45 degrees for left eye.
- Target: The cross on the right upper side in 2 directions seen with the right eye and the cross on the left lower side in 2 directions seen with the left eye are united and seen as one.
- Way of Test



1. Enter Heterophoria Mode by pressing Pola Cross Chart with Fixation.

2. Ask the patient, "Does it seem like a cross?"

- ▶ If the answer is "Yes," there is no Heterophoria. Test done.
- ▶ If the answer is "No," it is Heterophoria. Go on to the next test.

3. Start with Horizontal Heterophoria. Ask the patient as following.

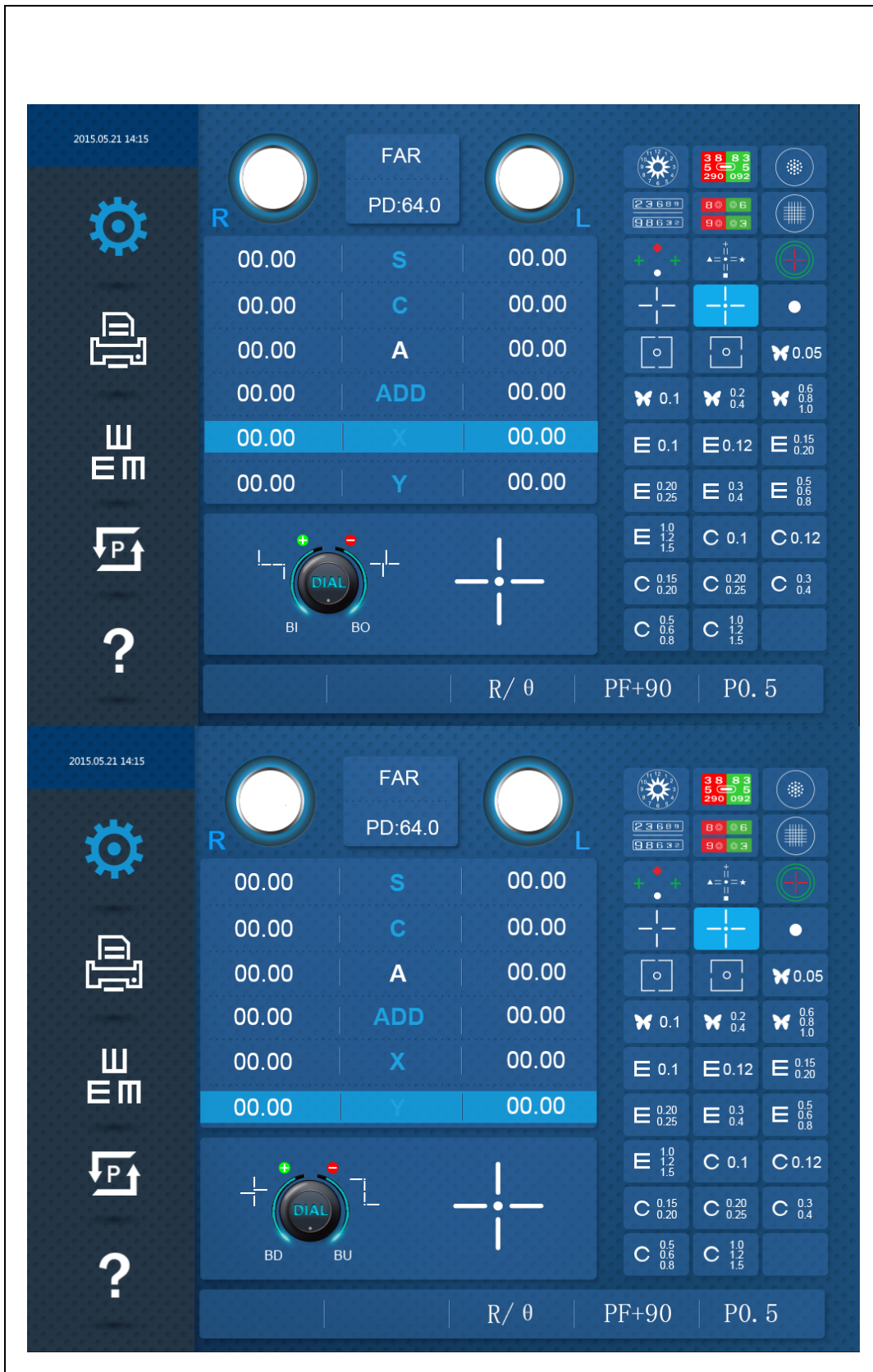
4. "Does the letter (⌊) locate on the left side of the letter (⌋), or the right side of it?"

- ▶ Located on left: "Exophoria" Turn the dial counterclockwise to increase BI prism. When the cross is seen well, finish the test.
- ▶ Located on right: "Esophoria" Turn the dial clockwise to increase BO prism. When the cross is seen well, finish the test.


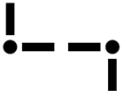






5. When Horizontal Heterophoria test is over, start with Vertical Heterophoria. Ask the patient as following.

6. "Does the letter (⌊) locate upside of the letter (⌋), or downside of it?"

- ▶ Located upside: "Left Hyperphoria" Turn the dial clockwise to increase BU prism. When the cross is seen well, finish the test.
- ▶ Located downside: "Right Hyperphoria" Turn the dial counterclockwise to increase BD prism. When the cross is seen well, finish the test.



