NIDEK

REFRACTOR
RT-5100

OPERATOR'S MANUAL

Original instructions

Eye & Health Care

NIDEK CO., LTD.

> Before using this product, be sure to read "SOFTWARE LICENSE AGREEMENT" at the end of this manual.
>
> The "SOFTWARE LICENSE AGREEMENT" contains the terms for use of the software and related materials included for this product.

Use this device properly and safely.

> ⚠ BEFORE USE, READ THIS MANUAL.
>
> This operator's manual includes operating procedures, safety precautions, and specifications for the NIDEK REFRACTOR RT-5100 when it is used in combination with any of the NIDEK chart presenting devices. The dioptric powers are indicated with a reference wavelength of 546.07 nm.
>
> Cautions for safety and operating procedures must be thoroughly understood before using this device.
>
> Keep this manual handy for verification.
>
> If you encounter any problems or have questions about the device, please contact NIDEK or your authorized distributor.
>
> *To use the functions described in this manual "only for Plus Package," the optional 21 Point Exams Plus Package must be installed on the RT-5100.
>
> *For simplicity, examples of chart type used in this manual are from CP-770M only. Any other type may be used unless specified otherwise.
>
> *This manual indicates the visual acuity by fractions (feet). Refer to "8.3 VA Conversion Table" (Page 267) for visual acuity represented by decimals (meters).

CAUTION! The United States Federal Law restricts this device to sale by or on the order of a licensed eye care practitioner.

Safety precautions

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 might result in serious injury under certain conditions. Safety precautions must be strictly followed at all times.

Usage precautions

Before Use

⚠ **WARNING** • **Be sure to secure the refractor head to the refractor arm.**
If the refractor head is dropped or falls, injury or device failure may result.

• **Connect the power plug to a grounded outlet.**
Electric shock or fire may result in the event of malfunction or power leakage.

⚠ **CAUTION** • **The safety precautions and operating procedures must be thoroughly understood before using the device.**
Improper use may cause unexpected malfunction or unintended results.

• **Do not store the device in an area that is exposed to rain or water, or contains poisonous gas or liquid.**

• **Do not store the device in dusty, hot, humid places or in direct sunlight.**

• **When connection between units is removed to move the device, and reconnection is necessary, contact NIDEK or your authorized distributor.**

• **Install the device on a stable and level surface.**
If the device falls, injury or device failure may result.

• **Never install the device in a place exposed to water.**

• **Install the device in an environment that meets the following conditions. The following conditions must be maintained during use.**
Conditions for use   Temperature: 10 to 35°C (50 to 95°F)
Humidity: 30 to 85% (No condensation)
Pressure: 800 to 1060 hPa
Installation place: Interior
No hazardous dust or smoke
A dust-free place
A place with little external light
A place free from vibration and shock

• **Be sure to level the refractor head before use.**
Failure to do so could affect the data accuracy. Level the refractor head by turning the leveling adjustment knob until the bubble is centered in the level.

• **Be sure to use a wall outlet that meets the power specification requirements.**
If the line voltage is too high or too low, the device may not operate properly. Malfunction or fire may result.

• **Do not overload the electrical outlet.**
Fire may result.

• **Fully insert the power plug into the outlet.**
Incomplete connection may cause fire.

- **Never use a power strip or extension cable to supply power to the device.**
  The electrical safety may be lowered.

- **Do not use a power cord other than the one supplied. Do not use the equipped power cord for any other purpose.**
  Malfunction or fire may result.

- **Install the device in area where the outlet that the power plug is inserted into is easily accessible during use. In addition, ensure that the power cord can be disconnected without the use of a tool.**
  Otherwise, it may interfere with disconnecting of the power from the input power source in case of abnormality.

- **Do not place heavy objects on the power cord.**
  A damaged power cord may cause fire or electric shock.

During Use

⚠ **WARNING**
- **When moving the refractor head, make sure that there are no obstacles in its path.**

  If the arm is swung carelessly, it may bump against someone or something and injury or malfunction may occur. In addition, the near point rod may topple over and injury may occur.

⚠ **CAUTION**
- **Unplug the power cord and contact NIDEK or your authorized distributor if the internal wires are exposed, the table turns on or off when the power cord is moved, or the cord and/or plug are not to the touch.**

  This may result in electric shock or fire.

- **Do not look directly into the illumination for the near vision test or VD check.**

  The retina of the operator or patient may be damaged.

- **Keep the measuring windows free of fingerprints and smudges.**

  Failure to do so could affect the data accuracy.

- **In the event of smoke or strange odors, immediately turn off the device and disconnect the power plug from the outlet. Once it is determined that the smoke has stopped, contact NIDEK or your authorized distributor.**

  Continued use of the device under such abnormal conditions may cause fire or electric shock.

- **When the device is not in use, turn it off and cover it with its dust cover.**

  If the device is not covered for an extended period, the accumulation of dust may affect the data accuracy.

- **Do not touch the touch-screen panel with anything other than the tip of a touch-screen pen.**

  Contact with a hard or sharp object such as a ball point pen may scratch the panel.
  In addition, although the tip of a touch-screen pen is covered with resin which is unlikely to scratch the panel, the panel may be scratched by strongly pressing the pen against the panel.
  Do not touch the panel with fingers. Doing so could decrease the panel sensitivity or make the panel dirty. It may affect the test accuracy.

- **Perform the visual and operation checks before using the device. If any abnormality is found, do not use the device.**

  Continued use of the device under such abnormal conditions may affect the data accuracy. Unexpected malfunction or faulty diagnosis may induce unexpected health hazards.

- **Before each patient, always clean the patient's contact area (forehead rest and face shields) using disinfectant alcohol.**

- **If the device fails, disconnect the power cord from the power outlet, then contact NIDEK or your authorized distributor without touching the interior of the device.**

- **Take care not to catch hands or fingers in moving parts.**

- **Do not modify the device or touch the interior of the device.**
  This may result in electric shock or malfunction.

- **When connecting interface devices to the device, confirm the terminal markings, then connect them securely without applying unnecessary great force.**
  Terminals or cables may become damaged.

- **Be sure to use only the printer paper (80620-00001) specified by NIDEK.**
  Other printer paper may cause improper printing and make the data unreadable.

- **Do not apply adhesive tape to the printed paper.**
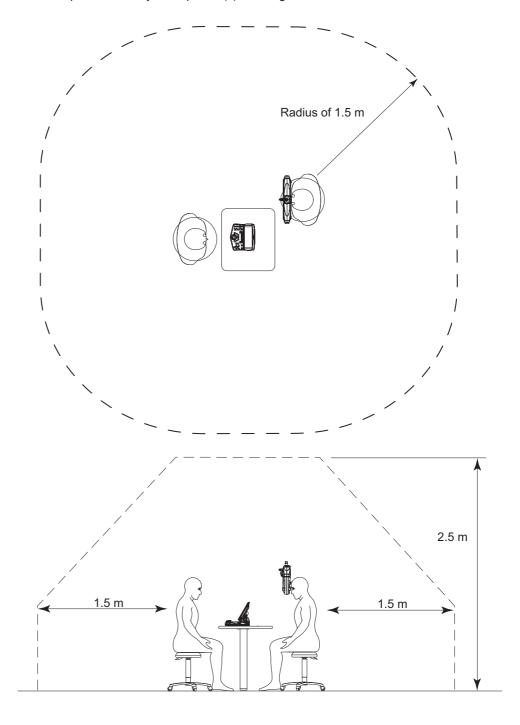 Printed characters may fade.

- **If the device is connected to a computer that does not comply with IEC 60601-1 (except those that use an AC adapter that meets the Class II requirements of IEC 60950-1), supply power to the device and PC through isolation transformers.**
  Electric shock may result. Contact NIDEK or your authorized distributor for installing isolation transformers.

○ Patient environment

> ⚠ **CAUTION** · **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, use an isolating transformer or common protective grounding**
>
> The patient environment is the volume of space in which contact can occur between the patient and any part of the device (including any connected device) or between the patient and any other person(s) touching the device.

Radius of 1.5 m

2.5 m

1.5 m

1.5 m

After Use

⚠ **CAUTION**
- **After using the device, remove the near point rod from the device and store it in a secure location.**

  If the near point rod is not removed, it may topple over and injury may occur.

- **If the device will not be used for a long time, disconnect the power cable from the wall outlet.**

  Settled dust may collect moisture, and short circuit or fire may result.

- **Occasionally clean the prongs of the power plug with a dry cloth.**

  If dust settles between the prongs, it may collect moisture, and short circuit or fire may result.

- **Do not pull the power cord to disconnect the plug from an outlet.**

  This can damage the metal core of the cord and may result in electric shock, short circuit or fire.

- **Before moving the device to another location, disconnect all the cords and cables.**

Maintenance

⚠ **CAUTION**
- **Only NIDEK service representatives or hospital personnel trained by NIDEK should attempt to modify or touch the interior of the device and/or upgrade the software.**

  NIDEK is not responsible for any accidents resulted from improper servicing.

- **When performing maintenance work, secure sufficient maintenance space.**

  Maintenance work in an insufficient space may result in injury.

- **When sending the device back to NIDEK for repair or maintenance, wipe the surfaces of the device (especially, the areas that come into patient contact) with a clean cloth dampened with ethyl alcohol for disinfection.**

- **Never use organic solvents such as a paint thinner to clean the exterior of the device.**

  It may ruin the surface of the device.

- **When cleaning the measuring window, be sure to remove any dust with a blower brush and wipe lightly with a soft cloth.**

  Wiping the window without removing dust may scratch the lens coating and impair measurement of the power or visual acuity.

- **To ensure the continued safe use of the device, it is recommended that the manager of this device make sure that maintenance and preventive inspection are performed at least once a year.**

  For details of maintenance and preventive inspection, ask NIDEK or your authorized distributor. If the manager of this device cannot perform the maintenance and preventive inspection, contact NIDEK or your authorized distributor.

📝 Note	• In rare cases, a pixel may be missing on the screen or a red, blue, or green pixel point may always be displayed.
	This does not represent a failure of the touch-screen panel; this is due to the structure of the liquid crystal display.

Disposal

⚠ **CAUTION**	• **Follow local governing ordinances and recycling plans regarding disposal or recycling of device components. The device contains the circuit board with a lithium battery mounted. Because the disposal method of lithium batteries varies according to the local government, follow the local governing ordinates and recycling plans when disposing of the circuit board with the lithium battery.**
	It is recommended to commission the disposal to a designated industrial waste disposal contractor. Inappropriate disposal may contaminate the environment.
	• **When disposing of packing materials, sort them by material and follow local ordinances and recycling regulations.**
	Inappropriate disposal may contaminate the environment.

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1. BEFORE USE

1.1   Outline of the Refractor

The NIDEK REFRACTOR Model RT-5100 is a computerized refractor used for subjective refraction in connection with the NIDEK AUTO REFRACTOMETER (AR), AUTO REF/KERATOMETER (ARK), AUTO REF/KER/TONOMETER (RKT), or AUTO LENSMETER (LM).

The RT-5100 includes a refractor head, control box, relay box, and printer.

The relay box is used for connecting not only the other three units but also the auto refractometer or lensmeter. The control box includes the key panel and display. The display is a touch-screen panel. The control box not only displays data and is used to perform almost all operations. In addition, the control box not only operates the refractor head but also the connected chart presenting device. It allows the refractor and charts to be controlled together.

Normally, the relay box and printer are installed on the system table (not included in the RT-5100 package.)

* In this operator's manual, the keys on the control box are indicated by key representations such as (Shift) or (R). The touch buttons on the touch panel other than chart buttons are indicated by brackets such as [Div.].

The touch panel chart buttons are indicated by button representations such as 400.

1.2   Intended Use
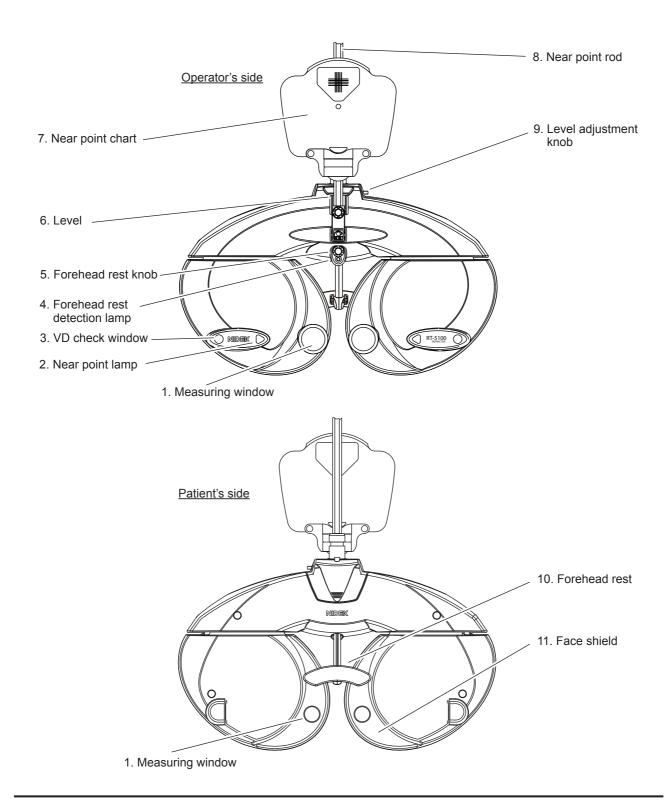
Instrument providing means of positioning spherical and cylindrical lenses, prisms and other optical devices in front of a subject's eyes for purpose of determining refractive error and binocular functions.

1.3   Connectable Devices

Connectable Chart Presenting device	Space Saving Chart: SSC-330, SSC-350, SSC-370
	Chart Projector: CP-690, CP-770
	System Chart: SC-1600, SC-1600Pola, SC-1700Pola, SC-2000
Connectable Lensmeter	LM-500, LM-600P, LM-970, LM-990, LM-990A, LM-1000, LM-1000P, LM-1200, LM-1800P, LM-1800PD
Connectable Auto Refractometer/Ref-Keratometer	AR-1 series, AR-20, AR-310A, AR-330A, AR-360A, AR-600, AR-600A, AR-610, AR-630A, AR-660A, HandyRef, ARK-1 series, ARK-30, ARK-510A, ARK-530A, ARK-560A, ARK-700A, ARK-710A, ARK-730A, ARK-9000, ARK-10000, HandyRef-K, OPD-Scan III, RKT-7700, TONOREF II, TONOREF III

1.4   Configuration

1.4.1   Refractor head

Operator's side

8. Near point rod

7. Near point chart

9. Level adjustment knob

6. Level

5. Forehead rest knob

4. Forehead rest detection lamp

3. VD check window

2. Near point lamp

1. Measuring window

NIDEK

RT-5100 REFRACTOR

Patient's side

10. Forehead rest

11. Face shield

NIDEK

1. Measuring window

2

1

1. Measuring window

The patient looks at any chart through these windows.

2. Near point lamp

Illuminates the near point chart.

The lamp lights up or goes out with [Near Lamp] on the window shown by pressing the left side switch of the control box.

3. VD check window

Used to check the patient's VD (vertex distance = distance from the corneal apex to the lens).

The windows have calibration markings of 12, 13.75, 16, 18, and 20 mm.

4. Forehead rest detection lamp

Used to make sure that the patient's forehead contacts the forehead rest.

When the forehead is away from the forehead rest, the lamp lights up.

5. Forehead rest knob

Moves the forehead rest forward and backward in order to adjust the VD.

6. Level
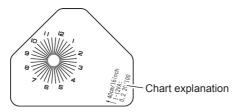
Used to make sure that the refractor head is level.
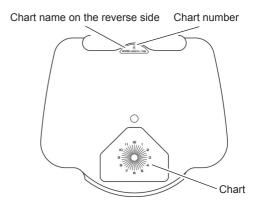
Turn the level adjustment knob until the air bubble is centered in the level.

7. Near point chart, Near point chart II (Near point chart II is only for Plus Package)

Used for the near vision test to measure addition powers.

When the chart is shifted to the left slightly, the chart explanation is indicated.

Chart name on the reverse side   Chart number

Chart explanation

Chart

For the chart on the near point chart or near point chart II, see "8.9 Near Point Chart (Standard)" (page 277) and "8.10 Near Point Chart II" (page 279).

📝 Note

- When switching the near point chart, do not rotate the near point chart while pressing the chart window frame.

  The near point chart may be rubbed off and become difficult to be seen.

8. Near point rod
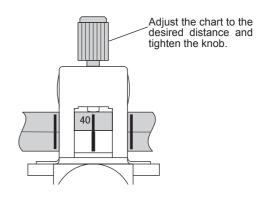
The distance from the patient's eye to the near point chart is marked in inches and centimeters.

- Align the black line at the near point chart holder with the scale of the desired distance.
- The number in red represents the power (diopter) corresponding to each distance in meters.
- Rotating the rod 180 degrees and inverting it up side down changes the scale from between centimeters and inches. See "1.6 Before First Use" (page 25).

Adjust the chart to the desired distance and tighten the knob.

40

9. Level adjustment knob

Adjusts the level of the refractor head.

The refractor head is tilted by 2.5° at maximum to the left or right.

10. Forehead rest

The patient's forehead touches here during refraction. Clean it before each refraction.

See "6.2 Cleaning Forehead Rest" (page 250).

11. Face shield

The patient's face touches here during refraction. Clean the face shields before each refraction.

See "6.3 Cleaning Face Shields" (page 250).
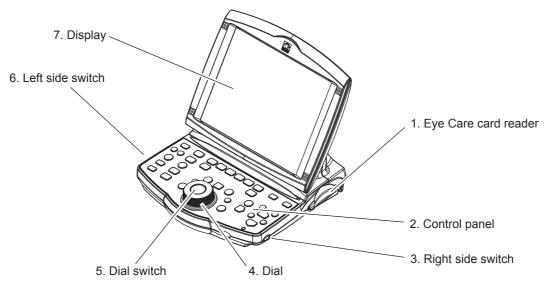
📝 Note | • Parts that come into contact with the patient during refraction are composed of the following materials:

Forehead rest: polypropylene

Face shields: ABS resin

Measuring window: clear glass

VD check window: acrylic resin

Near point chart: polyvinyl chloride

Near point rod, level adjustment knob: aluminum alloy

1.4.2　Control box

7. Display
6. Left side switch
1. Eye Care card reader
2. Control panel
3. Right side switch
5. Dial switch
4. Dial

1. Eye Care card reader

Reads objective data (AR data) or past lensometry data (LM data) via an Eye Care card.

The optional Eye Care card is necessary. The IC card of the old-type NIDEK IC card system (RT4IC-1) or commercial IC card are not available.

2. Control panel

See "○ Control panel (page 10)" for details.

3. Right side switch

Displays the Other Settings window.

> [C+/–]: Switches the cylinder reading between + and –.
> [ID No.]: Changes the ID No. whose data is printed.
> [Age]: Displays the Age input window.

4. Dial

Changes any measurement value.

> The selected (highlighted) value can be changed.
> Turn it clockwise ⇒ The value changes to the negative.
> Turn it counterclockwise ⇒ The value changes to the positive.
>
> Turn the dial while pressing (Shift) changes the increments. See page 134.

5. Dial switch

Switches the mode (S, C, A, VA).

> The values of S, C, A, and/or VA selected or selection order varies depending on the "Dial switch" parameter setting.

6. Left side switch

Displays the Chart Controls window.

> [Lamp off]: Turns off the chart lamp, display backlight, or the lamp for the near point chart. Pressing either button returns to the original status.
> [Ch.Lamp]: Turns on or off the lamp of the connected chart.
> [Near Lamp]: Turns on or off the lamp for near point chart in the refractor head.
> [Link off]: Prevents auxiliary lenses or mode from being switched with a corresponding chart key. See "3.13 Link Off Function" (page 120).
> [Level], [↑], [↓]: Align the chart to the patient's eye level when the SSC is connected.
> [Glare], [↑], [↓]: Appear only in the SSC-330U. Pressing [Glare] turns on or off the glare lamp. Pressing [↑] or [↓] controls the lamp intensity. The glare lamp condition icon appears above the program indication.
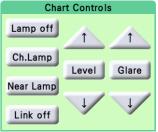
7. Display

> Displays S(SPH), C(CYL), A(AXIS) data and the presented chart.
>
> The LCD display is a touch-screen panel.
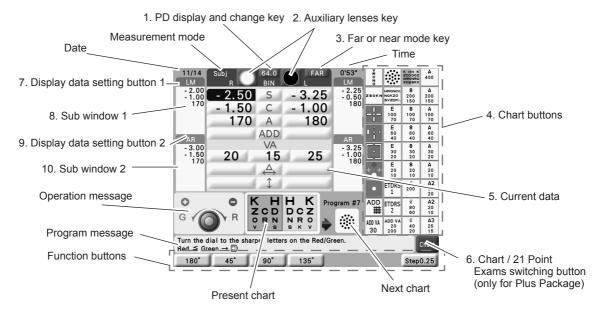
> 📝 Note
> • The materials that come into contact with the patient during refraction are as follows:
> Control panel, right/left side switch, dial, and dial switch: ABS resin
> Display, power switch, and fuse holder: standard electrical components

○ Display

(A) Measurement screen

1. PD display and change key   2. Auxiliary lenses key
Measurement mode   3. Far or near mode key
Date   Time
7. Display data setting button 1
8. Sub window 1
9. Display data setting button 2   4. Chart buttons
10. Sub window 2
Operation message   5. Current data
Program message
Function buttons   6. Chart / 21 Point Exams switching button (only for Plus Package)
Present chart   Next chart

1. PD display and change key
Enters the mode changing the pupillary distance.

Monocular PD (1/2 PD) ⇒ Enter by pressing (R) or (L) in PD mode.
Leave the mode ⇒ Press the PD key again.

