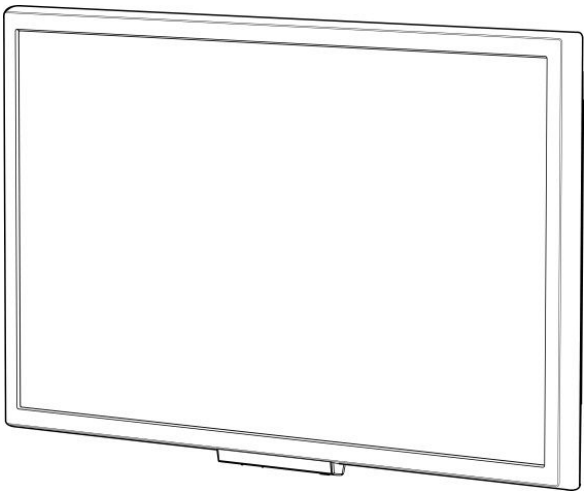
USER MANUAL

Digital Chart

HDC-9000N / HDC-9000PF



Huvitz Re:define, Re+create

IMPORTANT NOTICE

This product may malfunction due to electromagnetic waves caused by portable mobile phones, transceivers, radio-controlled toys, etc. Be sure to avoid having objects such as, which affect this product, brought near the product.

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Ver. 1.0

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HUVITZ Co., Ltd.

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435-862, Republic of Korea

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Contents

1. Introduction
1.1 Outline of product.....6
1.2 Classification.....6
2. Safety Information
2.1. Introduction.....7
2.2. Safety Symbols.....8
2.3. Environmental Factors.....9
2.4. Safety Precaution.....11
3. Features.....14
4. Using the Instrument
4.1. Preparation.....15
4.2. Operation procedure.....16
4.3. After using the Instrument.....17
5. Note for use
5.1. Notes on the Usage.....18
5.2. Notes on the Installation.....18
5.3. Notes on the Storage.....20
5.4. Notes on the environmental condition for Storage.....20
6. Configuration
6.1. Main Body.....21
6.2. Remote Control.....23
7. Installation
7.1. Preparation.....28
7.2. Installing the Main Body
7.2.1. Standard Installation.....28
7.2.2. Installation with a Mirror.....29
7.3. Configuring the Settings.....30
7.4. Interfacing with the Digital Refractor.....30
8. Using the Menu Mode and Functions

8.1. Executing and Operating the Menu Mode.....31
8.2. Using the Menu Mode.....33
8.2.1. Vision Test.....34
8.2.2. Vision Therapy.....43
8.2.3. Mode for Movie / Photo.....46
8.2.4. Settings.....48
8.3. Other Functions
8.3.1. The Link to Ref/Keratometer Function.....53
8.3.2. Adjusting the Contrast Sensitivity.....54
8.3.3. Input Custom Program.....55
8.3.4. Changing the Channel of the Remote Control.....55
9. Optometric Test Using the Digital Chart
9.1. Cylinder Axis Test.....56
9.2. Cylinder Power Test.....56
9.3. Binocular Cylinder Axis Test.....57
9.4. Binocular Cylinder Power Test.....57
9.5. Red/Green Test.....58
9.6. Cross Cylinder Test for Axis.....58
9.7. Cross Cylinder Test for Power.....59
9.8. Binocular Balance Test.....59
9.9. Dominant Eye Test for Patients with Phoria.....60
9.10. Worth 4 Dot Test.....60
9.11. Polarized Cross Test.....60
9.12. Fixation Disparity Test.....61
9.13. Coincidence Test.....61
9.14. Schober test.....61
9.15. Von Graefe Test.....62
9.16. Maddox Rod Test.....62
9.17. Zeiger Test.....62
9.18. Stereo Test.....63
9.19. Minute Stereo Test.....63
10. Maintenance
10.1. Replacement of battery of remote controller.....64
10.2. Cleaning.....64

10.3. Disposal.....64
11. Troubleshooting
11.1. LCD screen is not turned on.....65
11.2. Chart displays broken image.....65
11.3. The main body is not responsible to the remote.....65
11.4. The screen is too bright or too dark.....65
11.5. Visual acuity test results in overcorrection or undercorrection.....66
11.6. Visual acuity test results in overcorrection or undercorrection.....66
11.7. Red/Green filter is not filtering completely.....66
11.8. Polarizer test is not working.....66
12. Components List.....67
13. Product Specification.....68
14. EMC Declaration.....70
15. Service Information.....77

1. Introduction

1.1. Outline of product

The Huvitz Digital Chart (HDC-9000) is a computerized chart presenting device that provides charts for refractive correction test and various functional tests such as cross cylinder, red/green, binocular balance, fusion and suppression, heterophoria, associated phoria, aniseikonia, stereopsis, and dominant eye test for heterophoria. Since the Digital Chart implements charts on the LCD panel by exploiting the cutting edge digital technology, it's not only faster and quieter but also equipped with multifarious convenience functions. The contrast sensitivity and the background luminance of the chart are adjustable for environmental needs. The chart can be installed in a wide range from 1.5 to 6 meter. The distance between optotypes can be set to variable distance and even the selection of optotype can be randomized. Also the image gallery contains a dozen of image clips that the examiner could utilize during the examination. Various masking and random functions would be helpful for a punctual vision test.

The examiner may execute all the charts and functions by using the remote and the buttons on the main body of the digital chart. If the chart is connected to the Huvitz Digital Refractor, the examiner would just use the Operation Panel of the Digital Refractor for chart operation as it allows to control the lens unit and the chart device at the same time by a touch of buttons on it.

1.2. Classification

- Product Name
  Digital Eye Chart (Huvitz Digital Chart HDC-9000PF, HDC-9000N)

- Weight , Packing Unit
  Weight: 6.1 kg, Packing: EA

- Objective: Device for optometry, which can display letters or symbols, and can save and load videos for medical purpose.

- Manufacturer and dealer
  HUVITZ Co., Ltd. 689-3, Geumjeong-dong, Gunpo-si, Gyeonggi-do, 435-862, Republic of Korea

- Classification

Classification of Equipment	Parameter Value
According to protection against electric shock.	Class I [Grounded]. This includes the AC/DC adapter(XP power, AHM85PS12)
According to the degree of safety in the presence of Flammable Anesthetics mixture with air, with oxygen, or with nitrous oxide.	Equipment is NOT suitable for use in the presence of flammable anesthetics mixture with oxygen or with nitrous oxide
According to the mode of operation.	Continuous Operation.

2. Safety Information

2.1. Introduction

Safety is everyone's responsibility. The safe use of this equipment is largely dependent upon the installer, user, operator, and maintainer. It is imperative that personnel study and become familiar with this entire manual before attempting to install, use, clean, service or adjust this equipment and any associated accessories. It is paramount that the instructions contained in this manual are fully understood and followed to enhance safety to the patient and the user/operator. It is for this reason that the following safety notices have been placed appropriately within the text of this manual to highlight safety related information or information requiring special emphasis. All users, operators, and maintainers must be familiar with and pay particular attention to all Warnings and Cautions incorporated here in.

⚠ WARNING

"Warning" indicates the presence of a hazard that could result in severe personal injury, death or substantial property damage if ignored.

NOTE

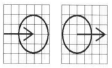
"Note" describes information for the installation, operation, or maintenance of which is important but hazard related if ignored.

⚠ CAUTION

"Caution" indicates the presence for a hazard that could result in minor injury, or property damaged if ignored.

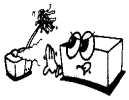
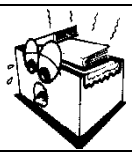
2.2. **Safety Symbols**

The International Electro-technical Commission (IEC) has established a set of symbols for medical electronic equipment, which classify a connection or warn of any potential hazards.

	Power Standby / ON
	Alternating Current.
	Direct Current.
	This symbol identifies a safety note. Ensure you understand the function of this control before using it. Control function is described in the appropriate User Manual.
	This symbol identifies a hot surface.
	Identifies the point where the system safety ground is fastened to the chassis. Protective earth connected to conductive parts of Class I equipment for safety purposes.
	This symbol identifies the date and manufacturer of manufacture.
	It indicates the connection of signal Input/Output.
UL Safety comliance :	This LCD monitor is U.L. Classified with respect to electric shock, fire and mechanical hazards only in accordance with 60601-1/CAN/CSA /C22.2 NO. 601.1

2.3. Environmental Factors

Please avoid the environments below for the operation or storage of the equipment.

	Where the equipment is exposed to water vapor. Don't operate the equipment with wet hands.
	Where the machine is exposed directly to the sunlight.
	Where the temperature changes frequently (Normal temperature for operation of the machine is at the range of 10°C ~ 40°C, and the humidity is at the range of 30%~75%.
	Where any heaters are at the close distance to the machine.
	Where the humidity is high and there are problems to the heat dissipation and/or ventilation.
	Where the equipment is subject to excessive shocks or Vibrations.
	Where the machine can be exposed to the chemical or flammable substances.
	Please keep the equipment out of dust and do not let inserted any metal parts such as coins, clips, etc.
	Do not disassemble or open the machine. The manufacture shall have no responsibility for any problems caused by these.
	Do not close the thermal ventilation outlet.

	Do not connect the AC power plug into the outlet while not putting the parts of machine together completely. It can harm the equipment.
	Do not pull the plug out of outlet while holding the cord.

For the normal operation of the machine, please keep the ambient temperature is 10℃ ~ 40℃, humidity is 30% ~ 75% and atmospheric pressure is 800 ~ 1060hpa. For the Transportation of the machine, please keep the ambient temperature is -40℃ ~ 70℃, humidity is 10% ~ 95% and atmospheric pressure is 500 ~ 1060hpa. For the Storage of the machine, please keep the ambient temperature is -10℃ ~ 55℃, humidity is 30% ~ 75% and atmospheric pressure is 700 ~ 1060hpa. Avoid environments where the equipment is exposed to excessive shocks or vibrations.

2.4. Safety Precaution

This equipment has been developed and tested in conformity with domestic & international safety standards and regulations, which guarantees the high stability of this product. This guarantees a very high degree of safety for this device. The legislator expects us to inform the user expressively about the safety aspects in dealing with the device. The correct handling of this equipment is imperative for its safe operation. Therefore, please read carefully all instructions before switching on this device. For more detailed information, please contact our Customer Service Department or one of our authorized representatives.

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1. This device must be used with accessory kits which were offered by HUVITZ. If customer want to use accessory kit from other manufacturer, that accessory kit's safety must be guaranteed by HUVITZ or manufacturer of accessory kit.

2. The equipment must be operated only by, or under direct supervision of properly trained and qualified person/s.

3. Modifications of this equipment may only be carried out by Huvitz's service technicians or other authorized persons.

4. Customer maintenance of this equipment may only be performed as stated in the User Manual. Any additional maintenance may only be performed by Huvitz's service technicians or other authorized persons.

5. The manufacturer is only responsible for effects on safety, reliability, and performance of this equipment when the following requirements are fulfilled: (1) The electrical installation in the respective room corresponds to the specifications stated in this manual and (2) This equipment is used, operated and maintained according to this manual.

6. Only persons who have undergone proper training and instructions are authorized to install, use, operate, and maintain this equipment.

7. User Manual should be kept in the place where the persons in charge of operation and maintenance can access easily any time.

8. Please do not pull on any cable. Always hold on to the plug when disconnecting cables.

9. Before every operation, proceed with visual inspection on the equipment exterior to seek any mechanical damage(s) to ensure the proper functioning.

10. Do not obstruct any ventilation outlet for proper heat dissipation.

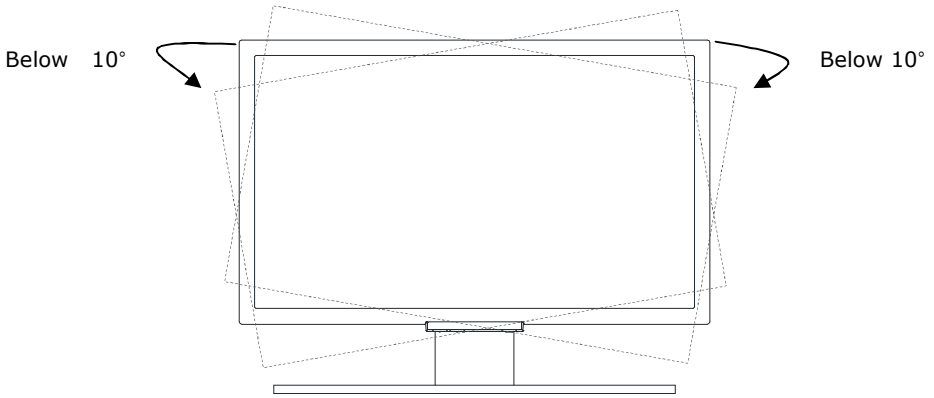
11. In case of any presence of smoke, spark or abnormal noise/smell from the machine, please power off immediately and pull out the plug.

12. The device should neither be kept nor installed in the place with the risk of explosion or near the alcohol, benzene and other inflammable substance.

13. The device should neither be kept nor installed in the place with high humidity. For the optimal operation, the humidity should be at the range of 30%~75%.

14. The manufacturer is not liable for damage caused by unauthorized tampering with the device(s). Such tampering will forfeit any rights to claim under warranty.

15. To avoid injury by tipping over, set the monitor to the following tilted position before moving.



16. Before connecting the AC power cord to the DC adapter outlet makes sure the voltage designation of the DC adapter corresponds to the local electrical supply.

17. Equipment grounding is vital for safe operation. Plug power cord into a properly earthed mains supply outlet whose voltage and frequency characteristics are compatible with those listed on the monitor or in this manual. Do not uses plug adapters or extension cords; such devices defeat the safety ground and could cause injury.

18. Grounding reliability is achieved only when the monitor is connected to a "hospital only" or "hospital grade" receptacle. Inspect routinely and do not use if damage is discovered.

19. Do not touch signal input, signal output or other connectors, and the patient simultaneously.

20. Plug the female and of the AC Power Cord into the AC inlet of the DC Adapter.

Caution: Make sure the power cord is the correct type that is required in your area.
This LCD monitor has a universal power supply that allows operation in either 100-120V AC or 200-240V AC voltage areas (no user adjustment is required).
Use the proper power cord with correct attachment plug type. If the power source is 120 V AC, use a power cord which is a Hospital Grade Power Cord with NEMA 5-15 style plug, labeled for 125 volts AC with UL and C-UL approvals. If the power source is a 240 V AC supply, use the tandem (T blade) type attachment plug with ground conductor power cord that meets the respective European country's safety regulation.
The hospital-grade plug for medical products intended for use in Denmark has DEMKO approval and is rated 13 amps at 250 Vac. Plug is recommended for use in medical applications and

specification are being added to the standard SB 107-2-D1. Plug mates with maker's Danish hospital-grade socket. Hospital sockets have slightly different shaped openings allowing only the hospital plug, not the standard Danish plug, to be inserted, to protect the ac circuit in specific medical settings.

21. External equipment intended for connection to signal input, signal output or other connectors, shall comply with relevant IEC Standard (e.g., IEC60950 for IT equipment and IEC60601-1 series for medical electrical equipment). In addition, all such combination-system-shall comply with the standard IEC60601-1 and/or IEC60601-1-1 harmonized national standard or the combination. If, in doubt, contact qualified technician or your local representative the operator should not touch the patient and accessible male parts of the SIP/SOP connectors simultaneously.

3. Features

The following features are main features of this device. You can get more precise information in the index of 8.

- HDC-9000PF consists of LCD panel that can express polarization.
- HDC-9000N consists of LCD panel that cannot express polarization. This device support binocular test through the Red/Green filter
- By the vision test function, you can check the color blindness and color weakness.
- By the two kind of Hue Test, You can check the color ability.
- You can adjust easily with button of remote controller. And also this device supports the function of adjusting of level of contrast.
- We can change test distance freely, from 1.5m to 6m in the unit of 10cm.

