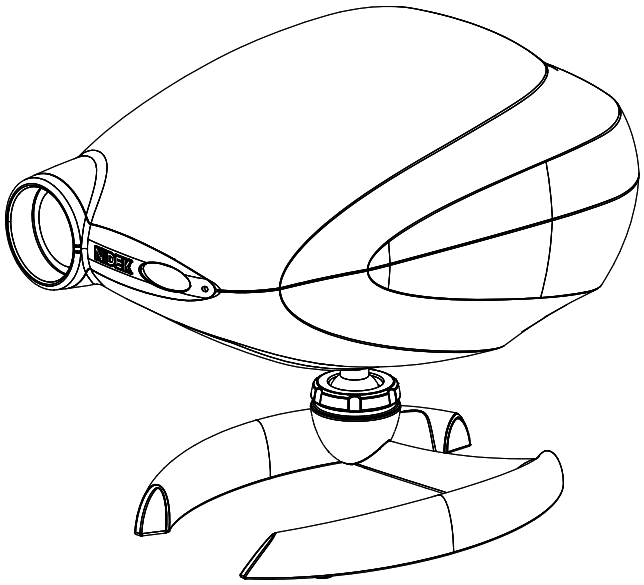
NIDEK

CHART PROJECTOR
CP-9

OPERATOR'S MANUAL



Original instructions

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CE

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Before Use

Be sure to read the SOFTWARE LICENSE AGREEMENT (page 2) before using this product.

This operator's manual includes operating procedures, safety precautions, and specifications for the Nidek CHART PROJECTOR CP-9.

The safety precautions and operating procedures must be thoroughly understood before operating the device.

Keep this manual handy for reference.

If you encounter any problems or have questions about the device, please contact Nidek or your authorized distributor.

CP009-P902-A7

IMPORTANT - READ CAREFULLY

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a) such Amendments are appropriate in terms of interests for customers of this Software; or

b) such Amendments are commercially reasonable and not contrary to the objective of this Agreement, even if such Amendments are disadvantageous to you.

Prior to the amendments, NIDEK will notify you of the terms and the effective date of such Amendments on the website or by any other means.

6.3. If you use the Software after the effective date of such Amendments, you shall be deemed to have agreed to such Amendments.

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7.1. This Agreement is effective until terminated. If you breach any term or condition of this Agreement, NIDEK may, without giving any prior notice to you, terminate this Agreement with immediate effect. Upon termination of this Agreement due to the breach of this Agreement, NIDEK reserves all the rights to claim damages resulting from such breach.

7.2. If this Agreement is terminated in accordance with the provision of 7.1., you must immediately cease the use of the Software, and delete, destroy and erase all the Software. Any fees paid by you for the license of the Software will not be refund for any reasons.

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9.1. EXCEPT OTHERWISE EXPRESSLY STIPULATED IN THIS AGREEMENT, IN NO EVENT WILL NIDEK BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, LOSS, CLAIMS OR COSTS WHATSOEVER, INCLUDING, WITHOUT LIMITATION, ANY LOST DATA, PROFITS, REVENUES, BUSINESS OPPORTUNITIES OR INFORMATION, LOSS OF USE OF ANY PRODUCT, PROPERTY OR EQUIPMENT, DOWNTIME COST , COST OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, OR ANY CLAIMS BY A THIRD PARTY, ARISING OUT OF OR RELATED TO THE USE OR INABILITY TO USE THE SOFTWWARE AND/ OR THE THIRD-PARTY-SOFTWARE, CHANGES, UPDATES OR MODIFICATIONS OF THE SOFTWARE AND/OR THE THIRD-PARTY-SOFTWARE, OR MAINTENANCE OR REPAIR SERVICE OF THE SOFTWARE IF ANY (collectively, the "DAMAGES"). THE ABOVE LIMITATIONS WILL APPLY REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, STRICT PRODUCT LIABILITY, OR OTHERWISE, EVEN IF NIDEK IS NOTIFIED OF THE POSSIBILITY OF SUCH DAMAGES.

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10. GOVERNING LAW AND ARBITRATION

10.1. This Agreement will be governed by and construed in accordance with the laws of Japan.

10.2. All disputes arising between you and NIDEK relating to this Agreement or the interpretation or performance thereof will be finally settled by binding arbitration in Tokyo in accordance with the Commercial Arbitration Rules of The Japan Commercial Arbitration Association. Judgment upon the award rendered by arbitration will be final and may be entered in any court having jurisdiction thereof.

11. SEVERABILITY

11.1. If any provision or any portion of any provision of this Agreement will be held to be invalid or unenforceable, that provision will be severed from this Agreement and such invalidity or unenforceability will not affect the remaining provisions of this Agreement. The remaining provisions of this Agreement will continue in full force and effect.

12. SURVIVAL

12.1. The provisions of 2, 3, 5, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19 and this provision will survive the termination of this Agreement and will be binding after the termination of the Agreement.

13. ASSIGNMENT

13.1. This Agreement or any part of this Agreement may not be assigned or transferred without prior written consent of NIDEK. The permitted assignee or transferee must agree to all the terms and conditions of this Agreement prior to the assignment or transfer.

13.2. This Agreement will be binding upon the permitted assignee or transferee and be enforceable by NIDEK.

14. ENTIRE AGREEMENT

14.1. This Agreement constitutes the entire agreement between you and NIDEK concerning the Software, and supersedes any prior written or oral agreement between you and NIDEK. No modification of this Agreement will be binding unless otherwise agreed in writing.

15. NO WAIVER

15.1. The failure of NIDEK to enforce at any time or for any period the provisions hereof in accordance with its terms will not be construed to be a waiver of such provisions or of the rights thereafter to enforce each and every provision.

16. NO THIRD PARTY RIGHTS

16.1. This Agreement is intended to be solely for the benefit of you and NIDEK and is not intended to confer any benefits upon or create any rights in favor of any person other than you and NIDEK.

17. HEADINGS

17.1. All headings are for convenience only and will not affect the meaning of any provision of this Agreement.

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18.1. The license agreement for the Software may be provided in multiple languages. In such event, unless otherwise agreed in writing, the following shall apply:

a) If you use the Software in any countries outside Japan, the license agreement for the Software shall be executed and delivered in a text using the English language. The text using the English language shall prevail and control; and

b) If you use the Software in Japan, the license agreement for the Software shall be executed and delivered in a text using Japanese language. The text using the Japanese language shall prevail and control.

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19.1. If the terms and conditions of the "Software License Agreement" included in operations manuals for NIDEK product are inconsistent with the terms and conditions of the "Software License Agreement" displayed on NIDEK product, the terms and conditions of the "Software License Agreement" included in operations manuals for NIDEK product prevail.

◆ Easy Search by Purpose

◆ Learning how to use the CP-9

◆ Installing the device

◆ Masking VA charts or filtering the Red-green chart

◆ Program Examination

◆ Other

Table of Contents

1 SAFETY PRECAUTIONS

⚠ BEFORE USE, READ THIS MANUAL.

The safety precautions and operating procedures must be thoroughly understood before operating the device.

Keep this manual handy for reference.

Use of this device is limited to doctors or health care providers authorized by a doctor.

The device complies with ISO 10938: 2016 (Ophthalmic optics -- Chart displays for visual acuity measurement -- printed, projected, and electronic).

For simplicity, examples of the chart type used in this manual are from Type T only. Any other type may be used unless specified otherwise.

In this manual, signal words are used to designate the degree or level of safety alerting. The definitions are as follows.

⚠ WARNING

Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage accident.

Even situations indicated by ⚠ CAUTION may result in serious injury under certain conditions. Safety precautions must be strictly followed at all times.

1.1 Usage Precautions

Before use

⚠ WARNING

- If any serious device-related incident occurs, report it to Nidek and the competent authority in the country where the user or patient, or both reside.
- Be sure to connect the power plug to a grounded power outlet.
  Electric shock or fire may result from device malfunction or electric leakage.

⚠ CAUTION

- Do not use this device for any purposes other than those intended.
  Nidek is not responsible for accidents or malfunctions caused by misuse.
- The safety precautions and operating procedures must be thoroughly understood before operating the device. Be sure to use only the accessories specified by Nidek.
  Using the device for purposes other than specified in this manual may cause unexpected malfunctions and/or adverse events.
- Do not disassemble, modify, or touch the interior of the device.
  The device contains no user-serviceable parts.
- Do not store the device in an area exposed to moisture or where toxic gases or liquids are present.
- Install the device in a location that meets the environmental conditions during use.
  Environmental conditions during use: *"5.1 Specifications" (page 51)*
- This device is operated by wireless infrared remote control. Install the device in a place where intense light including infrared rays such as sunlight or interior lighting will not interfere with the infrared light receiving window.
  If intense interference light interferes with the infrared light receiving window, the chart or masking may not switch properly. Adjust the room illumination by blocking out sunlight or turning off the nearby lighting.
- Avoid rapid temperature changes to prevent condensation on the device.
  If condensation occurs, do not use the device. Leave it for a few hours to allow it to warm to room temperature.
- Use a power outlet that meets the power supply specifications.
- Fully insert the power plug into the power outlet.
- Do not use power strips or extension cables for power supply.
- Be sure to use the provided power cord. Also do not connect the provided power cord to any other device.
- Install the device in a place where the power plug can be easily disconnected from the power outlet during use. Confirm that the power plug can be disconnected from the power outlet without using any tool.
  The device will not be able to be easily disconnected from power supply when malfunction occurs.
- Turn the power switch off and disconnect the power cord from the power outlet before connecting cables to the device.
- When connecting or disconnecting the connector, check the connector indication and orientation. Connect or disconnect the connector straight without applying excessive force.

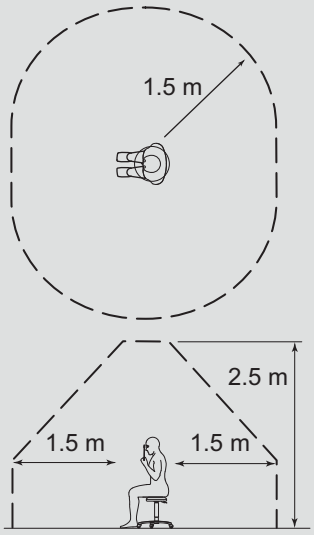
⚠ CAUTION

- When installing the device, use the optional table stand, wall bracket, floor stand, or their equivalent (CP stand).
  If the device is not installed in a stable condition, the chart may not be projected properly.
- Confirm that the fastening screw (knob) mounting the device on the table stand, wall bracket, or floor stand is tightened securely. In addition, clamp cables so that they will not be caught.
  If the device falls, injury or device failure may occur.
- When installing the device on a wall using the wall bracket, ensure that the wall is sturdy enough to support the weight (3.1 kg).
  If the device is hung on a plasterboard or thin board wall, it may fall, resulting in injury or device failure.
- When installing the device on a shelf or such using the table stand, ensure that it is sturdy enough to support the weight (3.1 kg). In addition, fasten the table stand with screws to prevent it from falling.
  If the device falls, injury or device failure may occur.

During use

⚠ CAUTION

- Do not perform servicing or maintenance on the device during use.
- Perform visual and operation checks before use. If abnormal conditions are encountered, stop using the device.
  If the device is used under abnormal conditions, intended results may not occur. Also unexpected malfunctions or health hazards may occur due to incorrect diagnosis.
- The beam is emitted from the LED aperture. Do not look into the beam.
  Eye damage may occur.
- Hold the remote control firmly so that it will not drop when using it. In addition, do not place the remote control in an unstable location such as the edge of a desk.
  The remote control may fall off, resulting in damage.
- Immediately replace the power cord if the internal wires are exposed, the device turns on or off when the power cord is moved, or the cord and/or plug are too hot to be held with hands.
- If malfunction occurs, disconnect the power cord from the power outlet. Do not touch the inside of the device, and contact Nidek or your authorized distributor.
- Use devices that comply with IEC 60601-1 in the patient environment. If any device that does not comply with IEC 60601-1 is to be used, install it outside the patient environment and use general-purpose data terminal equipment with a power supply that complies with IEC 60950-1 or IEC 62368-1, or separate it from other devices in the patient environment using a separation device that complies with IEC 60601-1.
  The patient environment is the volume of space in which contact can occur between the patient and any part of the device (including connected devices) or between the patient and any other person(s) touching the device (including connected devices) as shown to the right.



After use

⚠ WARNING

- If the remote control is not to be used for an extended period of time, remove the batteries.
  Leakage of battery acid may cause malfunction of the remote control or damage the peripheral part.

⚠ CAUTION

- Do not yank the power cord to disconnect it from the power outlet but hold the plug.
- If the device is not to be used for an extended period of time, disconnect the power cord from the power outlet.
- Maintain the specified environmental conditions when storing or transporting the device.
  Environmental conditions during storage or transport: *"5.1 Specifications" (page 51)*
- Use the specified packing material to protect the device from impact when transporting the device.
- Always use both hands when conveying the device to prevent it from dropping.

Maintenance

⚠ CAUTION

- No periodical maintenance is required for the device.
  Perform a pre-use check before using the device. *"3.1.1 Turning on the device" (page 27)*
- Only service personnel trained by Nidek are allowed to disassemble or repair the device.
  Nidek assumes no responsibility for any adverse events resulting from improper servicing.
- Secure a sufficient work space when performing maintenance.
- Do not disassemble or adjust the device other than as in the specified maintenance procedures.
  Electric shock or malfunction may occur. Hazardous LED radiation may be received.
- Be sure to use only the specified fuse (T 2 A 250 V).
  Failure to do so may result in fire.
- Do not mix old and new batteries together in the remote control.
  Leakage of battery acid may cause malfunction of the remote control or damage the peripheral part.
- Insert the batteries so that the orientations of the positive end ⊕ and the negative end ⊖ are aligned with the figures in the battery case.
  The remote control does not function normally. Additionally, leakage of battery acid may cause malfunction of the remote control or damage the peripheral part.
- With the expected service life as a guide, consider planned replacement of the device.
  If the expected service life of the device is exceeded, even with proper maintenance and inspection, the device reliability or safety may become degraded and fail to achieve the target values.

Disposal

⚠ CAUTION

- When disposing of the device and accessories, observe the local ordinances and recycling plans concerning disposal and recycling. Especially when disposing of lithium battery, printed circuit board, plastic parts containing brominated flame retardant, power cord, or batteries used internally, observe the instructions of local governments.

  For details on local ordinances, contact your local governments.

- When disposing of packing materials, sort them by material and follow local ordinances and recycling regulations.

1.2 Symbols

The device is labeled with the following symbols.

	Power off
	Power on
	Fuse
	Alternating current
	Date of manufacture
	Manufacturer

	Reference to operator’s manual
	Indicates that this product must be disposed of in a separate collection of electrical and electronic equipment in EU.
MD	Medical device
EC REP	EU authorized representative
SN	Serial number
CH REP	Swiss authorized representative

2 INTRODUCTION

2.1 Device Outline

The Nidek CHART PROJECTOR CP-9 is a chart presenting device that can achieve refraction at a distance of 2.9 m to 6.1 m (standard 5 m).

The main unit is operated by a wireless remote control or the control box on a motorized refractor (RT).

The equipped chart types and projection magnification differ depending on the device.

Projection magnification (at 5 m)	Chart type
30x variable magnification	Type T, Type PhM, Type G, Type M
30x fixed magnification	Type T, Type G
25x variable magnification	Type UK

◆ Intended use

The CHART PROJECTOR CP-9 is a device that projects charts for distance vision to be used for testing visual acuity.

◆ Intended patient population

- Age
  Except babies and infants (under 3 years old)
- Health condition
  Personnel who can sit on a chair and answer operator's questions
- Conditions - Visual function
  One or both eyes are normal or diseased. Eyes that have lost the visual function are not targeted.

◆ Intended user profile

Any qualified personnel such as ophthalmologists, nurses, orthoptists, or optometrists

◆ Intended use environment

Medical facility or optical store

⚠ CAUTION

- If the device is used outside the specified use location, intended performance and security level cannot be maintained.

2.2 Indications in this Manual

The following indications are used in this document:

“xxxxx” (Page x)	Indicates the reference title and page.
xxxxxx	Indicates the test results corresponding to the patient’s response or the actions needed to be taken.

Information related to operation is indicated by the icon display.

Setting

- Indicates information on settings.

Check

- Indicates items to be checked.

Knowledge

- Indicates detailed information on the product.

Tip

- Indicates tips useful for product operation.

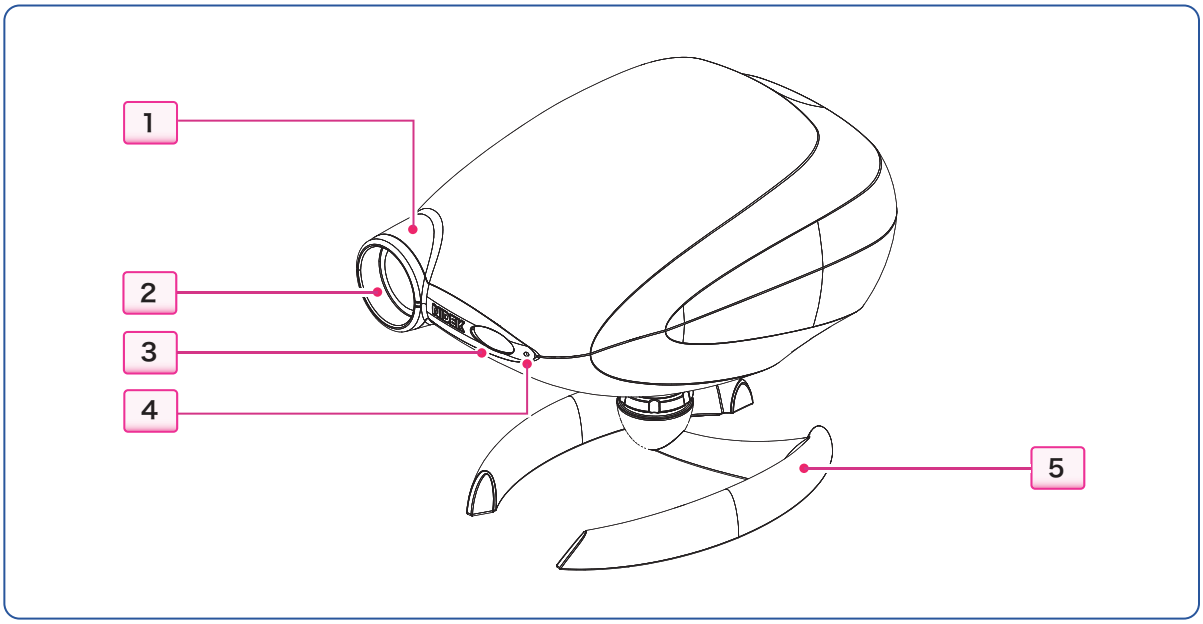
Help

- Indicates workarounds for when intended operation or intended results cannot be obtained.

2.3 Device Configuration and Functions

2.3.1 Device main unit

❖ The table stand illustrated below is an optional accessory sold separately.



1 Projection lens

Projects a chart. Remove the top cover to adjust the focus.

2 LED aperture

3 Infrared light receiving window

Receives infrared signals from the remote control.

4 Power indicator

Illuminates when the power switch is turned on.

5 Table stand (option)

The following optional stands are available for the main unit:

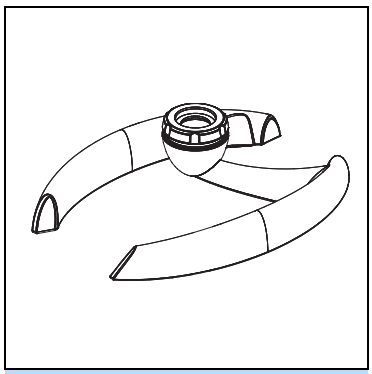
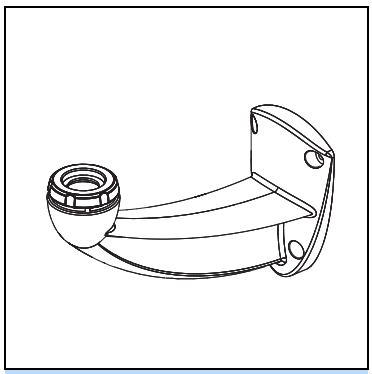
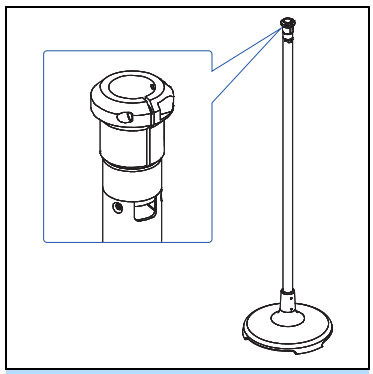


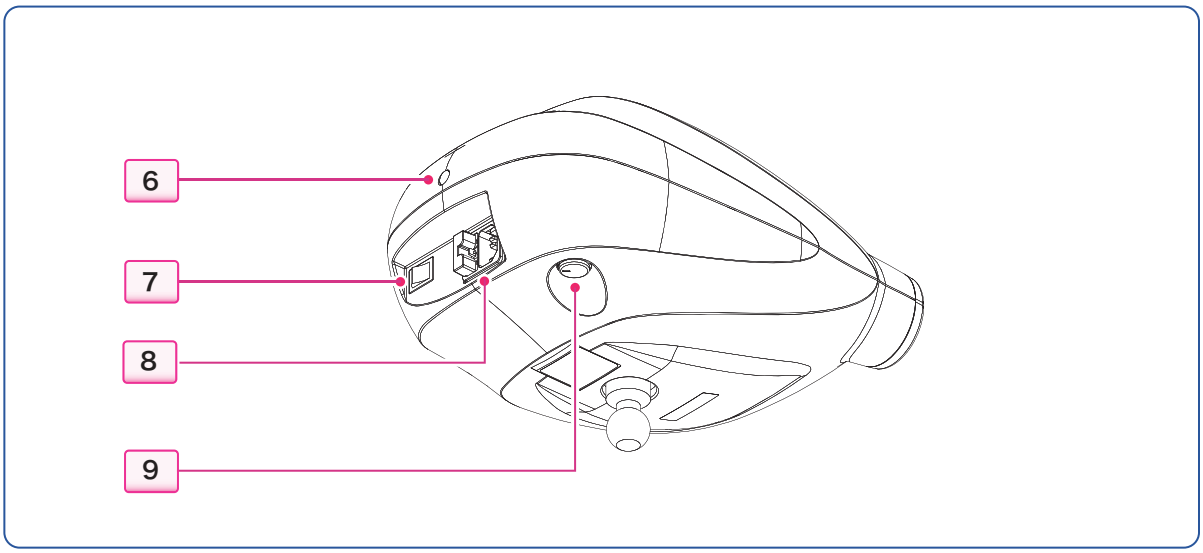
Table stand



Wall bracket



Floor stand



⚠ CAUTION

- Equipment connected to the analog or digital interfaces must be certified according to the representative appropriate national standards such as IEC 60601-1. Furthermore, all the equipment comprising the system must comply with the standard of IEC 60601-1. Anyone 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 IEC 60601-1. If you have any questions, contact Nidek or your authorized distributor.