2. Auxiliary lenses key
Displays the current inserted auxiliary lens.
Pressing this key displays the Auxiliary selection screen.

3. Far or near mode key
Displays the current measurement mode (far or near mode).

When in far mode, the key indication is "FAR" and when in near mode, the key indication is "NEAR".

The background of the data turns white when in far vision measurement mode and yellow when in near vision measurement mode. Far mode is automatically selected when the power is turned on or after data is cleared. Near mode is used to test the near visual function after far vision testing and addition power measurement. The refractor head converges to the working distance of 40 cm (variable) automatically in near mode.
The ADD key is not available in near mode. The near SPH values are calculated by adding the ADD values to the far SPH values. The appropriate lenses are placed. Only the far SPH values in near mode can also be used when the "SPH Far → Near" parameter is set to "SPH".

4. Chart buttons
Switches the chart.

5. Current data
Displays the data of the lens that is currently inserted into the refractor. Press other data to be changed as desired.

The numeric field that can be changed is highlighted.

The value can be changed with the dial, (+) or (−).

The currently set power is displayed in black.
ADD and Prism value become black when the value is set in ADD measurement mode or Prism measurement mode.

5-1.[S]

Goes into SPH mode that allows spherical powers to be adjusted.

Pressing [S] enters both eyes specifications of SPH mode.
Pressing the value S on the R side enters the right eye specifications of SPH mode.
Pressing the value S on the L side enters the left eye specifications of SPH mode.

5-2.[C]

Goes into CYL mode that allows cylindrical powers to be adjusted.

Pressing [C] enters both eyes specifications of CYL mode.
Pressing the value C on the R side enters the right eye specification of CYL mode.
Pressing the value C on the L side enters the left eye specification of CYL mode.

5-3.[A]

Goes into AXIS mode that allows cylindrical axis to be adjusted.

Pressing [A] enters both eyes specifications of AXIS mode.
Pressing the value A on the R side enters the right eye specification of AXIS mode.
Pressing the value A on the L side enters the left eye specification of AXIS mode.

5-4.[ADD]

Goes into ADD mode that allows additional powers to be adjusted.[1]
The refractor head converges to the working distance of 40 cm (variable) automatically in near mode.

See the "Working distance (WD)" parameter (page 136).
Pressing [ADD] enters both eyes specifications of ADD mode.
Pressing the value on the R side enters the right eye specification of ADD mode.
Pressing the value on the L side enters the left eye specification of ADD mode.

• Each time the key is pressed while the refractor head converges, the addition powers are added or removed. When the addition powers are removed, the highlight color for ADD on the screen changes and the time display switches to ADD-OFF. Pressing this key again returns the addition power indication to its original and the addition powers are added.

After addition power entry, the WD display appears to select the desired WD with the function key. When the WD is changed with prescription mode, the value is entered as the WD for prescription.
The mode can be switched among [LM], [AR], [Subj], and [Final] in ADD mode.

5-5.[VA]

This is a field on the undermost and right eye visual acuity, binocular visual acuity, left side visual acuity are entered from the left.

Pressing the each field goes into the mode which allows the visual acuity to be entered using the dial.

5-6.[⇔]/[△]

Goes into the mode which allows base in/out prism power in rectangular coordinates or prism absolute value in polar coordinates to be entered.

Pressing [⇔] or [△] enters Entering mode for binocular specifications.
Pressing the value on the R side enters Entering mode for the right eye specification.
Pressing the value on the L side enters Entering mode for the left eye specification.
See "2.3 Setting Prism Lenses" (page 40) for prism power entry.

5-7. [↕]/[θ]

Goes into the mode which allows base up/down prism power in rectangular coordinates or prism base angle in polar coordinates to be entered.
Pressing [↕] or [θ] enters Entering mode for binocular specifications.
Pressing the value on the R side enters Entering mode for the right eye specification.
Pressing the value on the L side enters Entering mode for the left eye specification.

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[1]. When ADD mode starts in a standard program, the ±0.5D cross cylinder lenses with –90° are placed.
However, when ADD mode starts by pressing (ADD) without the program, the lenses are not placed automatically. To place the ±0.5 D cross cylinder lenses, press [ADD ▦] .

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6. Chart / 21 Point Exams switching button (only for Plus Package)

Switches the chart switching button to 21 Point Exams list display. Pressing the button again returns to the chart list display.

7. Display data setting button 1

Pressing this button displays the window specifying the items to be displayed in sub window 1.

8. Sub window 1

Displays the items specified with Display data setting button 1. When no item is specified, the measurement mode values set previously are displayed.
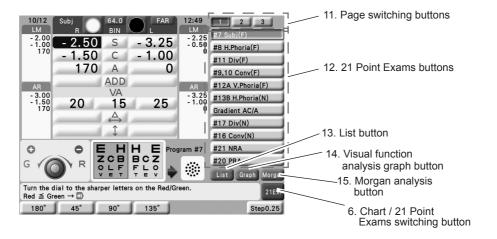
9. Display data setting button 2

Pressing this button displays the window specifying the items to be displayed in sub window 2.

10. Sub window 2

Displays the items specified with the Display data setting button 2. When no item is specified, the measurement mode values set prior to previous ones are displayed. (When the item to be displayed is specified in sub-window 1, the measurement mode values set previously are displayed.)

○ 21 Point Exams list display (only for Plus Package)

11. Page switching buttons

12. 21 Point Exams buttons

13. List button

14. Visual function analysis graph button

15. Morgan analysis button

6. Chart / 21 Point Exams switching button

11. Page switching buttons (only for Plus Package)

Switches the page of 21 Point Exams buttons.

12. 21 Point Exams button (only for Plus Package)

Selects an examination.

According to the selected examinations, chart, auxiliary lens, and data input mode are changed.

13. List button (only for Plus Package)

List displays the 21 Point Exams result.
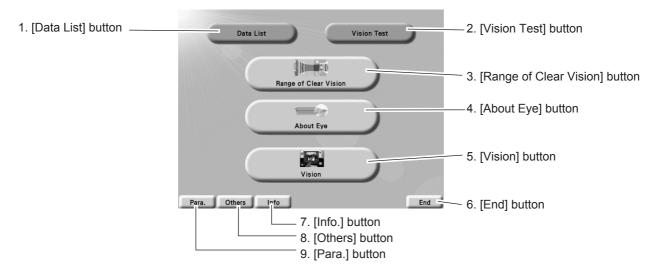
14. Visual function analysis graph button (only for Plus Package)

Displays the visual function analysis graph.

15. Morgan analysis button (only for Plus Package)

List displays the Morgan's criterion, measurement value, and judgment result.

(B) Main menu screen

1. [Data List] button
2. [Vision Test] button
3. [Range of Clear Vision] button
4. [About Eye] button
5. [Vision] button
6. [End] button
7. [Info.] button
8. [Others] button
9. [Para.] button

1. [Data List] button
Displays the list of measured data.
See "3.2 Data List" (page 97), "3.3 Displaying Refraction Diagram" (page 99).

2. [Vision Test] button
Displays the near chart screen.
See "3.4 Presenting Near Chart" (page 102).

3. [Range of Clear Vision] button
Displays the Range of Clear Vision test screen.
See "3.5 Range of Clear Vision" (page 103).

4. [About Eye] button
Displays the About Eye screen.
See "3.6.1 Image information "About Eye"" (page 110).

5. [Vision] button
Displays the Vision screen.
See "3.6.2 Image information "Vision"" (page 112).

6. [End] button
Returns to the measurement screen.

7. [Info.] button
Displays information about JPEG license.

8. [Others] button
Displays the Others screen.
See "3.14 Programming" (page 121) to "3.16 Setting Time and Date" (page 129).

9. [Para.] button
Displays the Parameters screen.
See "3.19 Parameter Settings" (page 133).
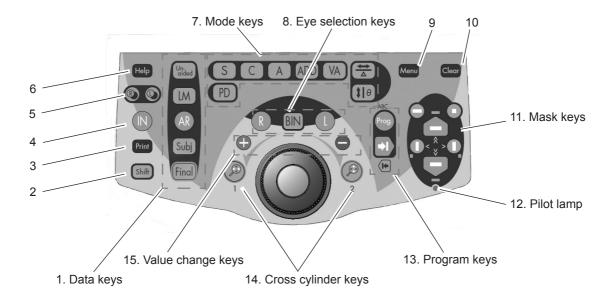
○ Control panel

The basic keys are indicated in light blue.

* The functions of some keys change when they are pressed with (Shift). In this manual, the indication such as (Shift) + (Prog.) means to press (Prog.) while pressing (Shift).

7. Mode keys   8. Eye selection keys   9   10
6
5
4
3
2
11. Mask keys
12. Pilot lamp
15. Value change keys   13. Program keys
1. Data keys   14. Cross cylinder keys

1. Data keys

Used for data entry into the RT-5100 or measurement.

Data in the selected mode is displayed at the center of the screen. The key selected is displayed in the upper-left corner of the screen.

Pressing a data key whose field is empty copies the previously displayed data into that field. However, pressing (Subj) while no subjective value is entered copies the data in AR or LM mode according to the "Preset power of Subj 1" parameter.

In addition, pressing any data key with (Shift) copies the displayed data regardless of whether or not data is contained in that field.

See "2.2 Entering Data" (page 30) for data entry method.

1-1. (Un-aided)

Measures the unaided visual acuity.

The corrective lens power in the refractor head is 0 D.

1-2. (LM)

Enters the lensmeter (LM) data.

1-3. (AR)

Enters the data from an auto refractor or a retinoscope.

1-4. [Subj]

Used to obtain the full correction.

> When data is received from an auto refractometer or a lensmeter, this field opens automatically.
> The elapsed time from data entry is displayed in the subjective data field when the "Operating timer" parameter is set to "Subj".

1-5. [Final]

Used to obtain the final prescription and best-corrected visual acuity.

> Pressing this key copies the full correction data from the subjective data field and adjusts it to the final prescription.
>
> [Shift] + [Final] ⇒ Goes into auto adjustment mode when the "Shift + Final" parameter is set to "Final Fit". See "2.7.2 Auto adjustment of far powers (with Program B)" (page 84) and "2.7.3 Power adjustment without standard programs" (page 85).

2. [Shift]

The increment or mode changes when a key is pressed or the dial is turned with this key.

3. [Print]

Prints the data or exports it to an external computer.

> See "2.8 Printing" (page 88).

4. (IN)

Enters the data from an auto refractometer or lensmeter.

> Press this key and confirm that the data No. on the screen are the same with the print data No. of the auto refractometer or lensmeter. Select the desired data key, [LM] or (AR).

5. (R), (L)

Switches the measuring windows to be opened or occluded.

6. [Help]

Indicates the explanation about the present chart.

Press this key again or [End] to cancel the indication.

> When this key is pressed during the standard program or program with sample instructions, the sample instructions for the test appear.

7. Mode keys

Select the mode whose data is changed.

Pressing any keys highlights the corresponding field to be changed.

The value in each mode can be changed with the dial, (+) or (−).

7-1. [S]

Goes into SPH mode that allows spherical powers to be adjusted.

7-2. C

Goes into CYL mode that allows cylindrical powers to be adjusted.

7-3. A

Goes into AXIS mode that allows cylindrical axis to be adjusted.

7-4. ADD

Goes into ADD mode that allows addition powers to be adjusted.[*2]

The refractor head converges to the working distance of 40 cm (variable) automatically in near mode.
See the "Working distance (WD)" parameter (page 136).

• When the "Preset ADD" parameter is set to "Yes" and the age is not input, the patient's age can be selected[*3].

• Each time the key is pressed while the refractor head converges, the addition powers are added or removed. When the addition powers are removed, the highlight color for ADD on the screen changes and the time display switches to ADD-OFF. Pressing this key again returns the addition power indication to its original and the addition powers are added.

After addition power entry, the WD display appears to select the desired WD with the function button.

The mode can be switched among LM , AR , Subj , and Final in ADD mode.

• Shift + ADD ⇒

Goes into the mode that allows the values for the near point of convergence (NPC), near point of accommodation (NPA), positive relative accommodation (PRA), or negative relative accommodation (NRA) to be entered. For each test procedure, see "4 TEST METHOD" (page 151).

7-5. VA

Goes into the mode that allows the visual acuity to be entered with the dial.

When the AR or LM data has been entered, press Un-aided or LM to present an estimated visual acuity (VA) chart.[*4]

7-6. PD

Goes into the mode that allows the PD in the refractor head to be adjusted.

Monocular PD (1/2 PD) ⇒ Adjust the PD after pressing R or L in PD mode.

To exit from the mode ⇒ Press PD again.

7-7. ⇄△

Goes into the mode that allows base in/out prism power in rectangular coordinates or prism absolute value in polar coordinates to be entered.

See "2.3 Setting Prism Lenses" (page 40) for prism power entry.

---

*2. When ADD mode starts in a standard program, the ±0.5D cross cylinder lenses with −90° are placed. However, when ADD mode starts by pressing ADD without the program, the lenses are not placed automatically. To place the ±0.5 D cross cylinder lenses, press ADD ⫯ .

*3. The addition powers are preset according to the selected age. See "8.4 Preset Addition Power" (page 268).

*4. The estimated VA chart is not presented when the "Preset VA" parameter is set to No or the data has already been entered in the final field. See "8.6 Estimated Visual Acuity Table" (page 270).

1

7-8. $\boxed{\updownarrow|\theta}$

Goes into the mode that allows base up/down prism power in rectangular coordinates or prism base angle in polar coordinates to be entered.

8. Eye selection keys

Select the right eye (R), left eye (L), or both eyes (BIN) for subjective refinement.

• The occluder is placed automatically in the non-selected eye side.
However, it is not placed during the binocular vision test with polarizing filters.

• $\boxed{\text{Shift}}$ + $\boxed{R}$ or $\boxed{L}$ $\Rightarrow$ Selects a dominant eye.
The yellow and bold R or L indication at the top of the screen is displayed to indicate the dominant eye.

8-1. $\boxed{R}$

Opens the right measuring window and places the occluder in the left one. Any value can be entered only for the right eye.

When the binocular vision test chart is selected, the left eye side is not occluded but the data entry only for the right eye is also possible.

8-2. $\boxed{L}$

Opens the left measuring window and places the occluder in the right measuring window. Any value can be entered only for the left eye.

When the binocular vision test chart is selected, the right eye side is not occluded but the data entry only for the left eye is also possible.

8-3. $\boxed{\text{BIN}}$

Opens both measuring windows.

The data entry for both eyes are available.

9. $\boxed{\text{Menu}}$

Displays the main menu screen.

10. $\boxed{\text{Clear}}$

Clears all displayed data. In addition, pressing a data key such as $\boxed{\text{LM}}$ or $\boxed{\text{AR}}$ with this key deletes the corresponding field data.

When the "Clear confirmation" parameter is set to "Yes", the confirmation window is displayed before data is cleared. It prevents data from being deleted by touching $\boxed{\text{Clear}}$ accidentally.

11. Mask keys

Isolate any horizontal or vertical line or single letter on the chart.

Press any of the chart keys to cancel the mask functions.

The visual acuity of the isolated horizontal line or letter is shown in the VA field on the screen.

11-1. ⬠ **or** ⬡

Isolates a horizontal line (same visual acuity letters) on the top or bottom line of the VA chart.

•This key also moves the isolation up and down when the horizontal line has been isolated.

•(Shift) + ⬠ ⇒ Isolates the horizontal line on the top line of the chart.

•(Shift) + ⬡ ⇒ Isolates the horizontal line on the bottom line of the chart.

11-2. >⬚ , ⬚<

Isolates a vertical line on the VA chart.

•This key also moves the isolation to the left or right when the vertical line or single letter has been isolated.

•(Shift) + >⬚ or ⬚< ⇒ Isolates a single letter in the lower-left or right corner on the chart.

11-3. ⬚

Isolates a single letter on the VA chart.

The letter in the upper-right corner of the chart is isolated.

•(Shift) + ⬚ ⇒ Isolates the single letter in the upper-left corner of the chart.

11-4. ⊟

Isolate a horizontal line in the middle of the VA chart.

•(Shift) + ⊟ ⇒ Applies the red-green filter on the VA chart.

(Shift) + ⊟ again ⇒ Releases the red-green filter.

12. Pilot lamp

Lights up in blue while the RT-5100 is turned on.

13. Program keys

See "2.5 Standard Program Refraction" (page 43) for programmed refraction.

13-1. (Prog.)

Starts a program.

The elapsed time from program start is measured and displayed in the upper right field on the display when the "Operating timer" parameter is set to "Prog."

•Pressing this key again restarts the program.

•(Shift) + (Prog.) ⇒ Switches the program among A, B, C, D, E, and #7. (#7 is only for Plus Package)

13-2. ⇨⬚

Used to forward next programmed refraction sequence.

•(Shift) + ⇨⬚ ⇒ Returns to the previous sequence.

1

14. Cross cylinder keys

Place a cross cylinder lens to measure the cylindrical axis or power.

When the key is pressed with both eyes open, the left measuring window is occluded automatically.

Open the left measuring window with ⊙ to perform the astigmatism test with both eyes open.[5]

The cross cylinder lens to be inserted can be selected with the "Cross cylinder (XC) test" parameter.

When the parameter is set to ±0.25 or ±0.50, the cross cylinder lens is inserted as follows:

14-1. ⊚₁

- In the cylindrical axis measurement, the cross cylinder lens is inserted so that the minus axis is located at 45° from the minus axis position of the cylindrical lens.

- In the cylindrical power measurement, the cross cylinder lens is inserted so that the minus axis is located at 90° from the minus axis position of the cylindrical lens.

- Clears the prism data for the right eye in prism entry mode.

14-2. ⊚₂

- In the cylindrical axis measurement, the cross cylinder lens is inserted so that the minus axis is located at 135° from the minus axis position of the cylindrical lens.

- In the cylindrical power measurement, the cross cylinder lens is inserted so that the minus axis is located at 0° from the minus axis position of the cylindrical lens.

- Clears the prism data for the left eye in prism entry mode.

- [Shift] + ⊚₂ ⇒ switches the time display to the refraction elapsed time. When the refraction elapsed time has already been selected, the time is cleared and start the count again.

15. Value change keys

Functions as the same as the dial.

15-1. ⊕
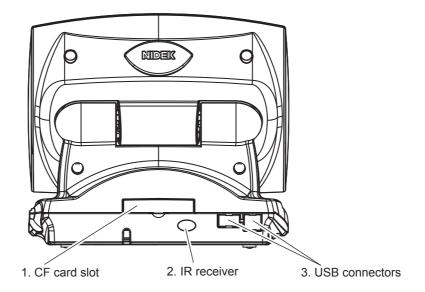
Increases the value to the positive side in 1 increments.

15-2. ⊖

Decreases the value to the negative side in 1 increments.

---

*5.　**Both windows remain open by pressing** ⊚₁ , ⊚₂ , [C] , [A] **, Auto, ±.25, or ±.50 function key.**

○ Rear side of the control box

1. CF card slot   2. IR receiver   3. USB connectors

1. CF card slot

It is used to update the software and importing or exporting programs.

Do not touch here because the CF (CompactFlash) card in which image data is stored is inserted.

2. IR receiver

This is not used.
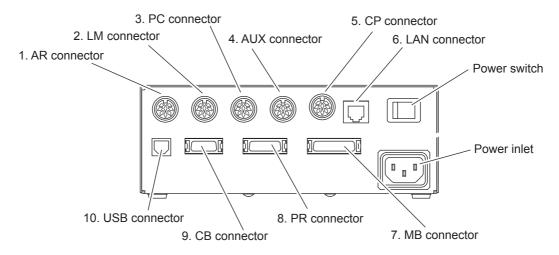
3. USB connectors

These are not available.

Do not connect anything to these connectors.

1

1.4.3　Relay box

The relay box is installed in the system table normally.

1. AR connector[*6]

Connects to an auto refractometer (AR) or optional memory box.

2. LM connector[*6]

Connects to a lensmeter (LM).

3. PC connector[*6]

Connects to a PC.

4. AUX connector[*6]

Auxiliary (AUX) communication connector (This is not available.)

5. CP connector[*6]

Connects to a chart presenting device (CP).

6. LAN connector[*6]

Connector for LAN connection (This is not available.)

7. MB connector

Connects to the refractor head (MB).

8. PR connector

Connects to a printer (PR).

9. CB connector

Connects to the control box (CB).