NOTE
If you set the distance under the 2.5m, This could result not clear expression of chart. If you want to see clear chart in the distance under the 2.5m, You must install mirror.

- Through the mirroring function, we can test examinee in the small room.
- The chart space can be changed by user.
- With the random chart, you can prevent examinee to remember order of chart.
- With various image, you can explain or use in the test.
- This device provides background contrast function. You can set background to display white or black.
- This device support communication with HUVITZ digital reflector in wired or wireless.

4. Using the Instrument

4.1. Preparation

Before using this product, please perform the required action refer to the following information and documentation.

- You can install the device in the wall mount, desk stand, moving stand. You should use stands and wall mount that provided by Huvitz.
- The device should be installed by qualified person or be installed under the supervision of qualified person.
- Check that the front side of the LCD panel is clean. Clean the dust on it.
- You must use cable and adapter which was provided by Huvitz.
- Simply check the device, after the connection of cable and adapter.
- Fix cable and adapter not to move.
- Check the remote controller battery right place and power remains.
- If the environment like test distance has been changed, Changed settings in the menu.
- In the case of HDC-9000PF, set the LCD panel right angle for using polarized filter.
- In the case of HDC-9000PF, Check if protective film on the LCD panel has been removed. The film or any other similar materials could obstruct the polarizer test

⚠ WARNING
Standard of adapter is DC12V 7A. You must use adapter and cable that provided by Huvitz. The adapter that provided by Huvitz have medical certification. Huvitz have no responsibility about problem that caused by using adapter and cable which are not provided by Huvitz.

4.2. **Operation procedure**

Operation procedures may differ from the users. Followings are the most basic operational sequence.

- Connect power adapter to main body correctly. Fix adapter with cable tie.
- Before to press ⏻ power switch, conform the flicker of LED under the LCD panel.
- After to press ⏻ power switch, conform the light of 3 LED.
- Wait for the boot up and display of the C chart.
- Guide the patient to the right distance, make the patient see the chart.
- Adjust the LCD panel angle if necessary.
- Start and proceed the tests with the necessary chart using remote control.
- If necessary, you can connect with Ref/Keratometer and you can display Ref/Keratometer image though the HDC-9000 LCD panel. Refer to the section 8.3.1 of this manual.
- Program function allows you to set the most commonly used chart order for optometry and it helps to test quickly. For more detailed operation of program function, see the Register to Start program.
- After a period of idle time, screen off or screen saver will be activated. To revert to the chart, press any button on the remote controller. To setup or change the screen saver operation, check the Setup Menu section.
- When turn off the device, Press ⏻ power switch until beep 2 times. After some second, when beep 2 times again, the power is completely off.

NOTE

In the black background color, the color on LCD can be spread. It's normal condition.

NOTE

In HDC-9000PF, existence of oil film phenomenon on LCD panel is normal condition. It is interference fringes.

4.3. After using the Instrument

- Turn off the ⏻ power switch of the main body and disconnect the power plug.
- Please do not pull on cable or do not use an impractical force.
- Remove the power if you are not using for a long time.
- Refer to the section "5.3 Notes on the Storage" and follow the steps for storage.
- Maintain all parts and cables clean and arranged for next use.
- Do not tamper or open the product. The manufacturer is not liable for the damages caused by such tampering..
- Do not plug the AC power cord into the outlet before the instrument is connected completely. This could provide reason for defects.
- Do not use organic solution such as thinner, benzene, etc. to clean the surface of this product. It may damage the product
- In case of no use of the machine for a long time, please put the dust cover on the device after powering and plugging off.
- For moving the instrument, disconnect the power first and hold firmly with both hands always.

5. Note for Use

5.1. Notes on the Usage

When using this product, please be aware of the followings

- Avoid places where ambient temperature is too low or too high for normal operation.
- Check the overall status of the instrument and any abnormally in the examinee persistently.
- If any abnormality is observed, the operator is required to take appropriate measures, stop the operation of the instrument and let the examinee in safe and stable condition.
- Avoid the examinee being touched by the instrument.
- During the examination using this instrument, maintain the examinee in upright and correct position.
- Carefully handle the instrument so as not to give impact on it or let fall it.
- Use the instrument under properly controlled ambient illumination. It could affect the test result.
- To interface this instrument with other instrument, contact the dealer you purchased the instrument.
- During the operation, if the instrument gives off smokes, sparks, strange noises or odors, immediately turn off and unplug the power. The contact the dealer you purchased the instrument.

5.2. Notes on the Installation

When installing this product, the installer should be aware of the following.

- Avoid places where the instrument is exposed to water vapor or moisture directly.
- Avoid places where the instrument is exposed to the condition under harmful influence by atmospheric pressure, humidity, temperature, ventilation, sunlight or by the air containing dust, salinity, sulfur and etc..
- Install the instrument on a place stable and leveled.
- Avoid places where the instrument is subject to excessive shocks or vibrations.

- Avoid places where the instrument is exposed to chemical material or explosive gas.
- Avoid places where it is near the heating equipment.
- Avoid places where the humidity us extremely high or there is a ventilation problem.
- Install the instrument within the capacity of the power supply and the power consumption.
- Install the instrument within the proper earth ground of the power.
- Check the contact of the switches and the polarity by using a device such as multi-meter to confirm safe and correct operation of the instrument.
- Check if the overall cable and power connection are correct and complete.
- Using the devices jointly could result a risk.
- Wall mount and stands must be installed by the order written in manual.

NOTE

Fix the power input and adapter not to move.

⚠ WARNING

Wall mount and stands are must be installed after You are well informed of caution in manual. The device should be installed by qualified person or be installed under the supervision of qualified person.

⚠ WARNING

In the place of inclined 10degree, the device might be collapsed. So please install device in the flat place.

⚠ WARNING

To prevent collapse, Do not install moving stand around examinee and examiner. When you move moving stand check the condition of floor.

5.3. **Notes on the Storage**

When storing this instrument, the user should be aware of the followings.

- Avoid places where the instrument is exposed to water vapor or moisture directly.
- Avoid places where the instrument is exposed to direct sunlight.
- Avoid places where the temperature changes extremely. Recommended storage temperatures is from -10℃ to 55℃, with the humidity between 10 and 95%.
- Avoid places where it is near the heating equipment.
- Avoid places where the humidity is extremely high or there is a ventilation problem.
- Avoid places where the instrument is subject to excessive shocks or vibrations.
- Avoid places where the instrument is exposed to chemical material or explosive gas.
- Be careful not to be inserted dust, especially metal.

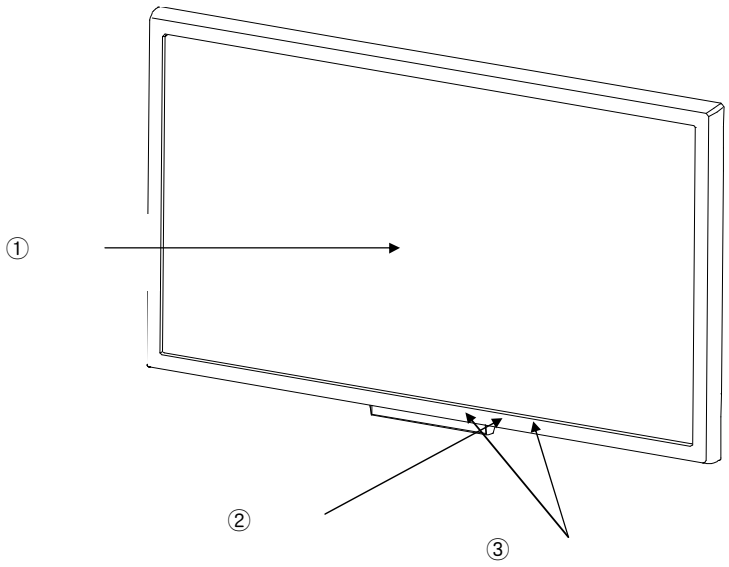
5.4. **Notes on the environmental condition for Storage**

When storing this instrument for a long period of time, keep the instrument maintained under following condition.

- Temperature: -10~55 ℃
- Humidity: 10~95 %(provide humidity keep lower than 40% under the condition of temperature between 35~55℃)
- Atmospheric Pressure: 700~1060 hPa

6. Configuration

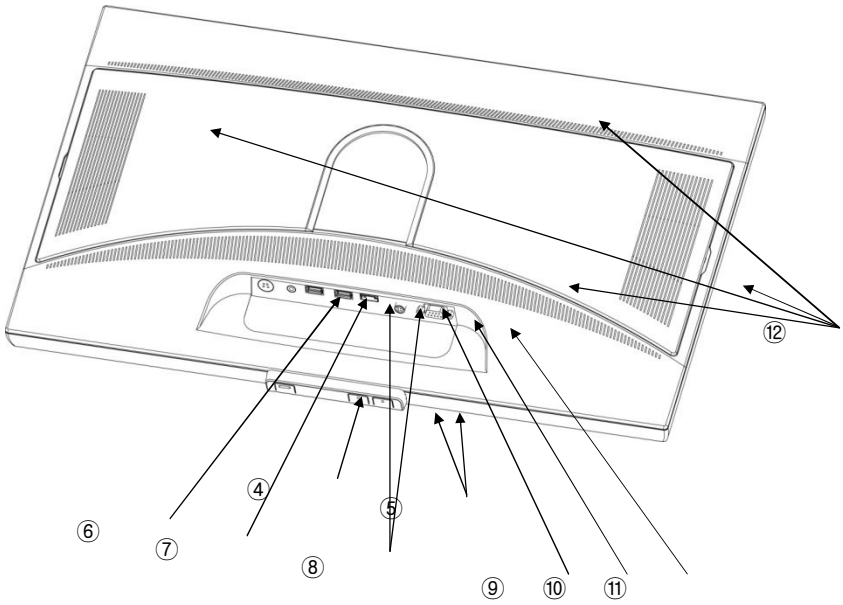
6.1. Main Body



① LCD Panel
The LCD Panel displays chart, menu and other information on it.

② IR Receiver Window
A window for receiving the remote signal. (Please keep unobstructed or cannot receive the IR signal normally)

③ LED
The LED indicates the operating status of the main body.



④ Power switch
It turns on and off the power of the main body.

⑤ LCD screen brightness control switch
Use to adjust the brightness of the LCD screen.

⑥ Power input
Power supply unit for connecting the power adapter.

⑦ Audio port

⑧ USB port

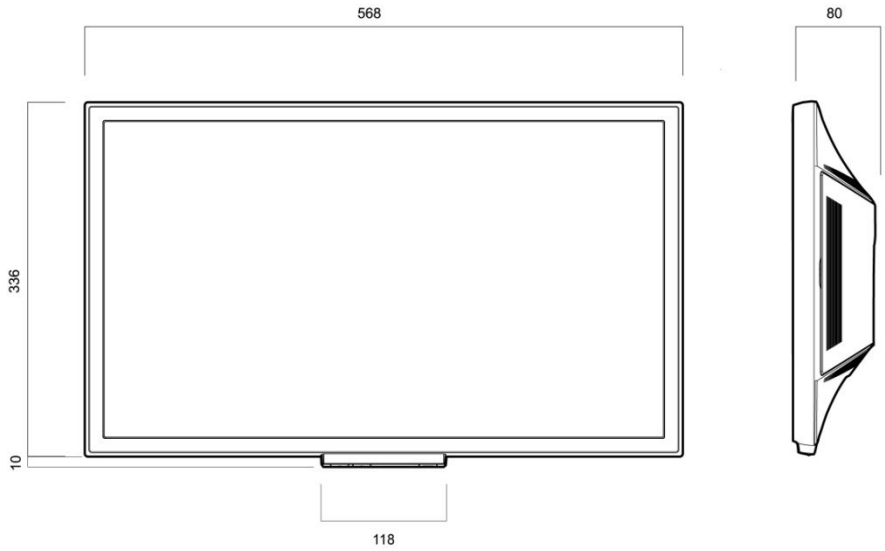
⑨ HDMI PORT
The port for connection with external monitor

⑩ Serial connector
Connector for the communication with other product or computer.

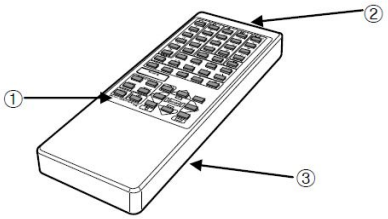
⑪ RGB port
Connect with an outer monitor.

⑫ Ventilation Slits
These slits ventilate the main body so that it keeps the appropriate temperature while the chart is running.

! WARNING
Do not cover or place anything on the ventilation slits. Overheat can cause a product malfunction



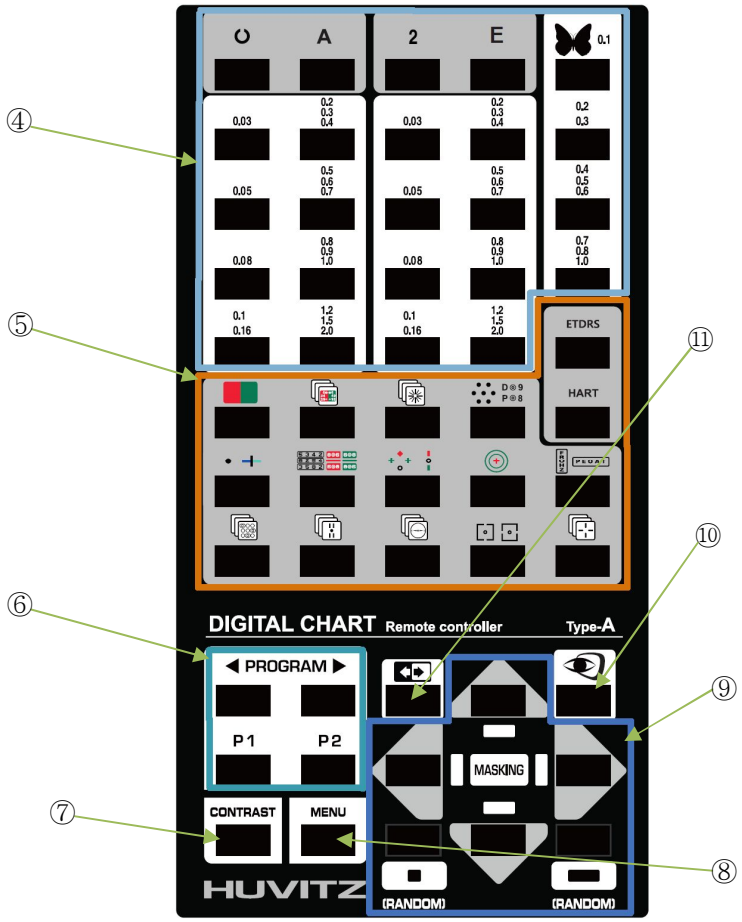
6.2. **Remote Control**



① Button Panel
Buttons provided on the remote executes charts, mask operation, menu, image gallery, contrast and etc.

② IR Transmitter Window
The transmitter inside the window emits infra red signals for the buttons.

③ Battery compartment
On the back of the remote provides a room for batteries. Open the cover to install or replace batteries. The size and type information about the battery is printed on the label attached on the back of the remote.