6 Top cover screw

The top cover can be detached by removing the cap and loosening the screw. *(page 79)*

Remove the top cover when changing the chart size, focus, chart luminance, remote control channel, refraction distance, or installation distance.

7 Power switch

8 Power inlet

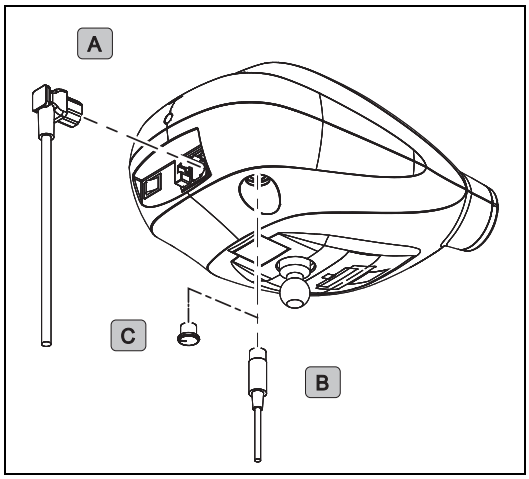
Connects the power cord A .

It is integrated with the fuse holder. For fuse replacement, *(page 45)*

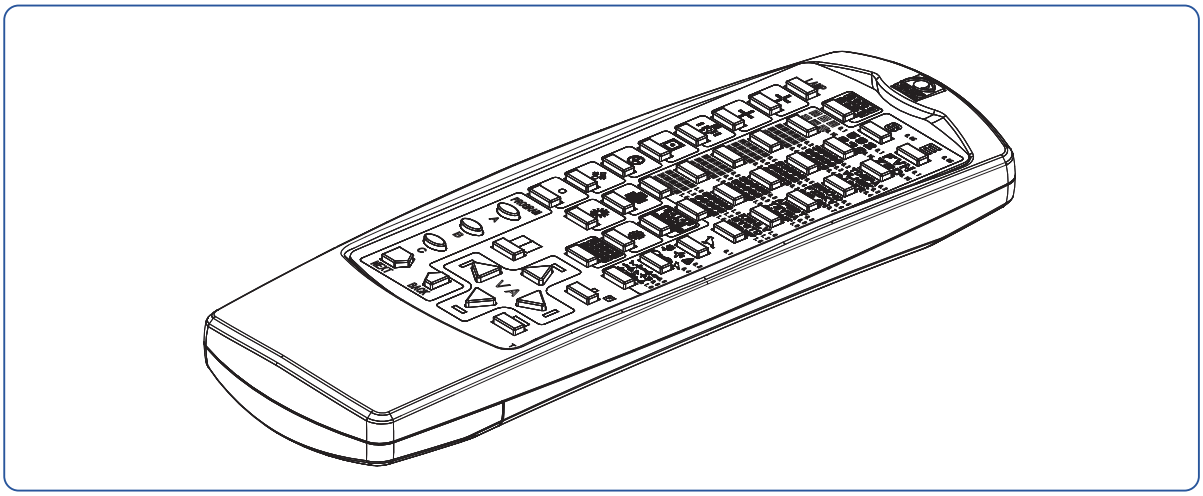
9 RT communication connector

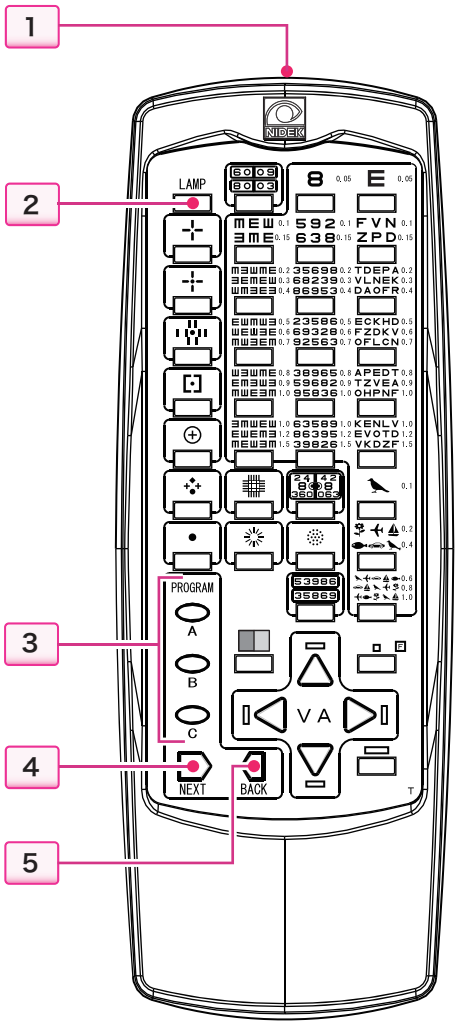
Connects the communication cable B used for synchronized operation with the Nidek motorized refractor (RT). *(page 41)*

Attach the provided connector cap C when no communication cable is connected.



2.3.2 Remote control (other than Type UK)





1 Transmitter

Transmits operation signals for controlling the main unit.

Aim the transmitter at the infrared light receiving window on the main unit to operate the remote control.

2 Lamp ON/OFF button LAMP

Turns the projection lamp on or off.

The device has a lamp auto off function. *(page 48)*

3 Program (A, B, C) buttons A B C

Starts each program.

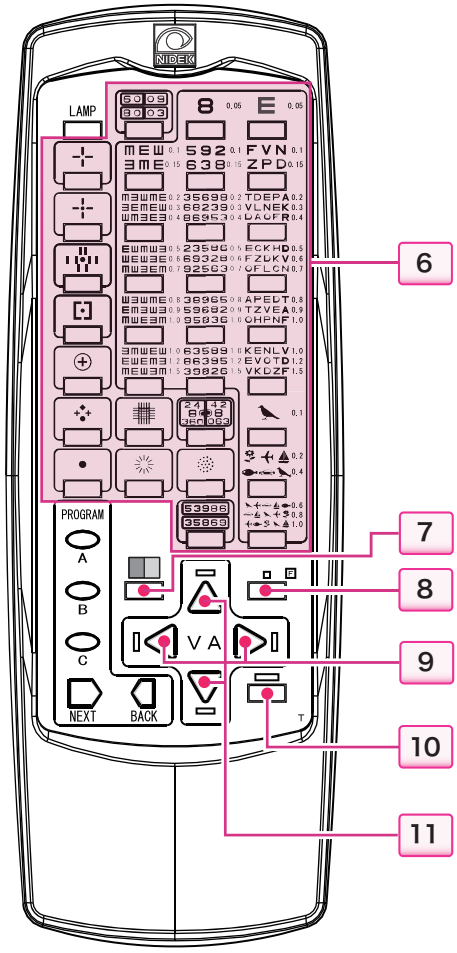
Three programs A, B, and C are available. Each program stores a maximum of 20 steps (charts). *(page 34)*

4 Program advance button NEXT

Presents the chart of the next step while a program is running.

5 Program back button BACK

Presents the chart of the previous step while a program is running.



6 Chart select buttons

Selects a chart from 33 varieties.

7 Red-green filter button

Applies the red-green filter to the VA chart. *(page 32)*

8 Single letter mask button / Function button

Isolates a single letter on the VA chart or clears the single letter isolation.

Press and hold the button to enter Setting mode.

Press and hold the button for about 3 seconds with the lamp off to enter Setting mode.

For details of Setting mode, *(page 46)*

9 Side move buttons

Moves the isolation right or left when a vertical line or single letter is isolated on the VA chart.

When no mask is applied or a horizontal line is isolated, a vertical line is isolated.

10 Horizontal line mask button

Isolates a horizontal line on the VA chart or clears the horizontal line isolation. *(page 30)*

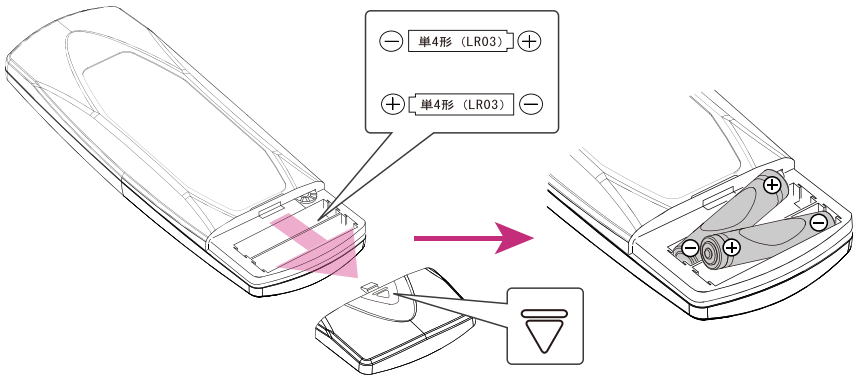
11 VA select buttons

Moves the isolation up or down when a vertical line, horizontal line, or single letter is isolated on the VA chart.

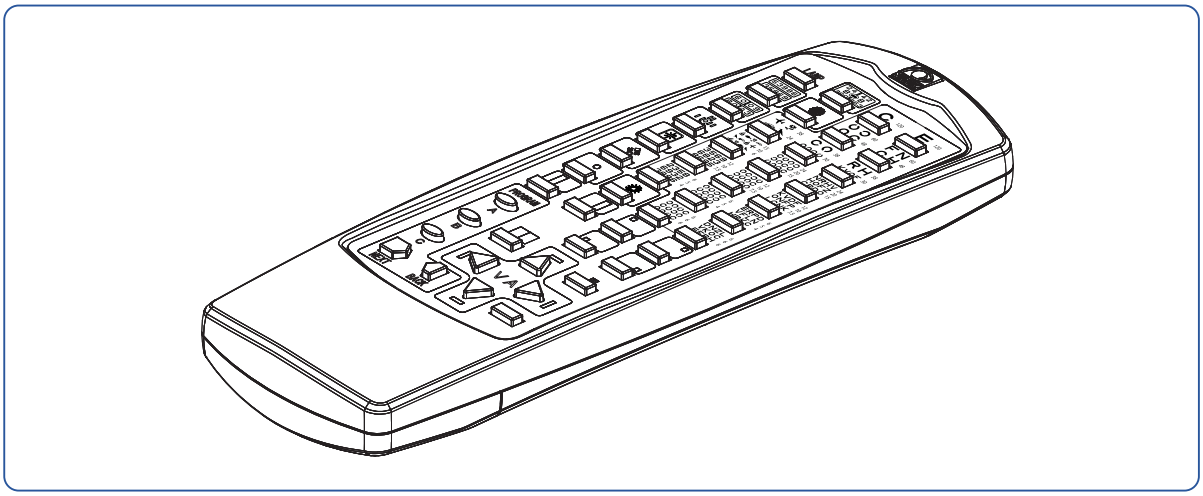
When no mask is applied, a horizontal line is isolated.

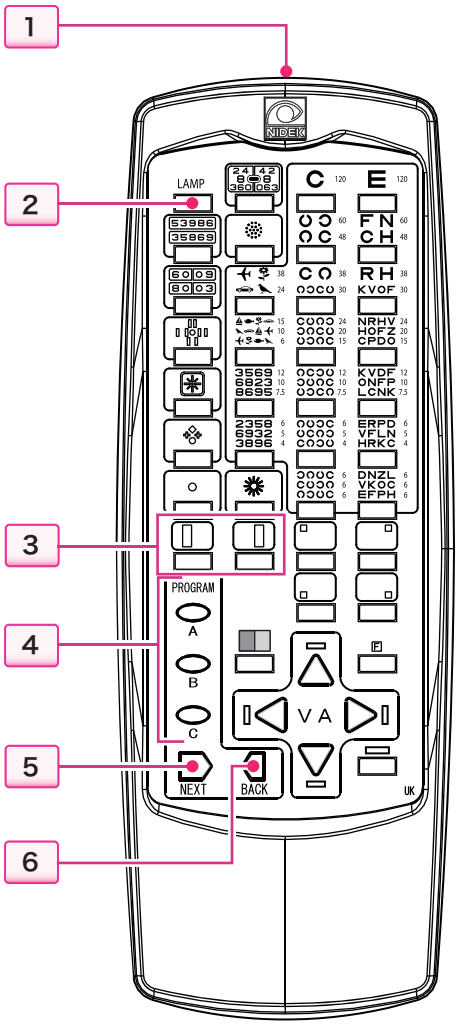
◆ Installing batteries in remote control

Remove the battery cover by pressing down on and sliding it out. When installing the batteries, insert the negative end first.



2.3.3 Remote control (Type UK)





1 Transmitter

Transmits operation signals for controlling the main unit.

Aim the transmitter at the infrared light receiving window on the main unit to operate the remote control.

2 Lamp ON/OFF button LAMP

Turns the projection lamp on or off.

The device has a lamp auto off function. *(page 48)*

3 Vertical line mask button

Isolates a vertical line on the VA chart. *(page 28)*

4 Program (A, B, C) buttons A B C

Starts each program.

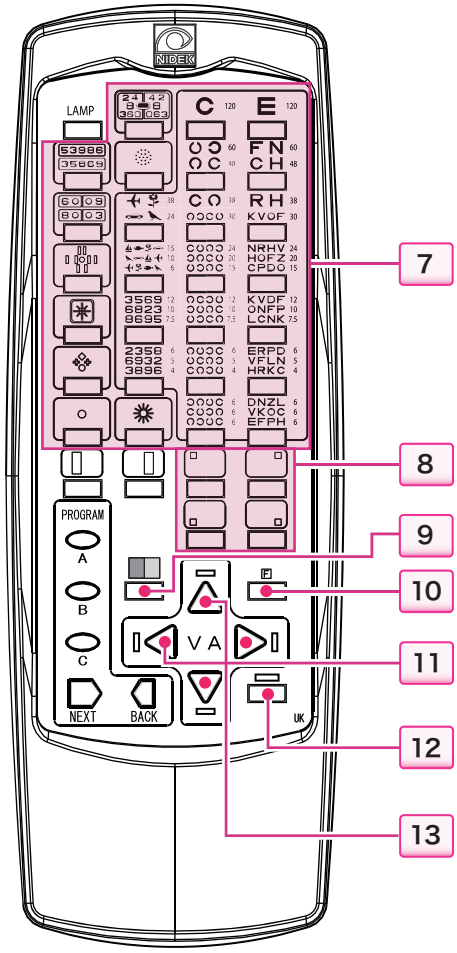
Three programs A, B, and C are available. Each program stores a maximum of 20 steps (charts). *(page 34)*

5 Program advance button NEXT

Presents the chart of the next step while a program is running.

6 Program back button BACK

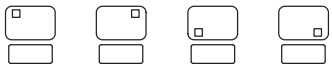
Presents the chart of the previous step while a program is running.



7 Chart select buttons

Selects a chart from 27 varieties.

8 Single letter mask button



Isolates a single letter on the VA chart. *(page 31)*

9 Red-green filter button

Applies the red-green filter to the VA chart. *(page 32)*

10 Function button

The device enters Setting mode for various functions.

Press and hold the button for about 3 seconds with the lamp off to enter Setting mode.

For details of Setting mode, *(page 46)*

11 Side move buttons

Moves the isolation right or left when a vertical line or single letter is isolated on the VA chart.

When no mask is applied or a horizontal line is isolated, a vertical line is isolated.

12 Horizontal line mask button

Isolates a horizontal line on the VA chart or clears the horizontal line isolation. *(page 30)*

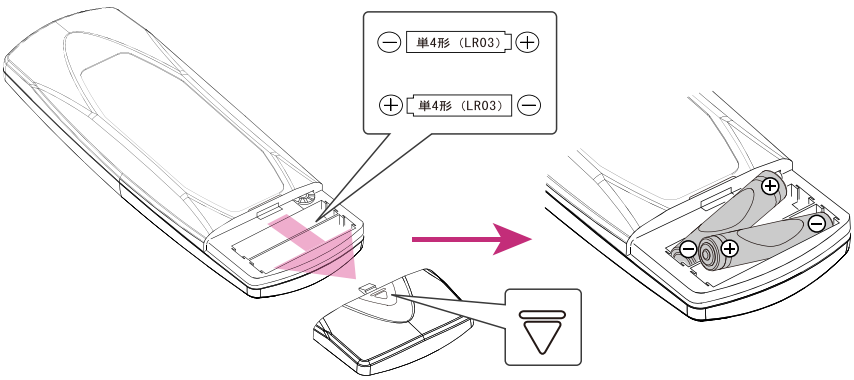
13 VA select buttons

Moves the isolation up or down when a vertical line, horizontal line, or single letter is isolated on the VA chart.

When no mask is applied, a horizontal line is isolated.

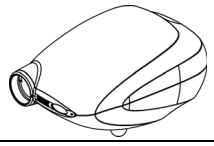
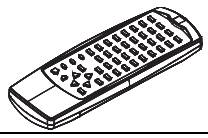
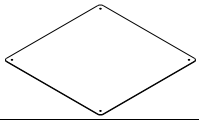
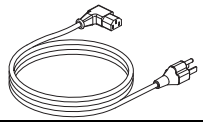
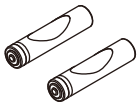
◆ Installing batteries in remote control

Remove the battery cover by pressing down on  and sliding it out. When installing the batteries, insert the negative end first.



2.4 Packed Contents

The following are included in the standard configuration. Check the contents before use.

	Part name (part number)	Quantity	Appearance
☐	Device main unit	1 unit	
☐	Remote control (34801-3004)	1 unit	
☐	Screen	1 unit	
☐	Polarizing glasses	1 unit	
☐	Wood screw	4 units	
☐	Power cord	1 unit	
☐	Battery for remote control	2 units	
☐	Spare fuse	2 units	
☐	Connector cap	1 unit	
☐	Operator’s manual (this book)	1 copy	

2.5 Settings according to Use

2.5.1 Selectable functions

The following settings can be changed as desired.

Volume of beeps (High/Low/Off)	*"4.4.2 Changing the volume of beeps" (page 47)*
Time until the lamp turns off automatically (15 minutes / 5 minutes / Off)	*"4.4.3 Changing the lamp auto off time" (page 48)*
Programming (desired program entry)	*"3.4 Programming" (page 38)*

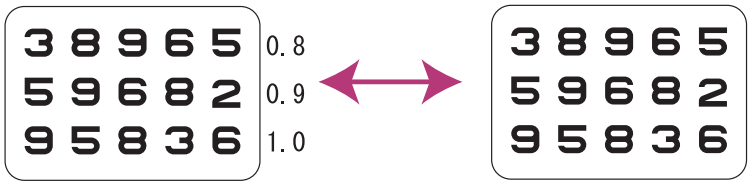
2.5.2 Settings for installation

For explanations about device installation, refer to the following.

⚠ CAUTION

- If you have any questions about device installation or movement, contact Nidek or your authorized distributor.
- Be sure to adjust the lamp brightness according to the refraction distance and projection distance after installing the device.
  The proper chart luminance cannot be obtained, resulting in incorrect examination.

Selecting whether to turn on VA values beside the VA chart	*"6.2 Turning On/Off VA Values on VA Chart" (page 81)*



Setting the remote control channel when multiple devices are concurrently used	*"6.3 Setting Remote Control Channels" (page 83)*
Setting the refraction distance and projection distance	*"6.4 Device Installation" (page 85)*
Installing the screen using the screen angle fixing set	*"6.4.2 Screen installation" (page 86)*
Changing the chart luminance	*"6.4.7 Changing the chart luminance" (page 93)*
Mounting the main unit on the stand (option)	*"6.4.8 Stand attachment (option)" (page 95)*
Adjusting the chart size and focus according to the refraction distance	*"6.4.4 Adjusting the chart size and focus (variable magnification type)" (page 90)*

Adjusting the lamp brightness according to the refraction distance and projection distance	*"6.4.6 Setting the lamp brightness according to refraction distance and projection distance" (page 92)*

3 OPERATING PROCEDURE

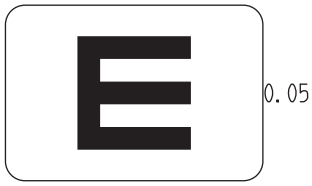
This chapter explains the operating procedures using the remote control. For the operating procedures in combination with the Nidek motorized refractor, refer to the operator's manual of the refractor.

3.1 Device Startup and Shutdown

3.1.1 Turning on the device

1 Turn on (|) the power switch of the main unit.

The 0.05 VA chart is presented.



2 Perform a pre-use check of the device.

Perform the following pre-use checks before using the device.

- ☐ The chart is in focus.
- ☐ No chipping appears on the VA chart.
- ☐ The chart luminance is even.
- ☐ The chart and mask can be switched by the remote control.
- ☐ The projection lens is clean.
- ☐ The screen is clean.

If any problem occurs, stop the operation and take actions according to *"4.1 Troubleshooting" (page 43)*.

3.1.2 After use

1 Turn off (◯) the power switch of the main unit.

2 Ensure that the polarizing glasses are clean and stored properly.

For cleaning polarizing glasses, *"4.5 Cleaning" (page 49)*

3.2 Chart Presentation

3.2.1 Chart selection

Pressing the corresponding chart button on the remote control presents the desired chart.

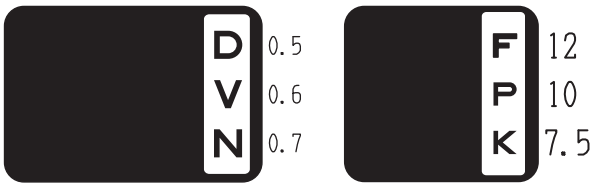
“5.2 Chart Types” (page 53)

3.2.2 VA chart masking

When a VA chart is presented, a masking function that isolates necessary optotypes and a red-green filtering function are provided.

Three kinds of isolations, horizontal line, vertical line, and single letter are available.

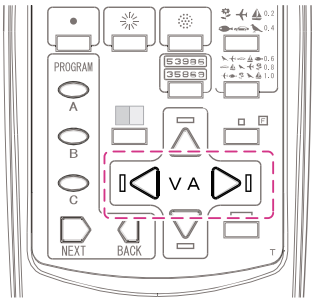
◆ Vertical line isolation



- Other than Type UK

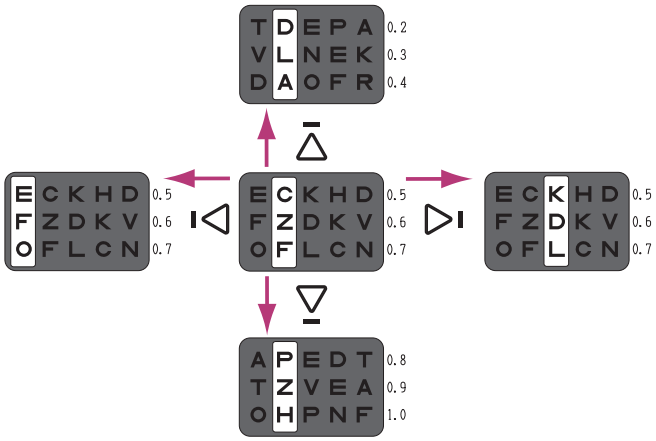
How to isolate a vertical line

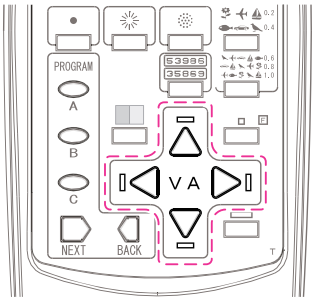
Press the side move button ◁/▷.