10. USB connector
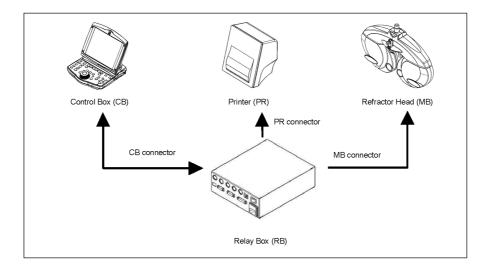
This is not available.

[*6]. **Accessory equipment connected to the analog and digital interfaces must be certified according to respective IEC standards (i.e. IEC 60950-1 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore, all configurations shall comply with the system standard IEC 60601-1-1. 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 IEC 60601-1-1. If in doubt, consult NIDEK or your authorized distributor.**

17

1.4.4　Connecting each unit
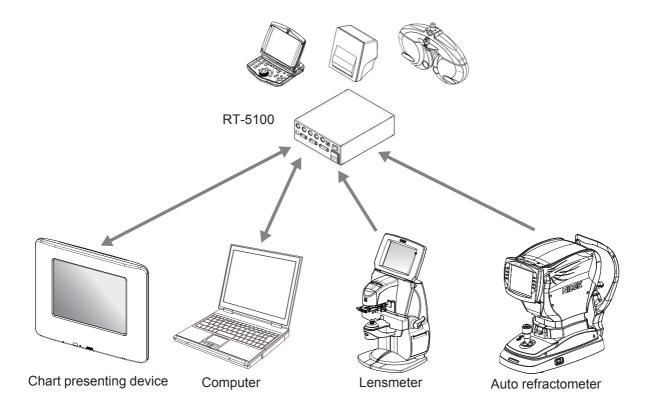
The diagram below indicates the configuration of the unit type (for installing the other company's table).

For the stand type and dedicated table type, refer to the manual of the stand and table.

1.4.5   Connecting peripherals

The RT-5100 can output measurement data, such as AR data and LM data, that is input with an auto refractometer or lensmeter to an external computer. AR data and LM data can also be input with the external computer.

RT-5100

Chart presenting device   Computer   Lensmeter   Auto refractometer

Connecting device	Connection terminal	Function
NIDEK chart presenting device	CP connector	• Switches charts.
Computer	PC connector	• Inputs AR data and LM data. • Outputs input data.
NIDEK lensmeter	LM connector	• Inputs LM data.
NIDEK auto refractometer	AR connector	• Inputs AR data that is used for subjective refraction as objective values.
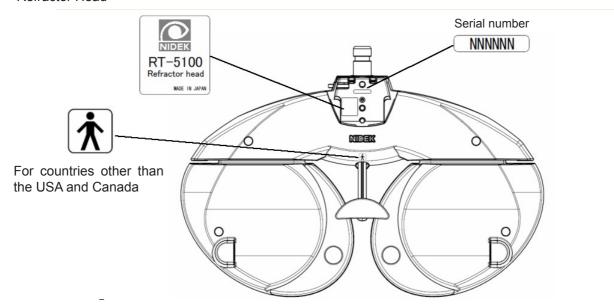
⚠ **CAUTION** • **When connecting the RT-5100 to other devices, make sure that the cables do not pose a risk to the patient, operator, or others. Also when connecting, removing, or upgrading devices, make sure that there is no risk to the patient, operator, or others.**

• **When connecting a computer, use a computer compatible with CISPR22/ CISPR24 or VCCI.**

1.5　Labels
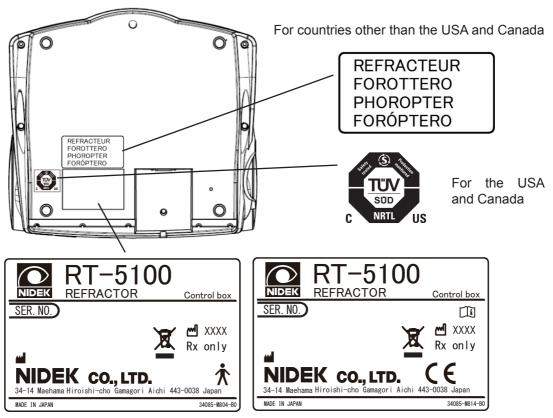
Cautionary labels are provided on the device.

⚠	Indicates that caution must be taken. Refer to the operator's manual before use.
📖	Indicates that the operator is advised to refer to the related instructions in the operator's manual.
🧍	Indicates that the degree of protection against electric shock is of a Type B Applied Part. 　*　The applied part is the forehead rest (see 10 in "1.4 Configuration" (page 2)).
○	Indicates that when the switch is pressed to this symbol side, power is not supplied to the device.
│	Indicates that when the switch is pressed to this symbol side, power is supplied to the device.
∼	Indicates that the RT-5100 must be supplied only with alternating current.
🏭	Indicates the date of manufacture.
🏭	Indicates the manufacturer.
🗑	Indicates that this product shall be disposed of in a separate collection of electrical and electronic equipment in EU.

1

<Refractor Head>

Serial number

NNNNNN

NIDEK
RT-5100
Refractor head
MADE IN JAPAN

For countries other than
the USA and Canada

<Control Box>

For countries other than the USA and Canada

REFRACTEUR
FOROTTERO
PHOROPTER
FORÓPTERO

REFRACTEUR
FOROTTERO
PHOROPTER
FORÓPTERO

For the USA
and Canada

RT-5100
NIDEK   REFRACTOR   Control box
SER. NO.
                        ☒   XXXX
                                  Rx only
NIDEK CO., LTD.
34-14 Maehama Hiroishi-cho Gamagori Aichi 443-0038 Japan
MADE IN JAPAN   34085-M804-B0

For the USA and Canada

RT-5100
NIDEK   REFRACTOR   Control box
SER. NO.   📖
                        ☒   XXXX
                                  Rx only
NIDEK CO., LTD.   CE
34-14 Maehama Hiroishi-cho Gamagori Aichi 443-0038 Japan
MADE IN JAPAN   34085-M814-B0

For CE and other countries

	Indicates that the product is certified for the US and Canadian markets, to the applicable US and Canadian standards.
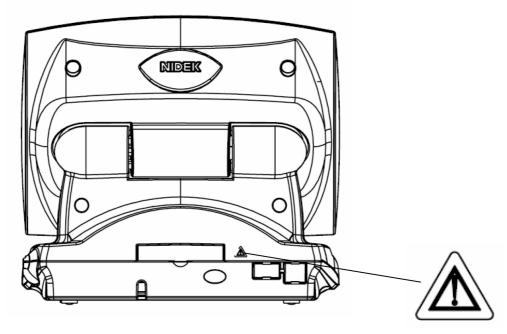
	CE marking
$\mathsf{C}\mathsf{E}$	Indicates that the product conforms fully to the requirements of the Medical Device Directive (93/42/EEC). The RT-5100 is classified as a Class I medical device according to the Medical Device Directive.
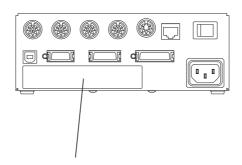
<Rear side of the Control Box>

For the USA and Canadian market

1

<Relay Box>
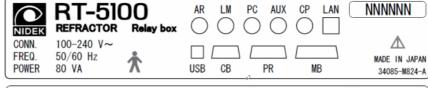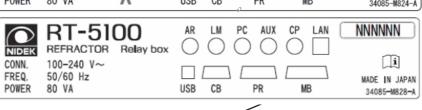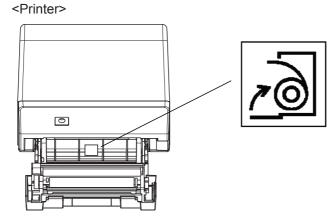
For the USA and
Canadian market
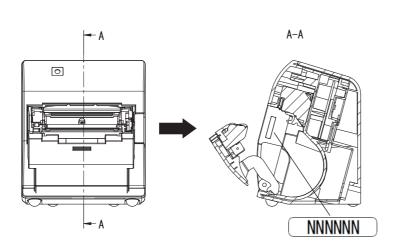
For CE and other
countries
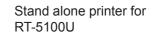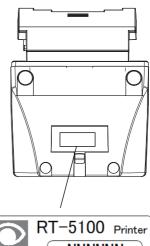
See "1.4.3 Relay box" (page 16).

<Printer>

Built-in printer for ST-5100 (table) / RT-5100S (stand)

Stand alone printer for
RT-5100U

A—A

The symbols shown on the display correspond to the symbols and those names defined in ISO 10341 (Ophthalmic instruments - Refractor heads) as shown in the following table.

Auxiliary lens	Marking		
	RT-5100	**ISO 10341**	
Red maddox rod	▦ or ▥	MR	Maddox rods
Pinhole plate	◉	PH or ◉	Pinhole
Occluder	●	BL or ●	Occluder
PD check lens	⊕	CL or ⊕	Cross line
Red filter	●	RF	Red filter
Green filter	●	GF	Green filter
Polarizing filter	◍ / ◍	PF	Polarization filter
Open aperture	○	OA	Open aperture
Lenses for retinoscope	RETI.	RL	Retinoscope lens
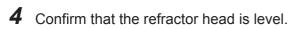
1.6　Before First Use

1 Confirm that the power cord of the system table on which the RT-5100 is installed is connected into the wall outlet.

2 Attach the forehead rest to the refractor head.
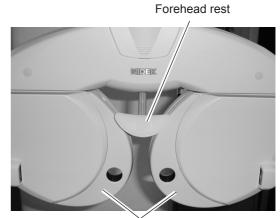
> See "6.2 Cleaning Forehead Rest" (page 250) for attachment procedure.

Forehead rest

3 Attach the two face shields on the refractor head.

> They are magnetic.

Face shields

4 Confirm that the refractor head is level.

> Turn the level adjustment knob until the air bubble is centered in the level.

Level　　　Level adjustment knob
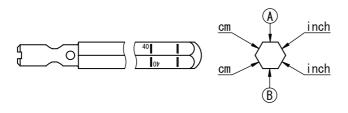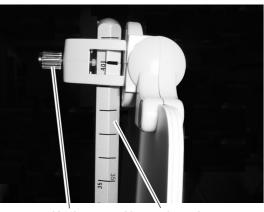
5 Attach the near point rod to the near point chart.

> The scales are printed on the near point rod as shown in the diagram below. When centimeters are desired to be displayed on the left as viewed from the front, insert the rod with surface A facing the knob, to display centimeters on the right, face surface B to the knob, then lightly tighten the knob.

Knob　　　Near point rod

cm ─ Ⓐ ─ inch

cm ─ Ⓑ ─ inch

25

6 Attach the near point rod to the refractor head.

Two round indentations are located at the base of the near point rod. Insert the rod as far as possible with the round indentation on the opposite side of the near point chart knob facing the knob. Tighten the knob.

7 Install the printer paper.

See "6.4 Replacing Printer Paper" (page 251) for more details.
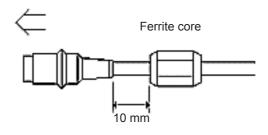
Round indentation   Knob

○ **For the unit or stand type of the RT-5100**

For these configurations, three ferrite cores are provided. When the RT-5100 is connected to external devices such as an auto refractometer or a lensmeter, attach the ferrite core at a position of 10 mm from the cable head of the RT-5100 relay box side of each communication cable.

RT-5100 relay box

Ferrite core

10 mm

📝Note • Attaching the ferrite cores is not necessary for the RT-5100/system table set.
The ferrite cores have already been attached.

1.7 Getting Started and Exiting

1.7.1 Getting started

Turn on the RT-5100 and connected chart presenting device such as the SSC-330.

1 Turn on the connected chart presenting device.

2 Remove the dust cover from the refractor head and turn the system table on.
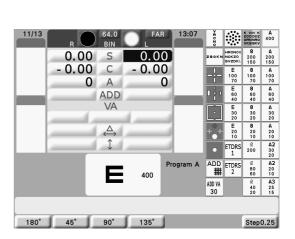
> Turn the power switch of the system table on.
>
> The lowest VA chart is presented.

3 Check the following before use.

> Perform the following checks before use.
>
> ☐ The measurement windows are clean.
>
> ☐ The screen to the right appears without any error.
>
> ☐ The lowest VA chart is presented in the chart presenting device.

1.7.2 Restore from power saving mode

When the RT-5100 is left idle for 15 minutes (variable) without any key operation, it goes into power saving mode. In this mode, the screen backlight and chart presenting device lamp go out.
The RT-5100 restores from this mode by pressing any key.

1.7.3 Exiting

1 Turn off power.

> Turn off the system table.

2 Clean the forehead rest and face shields.

3 Put the supplied dust cover over the refractor head.

> 📝 Note | • Be sure to keep the dust cover on the refractor while it is not in use.
>
> If optical parts become dirty, the chart viewability is impaired and the measurement accuracy is decreased.

2. OPERATING PROCEDURE

2.1 Operation Flow

2.2　Entering Data

Enter objective (AR) and/or lensmeter (LM) data.

2.2.1　From an auto refractometer

When the RT-5100 interfaces with one of the NIDEK auto refractometers, the measured data will be automatically transferred to the RT-5100 by pressing the Print button of the auto refractometer. The RT-5100 stores the data in the memory of the relay box. When the data is already in the memory, skip Steps 1 and 2.

> ✐Note
> - When connecting the RT-5100 to the auto ref/keratometer (ARK), set the "AR port" parameter to "ARK". When connecting the RT-5100 to the auto ref/kerato/tonometer (RKT), set the "AR port" parameter to "RKT". When connecting the RT-5100 to the ARK-10000 (V2.11 or later) or OPD-Scan III, set the "AR port" or "LM port" (port that the ARK-10000 is connected) parameter to WF (OPD). When performing patient view simulation with RT data on the OPD-Scan III (V1.05 or later), set "HDR".
> - When entering day and night data from the ARK-10000 or OPD-Scan III, see "2.2.6 Entering day and night data from ARK-10000 or OPD Scan III" (page 36).

1 Measure the patient's eye with the auto refractometer.

See the corresponding operator's manual.

2 After the measurement, press the Print button of the auto refractometer.

The measured data is printed and automatically stored in the memory of the RT-5100 relay box.

The number at the top of the printout is a called data No. The number is necessary to call up the stored data.

> ✐Note
> - The maximum data count is 9999. However, only the last 150 measurements are retained. Whenever the data count exceeds 150 measurements, the prior data up to the start of those 150 measurements are deleted.

3 Press (IN).

> The last data No. read from an auto refractometer or a lensmeter appears on the screen.

4 Set the data No. at the top of the printout.

> Change the data No. with the dial.

5 Enter the data.

> Press (AR).
>
> The refractor head is automatically set depending on the selected data. The subjective refinement starts.
>
> If the "Preset power of Subj 1" parameter is "LM" and the subjective data has already been entered, even if AR data is later entered, the subjective data remains unchanged.
>
> The elapsed time from data entry start in the subjective data field is displayed when the "Operating timer" parameter is set to "Subj." (except when the elapsed time indication has already started.)

The keratometry data from the ARK or intraocular pressure from the RKT is displayed in only the data list. They are printed together with the other data.

When the "AR port" parameter is set to the "WF(OPD)" or "HDR", or "LM port" parameter to "WF(OPD)", the RT-5100 operates as follows.

• When the Wave Front data is entered, the program becomes the program set in the "Program for WF data imported from OPD" automatically.

When the AR (ARK) data is entered, the program becomes the program set in the "Program for AR data imported from OPD" automatically.

If either program is running, the program cannot be switched when the Wave Front data is entered.

• When the Wave Front data is entered, AR is changed to WF on the display and in the print contents.

*To enter and use the Wave Front data, rewrite the program set in the "Program for WF data imported from OPD" parameter so that it is compatible with Wave Front data.

2.2.2　From a lensmeter

When the RT-5100 interfaces with one of the NIDEK lensmeters, the measured data is automatically transferred to the RT-5100 by pressing the Print button of the lensmeter. The RT-5100 stores the data in the memory of the relay box. When the data is already in the memory, skip Steps 1 and 2.

1 Measure the patient's glasses with the lensmeter.

See the corresponding operator's manual.

2 After the measurement, press the Print button of the lensmeter.

The measured data is printed and automatically stored in the memory of the RT-5100 relay box.

The number at the top of the printout is called a data No. The number is necessary to call up the stored data.

> ✐ Note
> • The maximum data count is 9999. However, only the last 150 measurements are retained. Whenever the data count exceeds 150 measurements, the prior data up to the start of those 150 measurements are deleted.

3 Press ⒤Ⓝ.

The last data No. read from an auto refrac-tometer or a lensmeter appears on the screen.

4 Set the data No. at the top of the printout.

Change the data No. with the dial.

5 Enter the data.

Press ⌊LM⌋ .

The refractor head is automatically set depending on the selected data. The subjective refinement starts.

If the "Preset power of Subj 1" parameter is "AR" and the subjective data has already been entered, even if LM data is later entered, the subjective data remains unchanged.

The elapsed time from data entry start in the subjective data field is displayed when the "Operating timer" parameter is set to "Subj". (except when the elapsed time indication has already started.)

2.2.3 Manual data entry with the dial

Manual data entry is also available with the dial.

> Note
> • When the AR or LM data is entered with the dial, the subjective data field does not open automatically.
>
> The subjective refinement starts with the data when (Subj) is pressed. Select the start values with (AR) or (LM) as necessary and press (Subj) to open the subjective data field.

1 Specify the data to be entered.
Select (LM) or (AR).

2 Specify the eye side.[7]
Select (R) for the right eye, (L) for the left eye, or (BIN) for both eyes.

3 Specify the mode.[7]
Select (S), (C), (A), (ADD), or (PD).
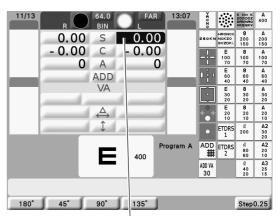
4 Enter the values.
Turn the dial to enter the values.

---

[7]. **Pressing the desired field on the screen allows its value to be entered.**
Pressing a numeric field highlights in blue indicating that its value can be entered.
Pressing [S], [C], [A], or [ADD] allows binocular values to be entered. Pressing the PD button allows a PD value to be entered.

The highlighted numeric field indicates the changeable value.

2.2.4   From an Eye Care card

The optional Eye Care card allows the data to be entered without connecting the auto refractometer or lensmeter to the RT-5100.

○ Auto refractometer or lensmeter → Eye Care card

A. When it is unnecessary to print the auto refractometer or lensmeter data:

1 Measure the patient's eye with the auto refractometer or measure the patient's glasses with the lensmeter.

2 Write the measured data to an Eye Care card.

Insert the card into the Eye Care card slot of the auto refractometer or lensmeter. The data is written to the card.

B. When it is necessary to print the auto refractometer or lensmeter data:

1 Insert an Eye Care card.

Insert the card into the Eye Care card slot of the auto refractometer or lensmeter.

Be sure to insert it before measurement.

2 Measure the patient's eye with the auto refractometer or measure the patient's glasses with the lensmeter.

3 Press the Print button of the auto refractometer or lensmeter.

The measured data is printed and then be written to the Eye Care card.

○ Eye Care card → RT-5100

1 Insert an Eye Care card into the Eye Care card reader of the control box.

The measured data is automatically read in the AR or LM data field.

The data in the Eye Care card is cleared.

📝 Note
• When the "Data clear confirmation by the EyeCare card insertion" parameter is set to "Yes", if data is read from Eye Care card with the measurement data displayed, a window is displayed asking whether or not to read the Eye care card data after clearing the displayed data.

Clear + input → Clear all of the displayed data and read the data in the Eye Care card.

Overwrite → Overwrite with the data in the Eye Care card without clearing the data displayed. Any items in the displayed data not included in the Eye Care card data remain as is. (However, for the Subjective field, follow the "Preset power of Subj 1" parameter setting.)

For the data writing procedure from the RT-5100 to the EyeCare card, see "3.22 Exporting Data to Eye Care Card" (page 148).

2.2.5　Entering day and night data
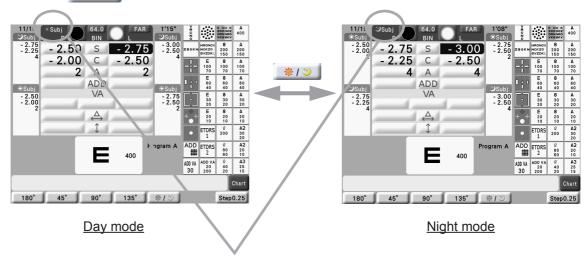
When the "Display the Day/Night switching button" parameter is set to "Yes", [☀ / 🌙] is displayed and night data can be input separately from day data.

> *　Day data is measurement data for bright environment and night data is measurement data for dark envionment.

✐ Note | • To measure in Night mode, a chart presenting device with Night measurement function (SSC-350/SSC-370/SC-1600/SC-1600Pola) is necessary.

2

By pressing [☀ / 🌙] , Day/Night mode can be alternated for data input.

Day mode　　　　　　　　　　　　　　　　Night mode

Day mode and Night mode are indicated by (☀/ 🌙) in the current mode field.