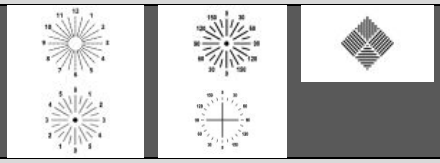
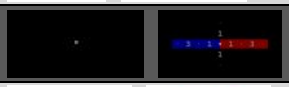
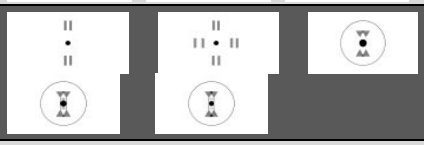
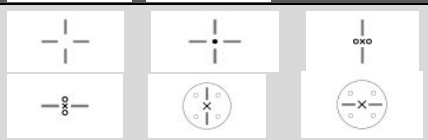
④ Buttons for Visual Acuity Test

These buttons executes visual acuity test.

Button	function
O	Landolt Ring charts (0.03~2.0)
A	Alphabet Letter charts (0.03~2.0)
2	Number charts (0.03~2.0)
E	Snellen E charts (0.03~2.0)
0.1	Figures for children (0.1~1.0)

⑤ Buttons for Functional Chart

Charts for polarizing test are displayed differently on the display panel depending on the chart model.

Button	Function	Lens	Chart
	Red/Green Filter		
	Red/Green Test, Cross grid Test for distance	Polar, Cross Cylinder	
	Astigmatism Test	Polar	
	Cross cylinder Test	Cross Cylinder	
	Maddox rod Test	Maddox rod	
	Binocular balance Test	Polar	
	Worth 4 dot Test, Dominant eye Test	Red/Green	
	Phoria Test	Red/Green	
	Horizontal/Vertical phoria Test	6BU prism, 10BI prism	
	Minutes Stereo Test	Polar	
	Stereo Test	Polar	
	Stereo Test	Polar	
	Phoria and aniseikonia test	Polar	
	Phoria Test	Polar	

⑥ Buttons for Program

Button	Function
◀	Executes the previous step of executing program
▶	Executes the next step of executing program
P1	▪ Executes the first step of the program PGM 1 ▪ Pressing the button 3 times in a row executes programming PGM1
P2	▪ Executes the first step of the program PGM 2 ▪ Pressing the button 3 times in a row executes programming PGM2

⑦ Button for Adjusting the Contrast Sensitivity

This button adjusts the contrast sensitivity of visual acuity charts. By the button press, the contrast is leveled down step by step. The total number of adjustable contrast and the default level are set in the menu.

⑧ Button for Menu Mode
This button executes the menu mode. Refer to the section 8.2 for detailed information.

⑨ Buttons for Chart Mask Operation

Button	Function
	▪ Isolates the letter in the 1st column of the 1st row. ▪ In the menu mode, selects menu item or execute it.
	▪ Isolate the mid row. ▪ In the menu mode, cancels executed menu item or exits the menu mode.
	▪ Moves the isolating position up 1 row or isolates the 1st row if there is no mask set previously. ▪ In the menu mode, changes the option value (+ key).
	▪ Moves the isolating position down 1 row or isolates the last row if there is no mask set previously. ▪ In the menu mode, changes the option value (- key).
	▪ Moves the isolating position leftward 1 column or isolates the 1st column if there is no mask set or horizontal line is isolated previously. ▪ In the menu mode, changes the selection of option item (left tab key)
	▪ Moves the isolating position rightward 1 column or isolates the last column if there is no mask set or horizontal line is isolated previously. ▪ In the menu mode, changes the selection of option item (left tab key)

⑩ Button for Image Gallery

Button	Function
	▪ Executes Image Gallery

⑪ Button for Reverse Background

Button	Function
	▪ Reverses background color black/white for Visual Acuity charts.

NOTE

When you change background to black color, the color could be spread to LCD panel or the White pixel could be appeared.

7. Installation

7.1. Preparation

Before installing this instrument, carefully check the following in advance.

- Model name HDC-9000PF, HDC-9000N (HDC-9000PF is polarization type, HDC-9000N is Red/Green type)
- Package contents listed in chapter 12.
- Exterior appearance of the LCD panel (any external material on the display should be removed and cleared including the protective film).

After checking the package contents and their status, proceed installing the instrument by following the procedure in the next sections. Anyone who performs installation should understand a fully aware of the notes and procedure related with the installation in this manual.

7.2. Installing the Main Body

The installation of this instrument is available in two ways, standard installation and mirroring installation. In case of installing the instrument in a small and limited space, mirroring installation could be chosen. Otherwise choose the standard installation.

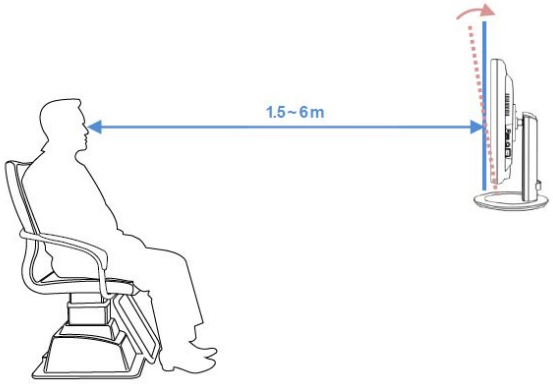
7.2.1. Standard Installation

① Fix the main body either to the chart stand or on the wall by using the wall mount. Before putting the main body, it is required to check the test distance first to confirm if it's proper for the standard installation.

② Put the main body at the position to be used. The distance from the examinee to the main body should be set by the step of 10cm or 0.5 feet as the software allows inputting the test distance in that step.

③ Put the power adaptor to the main body and connect the power cord to the wall outlet.

NOTE
Make the horizontal line between the eye of examinee and the center of HDC-9000 LCD panel. Especially, HDC-9000PF polarization type must be installed in the angle which polarization's afterimage is minimized.

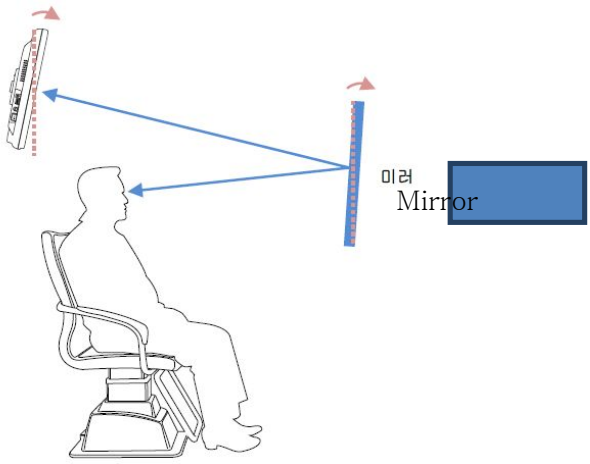


7.2.2. **Installation with a Mirror**

① Fix the main body on the wall by using the wall mount.

② Set and fix a mirror at the position that meets the required test distance. The test distance is calculated by summing the distance from examinee to the mirror and from the mirror to the LCD panel.

③ Put the power adaptor to the main body and connect the power cord to the wall outlet.

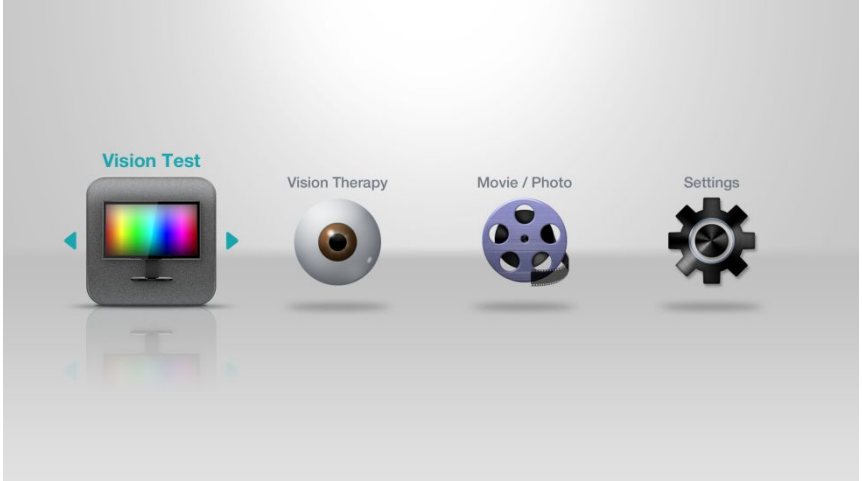


NOTE
Test distance should be calculated by sum of distance between LCD panel and mirror and distance between mirror and examinee.

7.3. Configuring the Settings

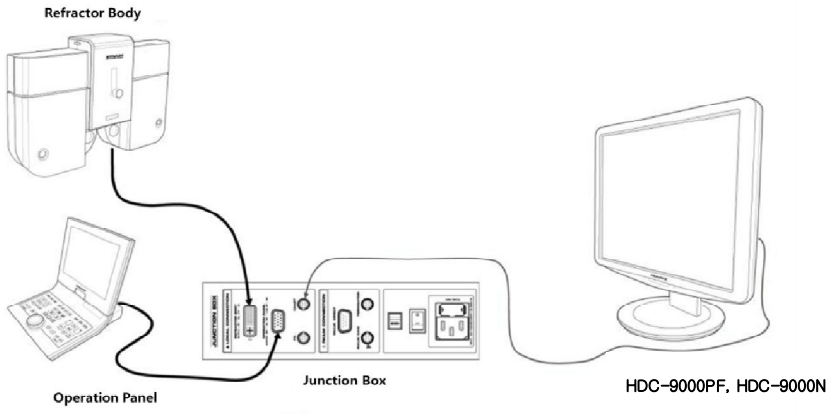
When this instrument is installed completely and is ready for starting up, turn it on and wait until it finishes the initialization.

If the system is started up without any problem, it shows the default chart on the display. Now it's the time to execute the menu mode and configure the internal settings to match the installation and the user's preferences. Press the MENU button on the remote and the system menu will be shown on the display like below



7.4. Interfacing with the Digital Refractor

This instrument allows interfacing it with the Huvitz Digital Refractor. In case of the model HDR-7000, it supports not only wired communication but also wireless communication by IR with this instrument. Refer to the installation manual of the digital refractor for detailed information about the interfacing how-to.

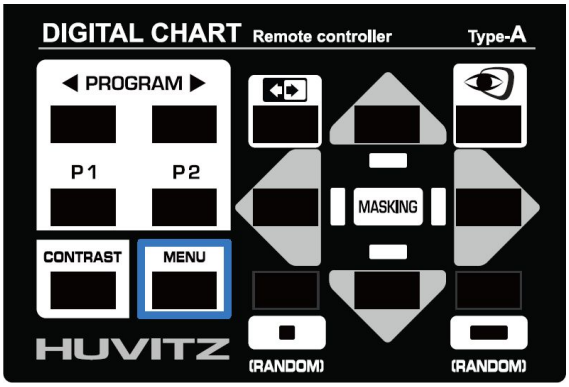


[Example of Wired Installation with HDR-7000]

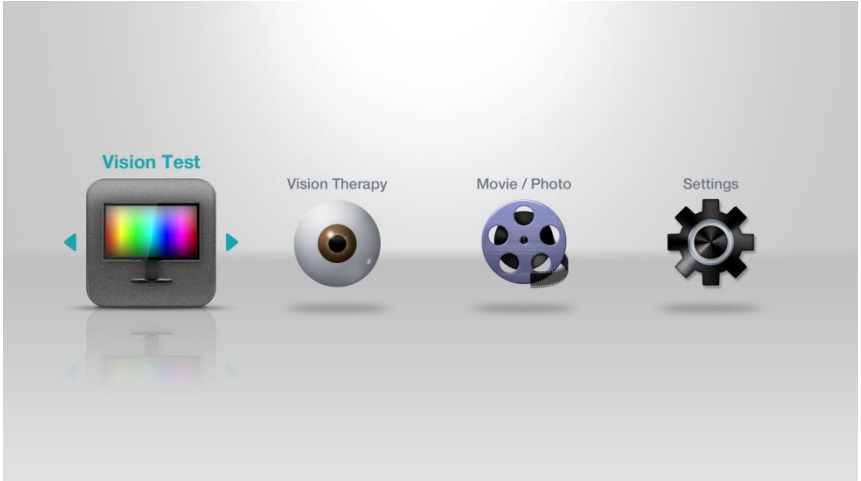
8. Using the Menu Mode and Functions

8.1. Executing and Operating the Menu Mode

Menu mode provides functions for setting options related with the chart and other adjustment functions. To execute the menu mode, press the MENU button on the remote.

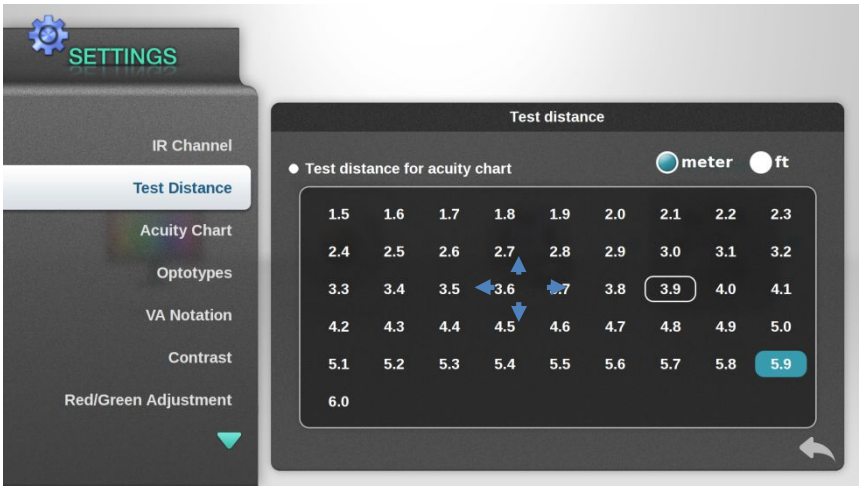


① Selecting and Executing Menu



Button	Function
	Changes the selection of the menu group between left and right side
	Changes the selection of menu item in a menu group vertically

② Selecting and Setting the Value of Option



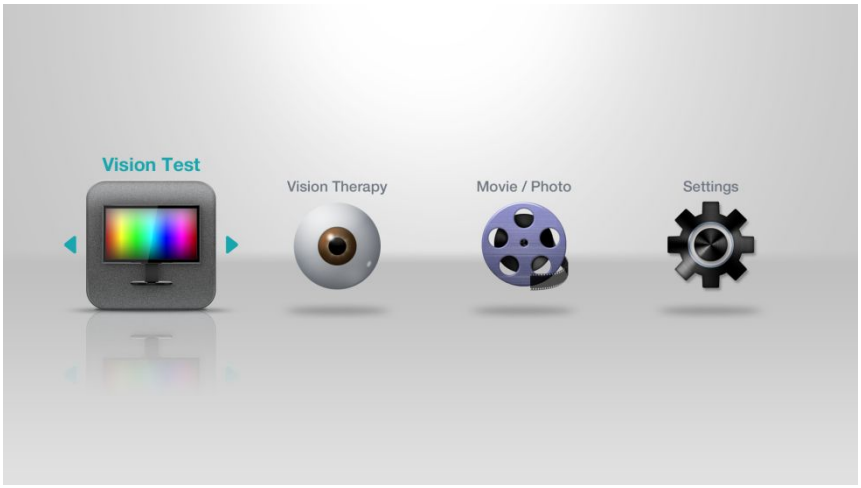
Use the arrow button to move to the menu or setting, and set the value with button.

③ Move to the upper menu

If you cannot find back button, you can go upper menu with button

8.2. **Using the Menu Mode**

Menu mode provides functions listed below.