How to move the isolation right, left, up, or down

Press the side move button ◁/▷ or VA select button △/▽.

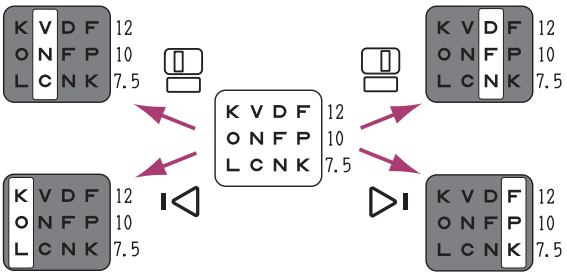


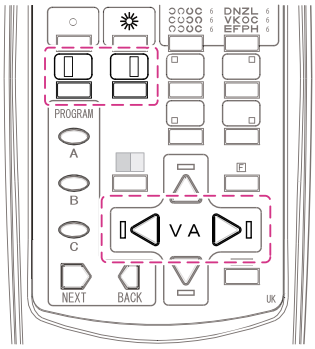


- Type UK

How to isolate a vertical line

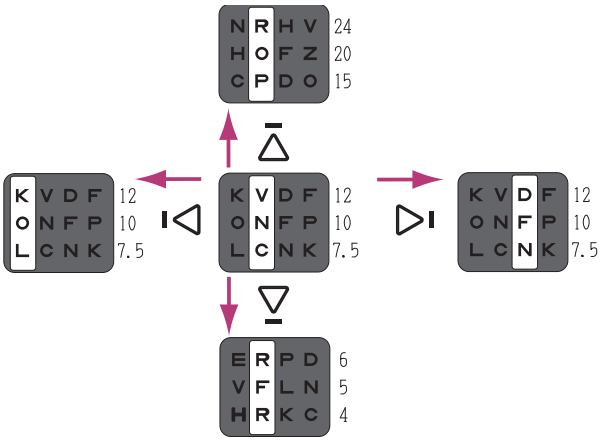
Press the vertical mask button / or side move button / .

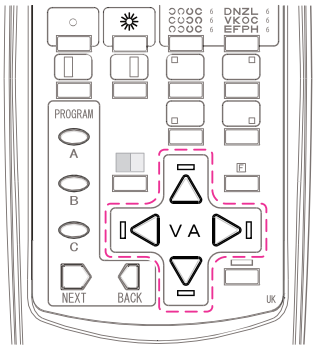




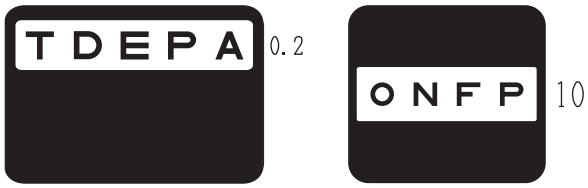
How to move the isolation right, left, up, or down

Press the side move button / or VA select button / .





◆ Horizontal line isolation

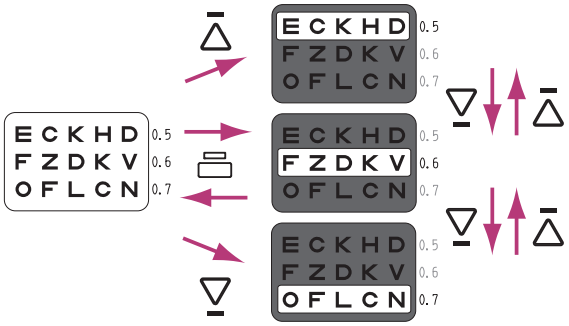


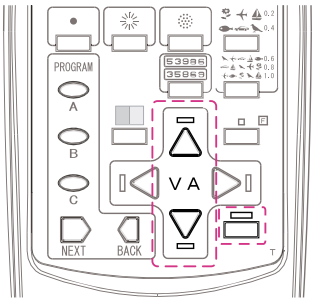
How to isolate a horizontal line

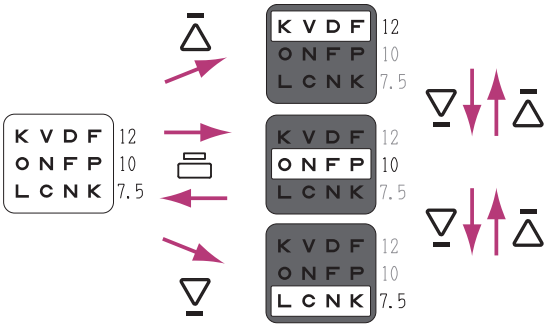
Press the horizontal line mask button or VA select button / .

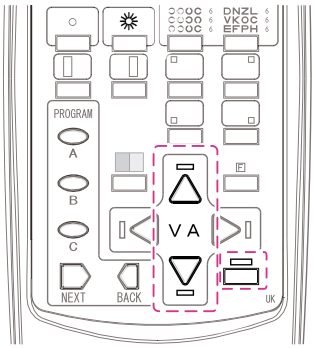
How to move the isolation up or down

Press the VA select button / .









Knowledge

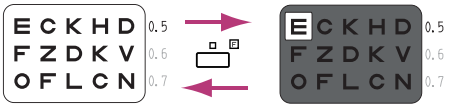
- Pressing the horizontal line mask button again with a horizontal line isolated clears the horizontal line isolation.
- At some visual acuities, multiple sets of charts are available for the same visual acuity to prevent the patient from memorizing the contents. When the same visual acuity is selected multiple times with the horizontal line, it is set to be presented alternately.

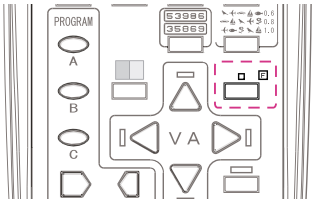
◆ Single letter isolation

- Other than Type UK

How to isolate a single letter

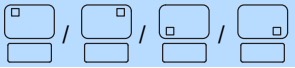
Press the single letter mask button  .

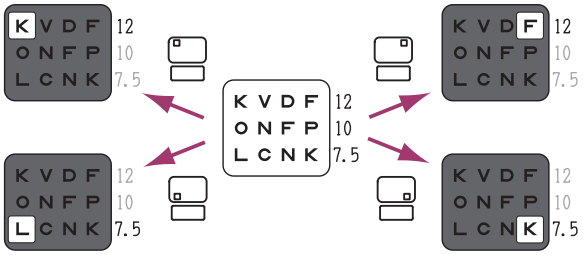


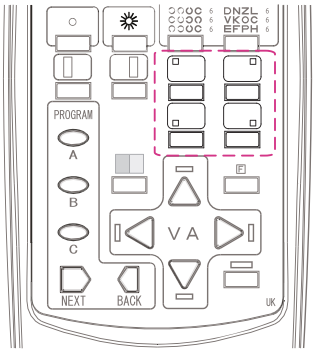


- Type UK

How to isolate a single letter

Press the single letter mask button  .

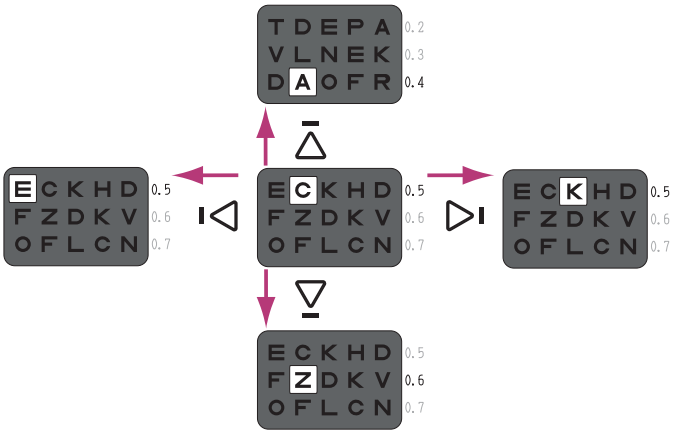


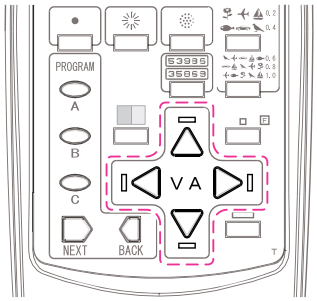


- Common to all types

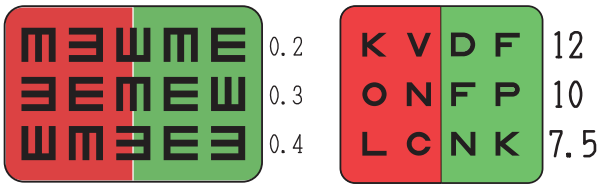
How to move the isolation right, left, up, or down

Press the side move button  or VA select button  .





◆ Red-green filter

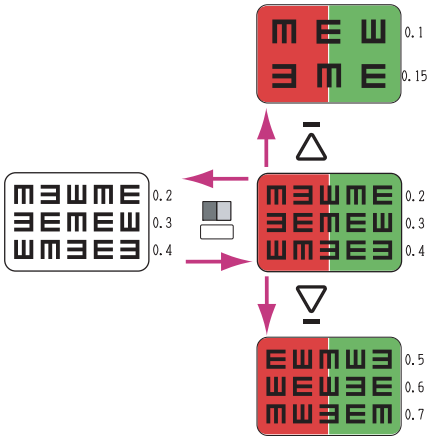


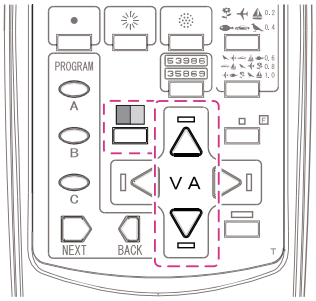
How to apply the red-green filter to the VA chart

Press the red-green filter button .

How to change the visual acuity value.

Press the VA select button / .



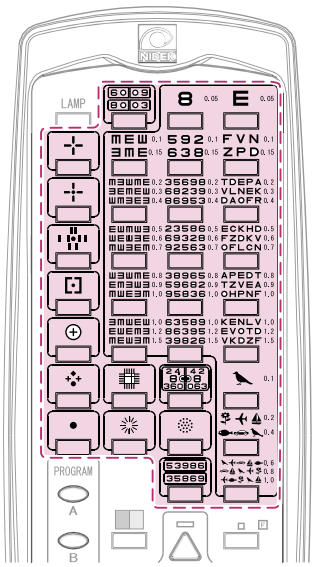


Knowledge

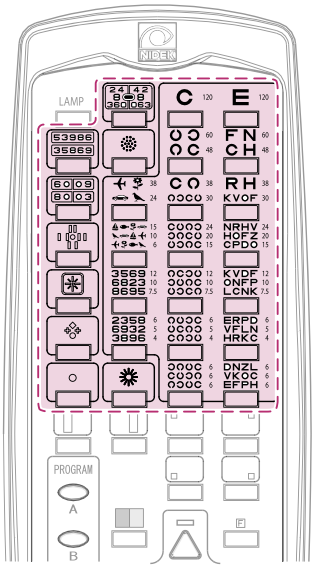
- Pressing the red-green filter button with the red-green filter applied removes the red-green filter.

◆ Clearing isolations or removing the red-green filter

Switching charts by pressing the chart select button clears the isolation or removes the filter.



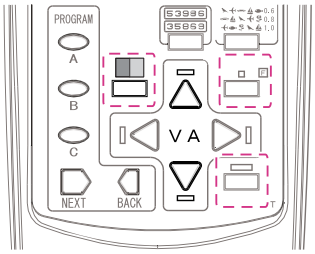
Other than Type UK



Type UK

Pressing the same button again clears the horizontal line isolation or removes the red-green filter.

- Horizontal line mask button
- Single letter mask button * other than Type UK
- Red-green filter button

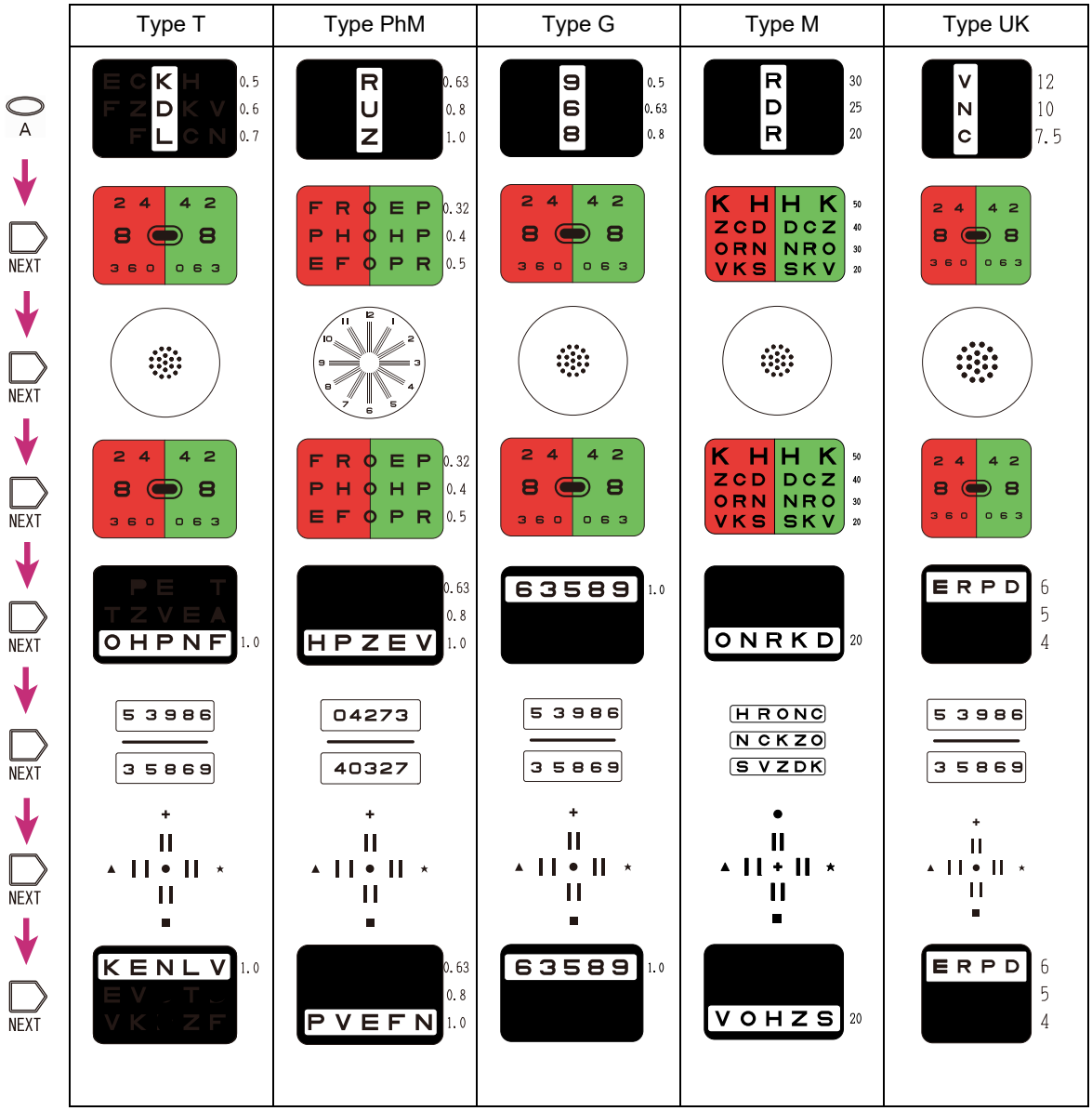


3.3 Program Examination

Three programs A, B, and C can be stored in the remote control. The following programs are written in program A by default.

Customize programs A to C to suit your use. *"3.4.1 Programming" (page 38)*

◆ Program A contents (default settings)



● Program operations

Starting each program	Program A (A) to Program C (C)
Presenting the chart of the next step	Program advance button (NEXT)
Presenting the chart of the previous step	Program back button (BACK)

● Procedure of subjective refraction by program A

1 Set a manual refractor.

Enter the objective measurement data and PD values in the refractor.

2 Instruct the patient to look at the chart through the refractor.

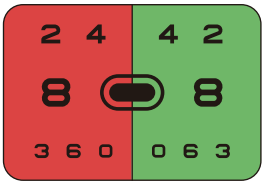
3 Cover the left eye of the patient.

4 Start program A to assess a rough visual acuity.

1) Press the program A button (A).
   The Letters chart (VA 0.7) is presented.
2) Ask the patient whether they can read the presented chart.

The patient can read one or more letters.	☞	Proceed to the next test.
The patient cannot read any letter.	☞	The objective measurement data is incorrect, or amblyopia is suspected.

5 Perform the red-green test to refine the spherical power.



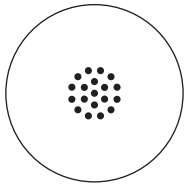
1) Press the program advance button (NEXT).
   The Red-green chart is presented.
2) Add +0.5 D sphere to fog the patient's vision.
3) Reduce the fog gradually until the letters on the red and green sides appear equally sharp.

The letters on the red side appear clearer.	☞	Add minus power.
The letters on the green side appear clearer.	☞	Add plus power.

Knowledge

- This spherical refinement is to place the circle of least confusion at the retina for the subsequent astigmatism test by cross cylinder.
  If the patient cannot see the red and green sides equally, make the green sharper slightly. In that state, the circle of least confusion can be brought to the retina by eye accommodation.

6 Refine the cylinder axis.

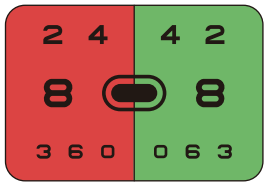


1) Press the program advance button (NEXT).
   The Dots chart is presented.
2) Refine the cylinder axis using the cross cylinder.
   Refer to the operator's manual of the refractor.

7 Refine the cylindrical power.

Refine the cylindrical power using the cross cylinder.
Refer to the operator's manual of the refractor.

8 Perform the red-green test to refine the spherical power.



1) Press the program advance button NEXT.
   The Red-green chart is presented.
2) Add +0.5 D sphere to fog the patient's vision.
3) Reduce the fog gradually until the letters on the red and green sides appear equally sharp.

The letters on the red side appear clearer.	Add minus power.
The letters on the green side appear clearer.	Add plus power.

Tip

- If the patient cannot see the red and green sides equally, make the red sharper slightly. This refinement is to avoid overcorrection.

9 Refine the lens power to the most plus power that provides the best-corrected visual acuity.

1) Press the program advance button NEXT.
   The Letters chart (VA 1.0) is presented.
2) Press the VA select button (△ or ▽) to determine the best-corrected visual acuity at which the patient can read.
   Add +0.25 D sphere gradually to refine the lens power to the most plus power that provides the best-corrected visual acuity.

❖ The full corrective power for the right eye is perfectly refined.

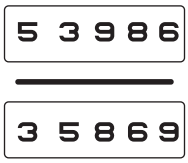
10 Uncover the left eye, then cover the right eye.

11 Test the left eye in the same manner of Steps 4 to 9.

❖ The full corrective power for the left eye is perfectly refined.

12 Uncover the right eye.

13 Perform the binocular balance test.



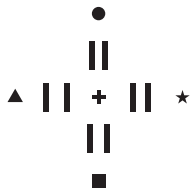
1) Press the program advance button (NEXT).
   The Binocular balance chart is displayed.
2) Insert the polarizing filters in the refractor.
   For right eye: 135°, for left eye: 45°
3) Make the upper and lower letters appear roughly equal.

The upper letters appear clearer.	☞	Add +0.25 D sphere to the right eye.
The lower letters appear clearer.	☞	Add +0.25 D sphere to the left eye.

If the patient can see them equally, binocular vision is balanced.

❖ The binocular full corrective power is perfectly refined.

14 Perform the stereo test.



1) Press the program advance button (NEXT).
   The Stereo chart is presented.
2) Insert the polarizing filters in the refractor.
   For right eye: 135°, for left eye: 45°
3) Ask the patient whether they can see four vertical bars stereoscopically.

15 Adjust the power by intended use.

Adjust the lens power to the most plus power that suits the intended use of the patient's glasses.

1) Press the program advance button (NEXT).
   The Letters chart (VA 1.0) is presented.
2) Press the VA select button (△ or ▽) to present the VA chart that provides visual acuity desired by the patient.
   Adjust the lens power to the most plus power that provides the intended visual acuity.

❖ Subjective refraction by program A is complete.

3.4 Programming

Programs A, B, and C are available. Program A is written by default.

For the contents, *"3.3 Program Examination" (page 34)*

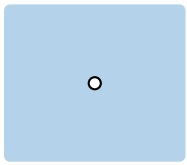
3.4.1 Programming

1 Turn on (|) the power switch.

2 Press the lamp ON/OFF button LAMP to turn the lamp off.

3 Press and hold any of the program buttons (A to C) for about 3 seconds to enter Program mode.

Three short beeps sound, and the Fixation chart is presented to indicate that the device has entered Programming mode.



4 Present a chart to be stored (with/without isolation), then press the program advance button NEXT .

The selected chart is stored in the program memory.

Tip

- Do not hold the program advance button NEXT . If the button is held, the same chart may be stored again.

5 Repeat Step 4 for each chart in the order to be presented.

Each program (A, B, or C) stores a maximum of 20 steps (charts).

6 Store all the charts, then press the same button (A to C) as in Step 3.

Three short beeps sound, and the Letters chart (VA 0.05) is presented to indicate that the device has exited Program mode.

Tip

- To overwrite a stored program, simply enter the newly desired charts in the usual manner.
- While a program is being written, the program back button BACK does not function.

Setting

- The contents of programs A, B, and C can be reset to their default settings.

For details, *"4.4.1 Resetting programs" (page 46)*

3.4.2 Program examination

To present charts in a predetermined order, programmed operation is useful.

Starting each program	Program A (A) to Program C (C)
Presenting the chart of the next step	Program advance button (NEXT)
Presenting the chart of the previous step	Program back button (BACK)

1 Press any of the program buttons ((A) to (C)).

The first chart of the selected program (A, B, or C) is presented.

2 Press the program advance button (NEXT) .

Pressing the button presents the chart of the next step.

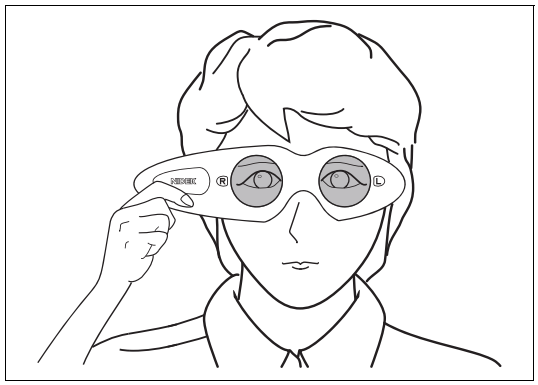
3 Pressing the program back button (BACK) goes back to the chart of the previous step.