When no data is input for the specified mode, the S/C/A values displayed before pressing [☀ / 🌙] are copied. However, when the subjective mode in which no data input has been specified, the "Preset power of Subj 1" parameter setting is prioritized. (For the Day mode, the day AR value or LM value is copied. For the Night mode, the night AR value or LM value is copied.)
In addition, when starting or the displayed data is cleared, the mode is Day mode.

○ Switching among Unaided and Final in Day/Night mode

Pressing (Un-aided) , (LM) , (AR) , (Subj) , or (Final) in Day mode or Night mode switches the data selection mode from among those Unaided to Final modes.
When nothing is input for the specified mode, the S/C/A values displayed before pressing are copied. However, when the subjective mode whose data is not input is specified, the "Subjective start value 1" parameter setting is prioritized.

○ Input data to Night mode from AutoRef/Lensmeter

In Night mode, input data from an auto refractometer or lensmeter according to the procedures in "2.2.1 From an auto refractometer" (page 30) and "2.2.2 From a lensmeter" (page 32).

2.2.6　Entering day and night data from ARK-10000 or OPD Scan III

Night data as well as day data can be entered simultaneously from the ARK-10000 (V2.13 or later) or OPD-Scan III.

> *　Day data is measurement data for bright environment and night data is measurement data for dark envionment.

> *Note*　• When the "Display the Day/Night switching button" parameter is set to "No", if night data is input, ☀/🌙 is displayed in the function buttons and Night/Day mode can be switched.

○ When calling up data from the ARK-10000 connected with a cable

When entering day data only, see "2.2.1 From an auto refractometer" (page 30).

> *　For detailed procedure for transferring data from the ARK-10000 to the RT-5100, refer to the ARK-10000 Operator's Manual.

> *Note*　• The "AR port" parameter needs to be set as "WF(OPD)".
> • On the ARK-10000 Settings screen, check "Send HD Exam data".
> • If the ARK-10000 Settings screen has the item "HD Exam support RT", check it.
> • Perform Steps 1 to 3 with the ARK-10000, and Steps 4 and later with the RT-5100.

1　Measure the patient's eye with the ARK-10000 in ARK/CT mode.

Refer to the ARK-10000 Operator's Manual.

2　After the measurement, press the print button of the ARK-10000.

3　The HD EXAM dialog box appears. Press [Send both data].

The measured data is printed and automatically stored in the memory of the RT-5100 relay box.

The number at the top of the printout is a called data No. The number is necessary to call up the stored data.
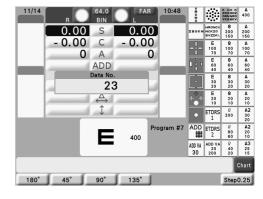
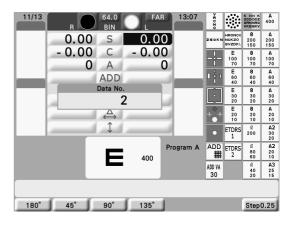> *Note*　• The maximum data count is 9999. However, only the last 150 measurements are retained. Whenever the data count exceeds 150 measurements, the prior data up to the start of those 150 measurements are deleted.

4　Press (IN).

The last data No. read from an auto refractometer or a lensmeter appears on the screen.

5　Set the data No. at the top of the printout.
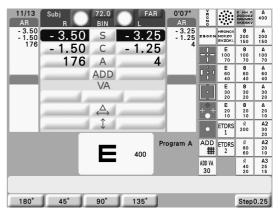
Change the data No. with the dial.

6 Enter the data.

Press (AR).

The refractor head is automatically set depending on the day data. The subjective refinement starts.

☀ is displayed next to the Measurement mode display as the indication of day data.

When the day data is the Wave Front data, the program becomes the program set in the "Program for WF data imported from OPD" parameter automatically. When the day data is the AR median value, the program becomes the program set in the "Program for AR data imported from OPD" parameter automatically. If either program is running, the program cannot be switched when the Wave Front data is entered.

*To enter and use the Wave Front data, rewrite the program set in the "Program for WF data imported from OPD" so that it is compatible with the Wave Front data.

7 Perform the subjective refinement based on the day data.

8 Press the ☀/🌙 function button.

The refractor head is automatically set depending on the night data. The subjective refinement starts.

🌙 is displayed next to the Measurement mode display as the indication of night data.

The program automatically switches to that set by the "Program for Night data imported from OPD" parameter.

If the program is running, the program cannot be switched when the night data is entered.

9 Prepare an environment suitable for night measurement. Perform the subjective refinement based on the night data and print the measured result.

For day data, "For day" is indicated on the printout, showing that the data is for glasses used in bright environments. See "〇 When printing day/night data (page 89)".

For night data, "For night" is indicated on the printout, showing that the data is for glasses used in dark environments.

The data is cleared.

2

○ When calling up data from the OPD-Scan III connected with a cable

When entering day data only, see "2.2.1 From an auto refractometer" (page 30).

* For detailed procedure of transferring data from the OPD-Scan III to the RT-5100, refer to the OPD-Scan III Operator's Manual.

> ✐ Note
> - Set the "AR port" parameter as follows.
>   When performing patient view simulation with RT data on the OPD-Scan III (V1.05 or later), set "HDR". For other cases, set "WF(OPD)".
> - On the Communication tab in the OPD-Scan III Settings screen, set "Connection Device" to "RT-5100 Support" then check "Send HD Exam Data".
> - On the Settings screen in the Measurement tab of the OPD-Scan III, check "RS232C Connection" in the Option field.
> - Perform Steps 1 and 2 with the OPD-Scan III, and Steps 3 and later with the RT-5100.

1 Measure the patient's eye with the OPD-Scan III in OPD/CT mode.

For details, refer to the OPD-Scan III Operator's Manual.

2 When the measured data is obtained, press the Verified and Save buttons of the OPD-Scan III.

The measured data is printed and automatically stored in the memory of the RT-5100 relay box.

The number at the top of the printout is called a data No. The number is necessary to call up the stored data.

> ✐ Note
> - The maximum data count is 9999. However, only the last 150 measurements are retained.
>   Whenever the data count exceeds 150 measurements, the prior data up to the start of those 150 measurements are deleted.

3 Perform the subjective refinement as with the procedures of Steps 4 and later in "○ When calling up data from the ARK-10000 connected with a cable (page 36)".

When the "AR port" parameter is set to "HDR", the patient ID of the OPD-Scan III (V1.05 or later) is also imported.

○ **When calling up data from the ARK-10000 and OPD-Scan III via Eye Care card**

The optional Eye Care card allows day and night data to be entered without connecting the ARK-10000 and OPD-Scan III directly to the RT-5100.

When entering day data only, see "2.2.4 From an Eye Care card" (page 34).

> * For detailed procedure for transferring data from the ARK-10000 or OPD-Scan III to the Eye Care card, refer to the ARK-10000 or OPD-Scan III Operator's Manual.

📝 Note
- Set the "AR port" parameter or the "LM port" parameter to "WF(OPD)".
- On the ARK-10000 Settings screen, check "Send HD Exam data" and "Use Eye Care Card".
- On the Communication tab in the OPD-Scan III Settings screen, set "Connection Device" to "EyeCareCard" then check "Send HD Exam data". On the Settings screen in the Measurement tab of OPD-Scan III, check "RS232C connection" in the Option field.

1 Measure the patient's eye with the ARK-10000 in ARK/CT mode. Write the measured data to the Eye Care card. Or measure the patient's eye with the OPD-Scan III in OPD/CT mode and write the measured data to the Eye Care card.

> For details, refer to the ARK-10000 or OPD-Scan III Operator's Manual.

2 Insert the Eye Care card into the Eye Care card reader of the control box.

> The measured data is automatically read from the Eye Care card to the control box. The day data is entered in the AR field.

> The data in the Eye Care card is cleared.

> The refractor head is automatically set depending on the day data. The subjective refinement starts.

> ☀ is displayed on the left of the measurement mode display as the indication of day data.

> When the day data is the Wave Front data, the program becomes the program set in the "Program for WF data imported from OPD" parameter automatically. When the day data is the AR median value, the program becomes the program set in the "Program for AR data imported from OPD" parameter automatically. If either program is running, the program cannot be switched when the Wave Front data is entered.

> *To enter and use the Wave Front data, rewrite the program set in the "Program for WF data imported from OPD" parameter so that it is compatible with the Wave Front data.

📝 Note
- When the "Data clear confirmation by EyeCare card insertion" parameter is set to Yes, if data is read from Eye Care card with the measurement data displayed, a window is displayed asking whether or not to read the Eye care card data after clearing the displayed data.

    Clear + input → Clear all of the displayed data and read the data in the Eye Care card.

    Overwrite → Overwrite with the data in the Eye Care card without clearing the data displayed. Any items in the displayed data that are not included in the Eye Care card data remain as they are. (However, for the Subjective field, follow the "Preset power of Subj 1" parameter setting.)

3 Perform the subjective refinement by the same procedure as Steps 7 and later in "○When calling up data from the ARK-10000 connected with a cable".

2.3 Setting Prism Lenses

2.3.1 Switching between rectangular and polar coordinates

1 Press ⟮⇄/△⟯ or ⟮↕|θ⟯ to go into prism entry mode.

Pressing the prism field on the screen also goes into prism entry mode.

2 Press [XY] or [rθ] on the screen.

This key toggles between rectangular (XY) and polar coordinates (rθ).
Ex.)

Right eye: 1.0ΔBI, 1.0ΔBU → 1.40Δ, BASE 45°

Left eye: 2.0ΔBO, 1.5ΔBD → 2.50Δ, BASE 323°

2.3.2 Rectangular coordinates (XY)

1 Press ⟮⇄/△⟯ or [⇔̂] on the screen.

The rotary prism lenses are placed in the refractor head.

The prism powers are highlighted in the central screen.

2 Enter base in/out prism powers.

Turn the dial to change the prism powers (in 0.5Δ increments).

Turn the dial clockwise ⇒ The powers increase to the BO (base out) side.

Turn the dial counterclockwise ⇒ The powers increase to the BI (base in) side.

3 Press ⟮↕|θ⟯ or [↕] on the screen.

4 Enter base up/down prism powers.

Turn the dial to change the prism powers (in 0.5Δ increments).

Turn the dial clockwise ⇒　Left eye: The powers increase to the BD (base down) side.

Right eye: The powers increase to the BU (base up) side.

Turn the dial counterclockwise ⇒ Left eye: The powers increase to the BU (base up) side.

Right eye: The powers increase to the BD (base down) side.

The prism powers can also be entered in 0.1Δ increments with ⊕ or ⊖ instead of the dial.

Pressing either key changes the power continuously. See page 135.

Turning the dial while pressing ⟮Shift⟯ changes the power in 2Δ increments.

2.3.3 Polar coordinates (rθ)

1 Press ⟮⇄/△⟯ or [△] on the screen.

The rotary prism lenses are placed in the refractor head.

The prism powers are highlighted in the central screen.

2 Enter the prism absolute values.

Turn the dial to change the absolute values (in 0.5Δ increments).

The prism absolute values can also be changed in 0.1Δ increments with ⊕ or ⊖ instead of the dial.

Pressing either key changes the power continuously. See page 135.

Turning the dial while pressing (Shift) changes the power in 2Δ increments.

3 Press ⬍θ or [θ] on the screen.

4 Enter the prism base angle.

Turn the dial to change the angle (in 1° increments).

Turning the dial while pressing (Shift) changes it in 5° increments.

2.3.4   Removing rotary prism lenses

The rotary prism lenses can be instantly removed with a single touch of any key.
For the 21 Point Exams of Plus Package, the rotary prism can be removed only when the exams are #8 H.Phoria(F), #13B H.Phoria(N), #12A V.Phoria(F), and #18A V.Phoria(N).

1 Press ⇄△ or ⬍θ again while the rotary prism lenses are placed in the measuring windows.[8]

The rotary prism lenses are removed from the measuring windows.

The highlight color on the screen changes and the time display changes to Δ-OFF. It indicates that the rotary prism lenses are removed.

When the rotary prism lenses are removed, the selected prism powers can be changed.
Pressing ⇄△ or ⬍θ again allows the rotary prism lenses to be placed.

📝Note • For Plus Package, the prism power is displayed in gray when the mode is other than prism mode and the rotary prism is not set.

For example, if [s] is pressed, the rotary prism is removed. When inserting the prism again, press ⇄△ or ⬍θ .

2.3.5   Prism data clear

The prism powers of the right and left eyes can be cleared separately.

⌕₁ ⇒ The prism power of the right eye is cleared.

⌕₂ ⇒ The prism power of the left eye is cleared.

2.3.6   Prism data comparison

When comparing the view of LM, AR, Subj, and Final value with the prism power inserted, press LM , AR , Subj , or Final with the prism power inserted. In addition, for Plus Package, rotary prism is not set when the mode is other than prism mode, LM , AR , Subj , or Final must be pressed with the Prism mode (Prism field is highlighted).

---

*8. **Pressing any of the [△], [θ], [△], or [⬍] keys whose numeric field is highlighted in blue while the rotary prism lenses are placed in the measuring windows also removes the rotary prism lenses. (When only single-eye numeric field is highlighted in blue, press the numeric field.) Pressing the key again allows the rotary prism lenses to be placed back.**

41

2.4   Preparation

1 Place the refractor head in front of the patient's eyes.

> 1) Clean the forehead rest, face shields, and measuring windows beforehand.
>
>   See "6 MAINTENANCE" (page 249).
>
> 2) Instruct the patient to lean against the forehead rest and look through the measuring windows.
>
>   Confirm that the forehead detection lamp goes out. When it lights up, the patient's forehead is away from the forehead rest.
>
> 📝Note
> - The forehead rest is for positioning the patient's forehead. Be careful that the patient does not push against the forehead rest.
>
>   If the forehead rest is pressed against too strongly, the support of the forehead rest may be broken.
>
> - If the forehead rest is set too far to the patient side, the patient may force his/her forehead against the forehead rest to approach the measuring window and the support may be broken. If the forehead rest is too far to the patient side, before the patient positions his/her forehead, retract the forehead rest with the forehead rest adjustment knob.

2 Press 〔PD〕.

> The PD adjustment lenses are placed in the measuring windows and the anterior segments of the patient's eyes are lighted.

3 Observe the patient's eyes from the operator's side.
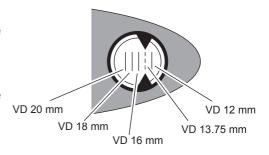
> Confirm that both eyes are located in the center of each measuring window.
>
> A. When they are shifted horizontally: Turn the dial to adjust the pupillary distance (PD).
>
> B. When either eye is shifted vertically: The patient's head is tilted. Instruct the patient to make the head level.

4 Adjust the vertex distance (VD).

> 1) Look through the VD check windows.
>
>   The windows are located on both sides of the refractor head.
>
> 2) Align the patient's corneal vertex to the desired VD marking.
>
>   Turn the forehead rest knob.

VD 20 mm VD 12 mm
VD 18 mm VD 13.75 mm
VD 16 mm

5 Press 〔PD〕 again.

> The PD adjustment lenses are removed from the measuring windows and the light goes off.

2.5 Standard Program Refraction

The RT-5100 includes two standard programs (Programs A and B) for full-corrected far value and prescription. See "8.8 Standard Programs" (page 272) for all test items in the standard programs.

For Plus Package, standard program #7 obtaining full-corrected far value is equipped other than programs A and B.

In this manual, standard program A and standard program #7 are presented as an example.

2.5.1 Program A

Containing unaided and aided visual acuity tests, this program uses the Final Fit (Auto adjustment function) to automatically adjust a prescription to suit the patient.

Pressing (Help) during the program shows sample instructions to the patient. (The instruction may not appear depending on the test. At this time, the normal help screen appears.)

1 Select Program A.

The program is switched with (Shift) + (Prog).
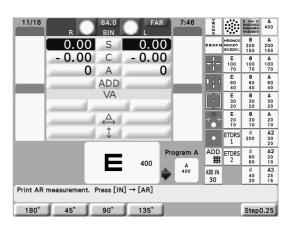
2 Press (Prog).
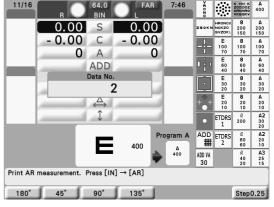
Program A starts.

3 Enter the AR data.[*9]

1) Measure the patient's eye with an auto refractometer and print the result.

2) Press (IN).

Confirm that the data No. is the same as the print data No. of the auto refractometer.

See "2.2.1 From an auto refractometer" (page 30).
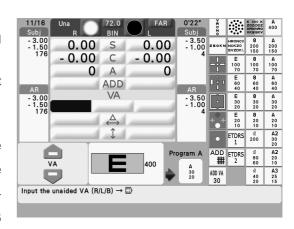
[*9] **When AR data and LM data have been entered before standard program A refraction is started, Steps 3 and Steps 7 to 8 are automatically skipped.**

3) Press (AR) .

The AR data appears in the subjective and AR data fields.

The unaided visual acuity test for the right eye starts.

When the AR data is measured with the auto refractometer not connected to the RT-5100, press (AR), enter the data manually, press (Subj) and (⇨🗍) . See "2.2.3 Manual data entry with the dial" (page 33).

4 Instruct the patient to look at the presented chart through the measuring windows of the refractor.

Or occlude the left eye without the refractor.

5 Measure the unaided visual acuity.

Refer to Steps 3 to 7 in "4.1.1 Unaided Visual Acuity Test" (page 151).

6 Press (⇨🗍) .

7 Confirm that the patient has his/her glasses.

Without glasses
→ Select [No] and go to Step 10.

With glasses
→ Select [Yes] and go to Step 8.
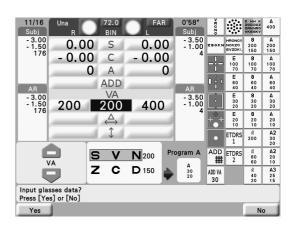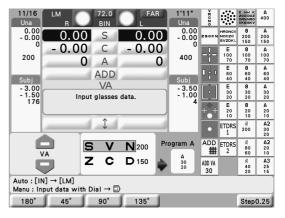
8 Enter the LM data.

1) Measure the patient's glasses with a lensmeter and print the result.

2) Press (IN) .

Confirm that the data No. is the same as the print data No. of the lensmeter.
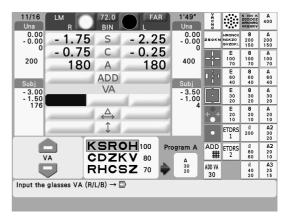
See "2.2.2 From a lensmeter" (page 32).

When the LM data is measured with the lensmeter not connected to the RT-5100, enter the data manually and press (⇨🗍). Refer to Steps 2 to 4 in "2.2.3 Manual data entry with the dial" (page 33).
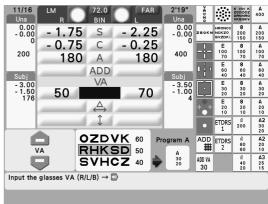
The aided visual acuity test starts and a chart is presented.

9 Measure the aided visual acuity.

Refer to Step 2 in "4.1.2 Aided Visual Acuity Test" (page 152).

| Note | • Patients may wear their own glasses during the aided visual acuity test. |
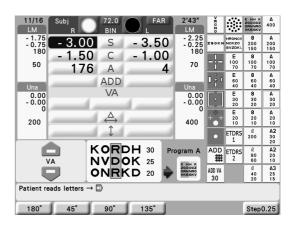
10 Start subjective refinement.

1) Press [⇨].

The left eye is occluded. The subjective refinement starts.

2) Confirm that the patient can read the presented chart.

When the patient can read even one letter on the chart, go to the next red-green test.

11 Refine the spherical power with the red-green test.

1) Press ⇨.

The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

When the cylindrical power is 0.00, the message whether the cross cylinder test is skipped or not appears. When the skip is selected, Steps 11 to 13 are skipped and the red-green test starts in Step 14.

2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

Letters on the red side are sharper. → Turn the dial clockwise one increment.

Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

📝Note
- In this spherical refinement, a circle of least confusion is maintained on the retina for the next cylindrical axis measurement with the cross cylinder. When the patient cannot see the red and green sides equally, make the green side sharper slightly.

12 Measure the cylindrical axis.

1) Press ⇨.

The dots chart is presented.

A cross cylinder lens is placed. The cross cylinder lens type is switched among [Auto], [±0.25], and [±0.50].

When the cylindrical power of the objective value is 0.25, the same cylindrical power measurement as Step 13 starts before the cylindrical axis measurement.[10]

When the cylindrical power of the objective value is 0, proceeding the program displays the message "No Cylinder power. Skip the Cylinder test? Press [YES] or [NO]."[11] Selecting "YES" skips Steps 12 and 13 and then proceeds to Step 14.

📝Note
- When the cylindrical power is 0 and "NO" is selected for the message "No Cylinder power. Skip the Cylinder test?" or the cylindrical power becomes 0 during measurement, the cylindrical power can be additionally reconfirmed by changing the axis.

  For details, see the note of "4.2.2 Astigmatism test with cross cylinder lens" (page 157)".