- Vision Test
  Vision color test, contrast test, hue test

- Vision Therapy
  Vergence, Pursuit, Saccadic, Tracking, Amsler Grid, Stereopsis

- Movie / Photo
  Management for user designated movie/photos

- Settings
  Change value for chart settings

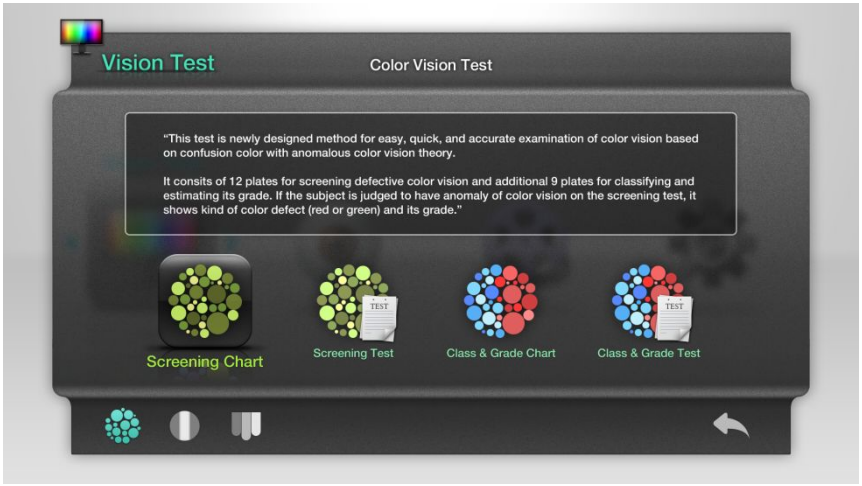
8.2.1. Vision Test

Vision Test is consist of Color Test, Contrast Test and Hue Test.

- Color Vision Test

This test is newly designed method for easy, quick, and accurate examination of color vision based on confusion color with anomalous color vision theory

It consists of 12 plates for screening defective color vision and additional 9 plates for classifying and estimating its grade. If the subject is judged to have anomaly of color vision on the screening test, it shows kind of color defect (red or green) and its grade



- Screening Chart

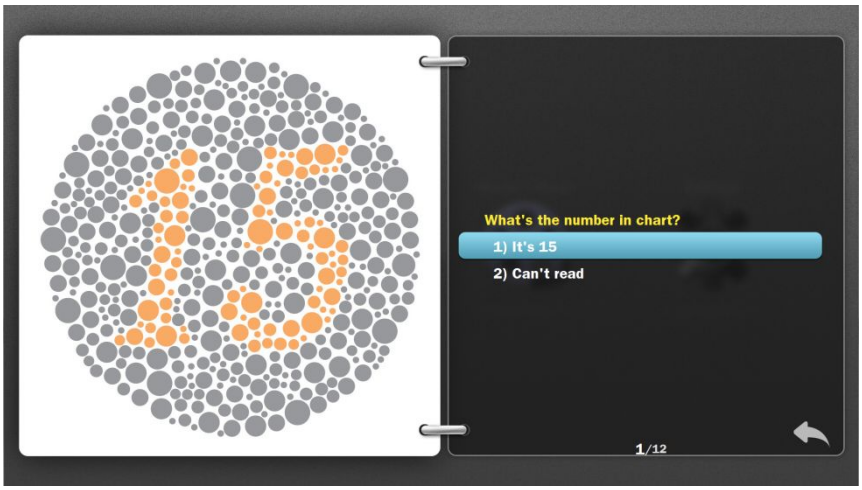
We provide 12 kind of chart to find defective color vision. You can change chart with button of remote control.

The chart will be seen differently depends on defective color vision.

title	Normal	1,2color defective	3color defective	Color weakness/ blindness
chart – 1	15	15	15	15
chart – 2	5	3	5	X
chart – 3	75	16	75	X
chart – 4	8	5	8	X
chart – 5	48	13	48	X
chart – 6	6	X	6	X
chart – 7	20	X	20	X
chart – 8	7	X	7	X
chart – 9	X	5	X	X
chart – 10	66	66	X	X
chart – 11	O	X	O	X
chart – 12	O	X	O	X

- Screening Test

Start test to find vision color defective.



Ask the number in left side of picture, and move to select the result in right side with button, confirm with the button.

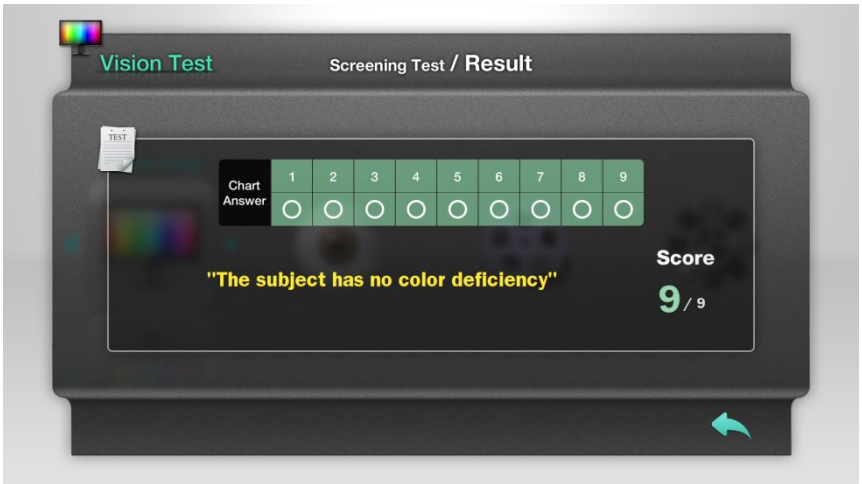
If the number of false is over 5, stop the test and show the result as color defect. And if the number is 3 or 4, decide the suspicion of color defect. The other case is normal.

- Class & Grade Chart

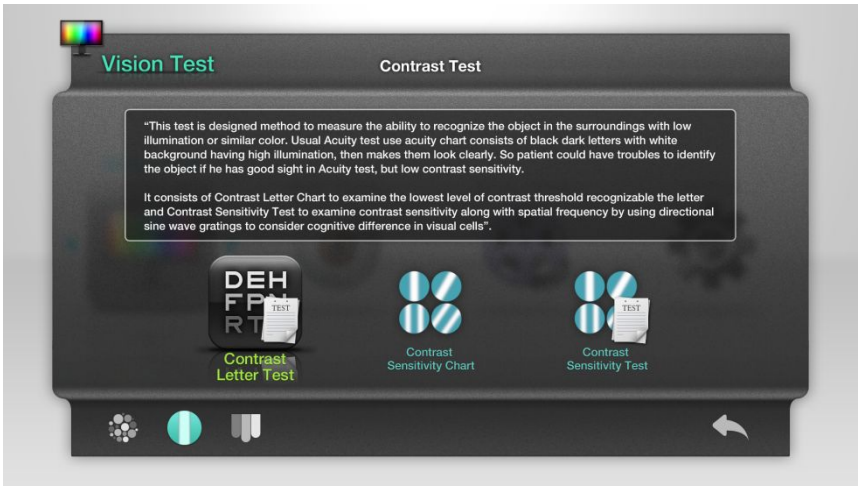
It show chart to classify level of color deficiency. Judge the level of color vision by whether read the chart. The contents in the chart is like under picture.

Title	normal	1 strong	2 strong	1 mid	2 mid	1 weak	2 weak
chart – 13 (number)	52	2	5	52	52	52	52
chart – 14	96	6	9	96	96	96	96
chart – 15	26	X	X	6	2	26	26
chart – 16	72	X	X	2	7	72	72
chart – 17	65	X	X	X	X	5	6
chart – 18	47	X	X	X	X	7	4
chart – 19 (curb)	up/down	down	up	up/down	up/down	up/down	up/down
chart – 20	up/down	X	X	up	down	up/down	up/down
chart – 21	up/down	X	X	X	X	down	up

- Class & Grade Test
  Start the test to judge the color defective. If the examinee fail to the former test, the other test is not appeared in the screen. And you will see result directly.



- Contrast Test



"This test is designed method to measure the ability to recognize the object in the surroundings with low illumination or similar color. Usual Acuity test use acuity chart consists of black dark letters with white background having high illumination, then makes them look clearly. So patient could have troubles to identify the object if he has good sight in Acuity test, but low contrast sensitivity.

It consists of Contrast Letter Chart to examine the lowest level of contrast threshold recognizable the letter and Contrast Sensitivity Test to examine contrast sensitivity along with spatial frequency by using directional sine wave gratings to consider cognitive difference in visual cells".

- Contrast Letter Test

  Contrast test by use of letter

Fist test distance is set to 2m. The chart can be changed via button on the remote control in units of 0.5 m, and via button the chart can be change in unit of 0.1 log.

- Contrast Sensitivity Chart

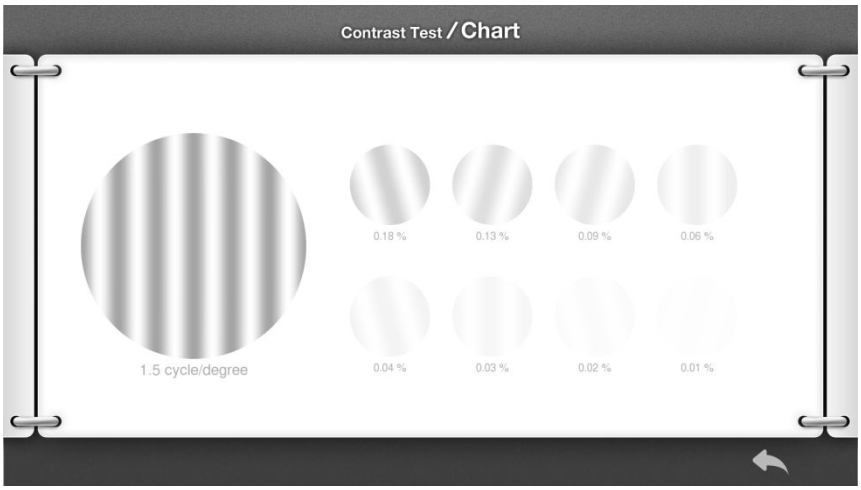
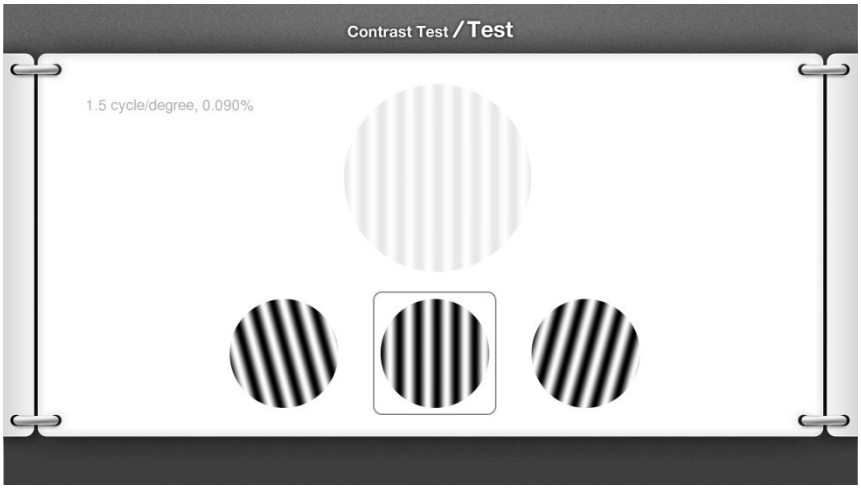


Chart page could be changed by button, and you can check the contrast sensitivity cycle/degree of next level.

You can activate the back button by button and can return to the menu by button or button.

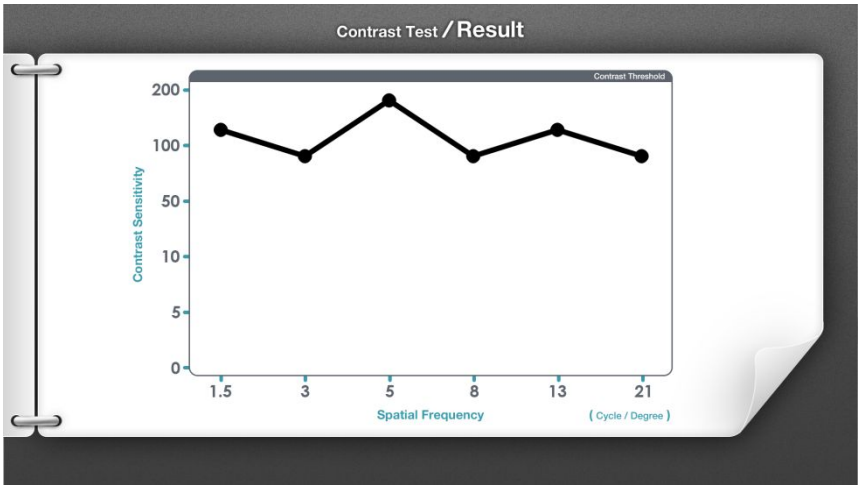
- Contrast Sensitivity Test

Execute the contrast test by use of sign pattern.



Move to the pattern by button, and select by button.

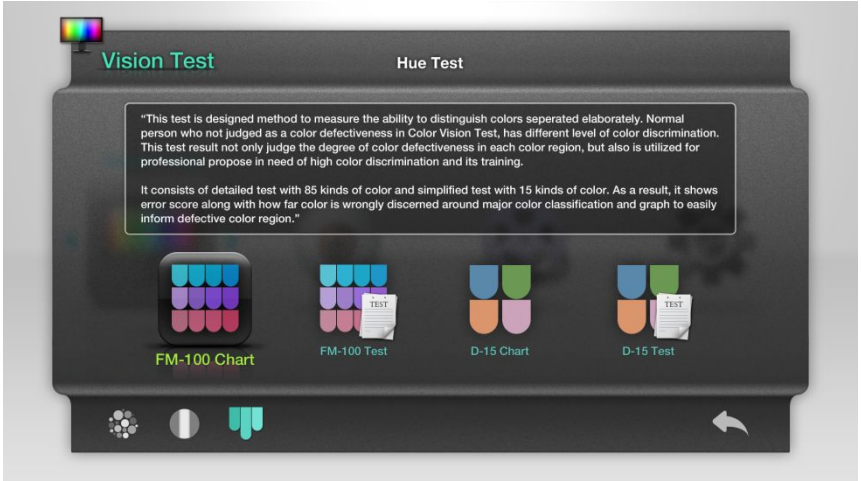
After the end of test, it will display the graph like following picture.



■ Hue Test

This test is designed method to measure the ability to distinguish colors seperated elaborately. Normal person who not judged as color defectiveness in Color Vision Test, has different level of color discrimination. This test result not only judge the degree of color defectiveness in each color region, but also is utilized for professional propose in need of high color discrimination and its training.