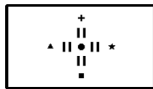
[Figure 51] Phoria Test with Fixation

Chart Shape	Heterophoria Type	Description
	Esophoria	1) Turn the dial clockwise until the Vertical Chart of the Cross becomes a cross shape, to increase BO prism.
	Exophoria	2) Turn the dial clockwise until the Vertical Chart of the Cross becomes a cross shape, to increase BI prism.
	Left.Hyperphoria	3) Press [BDBU]. Turn the dial clockwise until the Horizontal Cross Chart becomes a cross shape.
	Right.Hyperphoria	4) Press [BDBU]. Turn the dial clockwise until the Horizontal Cross Chart becomes a cross shape.
	Esophoria + Right.Hyperphoria	5) Correct the Horizontal Heterophoria like (1), and correct the Vertical Heterophoria like (4).
	Esophoria + Left.Hyperphoria	6) Correct the Horizontal Heterophoria like (1), and correct the Vertical Heterophoria like (4).
	Exophoria + Right.Hyperphoria	7) Correct the Horizontal Heterophoria like (2), and correct the Vertical Heterophoria like (4).
	Exophoria + Left.Hyperphoria	8) Correct the Horizontal Heterophoria like (2), and correct the Vertical Heterophoria like (3).

[Table 11] Interpretation of Phoria Test

5.17. Minute Stereo Acuity Test

- Purpose: Subjective test, progress a minute stereo Acuity test.
- Chart: Minute Stereo Vision Chart
- Auxiliary Lens: Polarized Filter with 135 degrees for right eye, and 45 degrees for left eye.
- Target: With Fixation as a center, it must be seen as rotating clockwise and as embossed.
- Way of Test

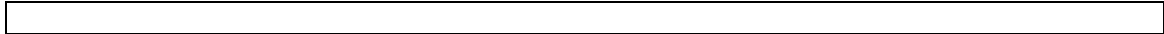


1. Press Minute Stereo Vision Chart and choose Minute Stereo Vision Test Mode.

2. Ask the patient, "How do you see the bars, with the standard of Fixation, from at 12, 3, 6, to 9 o'clock (clockwise)?"

- ▶ All the bars including central Fixation look like flat: The patient does not have the capability of stereo vision. Press [F5] and choose NG.
- ▶ The bars at 12 and 3 o'clock look like cubic: The patient can perceive to 1 arc minute. Press [F1] and setup it.
- ▶ The bars at 3 and 6 o'clock look like cubic: The patient can perceive to 2 arc minutes. Press [F2] and setup it.
- ▶ The bars at 6 and 9 o'clock look like cubic: The patient can perceive to 4 arc minutes. Press [F1] and setup it.
- ▶ The bars at 12 and central Fixation look like cubic: The patient can perceive to 10 arc minutes. Press [F4] and setup it.





[Figure 52] Minute Stereo Vision Test

## 6. Maintenance

### 6.1. Replacement of Printing Paper

Replace the roll printing paper as soon as possible if the red line appears in the paper.  
 Make sure to confirm kind and size of the paper.  
 (kind : thermal paper, size: 57mm in width and 30mm in diameter)

### 6.2. Cleaning

- Basically, keep this instrument clean. Don't use volatile object, thinner or benzene, etc.
- Polish each part with a dry cloth containing detergent solution.



### 6.3. Service Information

#### 6.3.1. Repair

- If the goods have a problem, please contact selling agent.
- Please refer to the name plate and let us have the following information.

- Model of the instrument : VT-700
- Phenomenon : In detail

#### 6.3.2. Disposal of the instrument

 <b>CAUTION</b>	This instrument incorporates a Alkaline battery, which may pollute the environment if the instrument is abandoned. Please ask a professional waste disposal company to handle disposal or distributor before disposing of the instrument.
 <b>CAUTION</b>	It must not be exposed to watery a place or where lots of water splashed. Do not put any container or product which contains liquid or gas, around this device.

## [Appendix] Hardware Specification

Measuring Range	
Spherical Lens	-29.00 ~ +26.75D (Regular) -19.00 ~ +16.75D (Cross Cylinder, Prism Test) (Step: 0.12D / 0.25D / 0.5D / 1D / 2D / 3D)
Cylinder Lens	0.00 ~ 8.75D (Step: 0.25D / 0.5D / 1D / 2D / 3D)
Cylinder Axis	0 ~ 180° (Step: 1 / 5 / 15 / 30 / 45°)

Pupil Distance	Far : 48 ~ 80 mm Near : 45 ~ 75 mm (Step: 0.5/1.0mm)
Working Distance	35 ~ 70 cm (Step: 5 cm)
Rotary Prism	0 ~ 20 Δ (Step: 0.1Δ / 0.2Δ / 0.5Δ / 1Δ / 2Δ)
Cross Cylinder	Jackson Cross Cylinder ±0.25D Jackson Cross Cylinder ±0.50D Dual Cross Cylinder
Retinoscopy Lens	+1.5D, +2.0D (Test Distance 67cm, 50cm)
<b>Specifications</b>	
Body	362(width) * 83(depth) * 299(height)mm, 3.5 kg
Controller	215width) * 230 (depth) * 226(height)mm, 1.5 kg
Junction Box	266(width) * 72(depth) * 240(height)mm, 1.3 kg
Power Supply	AC 100 ~ 240V, 50 / 60Hz
Power Consumption	90VA
<b>Auxiliar Lens</b>	
Open/Close Lens	
Pin Hole Lens	Φ 1mm
Moddox Rod	Right eye (horizontal red), Left eye (vertical red)
Red/Green Filter	Right eye (red), Left eye (green)
Polarized Light Filter	Right eye (135°, 45°), Left eye (45°, 135°)
Separating Prism	Right eye (6ΔBU), Left eye (10ΔBI can be added to 0~5Δ)
PD Test Lens	
Fixed Cross Cylinder Lens	Jackson Cross Cylinder ±0.50D, Axis fixation 90°
Vision Degrees	32°

Appendix: Diagram of VT - 700 installation online