---

[10]. When the "Intelligent XC" parameter is set to "Yes" (factory setting), the order or measurement type changes depending on the CYL value (cylindrical power). See "3.19 Parameter Settings" (page 133) for details.

[11]. When the "Intelligent XC" parameter is set to "Yes" (factory setting), the message is displayed.

2) Measure the cylindrical axis with the cross cylinder lens.

Flipped cross cylinder:

Ask the patient which is sharper, chart 1 presented by pressing ⊙₁ or chart 2 presented by pressing ⊙₂ .

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing (+))

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing (−))

Repeat the above until both charts appear equal.

Auto cross cylinder:

Charts 1 and 2 are presented simultaneously. Both chart positions appear in the lower left corner of the screen.

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing (+))

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing (−) .)

Repeat the above until both charts appear equal.

Types of cross cylinder lens

47

13 Measure the cylindrical power.

    1) Press ⏩.

        The cross cylinder lens axis changes.

    2) Measure the cylindrical power with the cross cylinder lens.

        Follow the same procedure as 2) of Step 12.

        on the chart, go to the next red-green test.

14 Refine the spherical power with the red-green test.

    1) Press ⏩.

        The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

    2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

        Letters on the red side are sharper. → Turn the dial clockwise one increment.

        Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

📝 Note   • When the patient cannot see the red and green sides equally, make the red side sharper slightly. It avoids overcorrection.

15 Refine the spherical power to achieve the best possible visual acuity with the most plus power.

    1) Press ⏩.

        The isolated 20/20 line is presented.

    2) Check the best possible visual acuity with ⬖ or ⬗.

    3) Refine the spherical power to achieve the best possible visual acuity with the most plus power.

        Turn the dial counterclockwise to add SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

The spherical power for the right eye is perfectly refined.

16 Follow the same procedures as Steps 10 to 15 for the left eye.

The spherical power for the left eye is perfectly refined.

17 Press ⇨⟩ .

Three short beeps are audible.

18 Perform the binocular balance test.

1) Press ⇨⟩ .

The polarizing filters are placed in the measuring windows;

Right eye: 135°, Left eye: 45°

In the visual acuity of 20/20 or better, the vision is fogged automatically for easy balance test when the "Fog for binocular balance" parameter is set to Yes.

2) Make the top and bottom lines appear equal.

The top line is sharper.

→ Press Ⓡ and turn the dial counterclockwise one increment.

The bottom line is sharper.

→ Press Ⓛ and turn the dial counterclockwise one increment.

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

✏️Note
- Binocular balance test can be performed in the binocular red-green test. See "4.4.2 Binocular red-green test" (page 165).
- When the patient cannot see the top and bottom lines equally in the binocular balance test, determine with which eye they view the binocular balance chart more clearly while referring to the visual acuity with LM data or dominant eye (Page 13).

The binocular spherical power is perfectly refined.

19 Perform the stereo test.

1) Press ⟨⇨⟩ .

The polarizing filters are placed in the measuring windows.

Right eye: 135°, Left eye: 45°

The stereo test chart is presented.

The fog which has been applied during the binocular balance test is automatically released.

2) Confirm that the patient can see four vertical lines stereoscopically.

Enter the recognized stereoparallax with the function button. For a patient who cannot see those lines stereoscopically, perform the binocular visual function test as necessary. See "4.4 Binocular Visual Function Test" (page 163).

20 Perform auto adjustment (Final Fit).

1) Press ⟨⇨⟩ .

2) Select [High] or [Low] for the patient's flexibility to the corrective lenses.

When making a decision about the patient's flexibility based on age, the dividing line is about 40 years of age.

The far powers are adjusted automatically and set in [Final 1]. See "2.7.1 Auto adjustment of far powers (with Program A)" (page 83) for more details.

The chart of 20/20 to 20/10 is presented.

21 Check the corrected visual acuity.

Refine the vision with ⊗₁ or ⊗₂ .

Hard to see or undercorrect → ⊗₂

The powers are adjusted higher by one increment and the data is stored in [Final 2].

Overcorrect or uncomfortable → ⊗₁

The powers are adjusted lower by one increment and the data is stored in [Final 2].

The prescription history is called up with the touch buttons such as [Full] (full correction), [Final 1], [Final 2]. It allows each viewability to be compared. Pressing [LM] on the control box can also compare the data with the LM one.

50

Remove the refractor head and check the viewability or visual acuity with a trial frame as necessary.

22 Select whether the near vision test is performed or not.

1) Press ⏵⫶ .

The "Near Vision test?" message appears.

2) Select whether the near vision test is performed or not.

Perform the near vision test.

→ Select [Yes]. The cross cylinder lenses are placed and near point lamp lights up.

Cancel the near vision test.

→ Select [No]. Program A is finished. Go to Step 28.

23 Enter the patient's age.

Select the age with the function buttons.

If age is already input, go to Step 24.

Go to Step 24 when the "Preset ADD parameter" is set to No.

The far powers are switched to the full correction powers to measure the addition powers accurately.
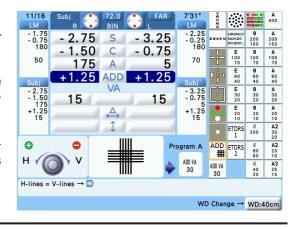
The refractor head converges.

📝 Note | • When the refractor head is converging, have the patient off their face temporarily from the refractor head.

24 Pull down the near point rod and set the near point chart to the desired working distance (normally 40 cm).

25 Measure the addition powers.

1) Select the cross-grid chart on the near point chart.

2) Ask the patient, "Which lines are sharper, the horizontal or vertical ones? Or are they about the same?"

Horizontal lines → Turn the dial counterclockwise in 1 increments until the lines appear equal.

51

Vertical lines → Turn the dial clockwise in 1 increments until the lines appear equal.

Same → It is not necessary to change the addition powers.

> 📝 Note
> • When the patient cannot see the horizontal and vertical lines equally, change the addition power so that the horizontal lines appear sharper than the vertical ones.
> • To continuously perform visual acuity test with addition powers, follow "4.1.3 Visual Acuity Test with Addition Powers" (page 153).

26 Check the near visual acuity.

1) Press ⇨▯ .

The cross cylinder lenses are removed.

Set the values determined by adding or subtracting the ones adjusted in Step 20 to/from the addition powers measured in Step 25 as the addition powers for prescription.

2) Reverse the near point chart and place the visual acuity chart in front of the patient.

3) Confirm that the patient can read the letter whose visual acuity is 20/30.

27 Press ⇨▯ .
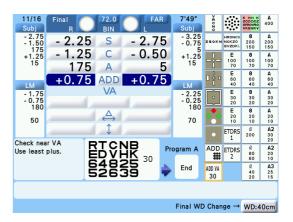
Program A is finished.
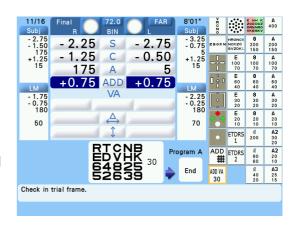
The near point lamp goes out.

28 Print the measured data.

Press (Print) .

29 Place the final prescription lens in a trial frame.

2.5.2　Program Day/Night

Program ☀🌙 is a program to determine the day full correction value based on the objective measurement data and then determine the night full correction value based on the day full correction value.
Pressing (Help) during the program shows sample instructions to the patient. (The instruction may not appear depending on the test. At this time, the normal help screen appears.)
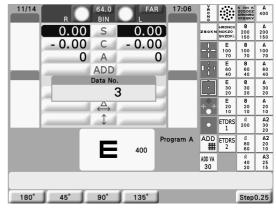
> ✍ Note
> • To measure with the program ☀🌙 , chart presenting device with night measurement function (SSC-350, SSC-370, SC-1600, and SC-1600Pola) are necessary.

1 Enter the AR data.

　　1) Measure the patient's eye with an auto refractometer and print the result.

　　2) Press (IN) .

　　　Confirm that the data No. is the same as the print data No. of the auto refractometer.

　　　See "2.2.1 From an auto refractometer" (page 30).

　　3) Press (AR) .
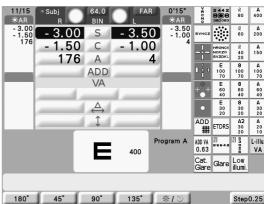
　　　The AR data appears in the subjective and AR data fields.

2 Select Program ☀🌙 .

　　When the program is not ☀🌙 , the program can be switched with (Shift) + (Prog).

3 Press (Prog).

> Program ☀🌙 starts.
>
> Perform measurement in Day mode.
>
> The left eye is occluded. The mode enters into the Subjective measurement mode.

4 Start subjective refinement.

> 1) Confirm that the patient can read the presented chart.
>
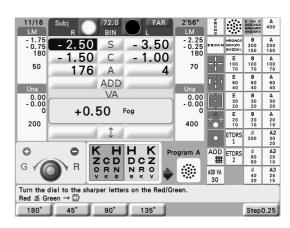> When the patient can read even one letter on the chart, go to the next red-green test.

5 Refine the spherical power with the red-green test.

> 1) Press ⇨◻.
>
> The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.
>
> When the cylindrical power is 0.00, the message whether the cross cylinder test is skipped or not appears. When the skip is selected, Steps 5 to 7 are skipped and the red-green test starts in Step 8.[*12]
>
> 2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

> Letters on the red side are sharper. → Turn the dial clockwise one increment.
>
> Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

> 📝 Note
>
> • In this spherical refinement, a circle of least confusion is maintained on the retina for the next cylindrical axis measurement with the cross cylinder. When the patient cannot see the red and green sides equally, make the green side sharper slightly.

6 Measure the cylindrical axis.

> 1) Press ⇨◻.
>
> The dots chart is presented.
>
> A cross cylinder lens is placed. The cross cylinder lens type is switched between [Auto], [±0.25], and [±0.50].
>
> When the cylindrical power of the objective value is 0.25, the same cylindrical power measurement as Step 7 starts before the cylindrical axis measurement.[*12]

---

*12. When the "Intelligent XC" parameter is set to Yes (factory setting), the order or measurement type changes depending on the CYL value (cylindrical power). See "3.19 Parameter Settings" (page 133) for details.

When the cylindrical power of the objective value is 0, proceeding the program displays the message "No Cylinder power. Skip the Cylinder test? Press [YES] or [NO]."[*13] Selecting "YES" skips Steps 6 and 7 and then proceeds to Step 8.

📝 Note
- When the cylindrical power is 0 and "NO" is selected for the message "No Cylinder power. Skip the Cylinder test?" or the cylindrical power becomes 0 during measurement, the cylindrical power can be additionally reconfirmed by changing the axis.

  For details, see the note of "4.2.2 Astigmatism test with cross cylinder lens" (page 157)".

2) Measure the cylindrical axis with the cross cylinder lens.

Flipped cross cylinder:

Ask the patient which is sharper, chart 1 presented by pressing 🔘 or chart 2 presented by pressing 🔘.

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing ⊕)

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing ⊖)

Repeat the above until both charts appear equal.

Types of cross cylinder lens

Auto cross cylinder:

Charts 1 and 2 are presented simultaneously. Both chart positions appear in the lower left corner of the screen.

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.
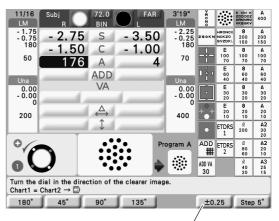
(Also possible by pressing ⊕)

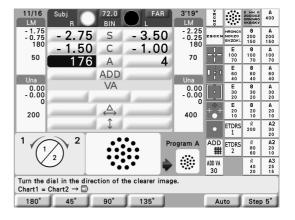**When chart 2 is sharper.**

→ Turn the dial clockwise one increment.

(Also possible by pressing ⊖.)

Repeat the above until both charts appear equal.

---

*13. **When the "Intelligent XC" parameter is set to "Yes" (factory setting), the message is displayed.**

---

7 Measure the cylindrical power.

1) Press ⇨⫿.

The cross cylinder lens axis changes.

2) Measure the cylindrical power with the cross cylinder lens.

Follow the same procedure as 2) of Step 6.

On the chart, go to the next red-green test.

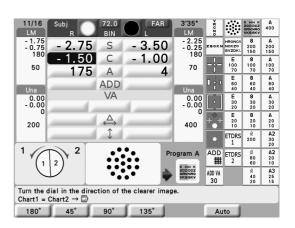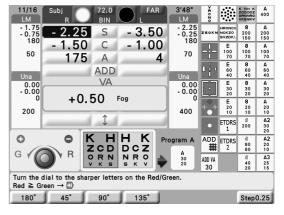**8** Refine the spherical power with the red-green test.

1) Press ⇨⫿.

The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

Letters on the red side are sharper. → Turn the dial clockwise one increment.

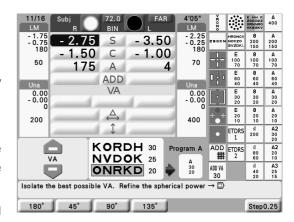Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

> ✐ Note
> • When the patient cannot see the red and green sides equally, make the red side sharper slightly. It avoids overcorrection.

9 Refine the spherical power to achieve the best possible visual acuity with the most plus power.

1) Press ⇨⫿.

The isolated 20/20 line is presented.

2) Check the best possible visual acuity with ⊖ or ⊟.

3) Refine the spherical power to achieve the best possible visual acuity with the most plus power.

Turn the dial counterclockwise to add SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

The spherical power for the right eye is perfectly refined.

10 Press ⟨⇨⟩ and follow the same procedures as Steps 4 to 9 for the left eye.

The spherical power for the left eye is perfectly refined.

11 Press ⟨⇨⟩ .

Three short beeps are audible.

12 Perform the binocular balance test.

1) Press ⟨⇨⟩ .

The polarizing filters are placed in the measuring windows;

Right eye: 135°, Left eye: 45°

In the visual acuity of 20/20 or better, the vision is fogged automatically for easy balance test when the "Fog for binocular balance" parameter is set to Yes.

2) Make the top and bottom lines appear equal.

The top line is sharper.

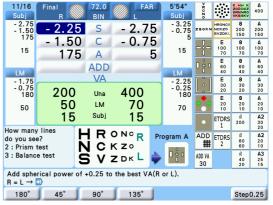→ Press ⓡ and turn the dial counterclockwise one increment.

The bottom line is sharper.

→ Press ⓛ and turn the dial counterclockwise one increment.

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

🖉 Note
- Binocular balance test can be performed in the binocular red-green test. See "4.4.2 Binocular red-green test" (page 165).
- When the patient cannot see the top and bottom lines equally in the binocular balance test, determine with which eye they view the binocular balance chart more clearly while referring to the visual acuity with LM data or dominant eye (Page 13).
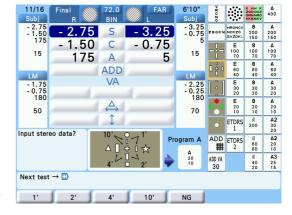
13 Perform the stereo test.
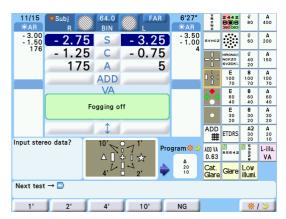
1) Press ⇨🔲 .

The polarizing filters are placed in the measuring windows.

Right eye: 135°, Left eye: 45°

The stereo test chart is presented.

The fog which has been applied during the binocular balance test is automatically released.

2) Confirm that the patient can see four vertical lines stereoscopically.

Enter the recognized stereoparallax with the function button. For a patient who cannot see those lines stereoscopically, perform the binocular visual function test as necessary. See "4.4 Binocular Visual Function Test" (page 163).

14 Measure the best possible visual acuity for both eyes.

1) Press ⇨🔲 .

The isolated 20/20 line is presented.

2) Check the best possible visual acuity with ⊖ or ⊖ .

3) Refine the spherical power to achieve the best possible visual acuity with the most plus power.

Turn the dial counterclockwise to add approximately SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

The spherical power for both eyes is perfectly refined.

🖉 Note

- Instead of the above procedure, the best possible visual acuity for both eyes can be determined as follows:

When releasing the fogging, give the patient sufficient time to view the VA chart.

(1) Add approximately SPH +0.75 D of fogging.

(2) Present a visual acuity chart for which the visual acuity is decreased by a few increments.

(3) When the patient can read the VA chart, press ⊖ to increase the visual acuity. When they cannot read the chart, add SPH -0.25 D to release the fogging and ask them to read it again.

Repeat the procedure to determine the best possible visual acuity with the most plus power.

15 Select whether the near vision test is performed or not.

    1) Press ⏩ .

       The "Near Vision test?" message appears.

    2) Select whether the near vision test is performed or not.

       Perform the near vision test.

       → Select [Yes]. The cross cylinder lenses are placed and near point lamp lights up.

       Cancel the near vision test.

       → Select [No]. Program A is finished. Go to Step 28.
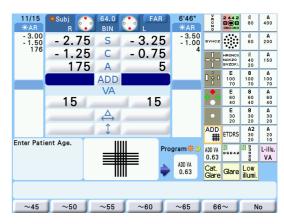
16 Enter the patient's age.

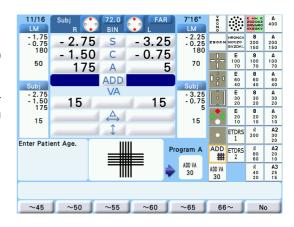   Select the age with the function buttons.

    If age is already input, go to Step 17.

    Go to Step 17 when the "Preset ADD" parameter is set to No.

    The refractor head converges.

📝 Note   • When the refractor head is converging, have the patient off his face temporarily from the refractor head.

17 Pull down the near point rod and set the near point chart to the desired working distance (normally 40 cm).

18 Measure the addition powers.

    Select the cross-grid chart on the near point chart.

    Ask the patient, "Which lines are sharper, the horizontal or vertical ones? Or are they about the same?"

    Horizontal lines → Turn the dial counter-clockwise in 1 increments until the lines appear equal.

    Vertical lines → Turn the dial clockwise in 1 increments until the lines appear equal.

    Same → It is not necessary to change the addition powers.

> 📝 Note
> - When the patient cannot see the horizontal and vertical lines equally, change the addition power so that the horizontal lines appear sharper than the vertical ones.
> - To continuously perform visual acuity test with addition powers, follow "4.1.3 Visual Acuity Test with Addition Powers" (page 153).

19 Check the near visual acuity.

1) Press ⏩.

The cross cylinder lenses are removed.
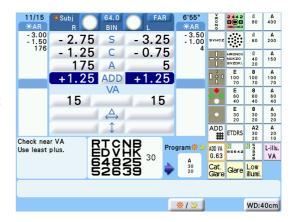
Set the near point chart II Letters chart at a position of 40 cm manually.

2) Measure the visual acuity chart for right eye, left eye, and both eyes.

Press Ⓡ, Ⓛ, or BIN to enter the VA value by turning the dial.

The VA value cannot be entered with the mask buttons such as ⬡ or ⬡.

20 Select whether the Night measurement test is performed or not.

1) Press ⏩.

The "Night vision test?" message appears.

2) Select whether the Night vision test is performed or not.

Perform Night vision test → Select [Yes].

Do not perform Night vision test → Select [No]. Program ☀🌙 is finished.

Then, Night measurement starts.
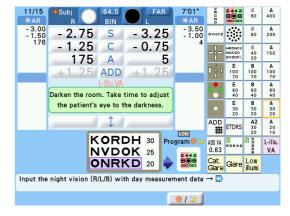
The chart becomes the brightness for Night.

> 📝 Note
> - Darken the room for Night measurement. It is recommended to take time to adjust the patient's eye to the darkness.

21 Check the VA when the chart is darkened with the full corrected power lens in Day mode inserted. Perform the subjective refinement based on the day data and print the measured result.

1) Press ⏩

The isolated 20/20 line is presented.

2) Check the best possible visual acuity with ⬡ or ⬡.

22 Enter Night mode and refine the spherical power with the red-green test.
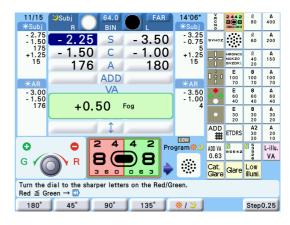
    1) Press ⏩

The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

When the cylindrical power is 0.00, the message whether the cross cylinder test is skipped or not appears. When the skip is selected, Steps 22 to 24 are skipped and the red-green test starts in Step 25.[*14]

    2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

Letters on the red side are sharper. → Turn the dial clockwise one increment.

Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

> 🖉 Note
>
> • In this spherical refinement, a circle of least confusion is maintained on the retina for the next cylindrical axis measurement with the cross cylinder. When the patient cannot see the red and green sides equally, make the green side sharper slightly.

23 Measure the cylindrical axis.

    1) Press ⏩ .

The dots chart is presented.

A cross cylinder lens is placed. The cross cylinder lens type is switched between [Auto], [±0.25], and [±0.50].

When the cylindrical power of the objective value is 0.25, the same cylindrical power measurement as Step 24 starts before the cylindrical axis measurement.[*14]

When the cylindrical power of the objective value is 0, proceeding the program displays the message "No Cylinder power. Skip the Cylinder test? Press [YES] or [NO]."[*15] Selecting "YES" skips Steps 23 and 24 and then proceeds to Step 25.