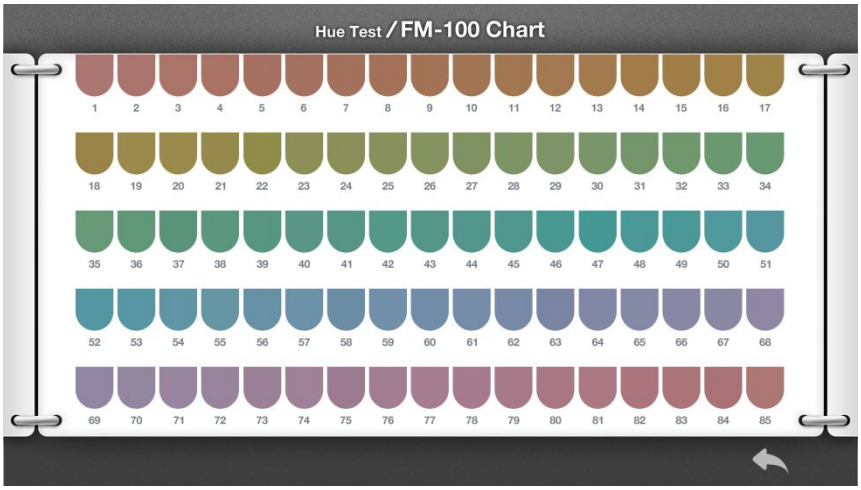
It consists of detailed test with 85 kinds of color and simplified test with 15 kinds of color. As a result, it shows error score along with how far color is wrongly discerned around major color classification and graph to easily inform defective color region



● FM-100 Chart

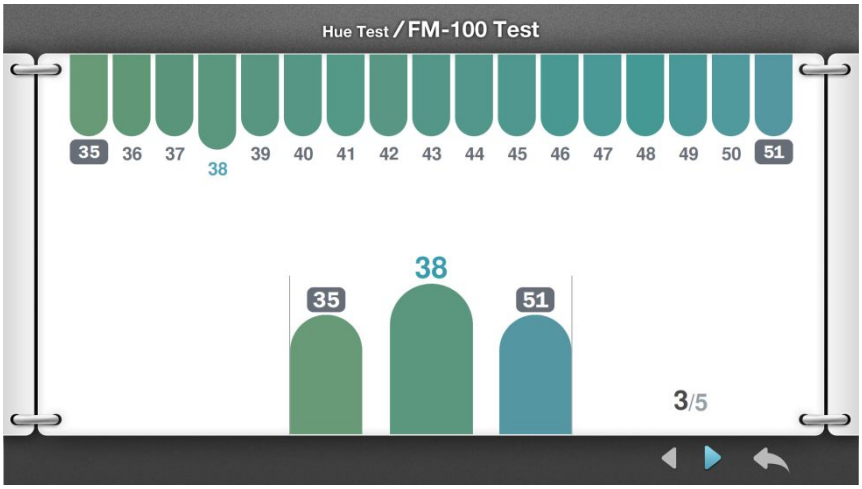
Check the color which used in FM-100 test.

Activate the return icon by pressing button. You can return to the menu by button or button.

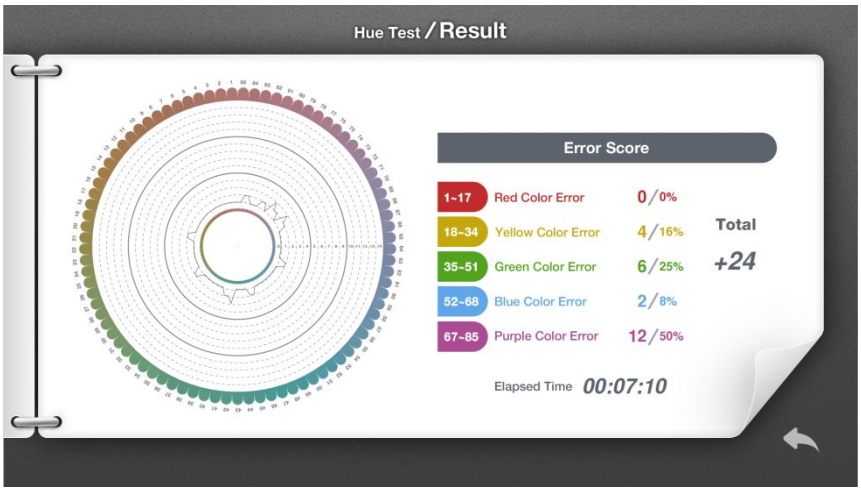


- FM-100 Test

Execute the FM-100 test. Let arrange the bars similar to upper side. Select color with button.



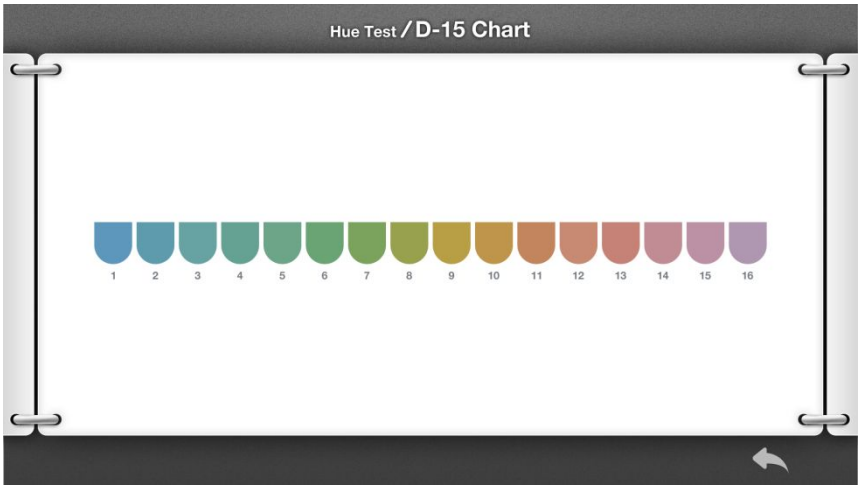
After all test you can see the result view.



If the result is close to 0, it means that bars were well arranged.

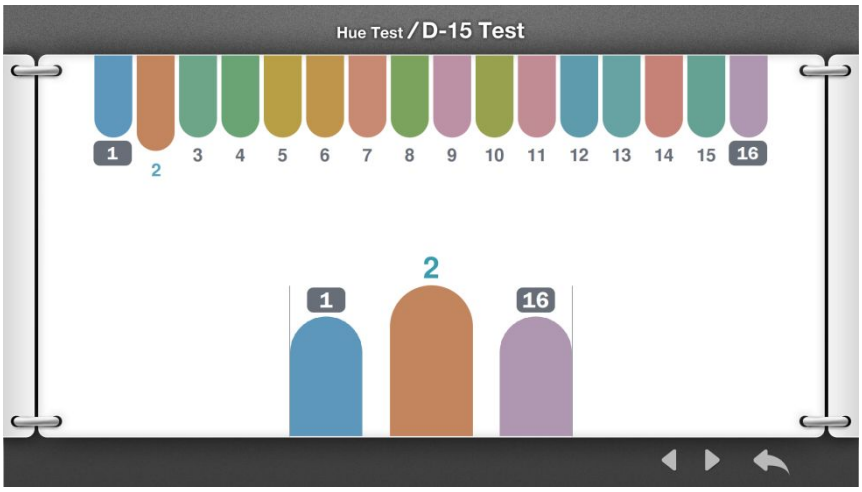
- D-15 Chart

  Check the color which used in D-15 test.



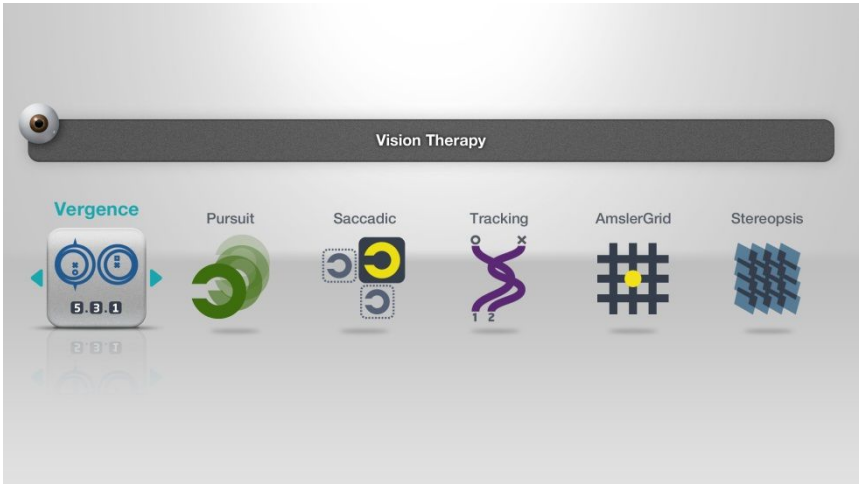
- D-15 Test

  Execute the D-15 test. The test procedure is similar to FM-100 test.

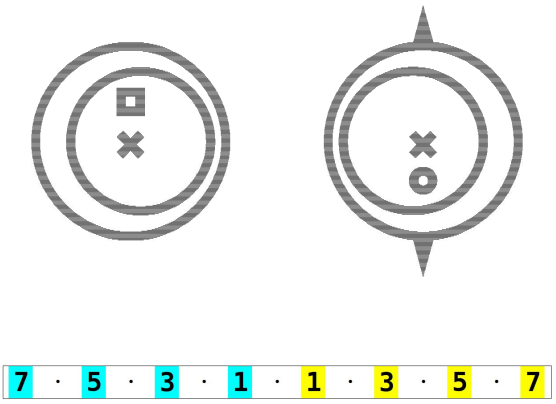


8.2.2. Vision Therapy

We provide following type of vision therapy.



- Vergence training

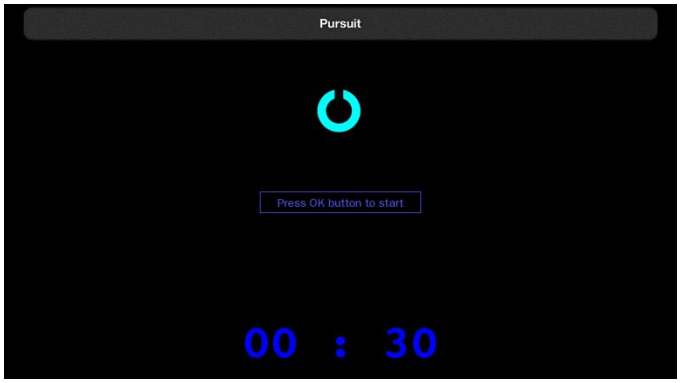


Vergence training could help to enhance the ability of eye by stimulation of eye.

- Pursuit training

This training could help to enhance the ability of eye by stimulation of eye through the tracking the moving object.

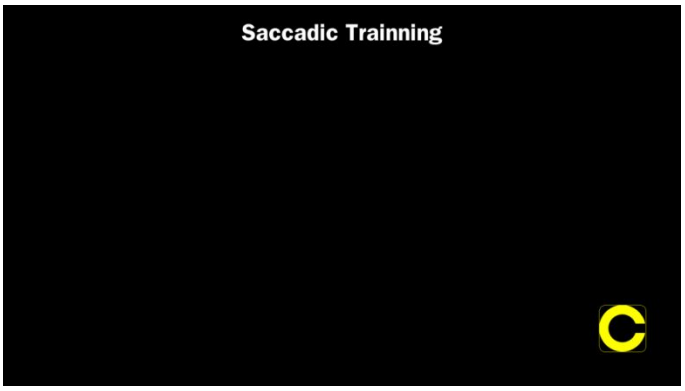
When next picture is appeared, press ■ button again.



When you match the direction of Landolt ring with remote-control, another Landolt ring will be appeared randomly.

- Saccadic training

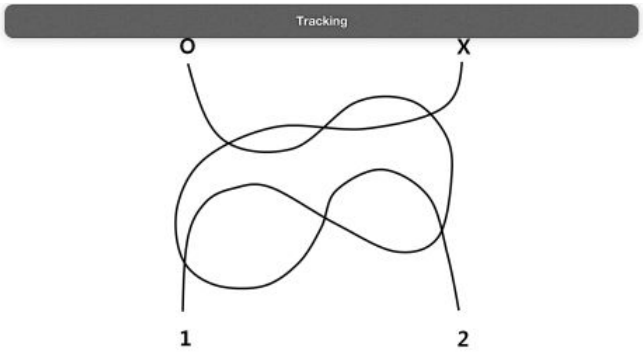
This training is rapidly perceive popup object.



When you match the direction of Landolt ring with remote-control as soon as possible, another Landolt ring will be appeared randomly.

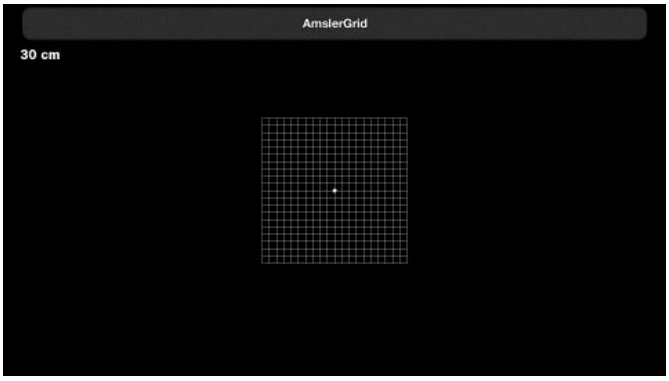
- Tracking training

  You can enhance the eye concentration ability through the tracking the lines of various pattern.



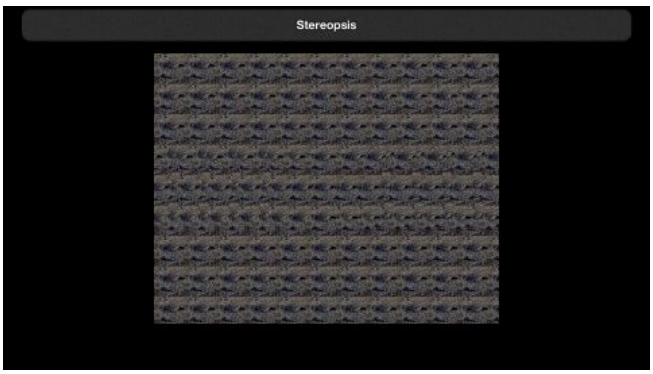
- Amsler Grid

  You can check whether eye was defective or not through the amsler grid.



- Stereopsis training

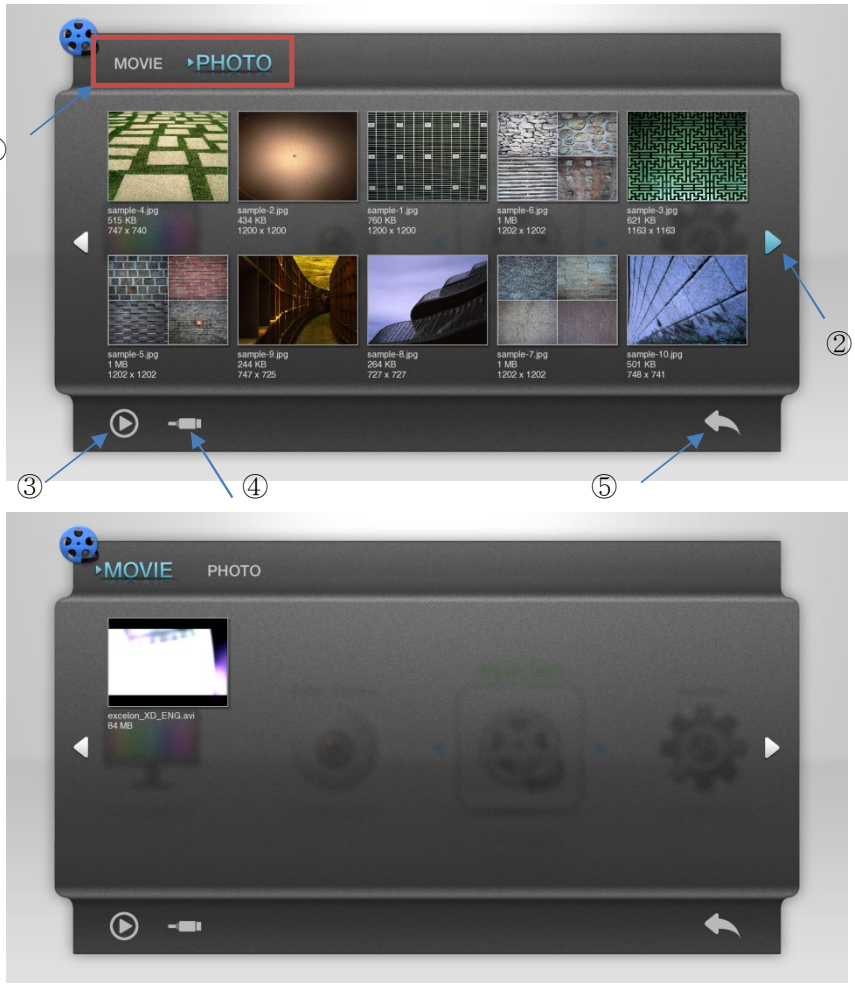
  This training could help to recovery the fatigue of eye.