3.5 Using Polarizing Glasses or Red-Green Glasses (Option)

- How to hold glasses correctly

Instruct the patient to hold the glasses with their right hand so that the NIDEK-printed side faces away from them, and look at the chart without inclination.

Confirm that the R indication on the glasses is on the right eye and the L indication on the left eye.



Wipe the area that comes into contact with the patient using clean gauze or absorbent cotton before refraction.

If necessary, dampen a cloth with rubbing alcohol, and gently wipe the area.

- Filter of glasses

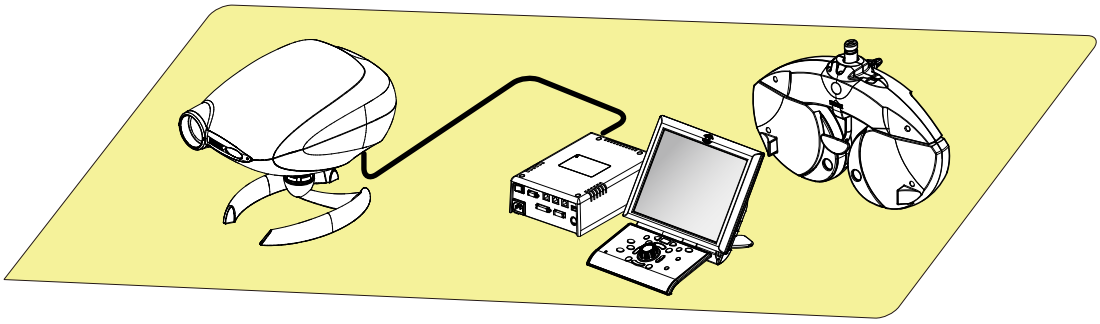
	Right eye	Left eye
Polarizing glasses (standard accessory)	135° polarizing filter	45° polarizing filter
Red-green glasses (optional accessory)	Red filter	Green filter

Check

- Confirm that the polarizing glasses are held in the correct orientation.
  If the orientation is improper, the polarizing axis will not be properly set, resulting in incorrect examination.

3.6 When Peripheral Devices are Connected

Charts to be projected can be specified in conjunction with a Nidek motorized refractor RT-3100/RT-5100/RT-6100 when it is connected.



Connecting device	Connection port	Function
Nidek refractor	RT communication connector	Specifies charts to be projected
Connectable device: RT-3100, RT-5100, RT-6100		

⚠ CAUTION

- Use the optional communication cable for connection.
- When connecting the device with other devices, confirm that no harms will be caused to the patient, operator, or a third party. Confirm the above also after adding, removing, updating, or upgrading a device.

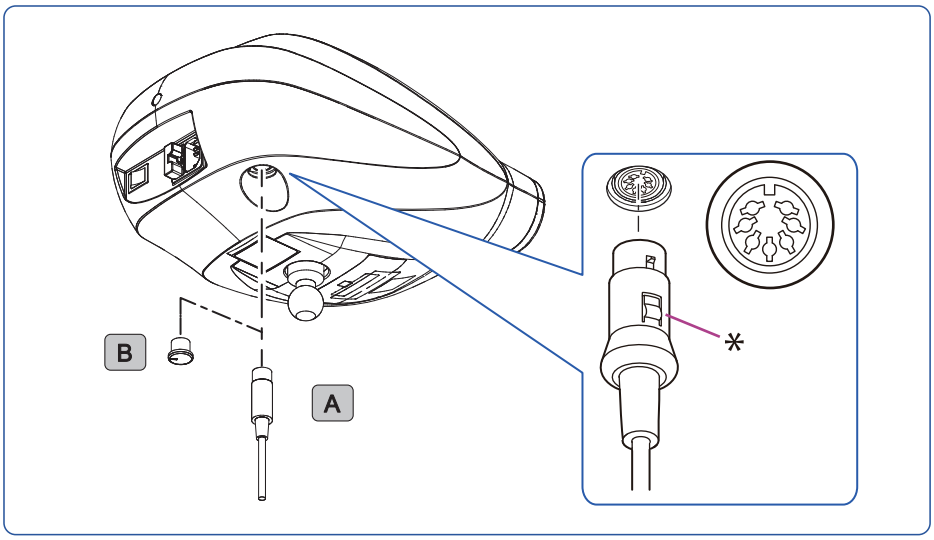
Knowledge

- Connect the communication cable to the relay box (for chart connector) of a refractor (RT-3100/RT-5100/RT-6100). For details, refer to the operator's manual of the refractor to be connected.

3.6.1 Connecting the communication cable

⚠ CAUTION

- Be sure to turn off each device before connecting the communication cable.
  Connecting the cable with the power on may cause malfunction.



Connect the communication cable to the RT communication connector.

Remove the connector cap **B** from the device, and insert the plug of the communication cable **A** straight into the connector in the proper orientation.

To disconnect the plug of the communication cable, hold the plug while pressing the button indicated by "*", then pull it out.

4 MAINTENANCE

4.1 Troubleshooting

If the device does not function properly, attempt to correct the problem according to the following table before contacting Nidek or your authorized distributor.

- Device malfunctions

Symptom	Actions
No chart is presented when the power switch is turned on.	• Check that the power cord is correctly connected. • Check that power is supplied from the power outlet. • Check whether the fuses have blown. If the fuses have blown, replace them. *(page 45)*
Buttons on the remote control are inoperable.	• Operate the remote control while aiming its transmitter at the main unit. • Check that the power switch on the main unit is turned on. • Check for obstacles between the main unit and the remote control. • Check the orientation of the batteries. • Replace the batteries if they are dead. *(page 44)* • Match the channel settings between the remote control and the main unit. *(page 83)*
The remote control operational distance has become shortened.	• The battery charge may be low. Replace the batteries with new ones.
Charts switch even though the remote control is not operated.	• Other devices may be interfering with the device. Check the channel settings. *(page 83)*

- Chart display errors

Symptom	Actions
Charts are not sharp.	• Adjust the focus of the chart. • Check the screen and the projection lens for their cleanliness. If necessary, clean them. *(page 49)*
Charts are blurred.	• Check that the device and the screen are installed at the correct angles. • Check that the projection distance is not beyond the focus range. • Check the lens for condensation. If condensation occurs, do not use the device. Leave it for a few hours to allow it to warm to room temperature.
Charts are tilted.	• Correct the attachment of the device to the stand (option).
Chipping or light leakage appears on the VA chart.	• The VA value display may not be properly adjusted. *(page 81)*
The chart luminance is not even.	• Check the screen and the projection lens for their cleanliness. If necessary, clean them. *(page 49)*

- If the symptom is not corrected by the above actions, contact Nidek or your authorized distributor.

4.2 Battery Replacement for Remote Control

If the remote control does not function due to its dead battery, replace the batteries.
Use two AAA alkaline (IEC: LR03 / ANSI: 24A) batteries for replacement.

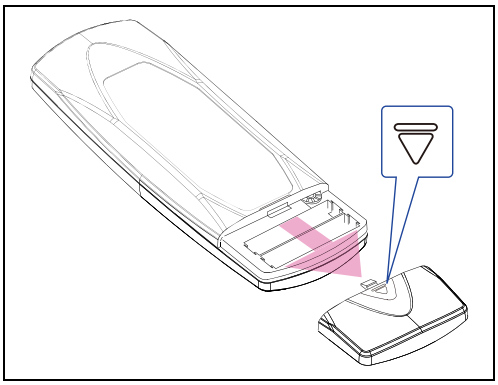
⚠ WARNING

- If the remote control is not to be used for an extended period of time, remove the batteries.
  Leakage of battery acid may cause malfunction of the remote control or damage the peripheral part.

⚠ CAUTION

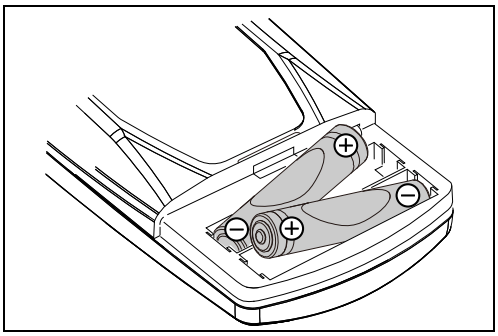
- Do not mix old and new batteries together in the remote control.
  Leakage of battery acid may cause malfunction of the remote control or damage the peripheral part.

1 Slide down the battery cover to remove it while pressing the part ▽ on the underside of the remote control.



2 Remove the old batteries.

3 Insert new batteries from the negative end.



⚠ CAUTION

- Insert the batteries so that the orientations of the positive end ⊕ and the negative end ⊖ are aligned with the figures in the battery case.
  If the orientation is incorrect, the remote control does not function normally. In addition, leakage of battery acid may cause malfunction of the remote control or damage the peripheral part.

4 Attach the battery cover.

Knowledge

- Removing the batteries from the remote control does not clear the program contents.

4.3 Fuse Replacement

If the device is not activated when the power switch is turned on, the fuses may be blown. Replace the fuses with spare ones.

⚠ CAUTION

- Turn the device off and disconnect the power cord from the power outlet before replacing fuses.
  If fuses are replaced with power on, electric shock may occur.
- Be sure to use only the specified fuse (T 2 A 250 V).
  Failure to do so may result in fire.

1 Turn off (◯) the power switch.

2 Disconnect the power cord from the power outlet.

3 Disconnect the power cord from the power inlet.

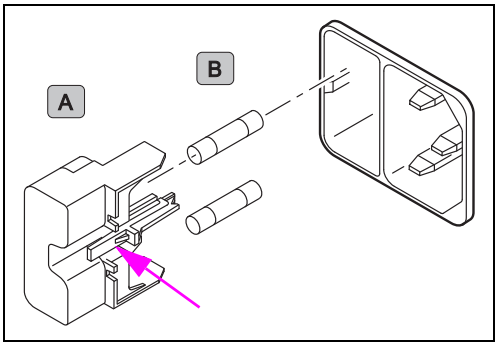
4 Remove the fuse holder [A] beside the power inlet.

Pull the fuse holder out while pressing the lever in the direction of the arrow.

5 Remove the fuses [B] , then insert new fuses.

Fuse rating: T 2 A 250 V

6 Reattach the fuse holder.



4.4 Various Settings

The following settings can be changed by remote control.

Resetting programs	Resets the contents of the selected program (A, B, or C) to their default settings.
Volume of beeps	Adjusts the volume of beeps that sound when the remote control is operated.
Lamp auto off time	Sets the time until the lamp turns off automatically when no operation continues.

4.4.1 Resetting programs

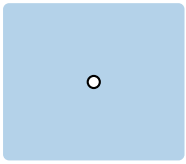
This section explains how to reset the contents of programs A, B, and C to their default settings.

1 Turn on (|) the power switch of the CP-9.

2 Press the lamp ON/OFF button LAMP to turn the lamp off.

3 Press and hold the function button F for about 3 seconds to enter Setting mode.

Five short beeps sound, and the Fixation chart is presented to indicate that the device has entered Setting mode.



4 Press the button of a program to be reset.

Multiple buttons can be selected.

Program A (A)	Resets program A to its default settings.
Program B (B)	Clears program B.
Program C (C)	Clears program C.

5 Press the function button F to exit Setting mode.

Five short beeps sound to indicate that the device has exited Setting mode.

4.4.2 Changing the volume of beeps

This section explains how to adjust the volume of beeps.

1 Turn on (|) the power switch of the CP-9.

2 Press the lamp ON/OFF button 

to turn the lamp off.

3 Press and hold the function button 

for about 3 seconds to enter Setting mode.

Five short beeps sound, and the Fixation chart is presented to indicate that the device has entered Setting mode.

4 Press the VA select buttons  to change the setting.

Select the volume from among “High”, “Low”, and “Off”.

VA select button 	The volume increases. (“Off” => “Low” => “High”) Pressing the VA select button  with “High” selected does not change the volume setting.
VA select button 	The volume decreases. (“High” => “Low” => “Off”) Pressing the VA select button  with “Off” selected does not change the volume setting.

5 Press the function button 

to exit Setting mode.

Five short beeps sound to indicate that the device has exited Setting mode.

4.4.3 Changing the lamp auto off time

This section explains how to set the time until the lamp turns off automatically when no operation continues.

“15 minutes”, “5 minutes”, or “no auto off” is selectable. (The default setting is 15 minutes.)

Knowledge

- Pressing any button on the remote control (or the control box of the motorized refractor) restores the lamp illumination.
- When the motorized refractor is connected, the lamp auto off operates according to the setting of the control box.

1 Turn on (|) the power switch of the CP-9.

2 Press the lamp ON/OFF button LAMP to turn the lamp off.

3 Press and hold the function button F for about 3 seconds to enter Setting mode.

Five short beeps sound, and the Fixation chart is presented to indicate that the device has entered Setting mode.

4 Change the setting with the side move buttons ▷| |◁ .

Select the lamp auto off time from among “15 minutes”, “5 minutes”, and “Off”.

Pressing the buttons sounds beeps to indicate the change of the setting.

Side move button ▷|	The time increases. Off (no beep) => 5 minutes (one beep) => 15 minutes (three beeps) Pressing the side move button ▷| with “15 minutes” selected does not change the setting.
Side move button |◁	The time decreases. 15 minutes (three beeps) => 5 minutes (one beep) => Off (no beep) Pressing the side move button |◁ with “Off” selected does not change the setting.

5 Press the function button F to exit Setting mode.

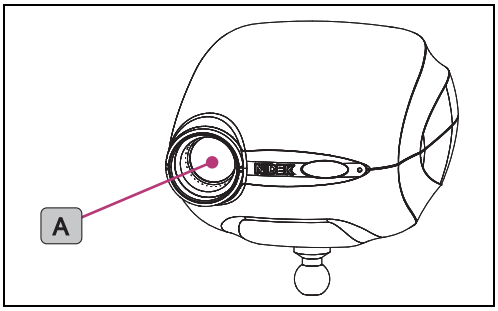
Five short beeps sound to indicate that the device has exited Setting mode.

4.5 Cleaning

◆ Projection lens

Remove any dust on the projection lens A with a blower brush.

For persistent dirt, wipe it with a sheet of lens cleaning paper.



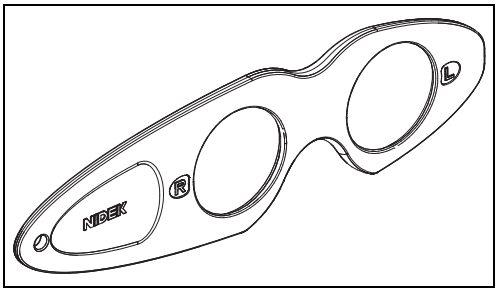
◆ Cover and screen

When the cover or screen becomes dirty, wipe it with a soft cloth. For persistent dirt, dampen the cloth with a neutral detergent, wring well, and wipe. Finally dry with a soft, dry cloth.

⚠ CAUTION

- Do not use any organic solutions such as thinner.
  The surface may be damaged.

◆ Polarizing glasses and red-green glasses

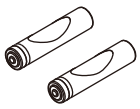


Area that comes into contact with the patient (frame)	Wipe with clean gauze or absorbent cotton. If necessary, dampen a cloth with rubbing alcohol, and gently wipe the area.
Filter	Lightly wipe with a soft, dry cloth. For persistent dirt, lightly wipe with a sheet of lens cleaning paper.

⚠ CAUTION

- Be careful not to rub the polarizing filter excessively because it is susceptible to scratches.

4.6 Consumable List

Part name (part number)	Appearance	Remarks
Battery for remote control (8041600020)		AAA alkaline battery (IEC: LR03 / ANSI: 24A) 2 units per device Use commercially available batteries.
Fuse (8040202174)		T 2 A 250 V 5x20 mm 2 units per device

- After replacing any consumables, be sure to restock them with spares.

5 SPECIFICATIONS AND TECHNICAL INFORMATION

5.1 Specifications

Performance	
• Refraction distance	2.9 to 6.1 m
• Projection magnification	30x (25x for Type UK) (at a distance of 5 m)
• Chart	33 types (27 types for Type UK)
• Masking function	No isolation, horizontal line, vertical line, single letter
• Filtering function	Red-green filter
• Chart size (at a distance of 5 m)	Type UK 250 mm (W) x 225 mm (H), 250 mm in diameter Other than UK 330 mm (W) x 225 mm (H), 275 mm in diameter
• Lamp	2.3 W, LED
• Background luminance	230 cd/m^2 (at a distance of 5 m), switchable
Power supply	
• Voltage	Main unit: 100 to 240 V AC * The voltage fluctuation should not exceed ±10% of the nominal voltage. Remote control: DC 3.0 V LR03 type battery x2
• Frequency	50/60 Hz
• Power consumption	60 VA
Dimensions and mass	
• Dimensions	Main unit: 188 mm (width) x 300 mm (depth) x 192 mm (height) Remote control: 66 mm (width) × 184 mm (length) × 21 mm (thickness)
• Mass	Main unit: 3.1 kg Remote control: 150 g (including batteries)
Environmental conditions	
• During use	Temperature: 10 to 35°C (50 to 95°F) Humidity: 30 to 90% (non-condensing) Atmospheric pressure: 800 to 1,060 hPa Installation location: Indoors (Ensure that no interference light such as direct sunlight or spot light directly shines on the infrared light receiving window.) Other conditions: No harmful dust or smoke

Environmental conditions	
• During storage	Temperature: -10 to 55°C (14 to 131°F) Humidity: 10 to 95% Atmospheric pressure: 700 to 1,060 hPa
• During transport (packed condition)	Temperature: -30 to 60°C (-22 to 140°F) Humidity: 10 to 95% Atmospheric pressure: 500 to 1,060 hPa Handling instructions: Keep dry, do not turn upside down, handle with care.

Other	
• Expected service life	8 years from the date of initial operation (defined by manufacturer) * Proper maintenance, inspection, and consumable parts replacement are necessary.

Classifications	
• Protection against electrical shock	Main unit: Class I ME equipment Remote control: Internally powered equipment
• Protection against harmful ingress of water or particulate matter	IPX0
• Suitability for use in an oxygen rich environment	ME equipment that is not intended for use in an oxygen rich environment
• Mode of operation	Continuous operation

Accessories	
• Standard accessories	Remote control (34801-3004), screen, polarizing glasses, wood screw (4 units), power cord, remote control battery (2 units), spare fuse (2 units), connector cap, operator's manual
• Optional accessories	Screen angle fixing set Table stand Wall bracket Floor stand Screen angle adjustment bracket Communication cable Red-green glasses Screen stand Reflection mirror

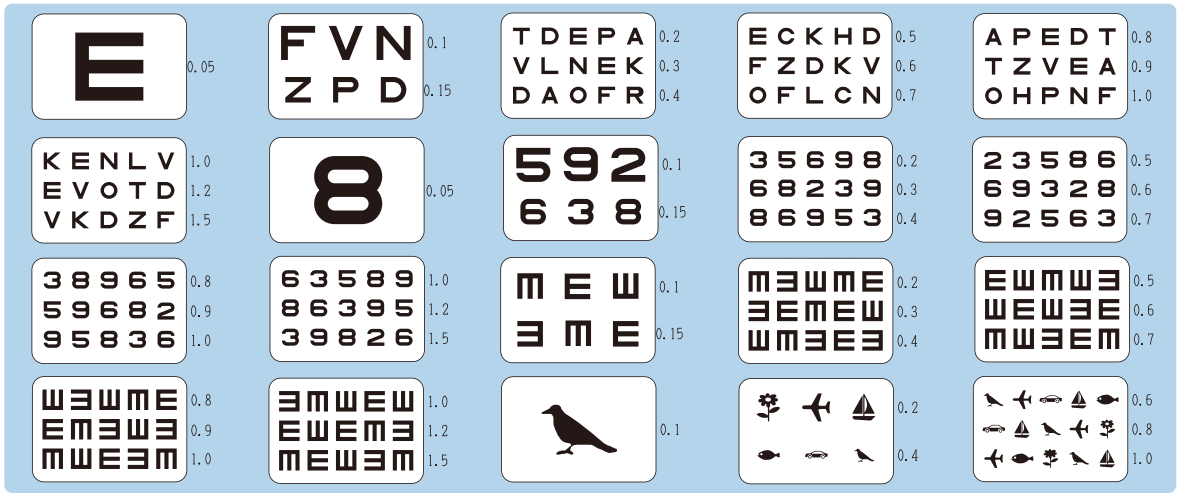
❖ If you need information to ensure cybersecurity, contact Nidek or your authorized distributor.