> 🖉 Note
>
> • When the cylindrical power is 0 and "NO" is selected for the message "No Cylinder power. Skip the Cylinder test?" or the cylindrical power becomes 0 during measurement, the cylindrical power can be additionally reconfirmed by changing the axis.
>
>   For details, see the note of "4.2.2 Astigmatism test with cross cylinder lens" (page 157)".

---

*14. When the "Intelligent XC" parameter is set to "Yes" (factory setting), the order or measurement type changes depending on the CYL value (cylindrical power). See "3.19 Parameter Settings" (page 133) for details.

*15. When the "Intelligent XC" parameter is set to "Yes" (factory setting), the message is displayed.

2) Measure the cylindrical axis with the cross cylinder lens.

Flipped cross cylinder:

Ask the patient which is sharper, chart 1 presented by pressing ⊙₁ or chart 2 presented by pressing ⊙₂

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing ⊕)

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing ⊖)

Repeat the above until both charts appear equal.

Types of cross cylinder lens

Auto cross cylinder:

Charts 1 and 2 are presented simultaneously. Both chart positions appear in the lower left corner of the screen.

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing ⊕)

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing ⊖.)

Repeat the above until both charts appear equal.

24 Measure the cylindrical power.

1) Press ⟦⇨⟧.

The cross cylinder lens axis changes.

2) Measure the cylindrical power with the cross cylinder lens.

Follow the same procedure as 2) of Step 23.

25 Refine the spherical power with the red-green test.

   1) Press [⇨▯] .

      The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

   2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

      Letters on the red side are sharper. → Turn the dial clockwise one increment.

      Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

> 📝 Note • When the patient cannot see the red and green sides equally, make the red side sharper slightly. It avoids overcorrection.

26 Refine the spherical power to achieve the best possible visual acuity with the most plus power.

   1) Press [⇨▯] .

      The isolated 20/20 line is presented.

   2) Check the best possible visual acuity with [▭] or [▭].

   3) Refine the spherical power to achieve the best possible visual acuity with the most plus power.

      Turn the dial counterclockwise to add SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

      The spherical power for the right eye is perfectly refined.

27 Press [⇨▯] and follow the same procedures as Steps 21 to 26 for the left eye.

      The night spherical power for the left eye is perfectly refined.

28 Press [⇨▯] .

      Three short beeps are audible.

29 Perform the binocular balance test.

1) Press ⇨🔲 .

   The polarizing filters are placed in the measuring windows;

   Right eye: 135°, Left eye: 45°

   In the visual acuity of 20/20 or better, the vision is fogged automatically for easy balance test when the "Fog for binocular balance" parameter is set to "Yes".

2) Make the top and bottom lines appear equal.

   The top line is sharper.

   → Press (R) and turn the dial counterclockwise one increment.

   The bottom line is sharper.

   → Press (L) and turn the dial counterclockwise one increment.

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

> 📝 Note
> - Binocular balance test can be performed in the binocular red-green test. See "4.4.2 Binocular red-green test" (page 165).
> - When the patient cannot see the top and bottom lines equally in the binocular balance test, determine with which eye they view the binocular balance chart more clearly while referring to the visual acuity with LM data or dominant eye (Page 13).

30 Perform the stereo test.

    1) Press [⇨▯]

        The polarizing filters are placed in the measuring windows.

        Right eye: 135°, Left eye: 45°

        The stereo test chart is presented.

        The fog which has been applied during the binocular balance test is automatically released.

    2) Confirm that the patient can see four vertical lines stereoscopically.

        Enter the recognized stereoparallax with the function button. For a patient who cannot see those lines stereoscopically, perform the binocular visual function test as necessary. See "4.4 Binocular Visual Function Test" (page 163).

31 Measure the best possible visual acuity for both eyes.

    1) Press [⇨▯] .

        The isolated 20/20 line is presented.

    2) Check the best possible visual acuity with ⊝ or ⊟ .

    3) Refine the spherical power to achieve the best possible visual acuity with the most plus power.

        Turn the dial counterclockwise to add approximately SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

    📝 Note   • Instead of the above procedure, the best possible visual acuity can be determined as follows:

        When releasing the fogging, give the patient sufficient time to view the VA chart.

        (1) Add approximately SPH +0.75 D of fogging.

        (2) Present a visual acuity chart for which the visual acuity is decreased by a few increments.

        (3) When the patient can read the VA chart, press ⊝ to increase the visual acuity. When they cannot read the chart, add SPH -0.25 D to release the fogging and ask them to read it again.

        Repeat the procedure to determine the best possible visual acuity with the most plus spherical power.

    The night spherical power for both eyes is perfectly refined.

32 Press [⇨▯] .

This completes Program ☀☽ .

2.5.3　Program #7 (only for Plus Package)

Program #7 is a program to determine the best possible visual acuity with the most plus power based on the objective measurement data.
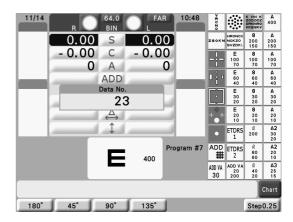
Pressing (Help) during the program shows sample instructions to the patient. (The instruction may not appear depending on the test. At this time, the normal help screen appears.)

1 Enter the AR data.

1) Measure the patient's eye with an auto refractometer and print the result.

2) Press (IN).

Confirm that the data No. is the same as the print data No. of the auto refractometer.

See "2.2.1 From an auto refractometer" (page 30).

3) Press (AR).
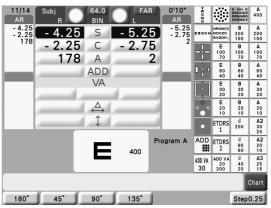
The AR data appears in the subjective and AR data fields.

2 Select Program #7.

When the program is not #7, the program can be switched with (Shift) + (Prog).

Program #7 can also be displayed by displaying the 21 Point Exams and pressing [#7 Subj(F)] also starts Program #7.

In this case, Step 3 is not necessary.

3 Press (Prog).

> Program #7 starts.

> The left eye is occluded. The subjective refinement starts.

4 Start subjective refinement.
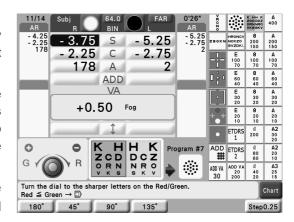
> 1) Confirm that the patient can read the presented chart.

> When the patient can read even one letter on the chart, go to the next red-green test.

5 Refine the spherical power with the red-green test.

> 1) Press ⇨🗋.

> The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

> When the cylindrical power is 0.00, the message whether the cross cylinder test is skipped or does not appear. When the skip is selected, Steps 5 to 7 are skipped and the red-green test starts in Step 8.[*16]

> 2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

> Letters on the red side are sharper. → Turn the dial clockwise one increment.

> Letters on the green side are sharper. → Turn the dial counterclockwise one increment.

> ✎ Note • In this spherical refinement, a circle of least confusion is maintained on the retina for the next cylindrical axis measurement with the cross cylinder. When the patient cannot see the red and green sides equally, make the green side sharper slightly.

6 Measure the cylindrical axis.

> 1) Press ⇨🗋.

> The dots chart is presented.

> A cross cylinder lens is placed. The cross cylinder lens type is switched between [Auto], [±0.25], and [±0.50].

> When the cylindrical power of the objective value is 0.25, the same cylindrical power measurement as Step 7 starts before the cylindrical axis measurement.[*16]

---

*16. When the "Intelligent XC" parameter is set to Yes (factory setting), the order or measurement type changes depending on the CYL value (cylindrical power). See "3.19 Parameter Settings" (page 133) for details.

When the cylindrical power of the objective value is 0, proceeding the program displays the message "No Cylinder power. Skip the Cylinder test?".[17] Selecting "YES" skips Steps 6 and 7 and then proceeds to Step 8.

📝 Note
• When the cylindrical power is 0 and "NO" is selected for the message "No Cylinder power. Skip the Cylinder test?" or the cylindrical power becomes 0 during measurement, the cylindrical power can be additionally reconfirmed by changing the axis.

For details, see the note of "4.2.2 Astigmatism test with cross cylinder lens" (page 157)".

2) Measure the cylindrical axis with the cross cylinder lens.

Flipped cross cylinder:

Ask the patient which is sharper, chart 1 presented by pressing ⓐ₁ or chart 2 presented by pressing ⓐ₂ .

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing ➕)

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing ➖)

Repeat the above until both charts appear equal.

Types of cross cylinder lens

Auto cross cylinder:

Charts 1 and 2 are presented simultaneously. Both chart positions appear in the lower left corner of the screen.

When chart 1 is sharper.

→ Turn the dial counterclockwise one increment.

(Also possible by pressing ➕)

When chart 2 is sharper.

→ Turn the dial clockwise one increment.

(Also possible by pressing ➖ .)

Repeat the above until both charts appear equal.

7 Measure the cylindrical power.

---

[17].   When the "Intelligent XC" parameter is set to "Yes" (factory setting), the message is displayed.

---

1) Press ⏩ .

The cross cylinder lens axis changes.

2) Measure the cylindrical power with the cross cylinder lens.

Follow the same procedure as 2) of Step 6.

On the chart, go to the next red-green test.

8 Refine the spherical power with the red-green test.

1) Press ⏩ .

The SPH +0.50 D lens is automatically added to fog the vision. The red-green chart is presented.

2) Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

Letters on the red side are sharper. → Turn the dial clockwise one increment.

Letters on the green side are sharper. → Turn the dial counterclockwise one incre-ment.

📝 Note • When the patient cannot see the red and green sides equally, make the red side sharper slightly. It avoids overcorrection.

9 Refine the spherical power to achieve the best possible visual acuity with the most plus power.

1) Press ⏩ .

The isolated 20/20 line is presented.

2) Check the best possible visual acuity with 🔲 or 🔲 .

3) Refine the spherical power to achieve the best possible visual acuity with the most plus power.

Turn the dial counterclockwise to add SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

The spherical power for the right eye is perfectly refined.

10 Press and follow the same procedures as Steps 4 to 9 for the left eye.

The spherical power for the left eye is perfectly refined.

11 Press .

Three short beeps are audible.

12 Perform the binocular balance test.

1) Press .

The polarizing filters are placed in the measuring windows;

Right eye: 135°, Left eye: 45°

In the visual acuity of 20/20 or better, the vision is fogged automatically for easy balance test when the "Fog for binocular balance" parameter is set to Yes.

2) Make the top and bottom lines appear equal.

The top line is sharper.

→ Press (R) and turn the dial counterclockwise one increment.

The bottom line is sharper.

→ Press (L) and turn the dial counterclockwise one increment.

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

✎Note
- Binocular balance test can be performed in the binocular red-green test. See "4.4.2 Binocular red-green test" (page 165).
- When the patient cannot see the top and bottom lines equally in the binocular balance test, determine with which eye they view the binocular balance chart more clearly while referring to the visual acuity with LM data or dominant eye (Page 13).

13 Measure the best possible visual acuity for both eyes.

1) Press ⇨◑ .

The isolated 20/20 line is presented.

2) Check the best possible visual acuity with ⊖ or ⊟ .

3) Refine the spherical power to achieve the best possible visual acuity with most plus power.

Turn the dial counterclockwise to add approximately SPH +0.25 D. When the chart appears blur, turn the dial clockwise one increment.

The spherical power for both eyes is perfectly refined.

✎Note   • Instead of the above procedure, the best possible visual acuity for both eyes can be determined as follows:

When releasing the fogging, give the patient sufficient time to view the VA chart.

(1) Add approximately SPH +0.75 D of fogging.

(2) Present a visual acuity chart for which the visual acuity is decreased by a few increments.

(3) When the patient can read the VA chart, press ⊟ to increase the visual acuity. When they cannot read the chart, add SPH -0.25 D to release the fogging and ask them to read it again.

Repeat the procedure to determine the best possible visual acuity with the most plus power.

14 Select whether the near vision test is performed or not.

1) Press ⇨◑ .

The "Near Vision test?" message appears.

2) Select whether the near vision test is performed or not.

Perform the near vision test.

→ Select [Yes]. The cross cylinder lenses are placed and near point lamp lights up.

Cancel the near vision test.
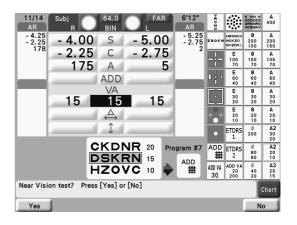
→ Select [No]. Program A is finished. Go to Step 28.
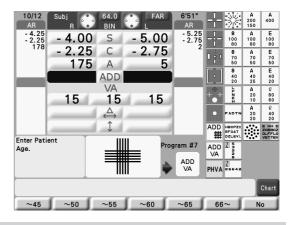
15 Enter the patient's age.

Select the age with the function buttons.

If age is already input, go to Step 16.

Go to Step 16 when the "Preset ADD" parameter is set to No.
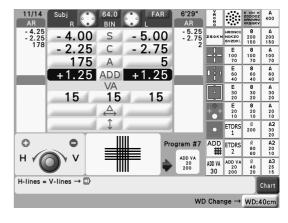
The refractor head converges.

📝 Note   • When the refractor head is converging, have the patient off his face temporarily from the refractor head.

16 Pull down the near point rod and set the near point chart to the desired working distance (normally 40 cm).

17 Measure the addition powers.

1) Select the cross-grid chart on the near point chart.

2) Ask the patient, "Which lines are sharper, the horizontal or vertical ones? Or are they about the same?"

Horizontal lines → Turn the dial counter-clockwise in 1 increments until the lines appear equal.

Vertical lines → Turn the dial clockwise in 1 increments until the lines appear equal.

Same → It is not necessary to change the addition powers.

📝 Note   • When the patient cannot see the horizontal and vertical lines equally, change the addition power so that the horizontal lines appear sharper than the vertical ones.

18 Check the near visual acuity.

    1) Press ⬅🔲 .

        The cross cylinder lenses are removed.
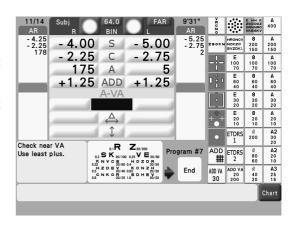
        Set the near point chart II A Letters chart at a position of 40 cm manually.

    2) Measure the visual acuity chart for right eye, left eye, and both eyes.

        Press Ⓡ , Ⓛ , or BIN to enter the VA value by turning the dial.

        The VA value cannot be entered with the mask buttons such as ⬭ or ⬡ .

19 Press ⬅🔲 .
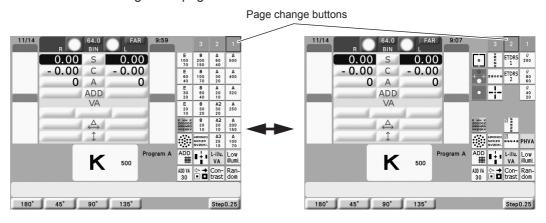
    This completes Program #7.

2

2.6　Chart Presentation
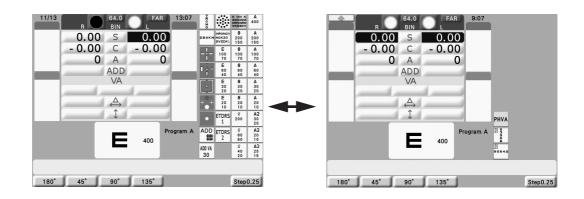
2.6.1　Chart selection

Pressing the desired chart button at the right of the screen presents the corresponding chart.

The selected chart is displayed at the center of the screen.

When the SC series is connected, pressing the page change button `1` to `3` at the top of the chart buttons changes the page.

Page change buttons

When the CP series F, ISO, M, T, U, G, PhM, or the SSC series M is connected, pressing the Shift button switches the page.

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2.6.2　Visual acuity chart mask functions

Press any mask key on the control box to use the mask functions.

Mask keys

> 📝 Note | • The SC series displays the isolated segment in the center of the screen instead of isolating the chart with mask functions.

○ **How to isolate a vertical line**

Press (Ⅱ)< or >(Ⅱ) .

When the vertical line is isolated:

- Press (Ⅱ)< or >(Ⅱ) . ⇒ The isolation moves to the left or right. (When the same key is pressed again to continue moving an isolation located at one end of the chart, short beeps are audible and the isolation moves to the opposite end of the chart.)

- Press ⊖ or ⊟ . ⇒ The isolation moves up or down.

> 📝 Note | • For charts with four columns on the SSC, the vertical isolated line is moved between only the two columns in the middle.

○ **How to isolate a horizontal line**

Press ⊖ . ⇒ The top line is isolated.
Press ⊖ . ⇒ The middle line is isolated.
Press ⊟ . ⇒ The bottom line is isolated.

When the horizontal line is isolated:

- Press ⊖ or ⊟ . ⇒ The isolation moves up or down.

- Press [Ran-dom] (only SC series). ⇒ The letter order is randomly rearranged at the same VA. When a single VA is displayed (low visual acuity etc.) for the cortical vision letter, vertical line letter, or single letter, the letter order is also randomly rearranged at the same VA.

- Press ⊖ (only SC series). ⇒ The letter order is randomly rearranged at the same VA.

> 📝 Note | • The VA value is automatically entered. (Except for when in Prism mode)

○ How to isolate a single letter

Press (▫).

⇒ The letter in the upper-right corner of the chart is isolated.

Press (Shift) + (▫).

⇒ The letter in the upper-left corner of the chart is isolated.

Press (Shift) + ([])<.

⇒ The letter in the lower-left corner of the chart is isolated.

Press (Shift) + >([]) . ⇒ The letter in the lower-right corner of the chart is isolated.

When a single letter is isolated:

- Press ([])< or >([]) . ⇒ The isolation moves to the left or right.

  (When the same key is pressed again to continue moving an isolation located at one end of the chart, short beeps are audible and the isolation moves to the opposite end of the chart.)

- Press (⬡) or (⬡). ⇒ The isolation moves up or down.

🖉 Note
- There are two letter charts of 20/20 to 20/10 to prevent patient memorization. When the vertical line or single letter isolation is moved to up or down, or the same visual acuity chart is selected twice or more, the two charts are presented alternately.
- The VA value is automatically entered. (Except for when in Prism mode)
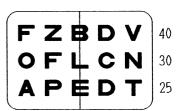
○ How to apply the red-green filter

Press (Shift) + (⬡).

The red-green filter is applied to the presented visual acuity chart.

While the red-green filter is applied;

- Press (⬡) or (⬡).

  ⇒ The visual acuity chart changes to another.

- Press (Shift) + (⬡). ⇒ The red-green filter is released.

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○ How to release the mask and filter

Pressing any chart button releases the applied mask or filter.

Chart presentations with the mask keys (without (Shift))
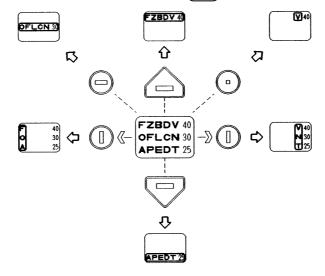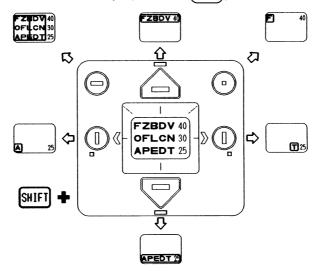
Chart presentations with the mask keys (also with (Shift))

2.6.3　Low illumination, glare lamp, and contrast functions (SSC series)

When the SSC-350, SSC-350CG, SSC-330U, or SSC-370 is connected, the following functions are available.

	Low illumination	Glare lamp	Contrast
SSC-350T/M/ SSC-370T/UK/M	Available	Unavailable	Unavailable
SSC-370MG	Available	Available	Unavailable
SSC-350TCG/MCG/ SSC-370MCG	Available	Available	Available
SSC-330U	Unavailable	Available	Unavailable

When the SSC-350 or SSC-370 is connected, in addition to the [Low illumi.] button, depending on the model, the following buttons are displayed below the chart buttons.

SSC-350TCG

SSC-350T/M
SSC-370T/UK/M
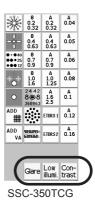
[Glare] : Turns on or off the glare lamp.
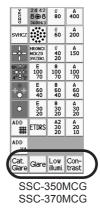
The glare function makes it possible to test the visual acuity under dazzling conditions. This function can evaluate vision deterioration caused by decreased contrast when scattered light reaches the macular part of the eye due to opacity or irregularity of the lens.
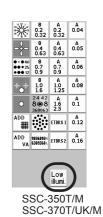
[ ] is shown to the right of the displayed chart on the chart window when the glare lamp is turned on.
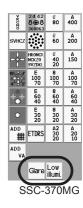
This button can also change the glare lamp luminance only for the SSC-350MCG or SSC-370MCG. Pressing [Glare] changes the luminance in the order of high luminance → medium luminance → low luminance → OFF.

[Low illumi.] :Switches between the low-light illumination and standard light illumination.