8.2.3. Mode for Movie / Photo

In mode for movie/photo, we provide functions which can display movie and photo from HDC-9000 or USB memory.

After selection with remote control, when you press button, you can see yellow border line. Yellow border line means that the file is selected.



① In the icon of “Movie/Photo” you can select movie management mode or photo management mode by left/right button.
② There are icons left and right side. If the icon’s color is blue, it means exist of next page.
③ Display selected file.
④ Select external storage (USB) or Select internal storage of HDC-9000 (SSD)
⑤ Escape the Mode for Movie/Photo

NOTE

▪ The information in inner storage of HDC-9000(SSD) cannot be changed, If you want to use your own movie or photo, use outer storage (USB).

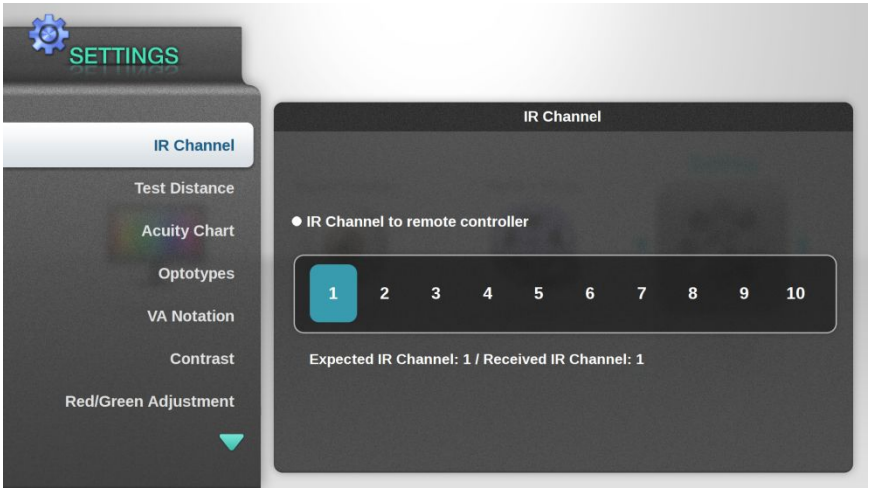
▪ If external storage(USB)'s name was consist of non-english letter, HDC-9000 cannot read it.

▪ HDC-9000 can read only movie of **avi** type.

▪ It may take long time as largeness of file. So please wait a minute.

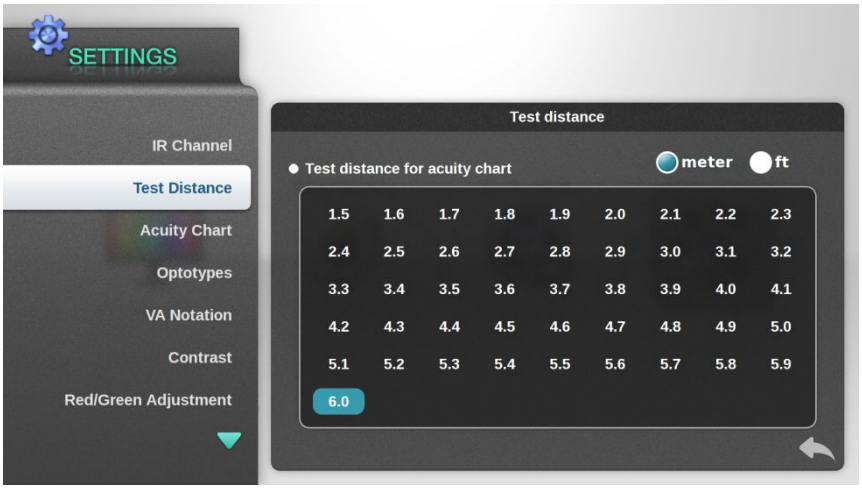
8.2.4. Settings

- IR Channel



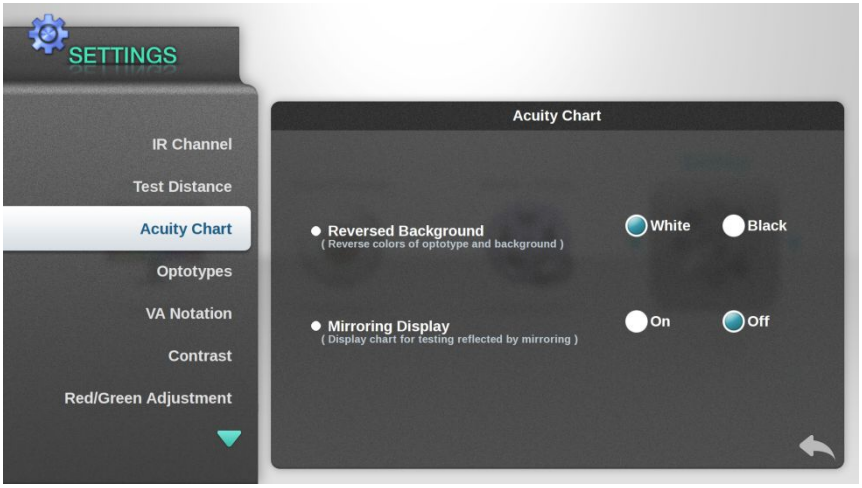
- ✓ Change IR channel of remote controller
- ✓ After the change of main body, Change IR channel of remote controller.
- ✓ The order of change IR channel of remote controller is 1→2→3→4→5→6→7→8→9→10→1. You can change channel by pressing button and button at the same time.
- ✓ If you do former procedure, you can see changed Received IR Channel value on the screen.

- Test Distance



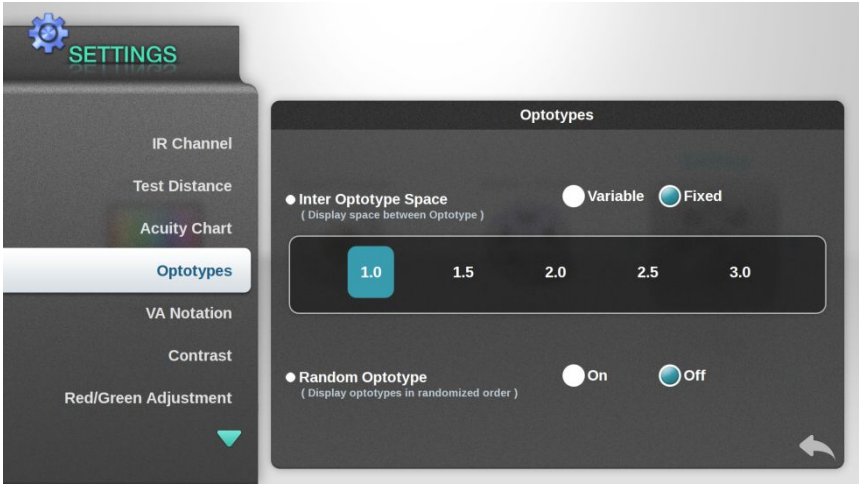
- ✓ In this menu, you can set the unit of length as meter or feet.

■ Acuity Chart



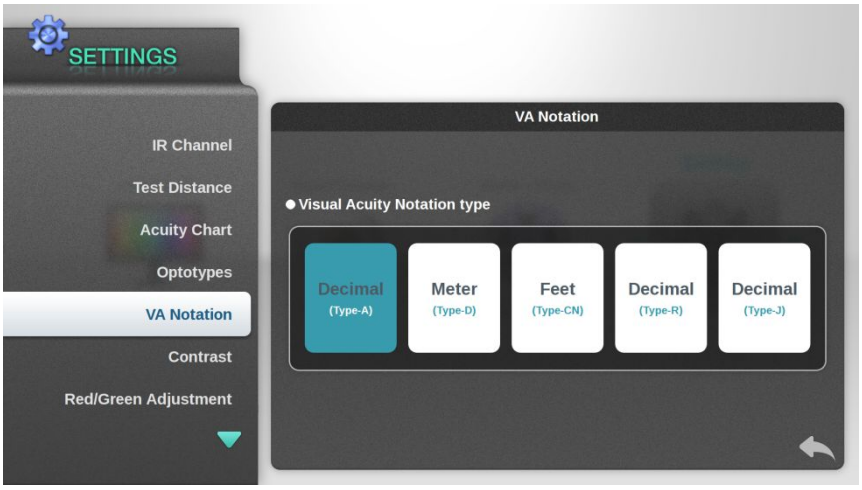
✓ You can set whether you will use Reversed Background Function and Mirroring Display Function.

■ Optotypes



✓ Adjust value of optotype space.
✓ To prevent to memory chart letter, you can turn on Random Optotype function..

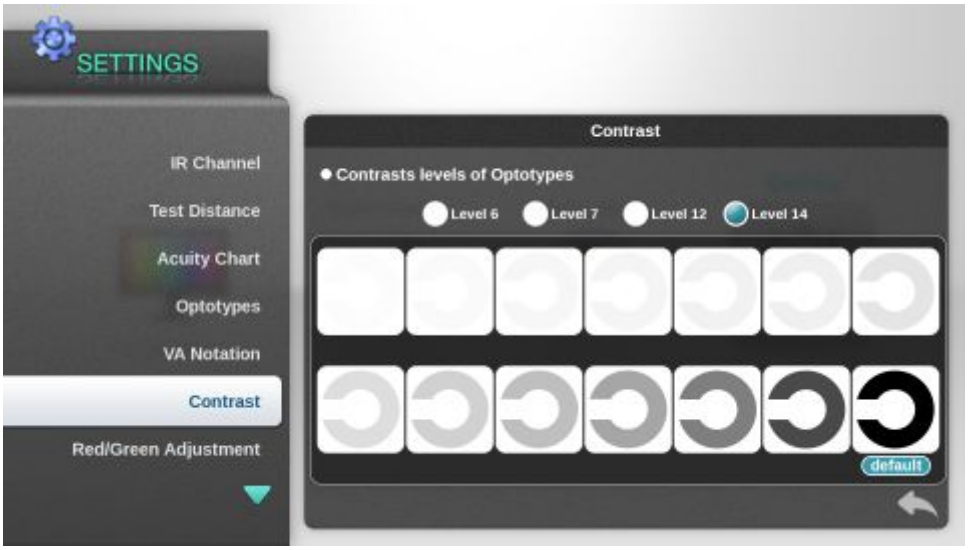
■ VA Notation



✓ Set the visual acuity notation type.
✓ Type-R, Type-J support Russian character and Hiragana.

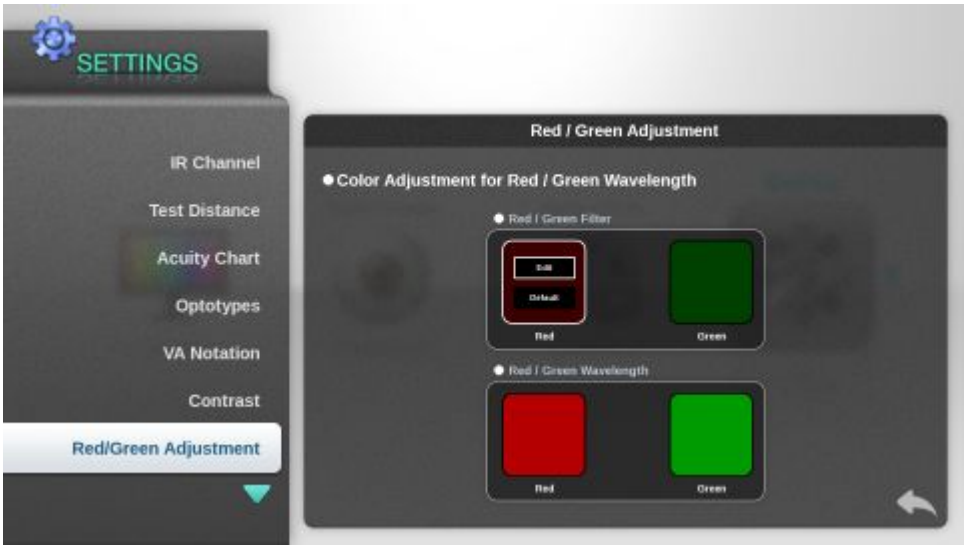
■ Contrast

This menu is that control brightness of background and color contrast.
This enable selection of Level value to atomize the changed quantity.

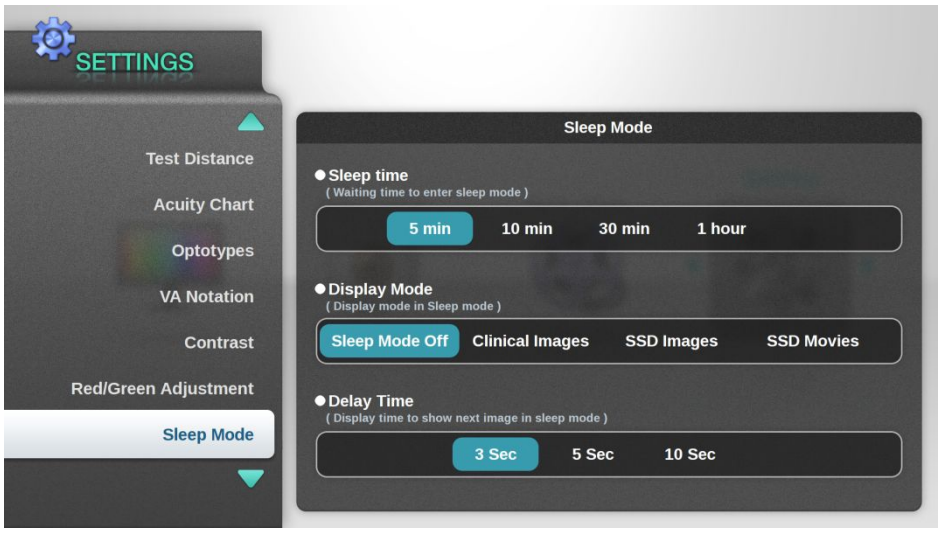


■ Red/Green Adjustment

Adjust color and balance of Red/Green chart and vergence chart.



■ Sleep Mode

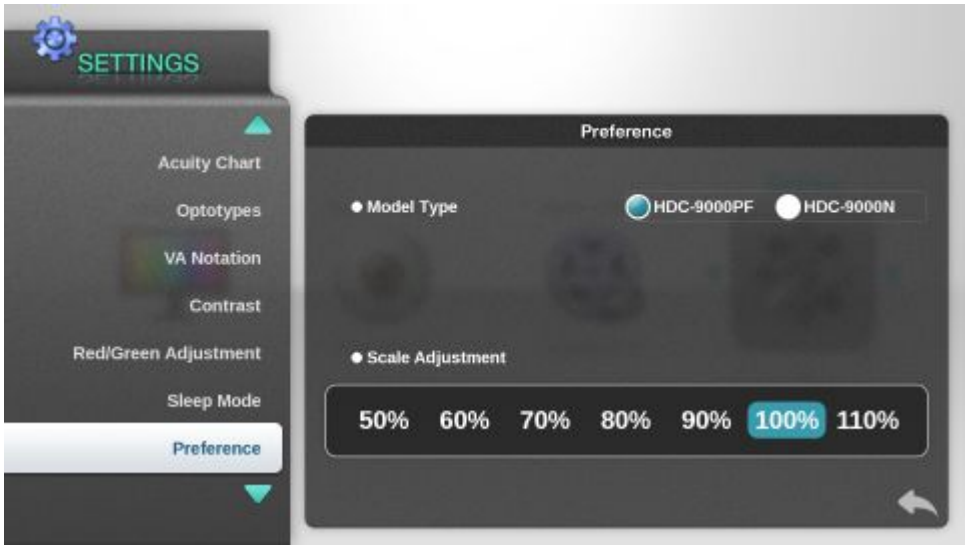


NOTE

- In the menu mode, sleep mode is not working.
- When device is set for SSD Movies, flickering screen is not malfunction.
- File in the external storage(USB) is not used for screen saver.