5.2 Chart Types

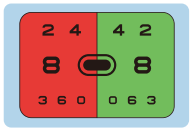
5.2.1 Chart list

◆ Type T

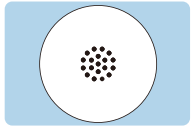
1. VA charts (Letters, Numbers, Tumbling E, Children)



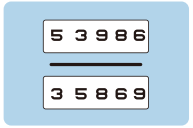
2. Red-green



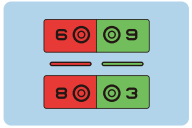
3. Dots



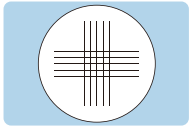
4. Binocular balance



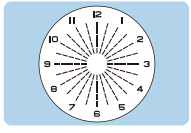
5. Duochrome balance



6. Cross grid



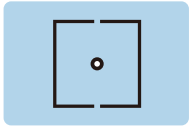
7. Astigmatism clock dial



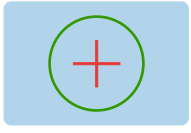
8. Phoria

9. Phoria with fixation

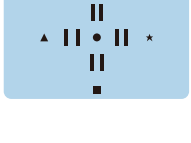
15. Vertical coincidence



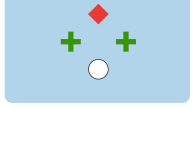
16. Schober



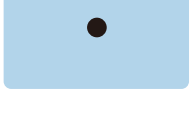
17. Stereo



18. Worth four-dot

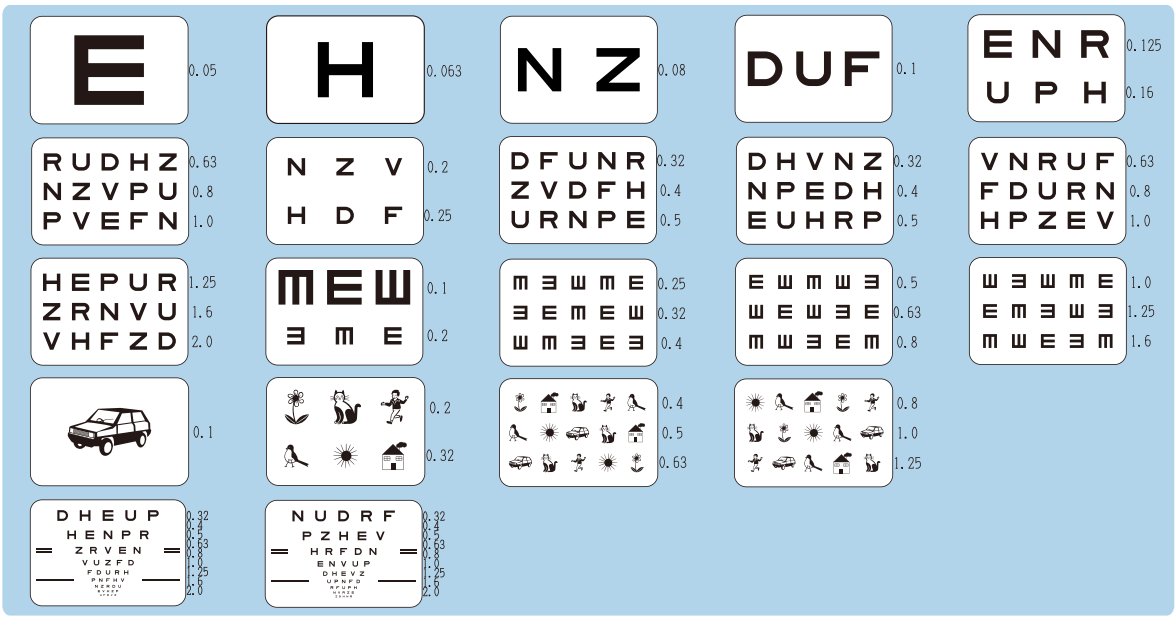


19. Fixation



◆ Type PhM

1. VA charts (Letters, Tumbling E, Children, ETDRS)



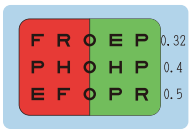
2. Red-green

7. Astigmatism clock dial

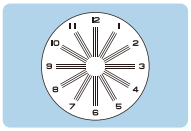
6. Cross grid

5. Duochrome balance

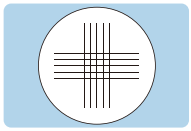
4. Binocular balance



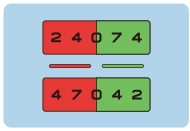
17. Stereo



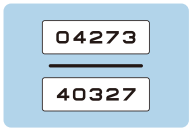
16. Schober



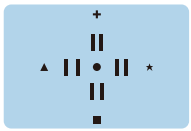
9. Phoria with fixation



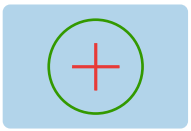
10. Mallett (vertical)



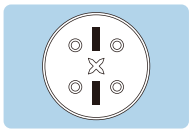
11. Mallett (horizontal)

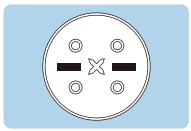


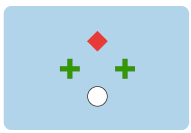
18. Worth four-dot

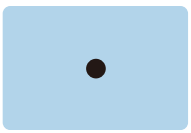


19. Fixation



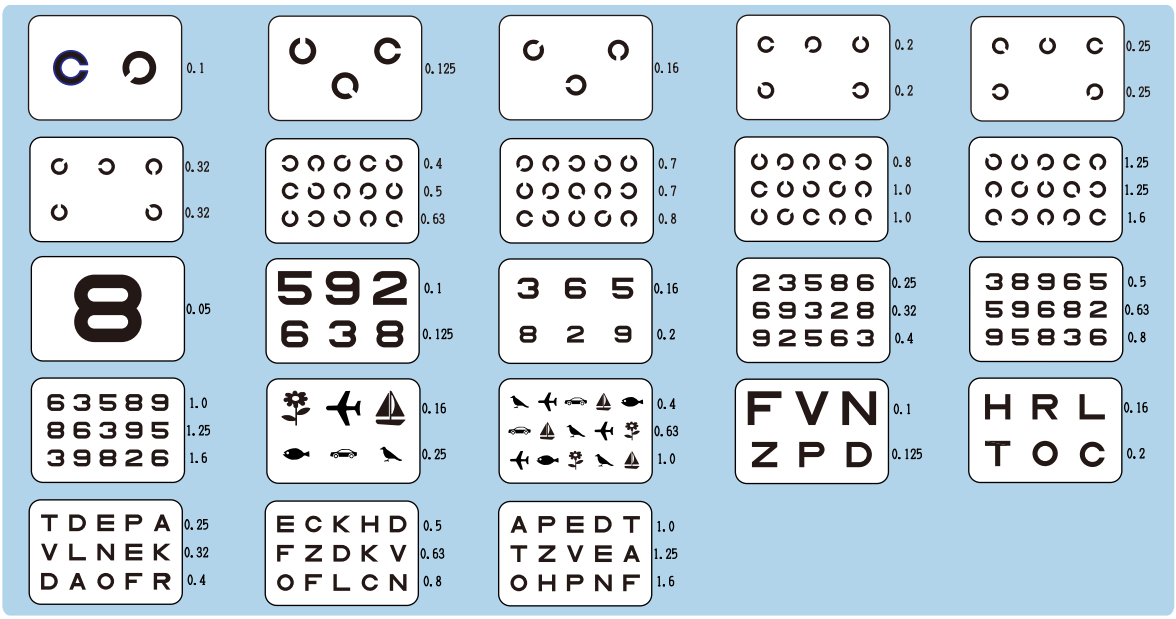






◆ Type G

1. VA charts (Letters, Numbers, Children, Tumbling E, ETDRS)



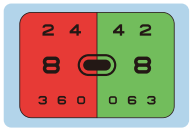
2. Red-green

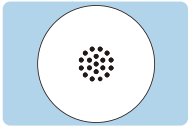
3. Dots

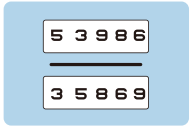
4. Binocular balance

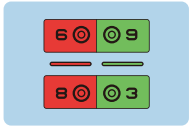
5. Duochrome balance

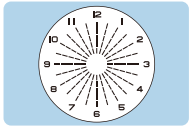
7. Astigmatism clock dial











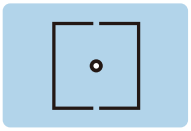
8. Phoria

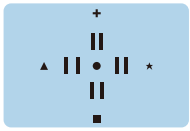
15. Vertical coincidence

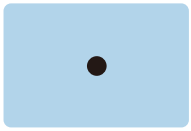
16. Schober

17. Stereo

19. Fixation

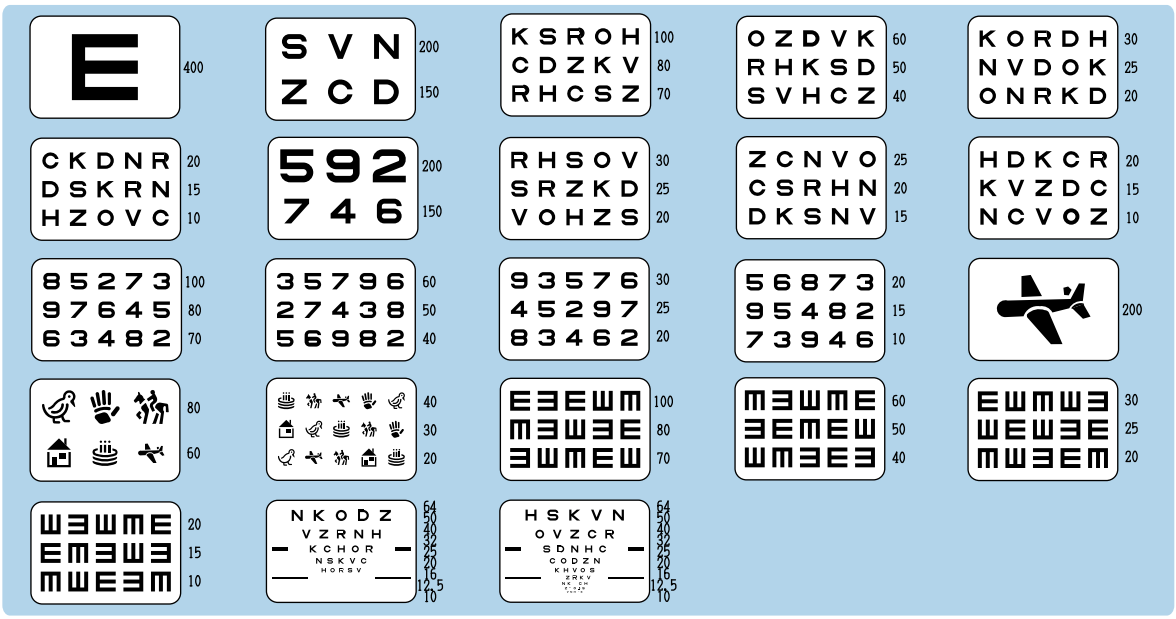




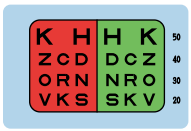


◆ Type M

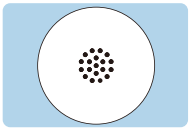
1. VA charts (Letters, Numbers, Children, Tumbling E, ETDRS)



2. Red-green



3. Dots

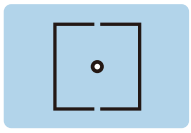


4. Binocular balance

13. Vertical line

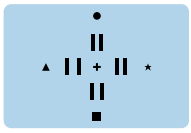
14. Horizontal line

15. Vertical coincidence

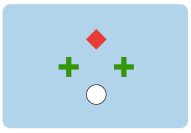


9. Phoria with fixation

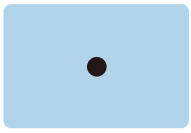
17. Stereo



18. Worth four-dot

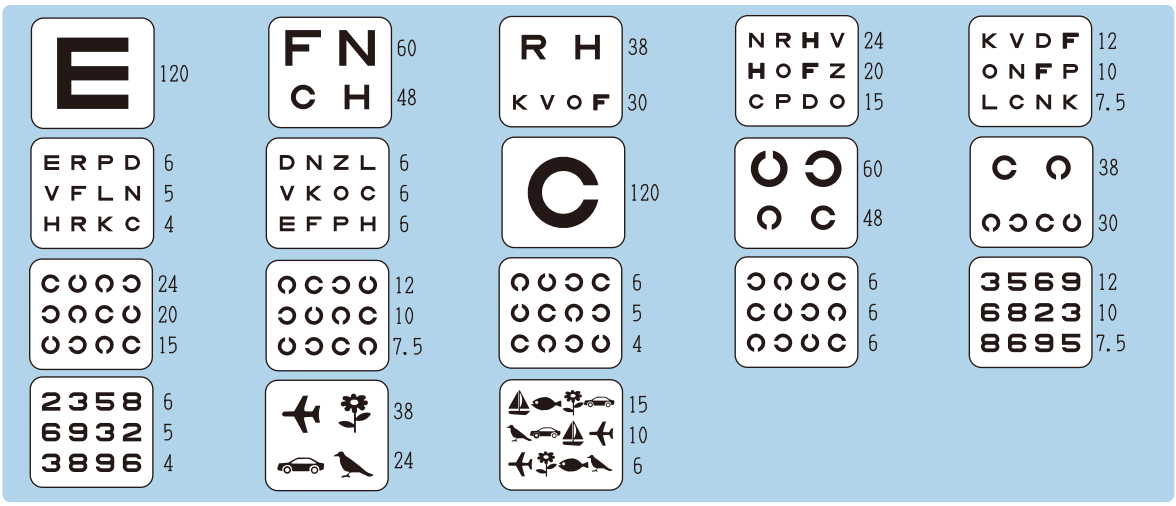


19. Fixation

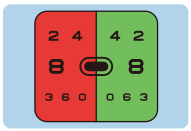


◆ Type UK

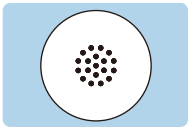
1. VA charts (Letters, Landolt C, Numbers, Children)



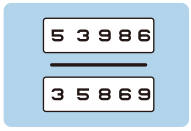
2. Red-green



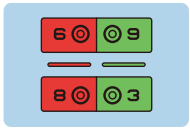
3. Dots



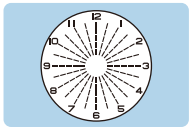
4. Binocular balance



5. Duochrome balance

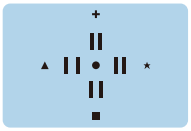


7. Astigmatism clock dial

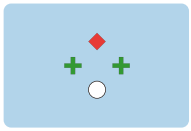


12. Muscle

17. Stereo



18. Worth four-dot



19. Fixation

5

5.2.2 Details on charts

1 Visual acuity (VA)

Purpose	Visual acuity test
Chart type	

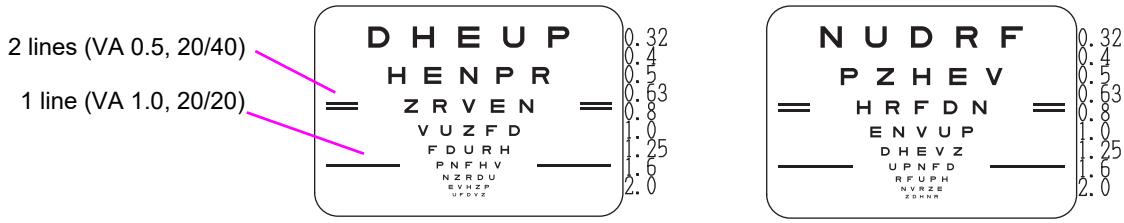
	Type T	Type PhM	Type G	Type M	Type UK
Letters	0.05 to 1.5	0.05 to 2.0	0.1 to 1.6	400 to 10	120 to 4
Landolt C	—	—	0.1 to 1.6	—	120 to 4
Tumbling E	0.1 to 1.5	0.1 to 1.6	—	100 to 10	—
Children	0.1 to 1.0	0.1 to 1.0	0.16 to 1.0	200 to 20	38 to 6
Numbers	0.05 to 1.5	—	0.05 to 1.6	200 to 10	12 to 4
ETDRS	—	0.32 to 2.0	—	64 to 10	—

The ETDRS charts have the following features compared with the conventional charts.

The five letters of the same visual acuity value are presented in one line.

The space between the letters of the same visual acuity value is equal to the width of the letters.

The space between the rows of the different visual acuity value is equal to the height of the letters of the lower row.



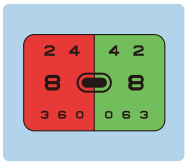
Knowledge

- ETDRS chart

ETDRS (Early Treatment Diabetic Retinopathy Study), invented by ETDRS Research Group (that the USA acts as a leader) is the chart for studying each eye treatment.

2 Red-green (Types T, PhM, G, M, and UK)

Purpose	Spherical refinement in red-green test
Ideal appearance	The letters on the red and green sides appear equally sharp.



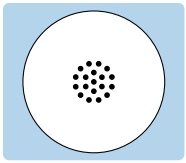
Tip

- Question example: “Which is sharper, the red or the green?”

The letters on the red side appear sharper.	Add minus power.
The letters on the green side appear sharper.	Add plus power.

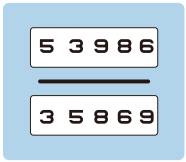
3 Dots

Purpose	To refine the cylinder axis and cylindrical power using the cross cylinder lens
Ideal appearance	Even when the cross cylinder lens is flipped, the clarity of dots does not change.



4 Binocular balance (Types T, PhM, G, M, and UK)

Purpose	To adjust the accommodation balance if necessary when the best-corrected visual acuity is equal in the right and left eyes
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	The letters on the upper and lower rows appear equally clear.



Right eye	Left eye	Binocular ideal appearance	
5 3 9 8 6	3 5 8 6 9	5 3 9 8 6 3 5 8 6 9	The letters on the upper and lower rows appear equally clear.
H R O N C N C K Z O	N C K Z O S V Z D K	H R O N C N C K Z O S V Z D K	(Type M)

Tip

- Question example: “Which is clearer, the upper or the lower?”

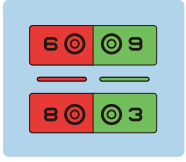
The upper letters appear clearer.	Add +0.25 D sphere to the right eye.
The lower letters appear clearer.	Add +0.25 D sphere to the left eye.

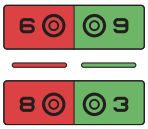
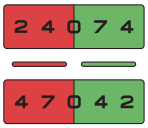
Knowledge

- The letters may differ depending on the chart type.

5 Polarized red-green

Purpose	To adjust the accommodation balance if necessary when the best-corrected visual acuity is equal in the right and left eyes
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	The letters on the upper and lower rows appear equally sharp.

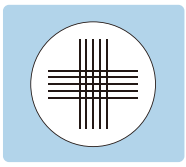


Right eye	Left eye	Binocular ideal appearance	
			The letters on the upper and lower rows appear equally sharp.
			(Type PhM)

All numbers and symbols on the upper and lower rows appear equally sharp.	
The red side appears sharper on the upper and lower rows.	Binocular balance is achieved.
The green side appears sharper on the upper and lower rows.	
The green side appears sharper on the upper row and the red side appears sharper on the lower row.	Add +0.25 D sphere to the right eye.
The red side appears sharper on the upper row and the green side appears sharper on the lower row.	Add +0.25 D sphere to the left eye.

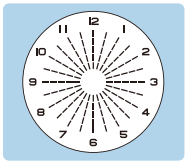
6 Cross grid (Types T and PhM)

Purpose	Spherical refinement
Auxiliary lens	±0.50 D cross cylinder lens (fixed with the axis set at 90°)
Ideal appearance	The vertical and horizontal lines appear equally clear.



7 Astigmatism clock dial chart (Types T, PhM, G, and UK)

Purpose	Cylinder axis refinement
Ideal appearance	All bars appear equally clear.



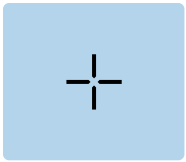
Tip

• Question example: “Does any bar appear especially clearer than the others?”

One of the bars appears clearer.	Determine the orientation of the minus cylinder axis by multiplying the smaller number (1-6) beside the clearer bar by 30°. Example) When Bar 2 appears clearer: 2×30° = 60°

8 Phoria

Purpose	To detect and correct horizontal and vertical phoria
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	A cross is seen.



Right eye	Left eye	Binocular ideal appearance
		 (Orthophoria)

Tip

- Question example:
  - "Can you see four bars?": "Yes" ☞ Testing can be continued. / "No" ☞ Testing cannot be continued.
  - "Do the vertical and horizontal bars form a cross at the center?": "Yes" ☞ Orthophoria / "No" ☞ Heterophoria
  - "Are the vertical bars shifted to the right or left?": "Shifted to the right" ☞ Esophoria / "Shifted to the left" ☞ Exophoria
  - "Are the horizontal bars shifted upward or downward?": Shifted upward ☞ Right eye hyperphoria / "Shifted downward" ☞ Left eye hyperphoria / "Not vertically shifted" ☞ No vertical phoria

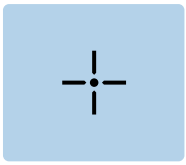
If a cross is not seen, adjust the following:

Phoria	Appearance	Procedure
Esophoria		Add the BO prism until the vertical bars are centered in the horizontal bars.
Exophoria		Add the BI prism until the vertical bars are centered in the horizontal bars.
Left eye hyperphoria		Add the BU prism to the right eye and the BD prism to the left eye until the horizontal bars are centered in the vertical bars.
Right eye hyperphoria		Add the BD prism to the right eye and the BU prism to the left eye until the horizontal bars are centered in the vertical bars.
Esophoria + Right eye hyperphoria		Correct the horizontal phoria in the same manner as for esophoria and the vertical phoria in the same manner as for right eye hyperphoria.
Esophoria + Left eye hyperphoria		Correct the horizontal phoria in the same manner as for esophoria and the vertical phoria in the same manner as for left eye hyperphoria.
Exophoria + Right eye hyperphoria		Correct the horizontal phoria in the same manner as for exophoria and the vertical phoria in the same manner as for right eye hyperphoria.

Exophoria + Left eye hyperphoria		Correct the horizontal phoria in the same manner as for exophoria and the vertical phoria in the same manner as for left eye hyperphoria.

9 Phoria with fixation (Types T, PhM, and M)

Purpose	To detect and correct heterophoria by giving stimuli for fusion
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	A cross is seen.



Right eye	Left eye	Binocular ideal appearance
		 (Orthophoria)

Tip

- Question example:
  - “Can you see four bars?”: “Yes” ☞ Testing can be continued. / “No” ☞ Testing cannot be continued.
  - “Do the vertical and horizontal bars form a cross at the center?”: “Yes” ☞ Orthophoria / “No” ☞ Heterophoria
  - “Are the bars vertically aligned?”: “Yes” ☞ No horizontal phoria / “No” ☞ Horizontal phoria
  - “Is the top bar shifted to the right or left of the bottom bar?”: “Shifted to the right” ☞ Esophoria / “Shifted to the left” ☞ Exophoria
  - “Are the bars horizontally aligned?”: “Yes” ☞ No vertical phoria / “No” ☞ Vertical phoria

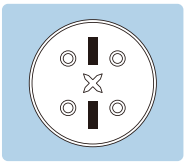
If a cross is not seen, adjust the following:

Phoria	Appearance	Procedure
Esophoria		Add the BO prism until the bars are vertically aligned.
Exophoria		Add the BI prism until the bars are vertically aligned.
Left eye hyperphoria		Add the BU prism to the right eye and the BD prism to the left eye until the bars are horizontally aligned.
Right eye hyperphoria		Add the BD prism to the right eye and the BU prism to the left eye until the horizontal bars are centered in the vertical bars.
Esophoria + Right eye hyperphoria		Correct the horizontal phoria in the same manner as for esophoria and the vertical phoria in the same manner as for right eye hyperphoria.

Esophoria + Left eye hyperphoria		Correct the horizontal phoria in the same manner as for esophoria and the vertical phoria in the same manner as for left eye hyperphoria.
Exophoria + Right eye hyperphoria		Correct the horizontal phoria in the same manner as for exophoria and the vertical phoria in the same manner as for right eye hyperphoria.
Exophoria + Left eye hyperphoria		Correct the horizontal phoria in the same manner as for exophoria and the vertical phoria in the same manner as for left eye hyperphoria.

10 Mallet (horizontal phoria) (Type PhM)

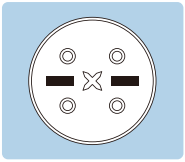
Purpose	To detect and correct heterophoria by giving stimuli for fusion
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	The two bars appear vertically aligned.

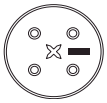
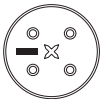


Right eye	Left eye	Binocular ideal appearance
		 (Orthophoria)

11 Mallet (vertical phoria) (Type PhM)

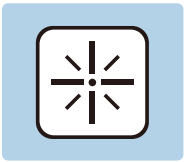
Purpose	To detect and correct heterophoria by giving stimuli for fusion
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	The two bars appear horizontally aligned.



Right eye	Left eye	Binocular ideal appearance
		 (Orthophoria)

12 Muscle (Type UK)

Purpose	To detect and correct heterophoria by giving stimuli for fusion
Auxiliary lens	Polarizing filter 135º for the right eye and 45º for the left eye
Ideal appearance	The bars appear vertically and horizontally aligned.



Right eye	Left eye	Binocular ideal appearance
		 (Orthophoria)

13 Vertical line (Type M)

Purpose	To detect and correct horizontal phoria (Von Graefe test)
Auxiliary lens	6ΔBU prism for the right eye
Ideal appearance	The two columns appear vertically aligned.