SSC-350MCG
SSC-370MCG

SSC-370MG

The low-light illumination function makes it possible to test the visual acuity under night-time conditions. This function can test whether or not the subject can recognize the low-light chart (9 to 10 cd/m^2) for reference to diagnose light sense disturbance.

[LOW] is shown to the right of the displayed chart on the chart window when of the low-light illumination.
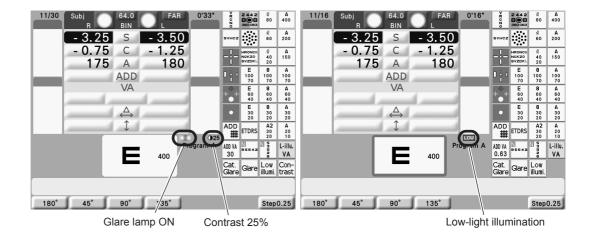
In addition, the control box screen becomes the brightness set for the Night mode. See "3.17 Controlling Backlight Brightness".

Con-trast : Switches the chart contrast in the order of 25%, 12.5%, 6%, and 100% (normal contrast).

The contrast function makes it possible to test the visual acuity under low-contrast conditions (25%, 12.5%, 6%). This function can evaluate the visual function according to contrast sensitivity, which is not measured in the standard test, and can observe changes with time.

◗25 is shown to the right of the displayed chart on the chart window when the contrast is 25%, ◗12 is shown when the contrast is 12.5%, and ◗6 is shown when the contrast is 6%.

Cat.Glare : Turns the glare lamp on at high luminance when the low illumination function is enabled. (Only SSC-350MCG and SSC-370MCG/MG)

Glare lamp ON   Contrast 25%   Low-light illumination
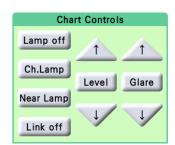
> *Note*
> • The low illumination, glare lamp, and contrast functions are available at any time during refraction.
> • The low illumination and contrast functions cannot be used at the same time.

When the SSC-330U (equipped with the optional glare lamp) is connected, pressing the left side switch of the control box displays the glare lamp buttons.

[Glare]:Turns on or off the glare lamp.

[↑], [↓]:Controls the lamp intensity.

is shown to the right of the displayed chart on the chart window when the glare lamp is turned on.
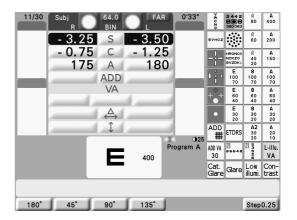
> *Note*
> • The glare lamp can be lighted up at all times.
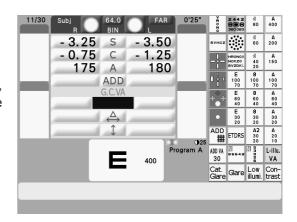
When the SSC-350M, SSC-350MCG, or SSC-330U equipped with optional glare lamp is connected, there is a special mode to test the visual acuity using the low illumination, glare lamp, or contrast function. For the SC-1700 PolaM, SC-2000M, SC-1600M, and SC-1600 PolaM only the test using the contrast function can be performed. The mode allows the measured data to be stored separately from normal measurement data.

1 Make the low illumination, glare lamp, or contrast function available according to the previous page.
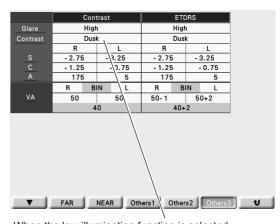
2 Press [VA] while pressing [Shift].

The VA field changes to the G.C.VA field.

3 Test the right, left, and binocular VA.

The measured VA, each function settings, SPH, CYL, and AXIS for the test are stored.

The results in this mode can be checked on the Others3 screen in the data list.

1) Press [Menu] to call up the main menu screen.

2) Press [Data List].

3) Press [Others3].

	Contrast		ETDRS	
Glare	High		High	
Contrast	Dusk		Dusk	
	R	L	R	L
S	- 2.75	- 3.25	- 2.75	- 3.25
C	- 1.25	- 0.75	- 1.25	- 0.75
A	175	5	175	5
	R	BIN	L	R	BIN	L
VA	50		50	50- 1		50+2
		40			40+2	
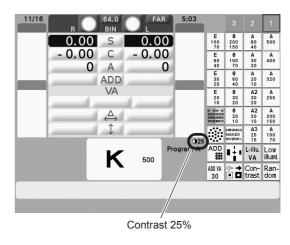
When the low illumination function is selected, "Dusk" is displayed in the Contrast field.

2.6.4 Contrast function, Night mode, and Reverse function (SC series)

When the SC series is connected, [Con-trast] and [⇆] or such are displayed below the chart buttons as shown to the right.

[Con-trast] : Switches the chart contrast in the order of 25%, 12.5%, 6%, and 100% (normal contrast).

> The contrast function makes it possible to test the visual acuity under low-contrast conditions (25%, 12.5%, 6%). This function can evaluate the contrast sensitivity visual function, which is not measured in the standard test, and can observe changes with time.

Contrast 25%

◖25 is shown to the right of the displayed chart on the chart window when the contrast is 25%, ◖12 is shown when the contrast is 12.5%, and ◖6 is shown when the contrast is 6%.
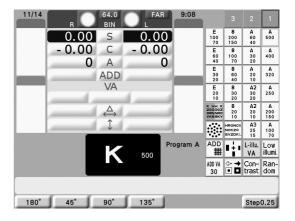
| ✐ Note | • Contrast can be tested at any time during refraction. |

[⇆] :Inverses the VA chart each time pressed.

| ✐ Note | • The inverted VA chart (white letters in black) is used for the special test such as amblyopia and VA value is a reference value. |
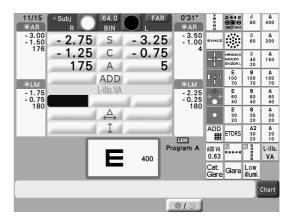
[LOW] : Switches between the low-light illumination and standard light illumination.
(SC-1600 and SC-1600Pola only)

The low-light illumination function makes it possible to test the visual acuity under night-time conditions. This function can test whether or not the subject can recognize the low-light chart (9 to 11 cd/m^2) for reference to diagnose light sense disturbance.

[LOW] is shown to the right of the displayed chart on the chart window when of the low-light illumination.

📝 Note | • The low illumination function can be used at any time during refraction.

○Displaying contrast VA chart (SC-1700PolaG+ and SC-1600PolaG+ only)

For the G+ chart of the SC-1700Pola and the SC-1600Pola, the chart with the same visual acuity can be presented in three contrast levels so that the contrast sensitivity can be compared.
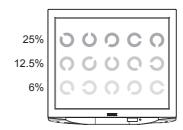
This is used for when visual acuity measurement is performed under low contrast conditions (25%, 12.5%, or 6%). It allows visual function evaluation by contrast sensitivity and observation of aged deterioration that is not readily apparent under normal visual acuity measurement.

Press the chart key to be displayed from among [0.4 ccc] to [1.6 ccc] on the chart control screen.

The contrast VA chart appears.

The contrast of each level is displayed by 25% (upper), 12.5% (middle), and 6% (lower).

Press [⊖] or [⊝] to change the visual acuity chart.

25%
12.5%
6%

📝 Note | • In the contrast VA chart, the red-green filter cannot be applied nor can the vertical/horizontal line isolation or single letter isolation be displayed.

2.7   Power Adjustment (Final Fit)

The RT-5100 is provided with the following two functions.

Auto adjustment function: The RT-5100 determines automatically the conditions such as LM data, flexibility (patient's age), refractive error type (myopia, hyperopia, astigmatism, oblique astigmatism, anisometropia) and calculates the Final Fit value from the binocular full correction.

Semi-auto adjustment function: The operator can adjust the Final Fit value manually.

The Final Fit value calculated with the auto adjustment function (Final Fit) is lower than an average prescription. It avoids overcorrecting the patient. Be sure to adjust the value with the semi-auto adjustment function.

When the Final Fit value is obtained, be sure to check the patient's viewability with a trial frame.

> 📝 Note
>
> • The calculated Final Fit value is a guide for determining the final prescription. The final prescription should be determined according to the patient's acceptance.
>
> • Be sure to measure and enter the full correction or LM data precisely. When the full correction is inaccurate, the LM data is not entered regardless of patient's wearing glasses, or the entered data is not correct, the calculated value may not provide visual comfort for the patient.
>
> • Auto adjustment cannot be performed for the night data.

2.7.1   Auto adjustment of far powers (with Program A)

Program A contains the auto adjustment function.

Refer to Step 20 in "2.5.1 Program A (Page 50)".

1   Press ⇨🔲 after the stereo test.

Enter the flexibility for new prescription.

It selects whether or not to adjust the spherical and cylindrical powers lower. When [Low] is selected, the powers are adjusted to 0.25 D lower than the ones when [High] is selected.

When making a decision about the patient's flexibility based on age, the dividing line is about 40 years of age.

2 Select [High] or [Low].

The auto adjustment function calculates the Final Fit value.

The bar graph appears during calculation.

When calculation is completed, the Final Fit value is displayed as Final 1 and corrective lenses are placed in the measuring windows. The chart of 20/20 to 20/10 is presented automatically.

The LM and subjective (monocular full correction) data are displayed in the left and right windows. It makes comparison easier.

2.7.2　Auto adjustment of far powers (with Program B)

Program B does not contain the auto adjustment function. Perform the following procedures to use the function.

　　　* The "SHIFT+Final" parameter must be set to "Final Fit".
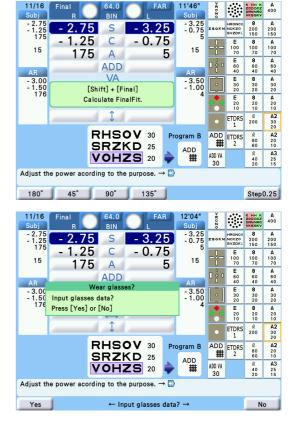
1 Measure the binocular full correction, press ⇨◻ after the stereo test.

The message whether to use the auto adjustment function appears.

2 Press (Final) while pressing (Shift).*18

The message whether to enter the LM data (glasses data) appears.

When the data has already been entered, go to Step 4.

---

*18.　　When the auto adjustment function is not used, adjust the powers manually and press ⇨◻ .

3 Select whether the LM data (glasses data) is entered or not.
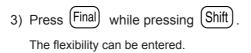
Without glasses → Press [No] and go to Step 4.

With glasses →

1) Press [Yes].

The LM data can be entered.

2) Enter the LM data manually.

See "2.2.3 Manual data entry with the dial" (page 33).

3) Press [Final] while pressing [Shift].

The flexibility can be entered.

4 Enter the flexibility.
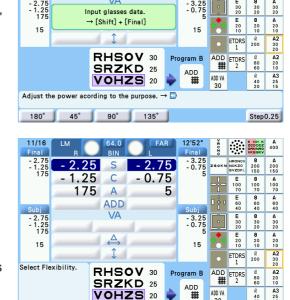
See "2.7.1 Auto adjustment of far powers (with Program A)" (page 83).

When calculation is completed, the auto-adjusted powers are displayed as Final 1 and corrective lenses are placed in the measuring windows. The chart of 20/20 to 20/10 is presented automatically.

2.7.3   Power adjustment without standard programs

The auto adjustment function can also be used when any standard program is not used.

*The "SHIFT+Final" parameter must be set to "Final Fit".

1 Measure the binocular full correction and press [Final] while pressing [Shift].

2 Perform auto adjustment with the same procedures as Steps 3 and 4 in "2.7.2 Auto adjustment of far powers (with Program B)".

📝 Note

• The auto adjustment function can be added in any program other than the standard programs. (see page 121). At this time, use the function with the same procedures as "2.7.1 Auto adjustment of far powers (with Program A)".

• When the "Adjust the power according to the purpose. → [⇨]] " message is written in the program without the auto adjustment function, adjust the far powers with the same procedures as "2.7.2 Auto adjustment of far powers (with Program B)".

2.7.4　Fine adjustment after auto adjustment (Semi-auto adjustment)

Adjust the Final Fit value calculated with the auto adjustment function precisely with the semi-auto adjustment function.

📝 Note | • The Final Fit value calculated with the auto adjustment function is lower than an average prescription. It avoids overcorrecting the patient. Be sure to adjust the value with the semi-auto adjustment function.

1 After auto adjustment, ask the patient whether he/she can see the chart clearly and comfortably with the lenses of final prescription 1 (Final 1).

2 Adjust the powers precisely.

Hard to see or undercorrect → Press 🎛.

Overcorrect or uncomfortable → Press 🎛.

The powers are adjusted and the data is stored in [Final 2].[19]

3 Repeat Steps 1 and 2 until the patient sees the chart most clearly and comfortably.

The powers are adjusted and the data is stored in the order of [Final 3], [Final 4] …[20]

2.7.5　Manual power adjustment

The powers can also be adjusted manually without the auto adjustment function.

Select the mode to be changed with (S) , (C) , or (A) and change each data with the dial.

For example:

1) Press ⊟ or ▽ to present a chart with a patient's desired visual acuity.

2) Adjust the spherical and cylindrical powers to achieve the best possible visual acuity with the most plus powers.

Manual adjustment is also available after auto adjustment.

*19.　See "8.1 Descriptions of Power Adjustment" (page 261) for adjusting the powers precisely with 🎛 or 🎛 when the auto adjustment function is not used.

*20.　The RT-5100 stores up to five final prescription data. When the data whose prescription number is 6 or later is stored, the prior data is deleted from Final 2. The Final 1 data (auto-adjustment) is not deleted.

○ How to adjust the data manually after auto adjustment

    1) Press [Final 1].

    2) Press [Copy].

      The Final 1 data is copied to Final 2.

    3) Adjust the copied data manually.

    4) Compare the viewability with [Final 1] and [Final 2].

    Select [Full] to adjust the full correction data manually in Step 1).

2
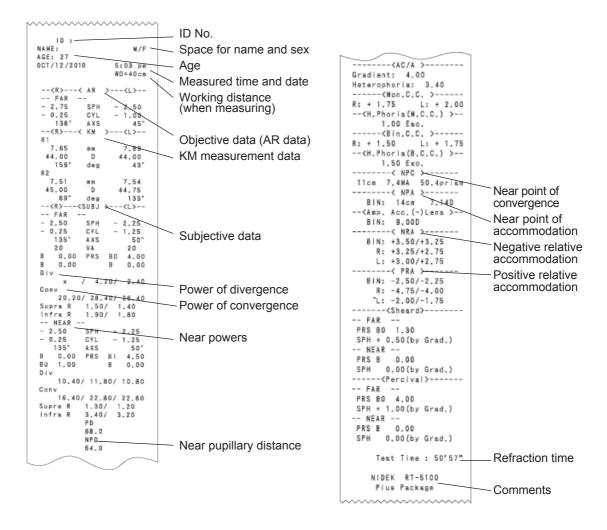
2.8   Printing

Data is printed with (Print) . When the "Print list" parameter is set to "Yes", pressing (Print) displays data list. Pressing (Print) again prints the data list.

The contents of the printout can be selected with the "Print format" parameter. See "3.19 Parameter Settings" (page 133).

To print a specified data only, press the desired data key ((Un-aided) , (LM) , (AR) , (Subj) , or (Final)) while pressing (Print) .

Printout sample:

ID No.
Space for name and sex
Age
Measured time and date
Working distance (when measuring)
Objective data (AR data)
KM measurement data

Subjective data

Power of divergence
Power of convergence

Near powers

Near pupillary distance

Near point of convergence
Near point of accommodation
Negative relative accommodation
Positive relative accommodation

Refraction time

Comments

> **✎ Note**
> - When a measurement is performed based on the day and night data from the ARK-10000 or OPD-Scan III, "For day" or "For night" is printed on the first line accordingly for the type of data.
> - When Wave Front data is entered, the Wave Front data is printed in the Objective data area.
> - The device uses thermal paper for printer. When saving the printings, make a copy of it.
>   The thermal paper may be difficult to read due to the aged deterioration.

2

○ Whether the CL data (CL conversion value) is printed or not

The "Print CL data" parameter selects whether the CL conversion value of the subjective data is printed together with the normal data. See "3.19 Parameter Settings" (page 133).
The contact lens conversion value is the value converted the Subjective value from VD (vertex distance) 12 mm to 0 mm.

○ Whether the trial lens data is printed or not

The "Print TL data" parameter selects whether the trial lens (TL) data for the final prescription is printed together with the normal data. See "3.19 Parameter Settings" (page 133).

○ Whether the data is cleared after printing

The "Clear after print" parameter selects whether the displayed data is cleared automatically after printing. See "3.19 Parameter Settings" (page 133).
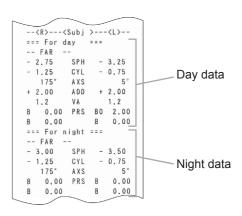
The latest 50 data which is already printed is stored in the memory. See "3.12.1 Calling up measurement data" (page 119).

○ KM measurement

To print the keratometry (KM) measurements converted to diopters, it is necessary to set the I/F Format parameter in the ARK to All.

○ When printing day/night data

When both day data and night data are input, the data are printed separately as shown to the right.

```
--<R>---<Subj >---<L>--
=== For day   ===
-- FAR  --
- 2.75    SPH   - 3.25
- 1.25    CYL   - 0.75
   175°   AXS        5°
+ 2.00    ADD   + 2.00
   1.2    VA       1.2
B   0.00  PRS BO  2.00
B   0.00        B  0.00
=== For night ===
-- FAR  --
- 3.00    SPH   - 3.50
- 1.25    CYL   - 0.75
   175°   AXS        5°
B   0.00  PRS B   0.00
B   0.00        B  0.00
```

Day data

Night data
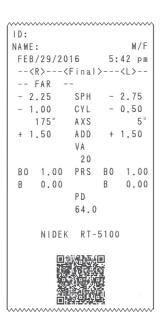
2.8.1 Printing with QR code

The final data (subjective or prescription data) is printed as a QR code.
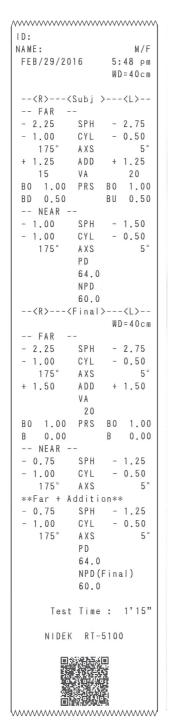
> ✐Note
> - If paper is rounded, QR code may not be identified. Smooth out paper before reading.
> - For details of printed QR code, ask NIDEK or your authorized distributor for the QR code manual in which the specifications is described.

○ When the "QR code" parameter is set to "QR1", the final data and the QR code are printed. See Figure1.

Figure 1

```
ID:
NAME:                 M/F
 FEB/29/2016    5:42 pm
--<R>---<Final>---<L>--
-- FAR  --
- 2.25    SPH   - 2.75
- 1.00    CYL   - 0.50
   175°    AXS       5°
+ 1.50    ADD   + 1.50
          VA
          20
BO  1.00  PRS  BO  1.00
B   0.00        B   0.00
          PD
          64.0

   NIDEK  RT-5100
```

90

○ When the "QR code" parameter is set to "QR2", all entered data and QR code of final data are printed. See Figure 2.

Figure 2

```
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
ID:
NAME:                    M/F
FEB/29/2016      5:48 pm
                  WD=40cm

--<R>---<Subj >---<L>--
-- FAR  --
- 2.25    SPH    - 2.75
- 1.00    CYL    - 0.50
   175°   AXS       5°
+ 1.25    ADD    + 1.25
   15     VA       20
BO  1.00  PRS  BO  1.00
BD  0.50        BU  0.50
-- NEAR --
- 1.00    SPH    - 1.50
- 1.00    CYL    - 0.50
   175°   AXS       5°
          PD
          64.0
          NPD
          60.0
--<R>---<Final>---<L>--
                  WD=40cm

-- FAR  --
- 2.25    SPH    - 2.75
- 1.00    CYL    - 0.50
   175°   AXS       5°
+ 1.50    ADD    + 1.50
          VA
          20
BO  1.00  PRS  BO  1.00
B   0.00        B   0.00
-- NEAR --
- 0.75    SPH    - 1.25
- 1.00    CYL    - 0.50
   175°   AXS       5°
**Far + Addition**
- 0.75    SPH    - 1.25
- 1.00    CYL    - 0.50
   175°   AXS       5°
          PD
          64.0
          NPD(Final)
          60.0

   Test Time : 1'15"

   NIDEK  RT-5100
```

2.8.2 Printing 21 Point Exams result (only for Plus Package)

For the Plus Package, result of each exams can be printed with 21 Point Exams No. In addition, Visual function analysis Graph and Morgan's criterion comparison result can also be printed. Select whether to print these result or not with the parameter setting.

○ 21 Point

Whether or not to print the 21 Point Exams No. with each exam result can be set with the "Print format 2" parameter.