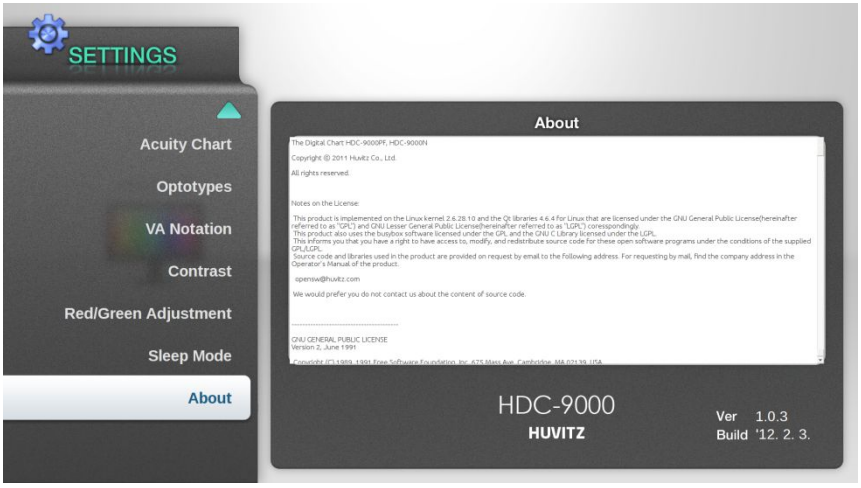
- Preference

Set or adjust PF/N type and scale adjustment.



- About

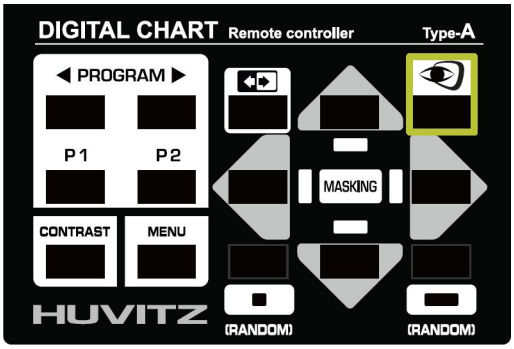
Display license information and date of update of HDC-9000.

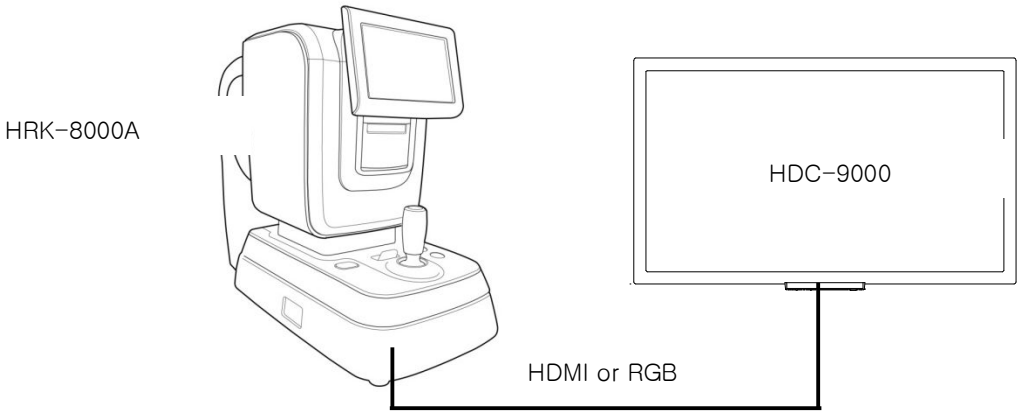


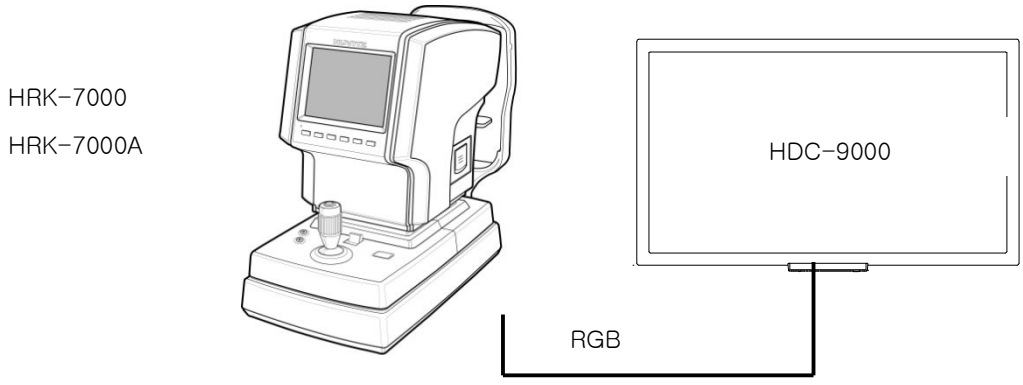
8.3. Other Functions

8.3.1. The Link to Ref/Keratometer Function

You can see display of Ref/Keratometer through the LCD chart panel.
After the connection with Ref/keratometer, Press button.



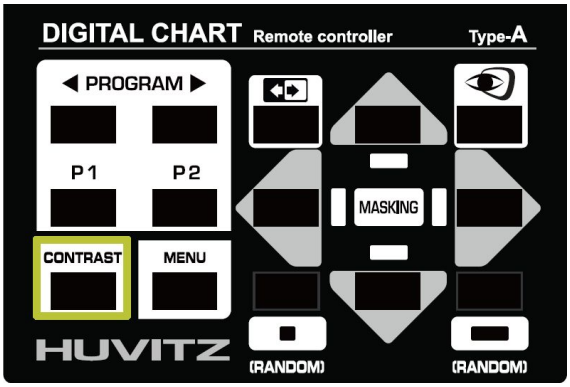




① You can use all of HRK series with connection of RGB port.
② Especially, you can see high resolution image of HRK-8000A though the HDMI port.
③ When you connect HRK-8000A though the RGB port, set the resolution to 1024 x 768 in HRK-8000A SETUP MODE.

8.3.2. **Adjusting the Contrast Sensitivity**

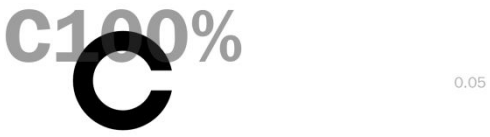
During performing an examination, the operator may adjust the contrast of the chart display for various reasons. It's possible either by pressing the "CONTRAST" button on the remote.



When the contrast-adjusting button is pressed, adjusted contrast value is displayed on the screen temporarily.

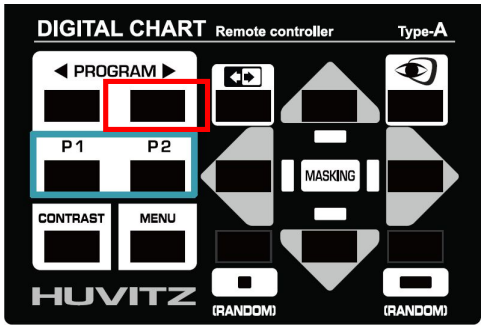
The contrast is leveled down step by step each time the operator press the "CONTRAST" button

In configuration, you can atomize changed quantity by selecting Level value in Contrast mode.



8.3.3. **Input Custom Program**

The buttons PGM1 and PGM2 on the remote execute custom program. By default PGM1 contains the system providing programmed sequence but PGM2 is empty. The users can reset and input their own optometric sequence into both the PGM1 and PGM2



Method to input program to P2

① When press P2 button 3 times, screen will display "Programming PGM2"
② Select one chart and save with right button of ◀PROGRAM▶.
③ Select another chart and save in the method of ②.
④ Select several charts in the method of upward.
⑤ After the complete of selection and save, escape with the P2 button.

Method to use program to P2

① Press P2 button one time, and then the chart which was saved first will appear.
② To see the second chart, press the right button of ◀PROGRAM▶.
③ As press right button of ◀PROGRAM▶, The charts will appear in the order of save.
If press left button of ◀PROGRAM▶, The former chart will re-appear.
④ Press chart button which is not saved in program. And then if press right button of ◀PROGRAM▶
The program will continue from the chart which escaped..

8.3.4. **Changing the Channel of the Remote Control**

The IR channel of the remote should always be identical with that of the main body. After the IR channel of the main body is changed by using the remote, the remote does not access to the main body immediately after saving and exiting the menu mode.

To change IR channel of remote control, it is convenient that change in the "IR Channel" mode.
For more details, refer to the section 8.2.4. of User Manual.

The order of change IR channel of remote controller is 1→2→3→4→5→6→7→8→9→10→1. You can change channel by pressing button and button at the same time.
If you not changed the channel in settings, you cannot distinguish in naked eye. So check the response of remote control when you press channel change button. If the main body response with button press, the channel synchro was completed.

9. Optometric Test Using the Digital Chart

9.1. Cylinder Axis Test

Title	Content
Purpose	To determine the correcting astigmatic axis roughly.
Chart	
Aux. Lens	None
Procedure	① Occlude one eye that's not to be examined. ② Add spherical lens power as much as the patient can read numbers around the chart. ③ Ask the patient if any direction is seen thicker. ④ If all the directions are seen even, there is no astigmatism exists. Otherwise thickest direction to get astigmatic axis.

9.2. Cylinder Power Test

Title	Content
Purpose	To determine the correct cylinder power
Chart	
Aux. Lens	None
Procedure	① Occlude one eye that's not to be examined. ② Add cylinder power until the patient sees all the directions evenly. ③ If the thickest direction changes by adding cylinder power, adjust the cylinder axis together. - Plus the axis if the thickest direction changes in clockwise. - Minus the axis otherwise.

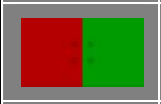
9.3. **Binocular Cylinder Axis Test**

Title	Content
Purpose	To determine the correcting astigmatic axis roughly.
Chart	
Aux. Lens	Polar
Procedure	① Add spherical lens power as much as the patient can read numbers around the chart. ② Ask the patient if any direction is seen thicker. ③ If all the directions are seen even, there is no astigmatism exists. Otherwise thickest direction to get astigmatic axis.

9.4. **Binocular Cylinder Power Test**

Title	Content
Purpose	To determine the correcting cylinder power
Chart	
Aux. Lens	Polar
Procedure	① Add cylinder power until the patient sees all the directions evenly. ② If the thickest direction changes by adding cylinder power, adjust the cylinder axis together. - Plus the axis if the thickest direction changes in clockwise. - Minus the axis otherwise

9.5. **Red/Green Test**

Title	Content
Purpose	To determine the correcting spherical power
Chart	
Aux. Lens	None
	 Polar
	Cross Cylinder(Fixed at 90°)
Procedure	① (Occlude one eye that's not to be examined). ② Add about 0.5D for fogging if necessary. ③ Ask the patient which side looks clearer, on the green or on the red. Add plus or minus power until the patient sees the both side the same. - Add plus power if the letters on green side is clearer. - Add minus power if the letters on red side is clearer. ③ (Cross Cylinder) Ask the patient if the horizontal lines and the vertical lines are the same in thickness. - Increase the spherical power by 0.25D if the horizontal lines are thicker. - Decrease the spherical power by 0.25D if the vertical lines are thicker.

9.6. **Cross Cylinder Test for Axis**

Title	Content
Purpose	To refine the correcting cylinder axis
Chart	
Aux. Lens	Jackson Cross Cylinder (±0.25 or ±0.50)
Procedure	① Occlude one eye that's not to be examined. ② Place the JCC lens before the eye such that its axes straddle at 45 degrees angles the correcting cylinder axis. ③ Find the exact cylinder axis by repeating circulating the JCC lens and asking the patient which view is sharper or less blurry until the two views are the same in

	sharpness. - Plus the axis if the view before circulation is sharper. - Minus the axis if the view after circulation is sharper.

9.7. Cross Cylinder Test for Power

Title	Content
Purpose	To refine the correcting cylinder power
Chart	
Aux. Lens	Jackson Cross Cylinder(±0.25 or ±0.50)
Procedure	① Occlude one eye that's not to be examined. ② Place the JCC lens before the eye such that its axes straddle at 90 degrees angles the correcting cylinder axis. ③ Find the exact cylinder power by repeating circulating the JCC lens and asking the patient which view is sharper or less blurry until the two views are the same in sharpness. - Decrease the cylinder power by -0.25 if the view before circulation is sharper. - Increase the cylinder power by -0.25 if the view after circulation is sharper.

9.8. Binocular Balance Test

Title	Content
Purpose	To equalize the accommodative stimulus for two eyes
Chart	
Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Fog the both eyes by +0.5D. ④ Ask the patient if the clearness of the top line and the bottom line is equal. - Add +0.25D on the right if the top line is clearer - Add +0.25D on the left if the bottom line is clearer

9.9. **Dominant Eye Test for Patients with Phoria**

Title	Content
Purpose	To determine the dominant eye of the patient with heterophoria
Chart	
Aux. Lens	Red/Green
Procedure	① Open the both eyes. ② Place the red filter before the right eye and the green filter before the left eye. ③ Ask the patient which bar is along with the central dot, red or green.

9.10. **Worth 4 Dot Test**

Title	Content
Purpose	To Check the fusion and suppression
Chart	
Aux. Lens	Red/Green
Procedure	① Open the both eyes. ② Place the red filter before the right eye and the green filter before the left eye. ③ Ask the patient how many targets he or she is seeing.

9.11. **Polarized Cross Test**

Title	Content
Purpose	To measure the lateral and vertical phoria
Chart	
Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Add prism before the eyes until the patient sees the horizontal and vertical lines aligned.

9.12. **Fixation Disparity Test**

Title	Content
Purpose	To measure the fixation disparity
Chart	
Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Add prism before the eyes until the patient sees the lines aligned

9.13. **Coincidence Test**

Title	Content
Purpose	To check the aniseikonia and measure the lateral and vertical phoria
Chart	
Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Check the coincidence of right and left bracket

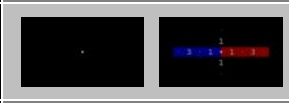
9.14. **Schober test**

Title	Content
Purpose	To measure the lateral and vertical phoria
Chart	
Aux. Lens	Red/Green
Procedure	① Open the both eyes. ② Place the red filter on the right and green filter on the left. ③ Add prism before eyes until the patient sees the cross in the center of the circles

9.15. **Von Graefe Test**

Title	Content
Purpose	To measure the phoria
Chart	
Aux. Lens	6 BU split prism before right eye
	10 BI split prism before left eye
Procedure	① Open the both eyes ② Place the proper prism before eye. ③ Add prism before eyes until the patient sees the two bars aligned

9.16. **Maddox Rod Test**

Title	Content	
Purpose	To measure the phoria	
Chart		
Aux. Lens	Vertical Maddox Rod Test	Vertical Maddox Rod on right
	Horizontal Maddox Rod Test	Horizontal Maddox Rod on left
Procedure	① Open the both eyes. ② Place the proper lens before eye. ③ Add prism before eyes until the patient sees the dot and bar aligned	

9.17. **Zeiger Test**

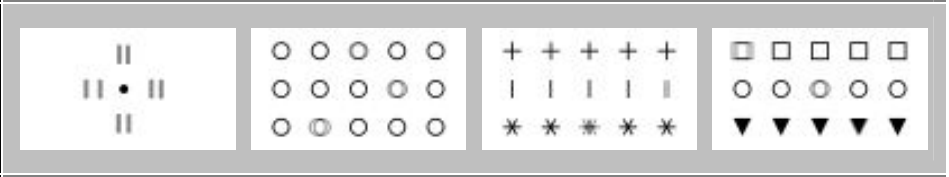
Title	Content
Purpose	To measure the phoria
Chart	

Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Add prism before eyes until the patient sees the lines and gradations aligned.