Right eye	Left eye	Binocular ideal appearance
		

Tip

- Question example: “Can you see two vertical columns? Are they vertically aligned?”

If the position is shifted, adjust the following:

Phoria	Appearance	Procedure
Esophoria (The upper column is shifted to the left.)		Add the BO prism to the left eye until the two columns are vertically aligned.
Exophoria (The upper column is shifted to the right.)		Add the BI prism to the left eye until the two columns are vertically aligned.

14 Horizontal line (Type M)

Purpose	To detect and correct vertical phoria (Von Graefe test)
Auxiliary lens	10ΔBI prism for the left eye
Ideal appearance	The two rows appear horizontally aligned.

Right eye	Left eye	Binocular ideal appearance

Tip

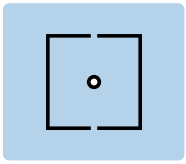
- Question example: “Can you see two horizontal rows? Are they horizontally aligned?”

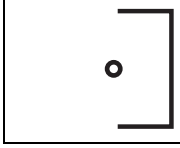
If the position is shifted, adjust the following:

Phoria	Appearance	Procedure
Right eye hyperphoria (The left row is higher.)	ZSOKN ZSOKN	Add the BD prism to the right eye until the two rows are horizontally aligned.
Left eye hyperphoria (The right row is higher.)	ZSOKN ZSOKN	Add the BU prism to the right eye until the two rows are horizontally aligned.

15 Vertical coincidence (Types T, G, and M)

Purpose	To detect aniseikonia and correct vertical phoria
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	• The right and left frames appear the same in size. • The right and left frames appear the same in height.



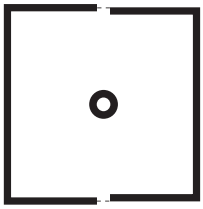
Right eye	Left eye	Binocular ideal appearance
		 (No aniseikonia, orthophoria)

❖ Detection of aniseikonia

Ask the patient whether the right and left frames appear the same in size.

(Example) 3.5% aniseikonia

The width of a line corresponds to approximately 3.5% aniseikonia.



Knowledge

- When the aniseikonia is due to anisometropia (refractive error difference of 2.00 D or greater between the right and left eyes), a spectacle lens prescription is suitable for axial anisometropia, and contact lens prescription is suitable for refractive anisometropia.

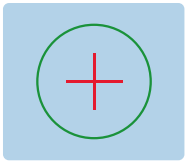
❖ To detect and correct vertical phoria

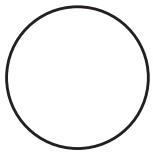
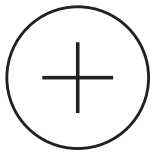
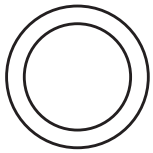
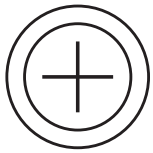
Ask the patient whether the right and left frames appear the same in height. If the frames are vertically shifted, adjust the following:

Phoria	Appearance	Procedure
Right eye hyperphoria (The left frame is higher.)		Add the BD prism to the right eye and the BU prism to the left eye until the right and left frames are vertically aligned.
Left eye hyperphoria (The right frame is higher.)		Add the BU prism to the right eye and the BD prism to the left eye until the right and left frames are vertically aligned.

16 Schober (Types T, PhM, and G)

Purpose	To detect and correct phoria
Auxiliary lens	Red filter for the right eye and green filter for the left eye
Ideal appearance	A cross is seen in the center.

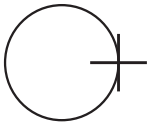
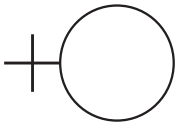
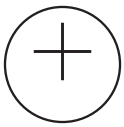
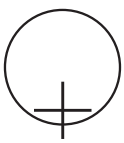


Right eye	Left eye	Binocular ideal appearance
		 A cross is seen in the center.
		 (Type G)

Tip

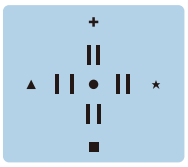
- Question example:
  - "Can you see the green circle with a red cross?": "Yes" ☞ Testing can be continued. / "No" ☞ Testing cannot be continued.
  - "Is the cross in the center of the circle?": "Yes" ☞ Orthophoria / "No" ☞ Heterophoria
  - "Is the cross shifted to the right or left?": "Shifted to the right" ☞ Esophoria / "Shifted to the left" ☞ Exophoria / "Not horizontally shifted" ☞ No horizontal phoria
  - "Is the cross shifted upward or downward?": Shifted upward ☞ Left eye hyperphoria / "Shifted downward" ☞ Right eye hyperphoria / "Not vertically shifted" ☞ No vertical phoria

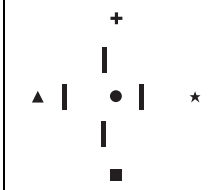
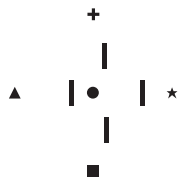
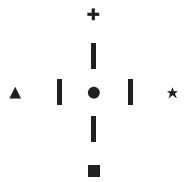
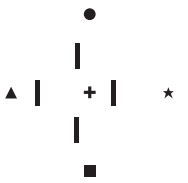
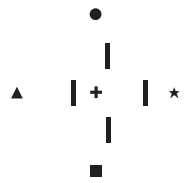
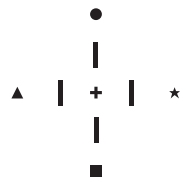
If the position is shifted, adjust the following:

Phoria	Appearance	Procedure
Esophoria (The cross is shifted to the right.)		Add the BO prism until the cross is seen in the center of the circle.
Exophoria (The cross is shifted to the left.)		Add the BI prism until the the cross is seen in the center of the circle.
Left eye hyperphoria (The cross is shifted upward.)		Add the BU prism to the right eye and the BD prism to the left eye until the cross is seen in the center of the circle.
Right eye hyperphoria (The cross is shifted downward.)		Add the BD prism to the right eye and the BU prism to the left eye until the cross is seen in the center of the circle.

17 Stereo (Types T, PhM, G, M, and UK)

Purpose	To detect stereoscopic vision
Auxiliary lens	Polarizing filter 135° for the right eye and 45° for the left eye
Ideal appearance	The vertical bar with a cross (circle) appears closest and then in the order of the vertical bars with a star, square, and triangle.

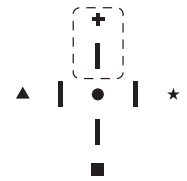
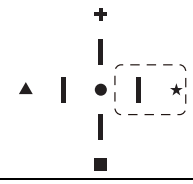
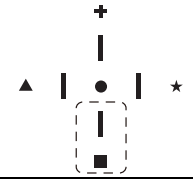
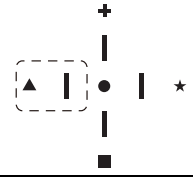


Right eye	Left eye	Binocular ideal appearance
		 The vertical bar with a cross appears closest and then in the order of the vertical bars with a star, square, and triangle.
		 The vertical bar with a circle appears closest and then in the order of the vertical bars with a star, square, and triangle. (Type M)

Tip

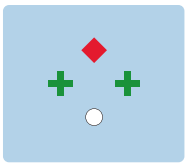
- Question example: “Do the vertical bar with a cross (circle) appear closest and then in the order of the vertical bars with a star, square, and triangle with respect to the cross in the center?”

Ask the patient whether the vertical bar with a cross (circle) appears closest and then in the order of the vertical bars with a star, square, and triangle with respect to the cross in the center.

Bar position		Stereoparallax
Vertical bar with a cross		The stereoparallax from the vertical bar with a circle is 10 minutes.
Vertical bar with a star		The stereoparallax from the vertical bar with a cross is 1 minute.
Vertical bar with a square		The stereoparallax from the vertical bar with a star is 2 minutes.
Vertical bar with a triangle		The stereoparallax from the vertical bar with a square is 4 minutes.

18 Worth four-dot (Types T, PhM, G, and UK)

Purpose	To detect fusion or suppression
Auxiliary lens	Red filter for the right eye and green filter for the left eye
Ideal appearance	A red diamond, green pluses, and a pink or red/green circle are seen.

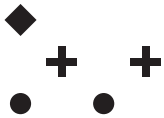
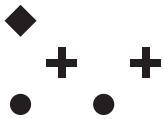
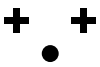


Right eye	Left eye	Binocular ideal appearance
 A red diamond and a red circle	 Green pluses and a green circle	 A red diamond, green pluses, and a pink or red/green circle

Tip

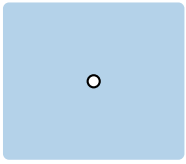
- Question example: “How many bright spots can you see? What colors are they?”

Check the number, shape, and color of bright spots.

Determination	Appearance	Procedure
Fusion (four spots)		A red diamond, green pluses, and a pink or alternate red/green circle are seen. However, if the patient has an obvious dominant eye: Right dominant eye=> Red circle Left dominant eye=> Green circle
Right eye suppression (three spots)		Two green pluses and a green circle are seen.
Left eye suppression (two spots)		A red diamond and a red circle are seen.
Diplopia (five spots)		Red  and green  are seen at the same time.
Alternate suppression (five spots). Right eye suppression and left eye suppression appear alternately.		Red  and green  are seen alternately.

19 Fixation point (Types T, PhM, G, M, and UK)

Purpose	To detect and correct horizontal phoria (Maddox method)
Auxiliary lens	Horizontal Maddox rod for the right eye
Ideal appearance	A white spot is seen in the center.



Right eye	Left eye	Binocular ideal appearance
		 A white spot is seen in the center.

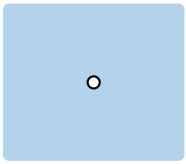
Tip

- Question example: “Is the white spot shifted to the right or left of the red rod? or is it on the red rod?”

If the white spot is horizontally shifted, adjust the following:

Phoria	Appearance	Procedure
Esophoria (The white spot is shifted to the left.)		Add the BO prism until the white spot appears to be completely within the red rod.
Exophoria (The white spot is shifted to the right.)		Add the BI prism until the white spot appears to be completely within the red rod.

Purpose	To detect and correct vertical phoria (Maddox method)
Auxiliary lens	Vertical Maddox rod for the left eye
Ideal appearance	A white spot is seen in the center.



Right eye	Left eye	Binocular ideal appearance
		 A white spot is seen in the center.

Tip

- Question example: “Is the white spot shifted upward or downward? or is it on the red rod?”

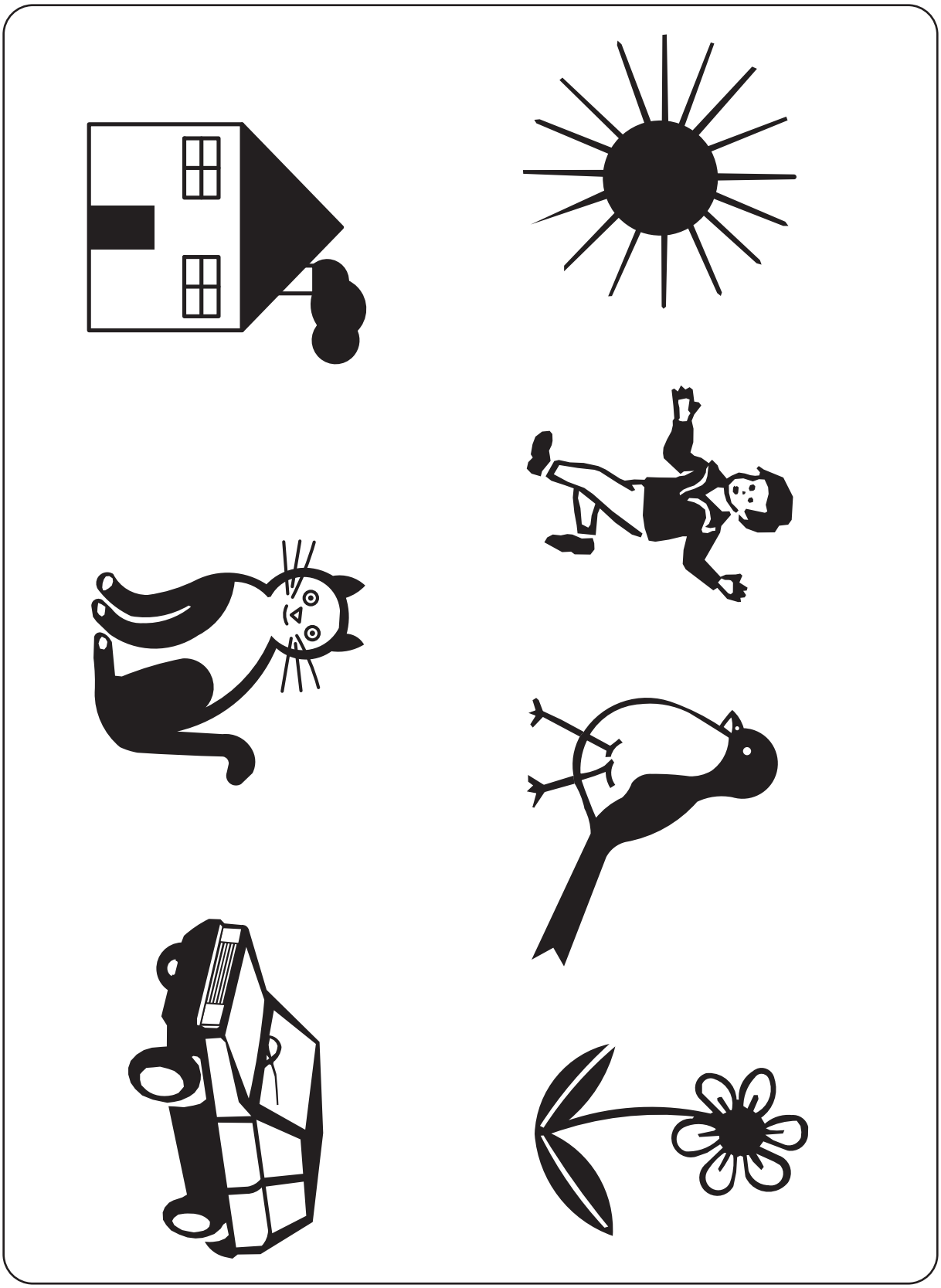
If the white spot is vertically shifted, adjust the following:

Phoria	Appearance	Procedure
Left eye hyperphoria (The white spot is shifted upward.)		Add the BU prism to the right eye until the white spot appears to be completely within the red rod.
Right eye hyperphoria (The white spot is shifted downward.)		Add the BD prism to the right eye until the white spot appears to be completely within the red rod.

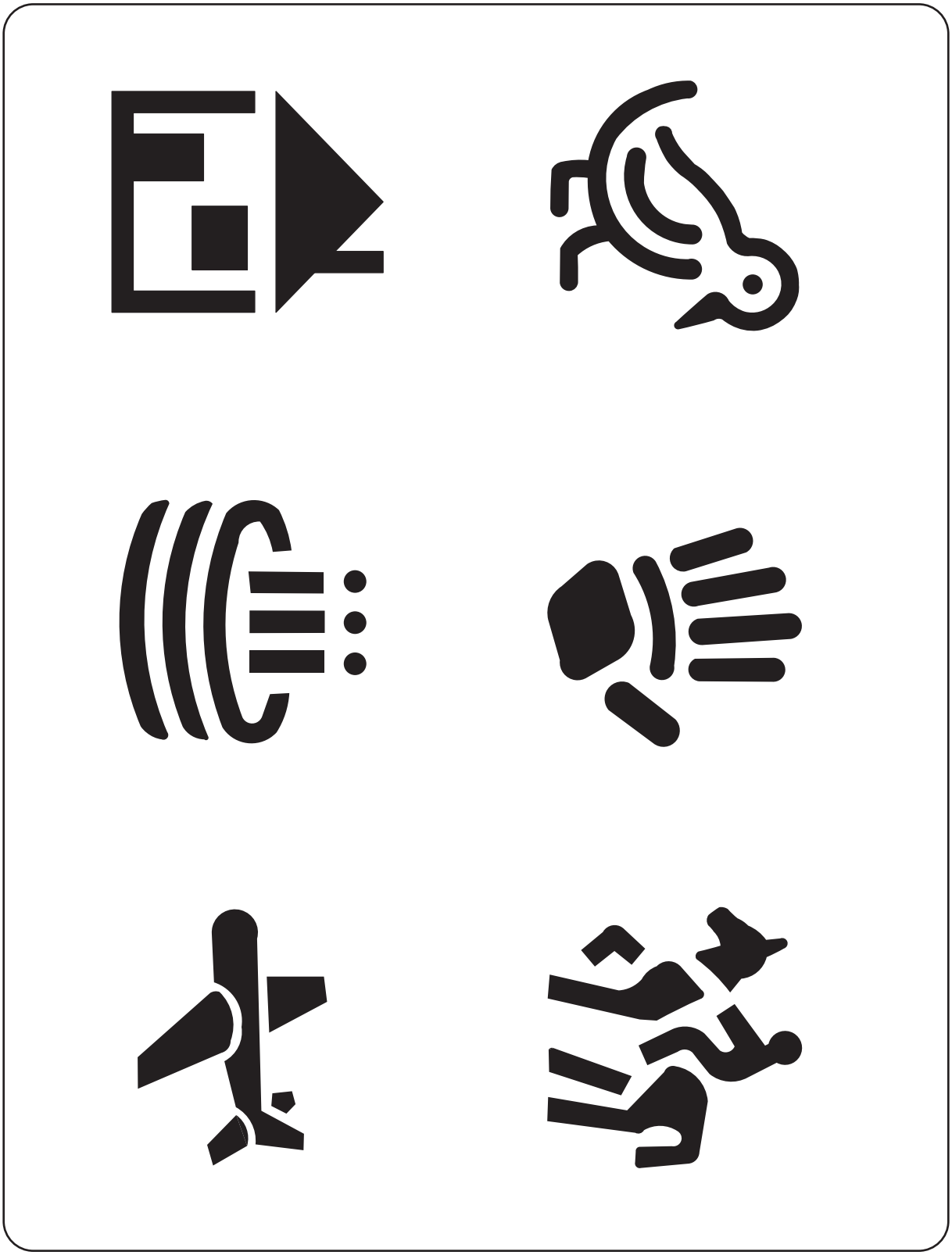
5.3 Children Chart Samples

For the children's charts of Types T, G, and UK, copy this page and use it when testing the visual acuity of children. For very young children, ask the patient to point to the illustration that they see on the screen.

For the children's charts of Type PhM, copy this page and use it when testing the visual acuity of children. For very young children, ask the patient to point to the illustration that they see on the screen.



For the children’s charts of Type M, copy this page and use it when testing the visual acuity of children. For very young children, ask the patient to point to the illustration that they see on the screen.



5.4 Glossary

The following terms and abbreviations are used for the device and operator's manual.

Term	
Red-green glasses	Glasses equipped with red-green filters used in the visual function test
Fogging	Technique of adding plus sphere power during refraction to control accommodation
Full corrective power	Clearest vision power
Cross cylinder	A lens consisting of two cylinders of equal power but of opposite designation, one being plus and the other minus, their axes set 90 degrees apart
Refraction distance	Distance from the patient's eyes to the screen
Control box	Operation input terminal to control the motorized refractor
Circle of least confusion	Position that is approximately in the middle of the anterior and posterior focal lines and provides the best image for astigmatic eyes
Screen	Diffuse reflector on which a chart is projected
Chart	Figures and symbols for the visual function test
Projection distance	Distance from the front of the device to the screen (installation distance)
Power indicator	A light indicating that the device is energized
Program	Presentation of charts in a preset order for examination
Polarizing glasses	Glasses equipped with polarizing filters used in the stereoscopic vision test
Masking function	Function to isolate a vertical line, horizontal line, or a single letter in the VA chart
Lamp auto off function	Function to turn the lamp off automatically when no operation continues
Stereo chart	A chart for testing stereopsis of binocular function

Abbreviation	
BD	Base Down
BI	Base In
BO	Base Out
BU	Base Up
CP	Chart Projector
D	Diopter
EMC	Electro-Magnetic Compatibility

Abbreviation	
LED	Light Emitting Diode
ME	Medical Electrical
PD	Pupillary Distance
RF	Radio Frequency
HF	High Frequency
RT	Refractor
VA	Visual Acuity

5.5 EMC (Electromagnetic Compatibility)

■ The device is suitable for use in stores and hospitals except for near active HF surgical equipment and RF shielded rooms with an ME system for magnetic resonance imaging, where the intensity of electromagnetic disturbances is high, electrophysiology laboratories, or areas where short-wave therapy equipment is used.

⚠ WARNING

- Do not use the device near, on, or under other electronic equipment or electromagnetic disturbance sources. Otherwise, it could result in improper operation. If such use is necessary, the device and the other equipment should be observed to verify that they are operating normally.
- Use of accessories, cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and cause improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) or electromagnetic disturbance sources as shown below should be used no closer than 30 cm (12 inches) to any part of the device, including the specified or provided cables. Otherwise, degradation of the performance of this equipment could result.
  The following are examples of electromagnetic disturbance sources:
  - Induction cooking appliance and ovens
  - RFID readers
  - Electronic article surveillance (EAS) systems
  - Sponge detection systems
  - Equipment used for position detection (e.g. in catheter labs)
  - Wireless power transfer charging systems for electrical vehicles

◆ Specified accessories

Part name
Remote control

◆ Specified cables

Part name	Cable shielded	Ferrite core	Length (m)
Power cord	No	No	2.5

◆ Essential performance

None

◆ Compliance for Emission Standard

Phenomenon	Product family standard	Compliance
Conducted and radiated RF emissions	CISPR 11	Group 1 Class B
Harmonic distortion	IEC 61000-3-2	*1
Voltage fluctuations and flicker	IEC 61000-3-3	*2

* 1 For the regions where the rated voltage is 220 V to 240 V, this device complies with this standard.
* 2 For the regions where the rated voltage (line to neutral) is 220 V to 250 V, this device complies with this standard.

◆ Test specifications for enclosure port immunity to RF wireless communications equipment

Test frequency (MHz)	Band (MHz)	Service	Modulation	Immunity test level (V/m)
385	380 to 390	TETRA 400	Pulse modulation 18 Hz	27
450	430 to 470	GMRS 460, FRS 460	FM ±5 kHz deviation 1 kHz sine	28
710	704 to 787	LTE Band 13, 17	Pulse modulation 217 Hz	9
745				
780				
810	800 to 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	28
870				
930				
1720	1700 to 1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation 217 Hz	28
1845				
1970				
2450	2400 to 2570	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band 7	Pulse modulation 217 Hz	28
5240	5100 to 5800	WLAN 802.11 a/n	Pulse modulation 217 Hz	9
5500				
5785				

◆ Compliance for Immunity Standard

Phenomenon	Basic EMC standard	Immunity test levels
Electrostatic discharge	IEC 61000-4-2	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air
Radiated RF electromagnetic field	IEC 61000-4-3	10 V/m 80 MHz - 2.7 GHz 80% AM at 1 kHz
Proximity fields from RF wireless communications equipment	IEC 61000-4-3	See “Test specifications for enclosure port immunity to RF wireless communications equipment”.
Electrical fast transients / bursts	IEC 61000-4-4	Input power port ±2 kV 100 kHz repetition frequency
		Signal input/output parts port ±1 kV 100 kHz repetition frequency
Surges Line-to-line	IEC 61000-4-5	Input power port ±0.5 kV, ±1 kV
Surges Line-to-ground		Input power port ±0.5 kV, ±1 kV, ±2 kV Signal input/output parts port ±2 kV
Conducted disturbances induced by RF fields	IEC 61000-4-6	3 V 0.15 MHz – 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz 80% AM at 1 kHz
Rated power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz
Voltage dips	IEC 61000-4-11	0% U_T; 0.5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°
		0% U_T; 1 cycle and 70% U_T; 25/30 cycles Single phase: at 0°
Voltage interruptions	IEC 61000-4-11	0% U_T; 250/300 cycles

6 APPENDIX: INSTALLATION

This chapter describes the explanation for the service personnel to install or move the device conveniently.

⚠ CAUTION

- If you have any questions about device installation or movement, contact Nidek or your authorized distributor.

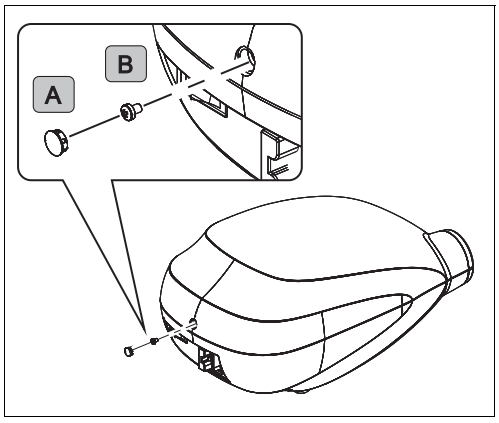
6.1 Removing or Attaching the Top Cover

Device setting includes adjustments of the internal electric board and the lens barrel with the top cover removed.

◆ Removing the top cover

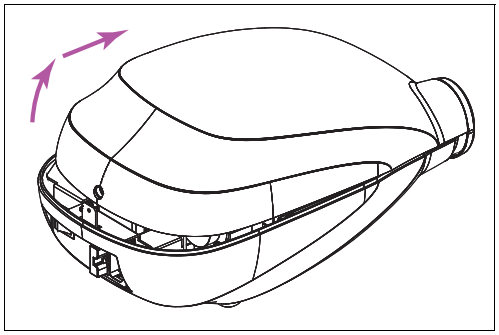
1 Confirm that the power switch is turned off (◯).

2 Remove the cap [A], then loosen the top cover mounting screw [B] with a Phillips screwdriver to remove it.

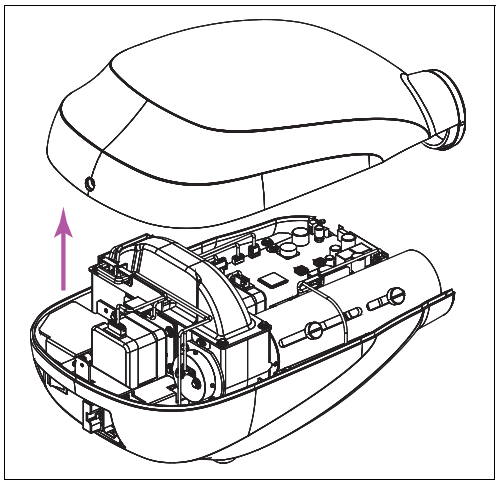


3 Remove the top cover.

1) Slide the top cover toward the front to remove it while lifting its rear.



2) Lift up the top cover to remove it.



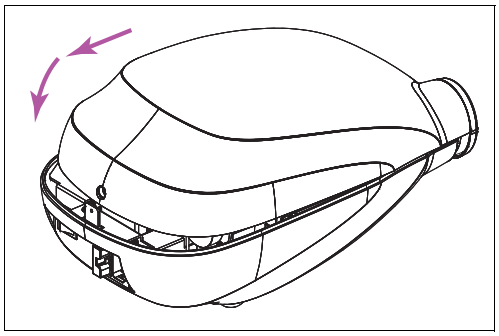
◆ Attaching the top cover

1 Confirm that the power switch is turned off (◯).

2 Place the top cover on the device in alignment with the position of the lens barrel.

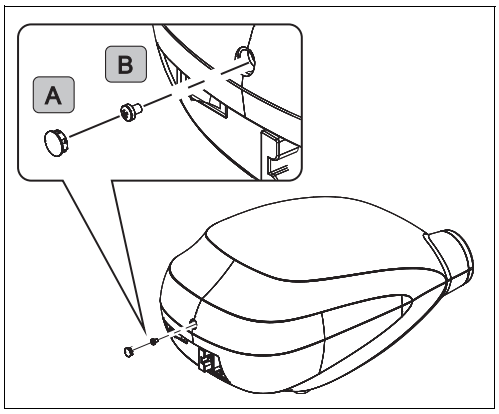
With the front fitted to the device, slide it toward the rear.

3 Align the top cover with the bottom cover.



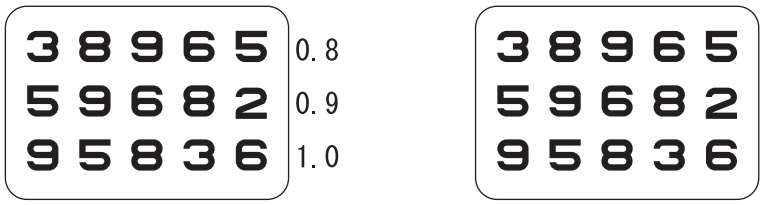
4 Attach the top cover with the top cover mounting screw [B], then fit the cap [A].

5 Turn the device on to confirm that the device functions properly.



6.2 Turning On/Off VA Values on VA Chart

VA values beside the VA chart can be turned on or turned off.



Turned on | Turned off

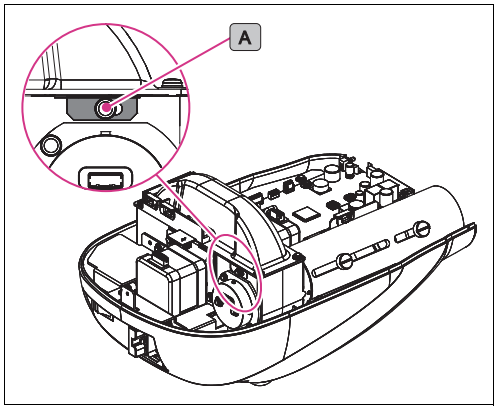
⚠ CAUTION

- Do not touch the internal structure of the device in the procedure other than specified.
  Electric shock or malfunction may occur.

1 Remove the top cover.

2 Turn on (|) the power switch to project a chart on the screen.

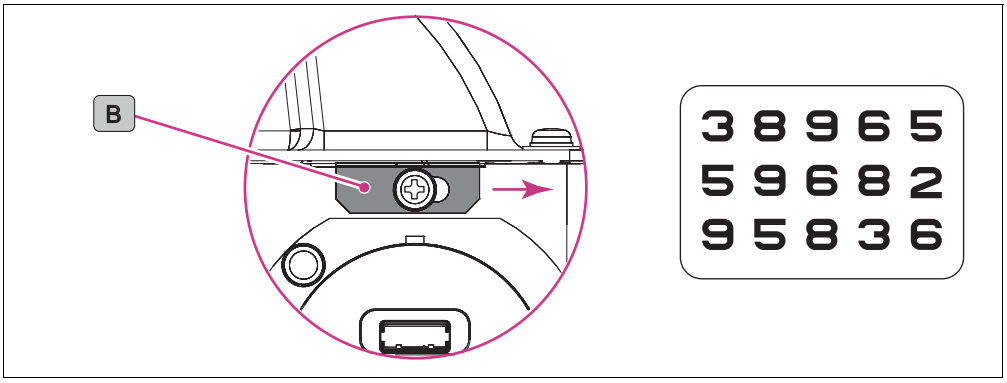
3 Slightly loosen the screw [A] right above the light source with a Phillips screwdriver.



4 Slide the black plate [B] to turn on or off the VA values.

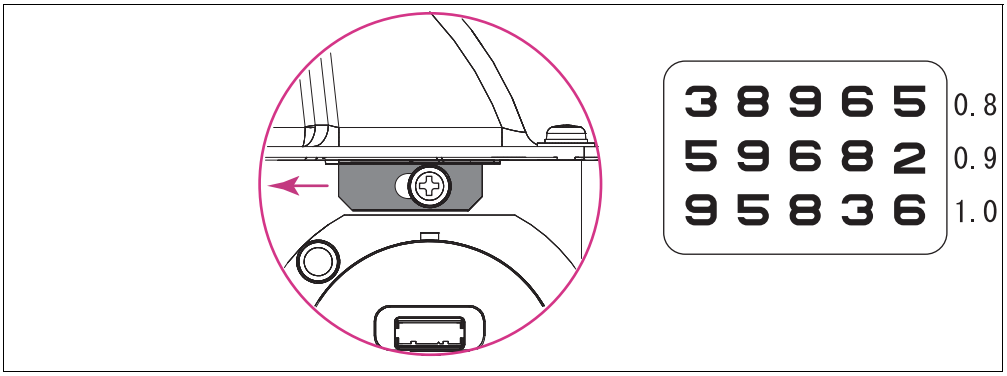
❖ Turning off VA values

Slide the black plate to the right, then lightly tighten the screw.



❖ Turning on VA values

Slide the black plate to the left, then lightly tighten the screw.



5 Switch the VA charts or apply masking to check the VA chart for chipping or light leakage.

If any chipping or light leakage is found, finely adjust the position of the black plate described in Step 4.

6 Tighten the screw to fasten the black plate.

7 Attach the top cover.

6.3 Setting Remote Control Channels

When two or more units of the CP-9 or other Nidek remote-controlled optometry systems are used in the same room, and the same remote control channels are used, device failure may occur due to interference. In this case, set different channels for each remote control.

❖ Setting remote control channels

Eight channels are available for the remote control channels. The same channels must be set for the remote control and the main unit.

Remote control channel	Main unit Rotary switch SW3	Remote control Rotary switch
0: (first unit)	0 (or 8)	0 (or 8)
1: (second unit)	1 (or 9)	1 (or 9)
2: (third unit)	2	2
3: (fourth unit)	3	3
4: (fifth unit)	4	4
5: (sixth unit)	5	5
6: (seventh unit)	6	6
7: (eighth unit)	7	7

The remote control channel is set to “0: (first unit)” for the default setting.

Setting

- When the CP-9 is used concurrently with the Nidek CP-670 that has four remote control channels, assign the remote control channels to No. 1 to No. 4. Assign the other channels to the CP-9.

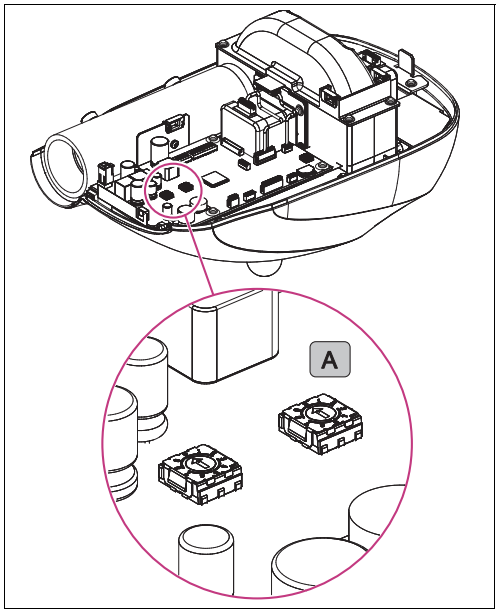
◆ Setting remote control channels of main unit

1 Turn off (◯) the power switch, then disconnect the power cord from the power outlet.

2 Remove the top cover.

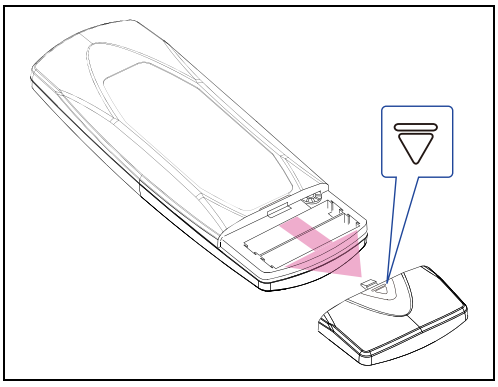
3 Follow the table above to set the rotary switch SW3 [A] on the printed circuit board.

4 Attach the top cover.

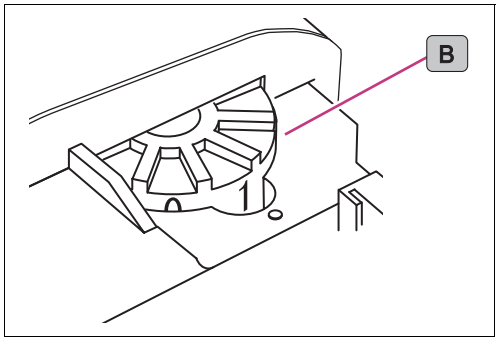


◆ Setting remote control channels of remote control

1 Slide down the battery cover to remove it while pressing the part ▽ on the underside of the remote control.



2 Follow the table to set the rotary switch B for the remote control channel to match the setting of the main unit.



3 Check that the main unit can be controlled by the remote control, then reattach the main unit and remote control covers.

6.4 Device Installation

Device installation includes the following:

1. Positioning of the patient, screen, and CP-9 *(page 85)*
2. Adjustment of the projection size and focus of the chart *(page 90)* *(page 91)*
3. Setting of the lamp brightness *(page 92)*
4. Adjustment of the lamp brightness according to the situation *(page 93)*

6.4.1 Installing the CP-9 according to refraction distance

This section explains how to position the screen and the CP-9 according to the refraction distance.

Install the CP-9 in the installation range (the distance from the screen to the front of the device) corresponding to the refraction distance.

In the installation range, the chart can be projected with the size corresponding to the refraction distance.

⚠ CAUTION

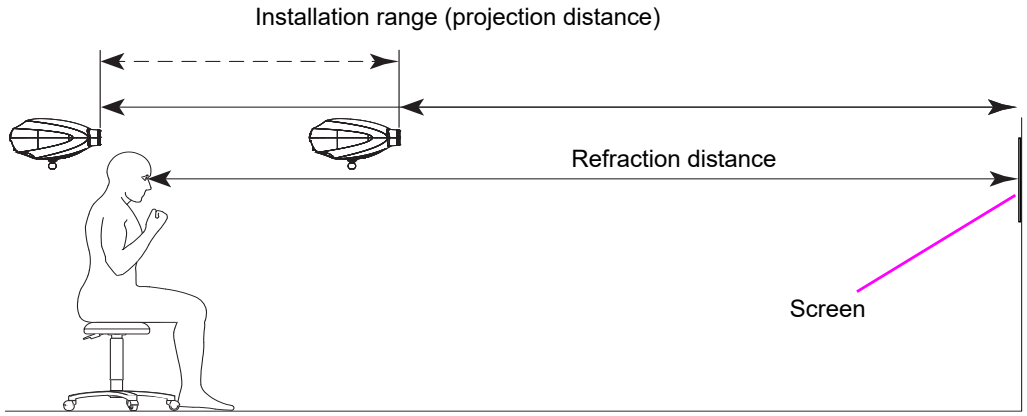
- Be sure to adjust the lamp brightness according to the refraction distance and projection distance after installing the device.
  The proper chart luminance cannot be obtained, resulting in incorrect examination.
  For details, *"6.4.6 Setting the lamp brightness according to refraction distance and projection distance" (page 92)*

Installation range of CP-9 corresponding to refraction distance (distance from screen)

30x/25x variable magnification type

Refraction distance		2.9 m	3 m	3.5 m	4 m	4.5 m
Installation range (projection distance)	Type UK	2.4 m to 3.1 m	2.5 m to 3.3 m	2.8 m to 3.7 m	3.2 m to 4.2 m	3.5 m to 4.7 m
	Other than UK	2.9 m to 3.9 m	3.0 m to 4.0 m	3.4 m to 4.7 m	3.9 m to 5.3 m	4.3 m to 5.9 m

5 m	5.5 m	6 m	6.1 m
3.9 m to 5.4 m	4.3 m to 5.8 m	4.7 m to 6.4 m	4.8 m to 6.5 m
4.8 m to 6.6 m	5.3 m to 7.3 m	5.7 m to 7.9 m	5.8 m to 8.0 m



30X fixed magnification type

Refraction distance	2.9 m to 6.1 m	
Installation range (projection distance)	2.9 m to 6.1 m	The refraction distance and the installation range must be the same for the fixed magnification type.

Setting

- Install the CP-9 at the same height as the patient's eyes. If the height cannot be properly adjusted, tilt the CP-9 slightly up and down so that the height of the projected chart is the same as the patient's eye height.
- Adjust the stand horizontally to prevent the CP-9 from tilting.

6.4.2 Screen installation

Adjust the mounting angle of the screen according to the position of the main unit and the patient so that the chart looks bright and clear.

❖ Installing the screen directly to a wall

Install the screen with the provided wood screws (4 units). In this case, adjust the angle with the position of the patient and the installation position of the CP-9.

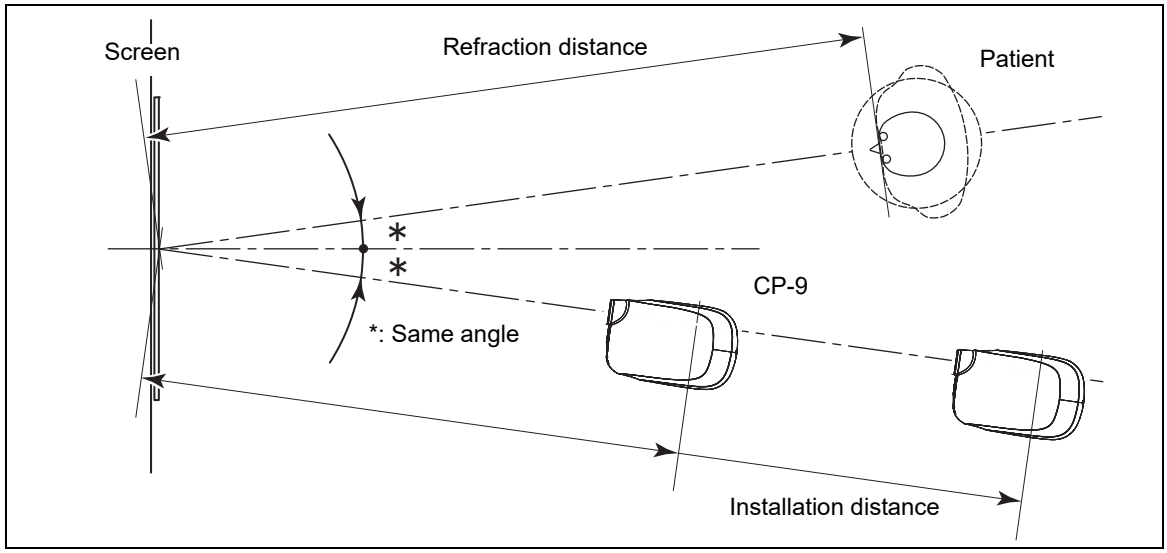


Chart type	Screen size
Type UK	400 mm (W) x 400 mm (H)
Other than UK	500 mm (W) x 400 mm (H)

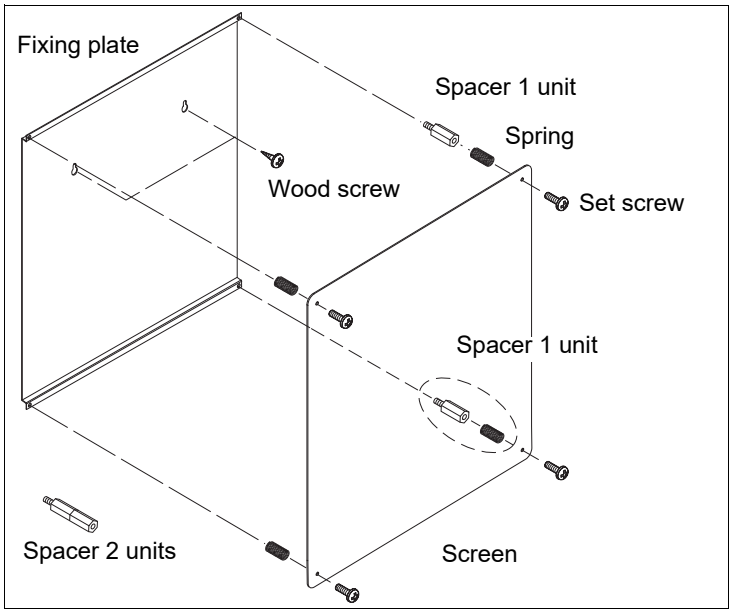
- Light sources not intended to illuminate the chart display, including specular reflections and illuminated objects, may not increase the chart background luminance from the viewpoint of the patient.
- Light sources visible to the patient (outside the chart itself) may not exceed the chart background in luminance.
- No light source shall illuminate the chart in such a way that a specular reflection from the chart surface reduces optotype contrast or is visible to the patient.

❖ Adjusting the angle of screen using screen angle fixing set (option)

Adjusting the angle of the screen presents bright and clear images to the patient.

The screen angle fixing set includes the following:

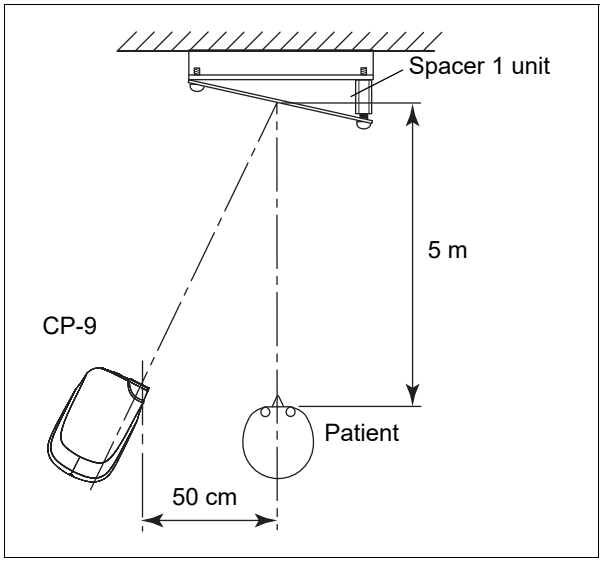
Fixing plate (1 unit)
Wood screw (2 units)
Set screw (4 units)
Spacer (4 units)
Spring (4 units)



Example of use

When installing the device at 50 cm left to the patient as shown in the figure to the right, use one spacer for each of the top right and bottom right corners of the fixing plate.

When installing the device at 1 m left to the patient, use two spacers for the same positions.