9.18. **Stereo Test**

Title	Content
Purpose	To check the stereoscopic vision
Chart	
Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Ask the patient if the patient can see the chart as stereopsis.

9.19. **Minute Stereo Test**

Title	Content
Purpose	To measure the fine depth perception of stereoscopic vision.
Chart	
Aux. Lens	Polar
Procedure	① Open the both eyes. ② Place the polarizing filters before the eyes, 135 degree on the right and 45 degree on the left. ③ Ask the patient if the which bars(which symbols) are distinguished in depth.

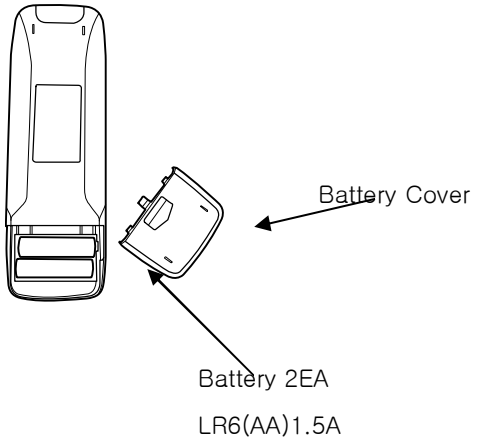
10. Maintenance

10.1. Replacement of battery of remote controller

① Open the cover with pushing cover.

② Change old battery to new battery. And close cover.

NOTE
Please make sure the direction of (+), (-). The specification of battery is LR6(AA) 1.5V .



10.2. Cleaning

① Sweep the outer surface and LCD panel with soft fabric material.

② When you do not use this device, store with dust cover.

10.3. Disposal

NOTE
When you dispose the device and accessory kit, Comply with related law and recycling plan. Disposal of Lithium battery can cause the environmental pollution. When you dispose the packing material, Comply with related law and recycling plan.

11. Troubleshooting

11.1. LCD screen is not turned on

① Check the power adapter. When the connection between adapter and main body is not adhere properly, the device cannot turn on properly.

② Check the power adapter which plug in, if power outlet have switch, Check the switch which is placed "on".

③ Before turn on the switch, check the flickering of LED of LCD panel.

④ When you turn on the switch, check the 3 LED light of LCD panel.

⑤ If the problem persists after checking the above procedure, contact the local distributor you purchased this instrument.

11.2. Chart displays broken image

① If the chart images are not displayed in normal. The SSD card could be damaged. Contact the local distributor for replacement.

11.3. The main body is not responsible to the remote

① Check if the remote is installed with the standard batteries. Refer to the label on the back of the remote for the size and type information about the battery.

② Replace the batteries with new ones. The batteries could have been discharged.

③ Check the IR channel of the remote. The channel should be identical with that of the main body.

- ✓ Try each channel number by changing the number in the setup menu.
  (Refer to the 8.3.4. section of User Manual)

④ If the problem persists after checking the above procedure, contact the local distributor you purchased this instrument.

11.4. The screen is too bright or too dark

① "Contrast" or "background adjust" button can be pressed not properly. Execute the menu mode

and set proper settings.

(Refer to the 8.2.4. section of User Manual)

② Other reason for unsuitable brightness could be outer influence from environment. Adjust brightness refer to the number ①.

③ If the problem persists after checking the above procedure, contact the local distributor you purchased this instrument..

11.5. **Visual acuity test results in overcorrection or undercorrection**

① Check the test distance in the setup menu. The test distance should be matching the real distance from the examinee to the chart display.

② The test distance could be changed. So re-measure the test distance and check the test distance in setting menu.

(Refer to the 8.2.4. section of User Manual)

11.6. **Visual acuity test results in overcorrection or undercorrection**

① When it is possible to adjust lightness of inspection room. Adjust lightness properly.

② Check the wavelength balance of red/green chart. The ambient illumination may affect the result of duochrome test. Execute the color adjustment menu and try adjusting the red/green balance.

(Refer to the 8.2.4. section of User Manual)

11.7. **Red/Green filter is not filtering completely**

① Check and adjust the red/green filter in the color adjustment menu.

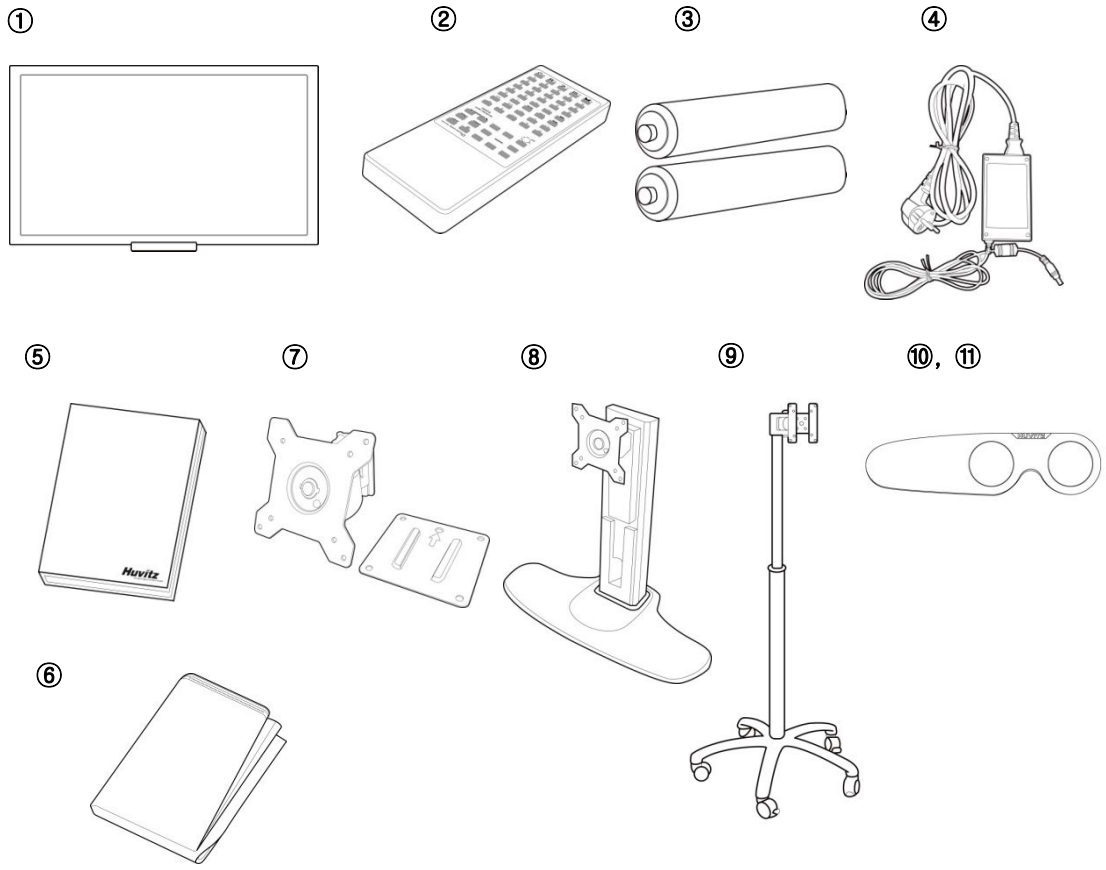
(Refer to the 8.2.4. section of User Manual)

11.8. **Polarizer test is not working**

① Check if protective film on the LCD panel has been removed. The film or any other similar materials could obstruct the polarizer test.

② Check the viewing angle of the LCD panel with the examining eyes. The angle should be re-adjusted depending on the height of the examinee.

12. Components List



① Main Body

② Remote Controller

③ Battery of remote controller (AA)

④ Adaptor and Power cable

⑤ User Manual

⑥ Dust Cover

⑦ Wall mount

⑧ Desk Stand (Optional)

⑨ Moving Stand (Optional)

⑩ Red/Green glasses (Optional)

⑪ Polarization glasses (Optional)

13. Product Specification

LCD Type	24inch Color TFT-LCD (Only HDC-9000PF polarized panel)
Resolution	1920 x 1080 pixels
White Luminance	300 cd/m^2
Chart window size	531.4mm(H) x 298.9mm(V)
Power	Input: 100-240VAC, 50/60Hz Output: DC+12V, 7.08A Model: AHM85PS12
Power Consumption	80VA
Main Body Size	568mm(W) x 346mm(H) x 80mm(D) / 6.1kg
Remote Control Size	64mm(W) x 195mm(H) x 21mm(D) / 160g
Test Distance	1.5 m ~ 6 m (0.1m step)
External Input	Audio, USB, HDMI, CAN, RGB
Controls	▪ wired (CAN) – HDR-7000, CDR-3100 ▪ wireless (IR) – Remote Control, HDR-7000
Main Body fixing Method	Wall mount
Optional	▪ Desk Stand ▪ Moving Stand ▪ Red/Green glasses ▪ Polarization glasses
Chart	▪ Landolt Ring, Alphabet, Number, Tumbling E ▪ Figures for Children, Russian Letter, Hiragana ▪ Functional Chart (Red/Green, Cross Cylinder, Binocular Balance, Fusion Suppression, Phoria, Aniseikonia, Streopsis Etc)

Masking Filter	▪ Dot, Row, Column ▪ Red/Green Filter
Settings	▪ Change IR channel of remote controller (10 channel) ▪ Mode for Movie or Photo ▪ Sleep Mode ▪ Contrast rearrange ▪ Red/Green balance ▪ Color adjustment for Red/Green filter ▪ Random function ▪ Chart space adjustment ▪ Chart background switching
Test	▪ Color vision test ▪ HUE test ▪ Contrast Sensitivity test
Etc	▪ Vergence, Saccadic, Stereopsis training ▪ Link to HRK-8000A with RGB or HDMI ▪ Link to HRK-7000 series with RGB ▪ Custom Program (2 program support)

14. EMC Declaration

14.1. Manufacturer's declaration - electromagnetic emission

The Model HDC-9000N/PF (Huvitz Digital Chart) is intended for use in the electromagnetic environment specified below. The customer or the user of HDC-9000N/PF should assure that it is used in such an environment		
Emission test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The Model HDC-9000N/PF uses RF energy only for its internal function. Therefore. Its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment
	Class A	The Model HDC-9000N/PF is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonics emission IEC 61000-3-2	N/A	
Voltage fluctuation IEC 61000-3-3	N/A	

14.2. Manufacturer's declaration - electromagnetic immunity

The Model HDC-9000N/PF (Huvitz, Digital Chart) is intended for use in the electromagnetic environment specified below. The customer or the user of the Model HDC-9000N/PF should assure that it is used in such an environment			
Immunity test	**IEC 60601 Test level**	**Compliance level**	**Electromagnetic Environment -guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	6 kV Contact 8 kV Air	6 kV Contact 8 kV Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Electrical fast Transient / burst IEC 61000-4-4	2kV for power supply lines 1kV for input/output lines	2kV for power supply lines 1kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.

The Model HDC-9000N/PF is intended for use in the electromagnetic environment specified below.

The customer or the user of the Model HDC-9000N/PF should assure that it is used in such an environment

Surge IEC 61000-4-5	1 kV differential mode 2 kV common mode	1 kV differential mode 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50/60Hz) Magnetic field IEC 61000-4-8	3.0 A/m	3.0 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Voltage dips, short Interruptions and Voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycle <5% U_T (<95% dip in U_T) for 5 s	<5% U_T (>95% dip in U_T) for 0.5cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycle <5% U_T (<95% dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Model HDC-9000N/PF requires continued operation during power mains interruptions, it is recommended that the Model HDC-9000N/PF be powered from an uninterruptible power supply or a battery
Note: U_T is the a.c. mains voltage prior to application of the test level.			

Immunity test	**IEC 60601 Test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms 150 kHz to 80 MHz	Portable and mobile RF communications equipment should be used no closer to any part of the Model HDC-9000N/PF , including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3,5}{V_1}]\sqrt{P}$

Radiated RF IEC 61000-4-3	3 V/m 80.0 MHz to 2.5 GHz	3 V/m 80.0 MHz to 2.5 GHz	**Recommended separation distance** 80 MHz to 800 MHz $d = [\frac{3,5}{E_1}]\sqrt{P}$ 800 MHz to 2.5 GHz $d = [\frac{7}{E_1}]\sqrt{P}$ Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as deter-mined by an electromagnetic site survey, (a) Should be less than the compliance level in each frequency range (b). Interference may occur in the vicinity of equipment marked with the following symbol:
NOTE 1) U_T is the A.C. mains voltage prior to application of the test level. NOTE 2) At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 3) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the EUT is used exceeds the applicable RF compliance level above, the EUT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the EUT.

Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V1] V / m.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the HDC-9000N/PF (Huvitz Digital Chart).

The Model HDC-9000N/PF is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The user of the HDC-9000N/PF can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the HDC-9000N/PF as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output Power (W) of transmitter	Separation distance (m) according to frequency of transmitter		
	150 kHz to 80 MHz $d = [\frac{3,5}{V_1}]\sqrt{P}$	80 MHz to 800 MHz $d = [\frac{3,5}{E_1}]\sqrt{P}$	800 MHz to 2.5 GHz $d = [\frac{7}{E_1}]\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30

For transmitters rated at a maximum output power not listed above, the recommended separation distance (d) in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Immunity and Compliance Level			
Immunity test	IEC 60601 Test Level	Actual Immunity Level	Compliance Level
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	3 Vrms
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	3 V/m

14.3. Guidance and manufacturer's declaration - electromagnetic immunity

The Model HDC-9000N/PF is intended for use in the electromagnetic environment specified below. The customer or the user of the HDC-9000N/PF should assure that it is used in such an environment			
Immunity test	**IEC 60601 Test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80MHz	3 Vrms 150 kHz to 80 MHz	The HDC-9000N/PF must be used only in a shielded location with a minimum RF shielding effectiveness and, for each cable that enters the shielded location with a minimum RF shielding effectiveness and, for each cable that enters the shielded location
Radiated RF IEC 61000-4-3	3 V/m 80.0 MHz to 2.5 GHz	3 V/m 80.0 MHz to 2.5 GHz	Field strengths outside the shielded location from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than 3V/m. Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. NOTE 2) It is essential that the actual shielding effectiveness and filter attenuation of the shielded lo cation be verified to assure that they meet the minimum specification.
Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predi cted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitt ers, an electromagnetic site survey should be considered. If the measured field strength outside the shielded location in which the EUT is used exceeds 3V/m, the EUT should be observed to verify norm al operation. If abnormal performance is observed, additional measures may be necessary, such as relocating the EUT or using a shielded location with a higher RF shielding effectiveness and filter attenuation.

15. Service Information

How to contact service: If there are any problems with the equipment, please follow the steps below:

- First of all, refer to the section 11, according to the problem that you are encountered. And then follow the suggested sequences.
- If the problem persists, please contact the local distributor in your province or country at first.
- We recommends customers to fill up the following form after purchase and retain this manual as a permanent record of purchase.

Date of purchase: _____

Distributer: _____

Address: _____

Contact: _____

Model No. : _____

Serial No. : _____

- If you can't contact with your local distributor, you can directly get in touch with the service department of the HUVITZ using the phone number and the address written in the below table.

HUVITZ Co., Ltd

Huvitz B/D, 689-3

Geumjeong-dong

Gunpo-si Gyeonggi-do,

435-862

Republic of Korea

Call: +82-31-477-9020

Fax: +82-31-477-9022

URL : http://www.huvitz.com

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