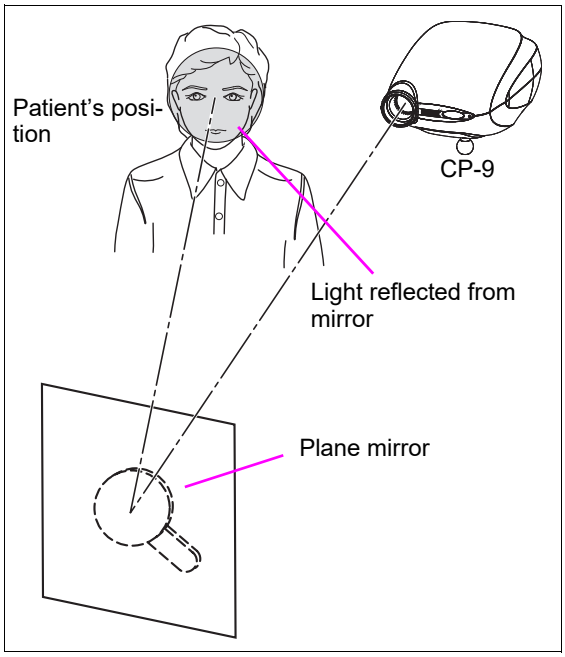


To place the screen in the proper position, checking with a plane mirror is recommended as described later.

⚠ CAUTION

- Do not look directly into the projection beam when checking.
  Eye damage may occur.

1) Project a chart on the screen.
2) Hold a plane mirror such as a hand mirror up to the screen.
3) Adjust the angle of the screen (or the position of the CP-9 or patient) so that the light is reflected toward the patient's eyes.



Setting

- The chart luminance can be adjusted according to the device installation conditions.
  For details, *"6.4.7 Changing the chart luminance" (page 93)*

6.4.3 Installing the screen with screen angle adjustment bracket

⚠ CAUTION

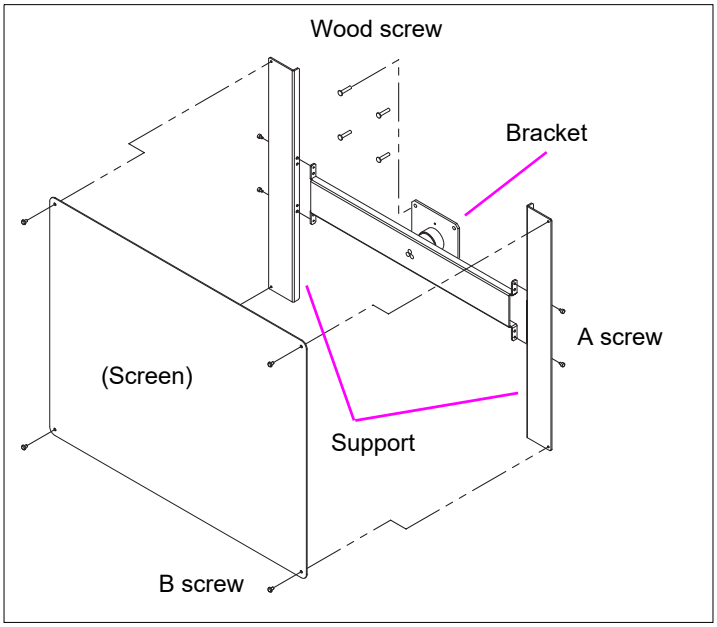
- Be sure to install the screen angle adjustment bracket on a wall that is sturdy enough to support the weight (1.5 kg).
  If the bracket is hung on a plasterboard or thin board wall, it may fall, resulting in injury or device failure.

The screen angle adjustment bracket (option) includes the following:

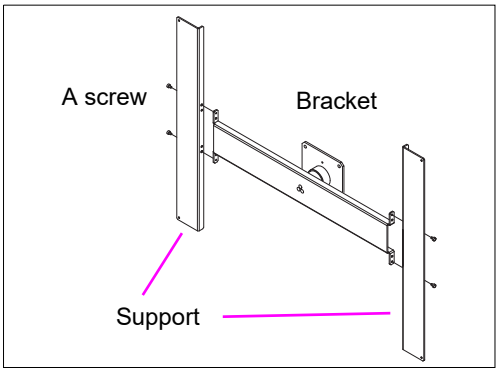
Bracket (1 unit)
Support (2 units)
A screw (4 units)

B screw (4 units)

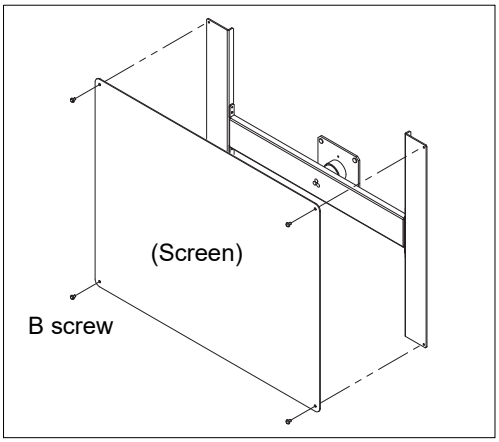
Wood screw (4 units)



1) Attach the two supports to the bracket with the two A screws for each end.
   Place them on a table to prevent the supports from being installed at an angle.



2) Install the screen angle adjustment bracket on a wall with the four wood screws.
3) Place the screen on the bracket with the four B screws.
4) Adjust the angle of the screen according to its use.



6.4.4 Adjusting the chart size and focus (variable magnification type)

Adjust the chart size and focus according to the refraction distance.

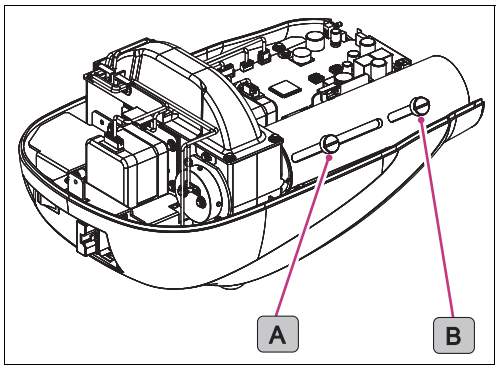
1 Confirm that the power switch is turned off (◯).

2 Remove the top cover.

3 Turn on (|) the power switch to project a chart on the screen.

The 0.05 VA chart “E” is projected on the screen.

4 Move the projection lens with knob A [A] and knob B [B] on the lens barrel to adjust the chart size and focus.



Check the size by placing the test scale on the screen.

Adjust it so that the projected chart “E” precisely overlaps the test scale from the end of this operator’s manual that corresponds to the distance.

Adjust the chart size and focus by adjusting knobs A and B alternately.

Knob A [A]	Adjusts the chart size.
Knob B [B]	Adjusts the chart focus.

After adjustment, lightly tighten knob A and knob B by hand so that the projection lens does not move.

⚠ CAUTION

- Do not touch the device interior other than knobs A and B during adjustment.
  Electric shock or malfunction may occur.

◆ Adjusting the projection distance

If the distance between the patient and the screen or the distance between the device and the screen is changed, the projection distance needs to be adjusted with the provided test scale.

The size of the projected chart changes with the projection distance.

The test scale shows the size of the 0.05 (120 for Type UK, 400 for type M) VA chart “E” (“8” for Type G) corresponding to the refraction distance. Adjust the projection distance so that the projected chart and the test scale are the same in size.

6.4.5 Adjusting the chart focus (fixed magnification type)

Adjust the chart focus according to the refraction distance.

1 Confirm that the refraction distance and the projection distance are the same.

The refraction distance is in the range of 2.9 m to 6.1 m.

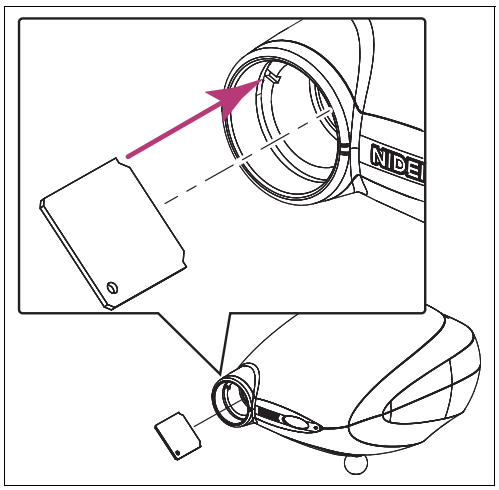
2 Turn on (|) the power switch to project a chart on the screen.

The 0.05 VA chart “E” is projected on the screen.

3 Fit the focus adjustment tool into the notches at the end of the lens barrel, then rotate the focus ring to adjust the focus of the chart.

Adjusting the focus of the chart allows the correct chart size.

If necessary, check the chart size with the test scale.



6.4.6 Setting the lamp brightness according to refraction distance and projection distance

Set the lamp brightness according to the refraction distance and the projection distance.

This setting allows the chart luminance to be the standard 230 cd/m^2.

Setting

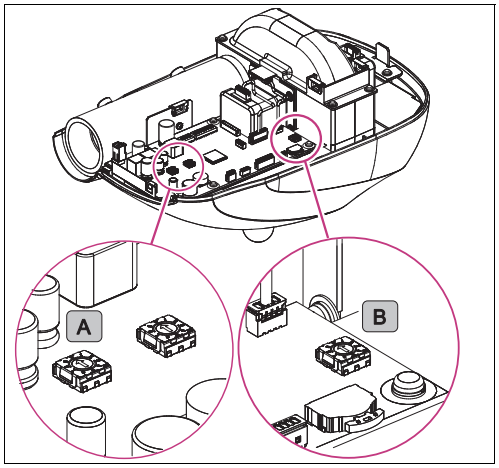
- The lamp brightness for the refraction distance (5 m) and projection distance (5 m) is set as its default setting.

1 Confirm that the power switch is turned off (◯).

2 Remove the top cover.

3 Turn on (|) the power switch to project a chart on the screen.

4 Follow the table to set the rotary switch SW2 A according to the refraction distance.



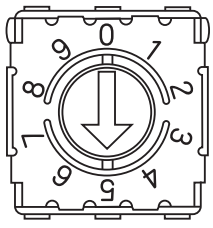
From the table below, select the setting for the refraction distance that is closest to the actual distance.

Refraction distance	3.0 m	3.5 m	4.0 m	4.5 m	5.0 m	5.5 m	6.0 m
SW2	1	2	3	4	5	6	7

Switch settings 0, 8, and 9 of SW2 are the same as Setting 1.

Turn the rotary switch with a flatblade screwdriver.

The number indicated by the arrow is the set value.



Follow the table to set the rotary switch SW4 B according to the installation distance.

Calculate the setting distance to select the closest setting in the table.

Setting distance = Installation distance − Refraction distance

The default setting is 5.

Setting distance	-2.0 m	-1.5 m	-1.0 m	-0.5 m	0.0 m	0.5 m	1.0 m	1.5 m	2.0 m
SW4	1	2	3	4	5	6	7	8	9

Switch setting 0 of SW4 is the same as setting 1.

Setting

- When setting the chart to a luminance other than the standard, change the setting of the rotary switch SW4.

  For details, *"6.4.7 Changing the chart luminance" (page 93)*

5 Reattach the top cover.

⚠ CAUTION

- Do not touch the device interior other than the rotary switch during setting.
  Electric shock or malfunction may occur.

6.4.7 Changing the chart luminance

The luminance of the projected chart can be changed to suit the installation conditions. To change the luminance, use the rotary switch SW4 on the board.

⚠ CAUTION

- Change the chart luminance with the top cover removed and the lamp illuminated. Do not touch the lamp cover and its surroundings because they become hot.
  Burns may occur.
- Do not touch the device interior other than the rotary switch during setting.
  Electric shock or malfunction may occur.

1 Confirm that the power switch is turned off (◯).

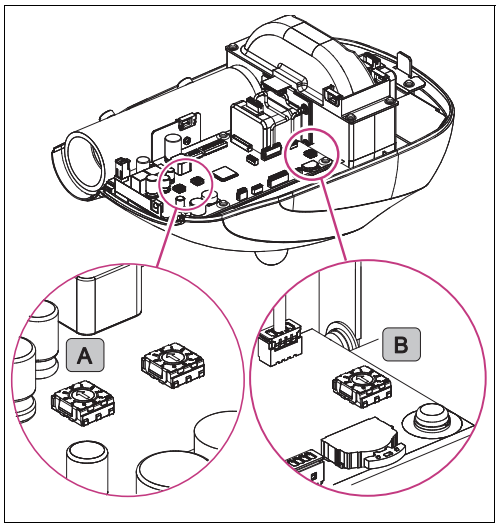
2 Remove the top cover.

3 Turn on (|) the power switch to project a chart on the screen.

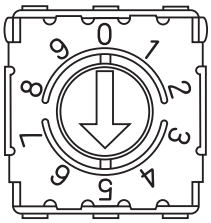
4 Turn the rotary switch SW4 **B** on the board to change the lamp brightness.

This setting allows the chart luminance to be the standard 230 cd/m^2.

For the setting distance, *"6.4.6 Setting the lamp brightness according to refraction distance and projection distance" (page 92)*



Increasing the setting of SW4 brightens the chart and decreasing the setting darkens the chart.



Change of SW4	-4	-3	-2	-1	0	+1	+2	+3	+4
Chart luminance (cd/m^2)	← Darkened				Standard	Brightened →			
	150	170	190	210	230	250	270	290	310

Setting

- When the SW4 setting is increased or decreased by one increment, the chart luminance changes approximately 20 cd/m^2.

5 Reattach the top cover.

Knowledge

- Chart luminance standard: ISO 10938: 2016 (Ophthalmic optics -- Chart displays for visual acuity measurement -- printed, projected, and electronic)

  The luminance of the white background surrounding the chart is 80 to 320 cd/m^2 (the standard luminance 200 cd/m^2 is recommended).

6.4.8 Stand attachment (option)

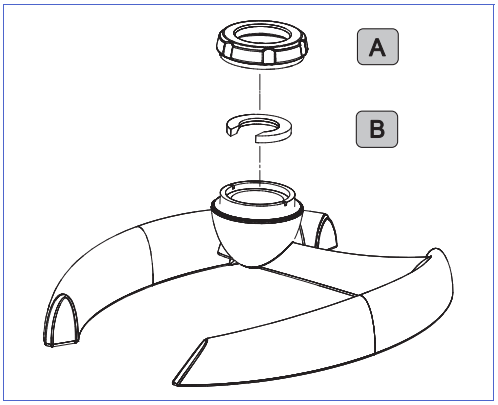
⚠ CAUTION

- When installing the device, use the optional table stand, wall bracket, floor stand, or their equivalent (CP stand).
  If the device is not installed in a stable condition, the chart may not be projected properly.
- Confirm that the fastening screw (knob) mounting the device on the table stand, wall bracket, or floor stand is tightened securely. In addition, clamp cables so that they will not be caught.
  If the device falls, injury or device failure may occur.
- When installing the device on a wall using the wall bracket, ensure that the wall is sturdy enough to support the weight (3.1 kg).
  If the device is hung on a plasterboard or thin board wall, it may fall, resulting in injury or device failure.
- When installing the device on a shelf or such using the table stand, ensure that it is sturdy enough to support the weight (3.1 kg).
  If the device falls, injury or device failure may occur.

◆ Mounting on table stand

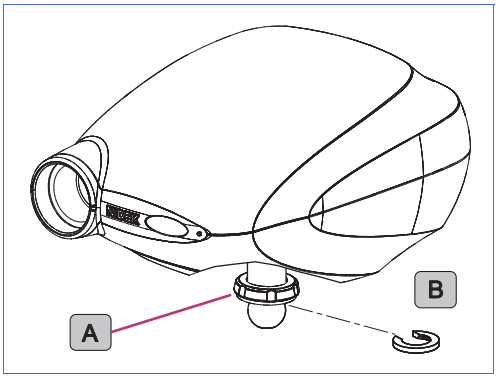
1 Turn the table stand knob [A] counterclockwise to remove it.

2 Take out the stop ring [B].



3 Insert the knob [A] into the CP-9 mounting shaft, then fasten the stop ring [B] in a crosswise direction.

The stop ring needs to be fastened so that the hole with a larger diameter faces down.

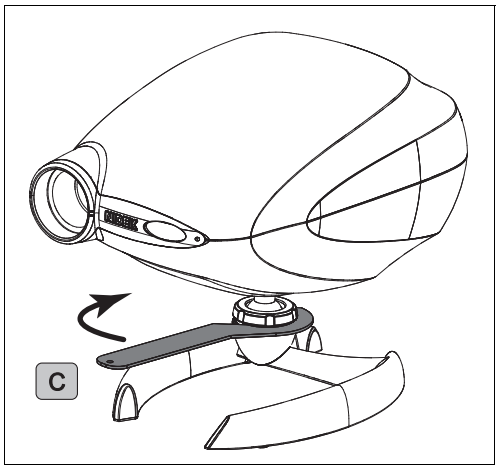


4 Fit in the mounting shaft to the table stand, then turn the knob clockwise to secure it.

5 Tighten the knob firmly with the provided wrench C .

Fit the wrench end in the knob groove to tighten it.

After adjusting the orientation of the main unit, tighten the knob securely so that the main unit does not move.



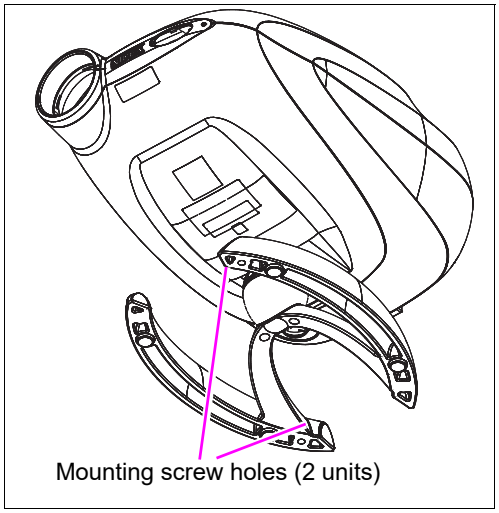
◆ Securing the table stand

Secure the table stand to the table with screws to prevent the device from falling.

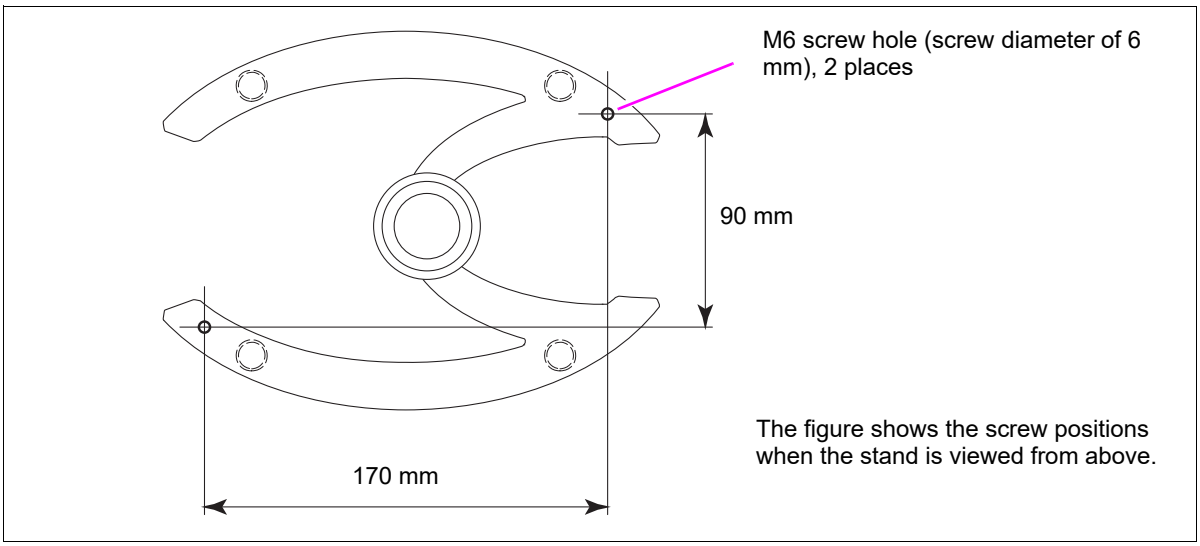
Two holes must be drilled into the table to secure the stand.

Use two commercially available M6 screws (screw diameter of 6 mm).

The screw length depends on the table thickness. 30 mm is appropriate when the table thickness is 20 mm. If the screw is too long, adjust the length with a washer or such.



❖ Hole position of mounting screw

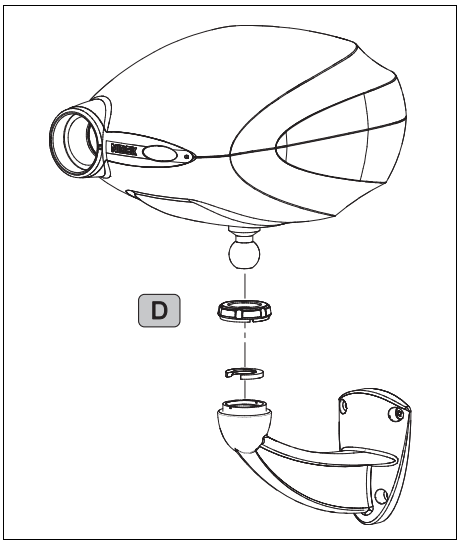


◆ Mounting on wall bracket

The mounting procedure is the same as for the table stand.

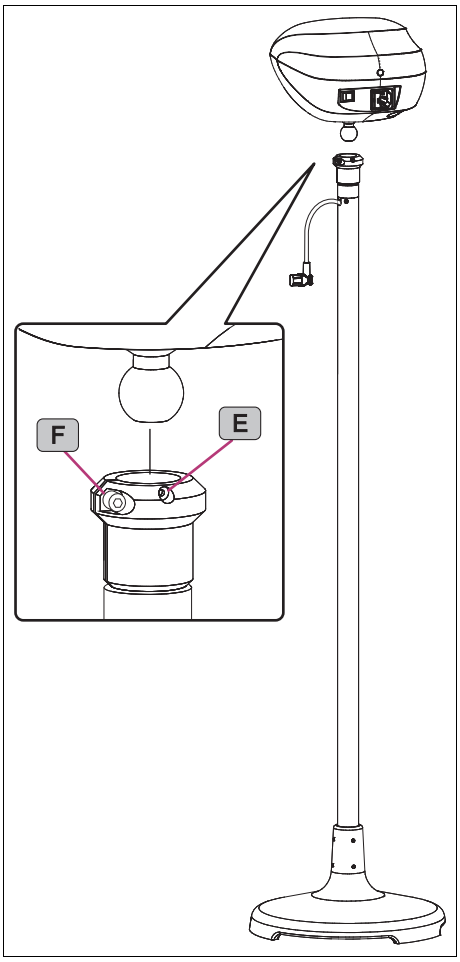
When tightening the knob **D** with a wrench, be careful not to apply forces to the screws holding the bracket to the wall.

Install the wall bracket on a wall with the provided four wood screws.



◆ Mounting on floor stand

1) Loosen the stopper screw **E** .
   Ensure that the tip of the screw does not come out inside.
2) Loosen the fastening screw **F** with the provided L-shaped wrench.
3) Fit in the mounting shaft of the CP-9, then tighten the fastening screw **F** .
4) Tighten the stopper screw **E** .



7 INDEX

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NIDEK TEST SCALE
FOR CHART PROJECTOR