Printout sample of when the "Print format 2" parameter is set to "21 Point Exams" (default):

```
      ID :
NAME:                 M/F
AGE: 27
2011.10.12        4:58 pm
                  WD=40cm

  --<R>---< AR  >---<L>--
  -- FAR --
  - 2.75    SPH    - 2.50
  - 0.25    CYL    - 1.00
    138°    AXS      45°
  --<R>---< KM  >---<L>--
  R1
    7.65    mm      7.69
   44.00    D      44.00
     159°   deg      43°
  R2
    7.51    mm      7.54
   45.00    D      44.75
     69°    deg     133°
  -<R>--<#7A Subj >--<L>-
  -- FAR --
  - 2.50    SPH    - 2.25
  - 0.25    CYL    - 1.25
    135°    AXS      50°
    0.9     VA       0.9
  -- NEAR --
  - 2.50    SPH    - 2.25
  - 0.25    CYL    - 1.25
    135°    AXS      50°
  ---<#8 H.Phoria FAR>---
       4.00 Eso.
  ---<#9,10 Conv FAR >---
     20.20/ 28.40/ 26.40
  ----<#11 Div FAR >-----
       x  /  4.20/  2.40
  --<#12A V.Phoria FAR>--
       Ortho.
  ---<#12B Sup/Inf FAR>--
  Supra R   1.50/  1.40
  Infra R   1.90/  1.80
  -<#13B H.Phoria NEAR >-
       4.50 Exo.
  --------<AC/A >--------
  Gradient: 4.00
  Heterophoria:  3.40
  ----<#14A Mon.C.C.>----
  R: + 1.75      L: + 2.00
  -<#15A H.Phoria(#14A)>-
       1.00 Eso.
  ----<#14B Bin.C.C.>----
  R: + 1.50      L: + 1.75
  -<#15B H.Phoria(#14B)>-
       1.50 Exo.
  ----<#16 Conv NEAR>----
     16.40/ 22.80/ 22.60
  ----<#17 Div NEAR >----
     10.40/ 11.80/ 10.80
```

21 Point Exams results

```
  -<#18A V.Phoria NEAR >-
       1.00 L Hyper.
  --<#18B Sup/Inf NEAR>--
  Supra R   1.30/  1.20
  Infra R   3.40/  3.20
  --------< NPC >-------
  11cm  7.4MA  50.4prism
  ------<#19 NPA>-------
    BIN: 14cm   7.14D
  -----<#19 (-)Lens>-----
    BIN:  9.00D
  -------<#20 PRA>-------
    BIN: -2.50/-2.25
      R: -4.75/-4.00
      L: -2.00/-1.75
  ------<#21 NRA>-------
    BIN: +3.50/+3.25
      R: +3.25/+2.75
      L: +3.00/+2.75
  -------<Sheard>-------
  -- FAR --
  PRS BO  1.30
  SPH + 0.50(by Grad.)
  -- NEAR --
  PRS B   0.00
  SPH   0.00(by Grad.)
  ------<Percival>-------
  -- FAR --
  PRS BO  4.00
  SPH + 1.00(by Grad.)
  -- NEAR --
  PRS B   0.00
  SPH   0.00(by Grad.)
        PD
        68.0
        NPD
        64.0
  Test Time : 50'57"

  NIDEK  RT-5100
   Plus Package
```

21 Point Exams results

Prism value and SPH adjustment value that satisfies the Sheard's criterion

Prism value and SPH adjustment value that satisfies the Percival's criterion

Printout sample of when the "Print format 2" parameter is set to "Standard":

```
    ID :
NAME:              M/F
AGE: 27
OCT/12/2010      5:03 pm
                 WD=40cm

 --<R>---< AR  >---<L>--
 -- FAR  --
 - 2.75    SPH    - 2.50
 - 0.25    CYL    - 1.00
   138°    AXS      45°
 --<R>---< KM  >---<L>--
R1
   7.65     mm     7.69
  44.00     D     44.00
   159°    deg      43°
R2
   7.51     mm     7.54
  45.00     D     44.75
    69°    deg     133°
 --<R>---<SUBJ >---<L>--
 -- FAR  --
 - 2.50    SPH    - 2.25
 - 0.25    CYL    - 1.25
   135°    AXS      50°
    20     VA       20
B   0.00  PRS  BO  4.00
B   0.00        B  0.00
Div
     x   /  4.20/  2.40
Conv
    20.20/ 28.40/ 26.40
Supra R  1.50/  1.40
Infra R  1.90/  1.80
 -- NEAR --
 - 2.50    SPH    - 2.25
 - 0.25    CYL    - 1.25
   135°    AXS      50°
B   0.00  PRS  BI  4.50
BU  1.00        B  0.00
Div
    10.40/ 11.80/ 10.80
Conv
    16.40/ 22.80/ 22.60
Supra R  1.30/  1.20
Infra R  3.40/  3.20
          PD
          68.0
          NPD
          64.0
```

```
--------<AC/A >--------
Gradient: 4.00
Heterophoria: 3.40
------<Mon.C.C. >------
R: + 1.75    L: + 2.00
--<H.Phoria(M.C.C.) >--
      1.00 Eso.
------<Bin.C.C. >------
R: + 1.50    L: + 1.75
--<H.Phoria(B.C.C.) >--
      1.50 Exo.
--------< NPC >--------
11cm  7.4MA  50.4prism
--------< NPA >--------
  BIN: 14cm   7.14D
--<Amp. Acc.(-)Lens >--
  BIN: 9.00D
--------< NRA >--------
  BIN: +3.50/+3.25
   R: +3.25/+2.75
   L: +3.00/+2.75
--------< PRA >--------
  BIN: -2.50/-2.25
   R: -4.75/-4.00
   L: -2.00/-1.75
--------<Sheard>--------
-- FAR  --
PRS BO  1.30
SPH + 0.50(by Grad.)
-- NEAR --
PRS B   0.00
SPH   0.00(by Grad.)
------<Percival>-------
-- FAR  --
PRS BO  4.00
SPH + 1.00(by Grad.)
-- NEAR --
PRS B   0.00
SPH   0.00(by Grad.)

   Test Time : 50'57"

   NIDEK  RT-5100
   Plus Package
```

Prism value and SPH adjustment value that satisfies the Sheard's criterion

Prism value and SPH adjustment value that satisfies the Percival's criterion

Phoria indication:

Exo.: exophoria   Eso.: esophoria   Ortho.: orthophoria

Hyper.: hyperphoria

Vertical divergence indication:

Supra.: supravergence   Infra.: infravergence

○ ON/OFF of printing of the Morgan's criterion compared result

Whether or not to print the comparison result of the Morgan's criterion can be set with the "Print Morgan's System" parameter.

No → The compared result with the criterion is not printed.
Yes → The compared result with the criterion is printed.

```
-------< Morgan >------
-- A --
#11 Div (Rec/Bre)      L
#17A Div (Blur)        L
#17B Div (Rec/Bre)     L
#20 PRA (Blur)         N
#19 Accommodation      H
-- B --
#9 Conv (Blur)         H
#10 Conv (Rec/Bre)     H
#16A Conv (Blur)       N
#16B Conv (Rec/Bre)    H
#14A Lag (Bin)         H
#14B Lag (Mon)         H
#21 NRA (Blur)         H
-- C --
#8 Phoria (FAR)        L
#13B Phoria (NEAR)     N
Gradient AC/A          N
```

○ ON/OFF of printing of the Visual function analysis graph
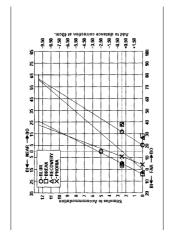
Whether or not to print the visual function analysis graph can be set with the "Graph print" parameter.

No → The graph is not printed.
As - +13.00D → Graph between As to +13.00D is printed.
As - +3.00D → Graph between As to +3.00D is printed.
*AS: Accommodation stimulus
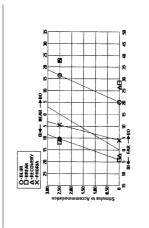
When the "Graph print" parameter is set to "As - 13.00D"

When the "Graph print" parameter is set to "As - +3.00D"

3. ADVANCED FEATURES
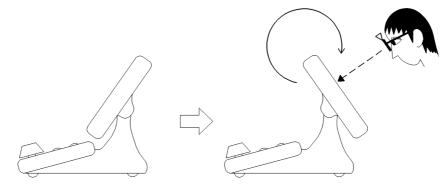
This section explains useful features of the RT-5100.

3

● To adjust the backlight brightness

$\Rightarrow$ 3.17 Controlling Backlight Brightness (Page 131)

● To clear AR or LM data stored in the relay box

$\Rightarrow$ 3.20 Clearing Stored Data (Page 146)

● To export data to an external computer

$\Rightarrow$ 3.21 Exporting Data to Computer or OPD-Scan III (Page 147)

3.1 Presenting Screen to Patient

The RT-5100 can show various images to the patient when the display is tilted to the patient's side. When the display is tilted, the screen image flips automatically for the patient's easy view.

3.2　Data List

All measured data can be displayed by a list.

1　Select [Data List].

　　1)　Call up the main menu screen.
　　　　Press (Menu) .
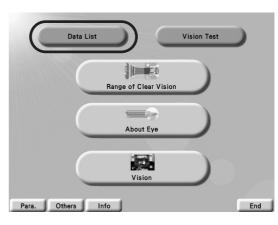
　　2)　Press [Data List].

2　Select the desired data.
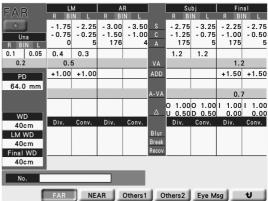
　　Select the data with the function button.
　　[FAR] displays the list of far point data.
　　　A-VA: VA value with the ADD power input
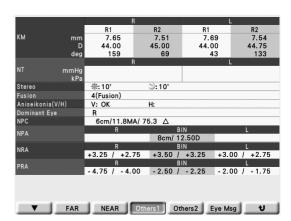
　　[NEAR] displays the list of near point data.

　　[Others 1] displays KM, NT, Stereo, Fusion, Aniseikonia, Dominant eye, NPC, NPA, NRA, and PRA.

[Others 2] displays the PH VA, L-illu. VA, subjective data, prescription data, contact lens conversion value[*21], and data for trial lens.

> PH VA: VA value using pin hole
>
> L-illu.VA: VA value of day data with the brightness for Night mode

[Others 3] displays Contrast VA and ETDRS VA.

> This is displayed only when the chart type is SSC-370M, SSC-370MG, SSC-370MCG, SSC-350M, SSC-350MCG, SSC-330U, SC-2000M, SC-1700PolaM, SC-1600M, or SC-1600PolaM.

	Una			LM			AR			Subj			Final		
	R	BIN	L	R	BIN	L	R	BIN	L	R	BIN	L	R	BIN	L
FAR											15	15			
PH VA NEAR															
L-illu.VA FAR											15	15			

	Subj		CL	
	R	L	R	L
S	-2.75	-3.25	-2.75	-3.25
C	-1.25	-0.75	-1.25	-0.75
A	175	5	175	5
SE			-3.25	-3.50

	Final		TL	
	R	L	R	L
S	-2.75	-3.25	-2.25	-2.75
C	-1.25	-0.75	-1.00	-0.50
A	175	5	175	5

`▼` `FAR` `NEAR` `Others1` `Others2` `Others3` `↻`

[↻] returns to the Main Menu.
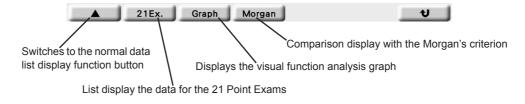
Pressing Menu returns to the measurement screen.

[☀] or [🌙]

Switches between day and night data.

(When the "Display the Day/Night switching button" parameter is set to Yes or when the night data is input from the ARK-10000/OPD-Scan III, this button is displayed.)

[▼] Switches to the 21 Point Exams result display function switch. (only when in the Plus-Package)

`▲` `21Ex.` `Graph` `Morgan` `↻`

Switches to the normal data list display function button

List display the data for the 21 Point Exams

Displays the visual function analysis graph

Comparison display with the Morgan's criterion

---
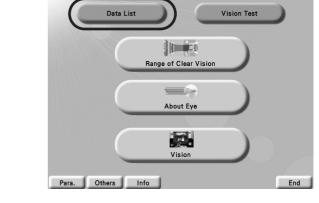
*21. **The contact lens conversion value is the value converted the Subjective value from VD (vertex distance) 12 mm to 0 mm.**
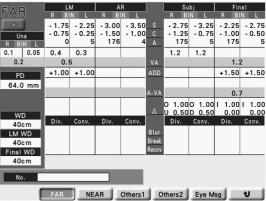
3.3 Displaying Refraction Diagram

The RT-5100 is equipped with the eye message function to show the eye condition with the refraction diagram on the basis of the subjective SPH and CYL value. This function can be used to explain the eye refraction condition to the patient.
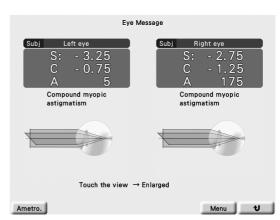
1 Display the Eye Message screen.

1) Call up the main menu screen.

Press (Menu) .

2) Press [Data List].

3) Display the Eye Message screen.

Press [Eye Msg].
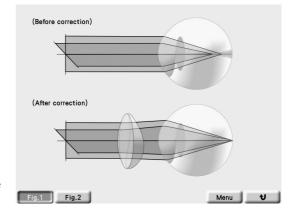
> **Note**
> - In contrast to the measurement screen, the left eye data is displayed on the left and the right eye data is displayed on the right.
> - The Eye Message screen is displayed based on the subjective value (complete correction power). When there is no subjective value, the objective value is displayed.
> - The refraction diagram has eight types, emmetropia, astigmatism, compound myopic astigmatism, hyperopia, hyperopic astigmatism, and compound hyperopic astigmatism. From those types, the appropriate refraction diagram of the refractive status of the subjective value is displayed. The refraction power and cylinder axis of the subjective value are not accurately reflected.

Press [Menu] to return to the main menu screen.

Press [↻] to return to the previous screen.
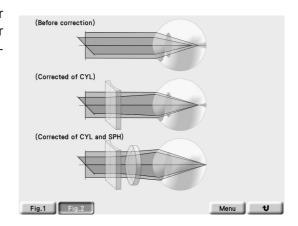
2 Press the displayed refraction diagram.

The magnified diagram of the selected refraction diagram and the refraction diagram when corrected by glasses are displayed.

For eyes with astigmatism, two types of this screen are prepared and can be switched between Fig.1 and Fig.2 in the lower left of the screen.

When [Fig.2] is pressed, the diagram for only corrected CYL and the diagrams for both SPH and CYL after correction are displayed.

Pressing [Menu] returns to the main menu screen.
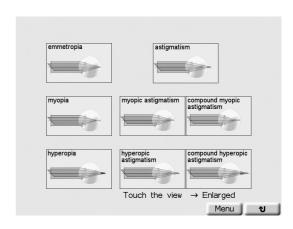
Pressing [↻] returns to the Eye Message screen.

○ List display of the Refraction Diagram

Pressing [Ametro.] on the Eye Message screen of 3) in Step 1 displays the eight types of refraction diagrams in the list.

Pressing the refraction diagram displays the enlarged diagram and the refraction diagram corrected with glasses.
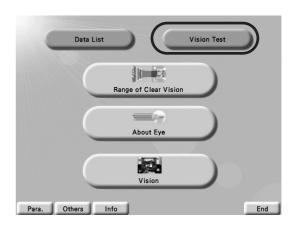
3.4　Presenting Near Chart
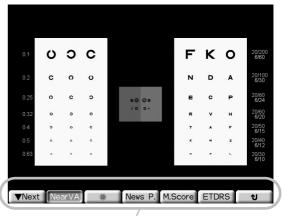
Near chart can be presented on the display.

1 Call up the main menu screen.
Press [Menu].

2 Display the Near Chart screen.
Press [Vision Test].

3 Select the desired chart to be displayed with the function button.

[▼ Next]……Changes the function buttons.

[↻]……Returns to the main menu screen.

Function buttons

Pressing [Help] displays the explanation of presented near chart. Pressing [Help] again or [↻] returns to the Near Chart screen.

Help is not available for the newspaper and music score buttons.

📝Note
- The Near Chart screen is just a guide. To measure accurately, use the accessory near point rod and near point chart.
- Just after turning on the power, [Vision Test] in the Main Menu may not be functional as the images are being loaded in the background.
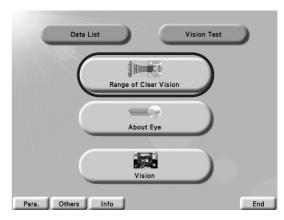
  The function can be used after the images are loaded.

3.5　Range of Clear Vision

The range of clear vision can be checked based on the measurement value.

1 Call up the main menu screen.
Press (Menu) .

2 Display the Range of Clear Vision test screen.
Press [Range of Clear Vision].

Note	• To obtain the range of clear vision, subjective values (complete correction power) with additional measurement or final prescriptions are needed.
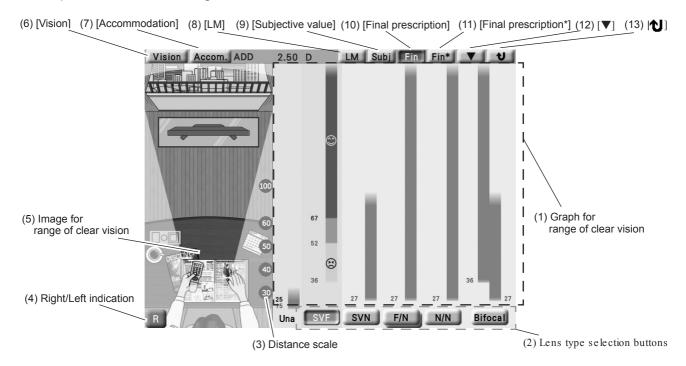
  When the appropriate complete correction power and add power are not entered, the range of clear vision is not displayed correctly.

  For the method of obtaining the subjective value and final prescription, see "2.5.1 Program A" (page 43).

• The range of clear vision cannot be checked for the night data.

○ Explanation of the Range of Clear Vision screen

(6) [Vision]   (7) [Accommodation]   (8) [LM]   (9) [Subjective value]   (10) [Final prescription]   (11) [Final prescription*] (12) [▼]   (13) [↻]

(5) Image for range of clear vision

(1) Graph for range of clear vision

(4) Right/Left indication

(3) Distance scale

(2) Lens type selection buttons
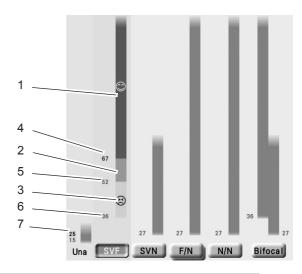
(1) Graph for range of clear vision

The graph for range of clear vision is shown when each type of lens is used.

The lower portion of the graph is the near point and the upper portion of the graph is the far point. The graph for range of clear vision for the selected lens is shown in blue, green, and yellow. The graphs for the other types of lens are shown in gray.

1. Blue portion of the graph (😊):

Clearly visible area using an accommodation of less than one-half

> 📝 Note
>
> • The graph of naked eye is difficult to see clearly if the astigmatism is 0.75 D or more, so 😐 indication should be used instead of 😊 indication.
> • The blue portion in the graph turns red and 😊 indication changes to 😣 indication for [Fin] and [Fin*] in the following cases.
>   ・When the eye is myopic and overcorrected
>   ・When the eye is hyperopic and SPH final prescription is a negative value with CYL mode is - reading
> For these cases, the vision can be improved but may impose eye strain. So it is recommended to change the final prescription to one with the graph turns blue.

2. Green portion of the graph:

Clearly visible area using an accommodation between one-half and two-thirds

3. Yellow portion of the graph (😖):

Clearly visible area using an accommodation between two-thirds and full

4. Blue letter:

The position where half of the accommodation is used (distance from the eye, unit: cm)

5. Green letter:

The position where two-thirds of the accommodation is used (distance from the eye, unit: cm)

6. Clear vision range limit (Red letter):

Limit of clearly visible area using full accommodation (distance from the eye, unit: cm)
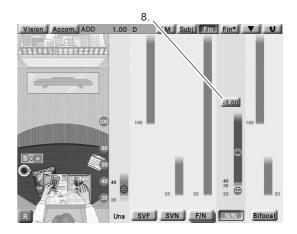
7. Black letter:

Distance point with naked eye (unit: cm)

8. Negative addition:

Negative addition of near/near lens. This is displayed only when [N/N] is selected.

The negative addition switches between [-1.00] → [-1.50] → [-2.00] → [-1.00] → ··· each time the key is pressed and changes the graph of negative addition near/near lens range of clear vision.

3

(2) Lens type selection buttons

Select a lens type.

The range of clear vision of the selected lens type is displayed by a blue, green, and yellow graph.
When [F/N] is selected, pressing [F/N] again switches to [M/N]. For [M/N], the far point is displayed in the closer position.

(3) Distance scale (30 , 40 , 50 , 60 , 100)

Guide for indicating the distance from the eye. Unit: cm

Touching the circled number displays additional lines indicating the distance on the graph for the range of clear vision.

(4) Right/Left indication

Indicates right eye or left eye of the presented range of clear vision.

Pressing this indication switches right eye and left eye.

(5) Image for the range of clear vision

Displays the clearly visible range for the selected lens type.

The graph for the range of clear vision is displayed as an image for easy understanding.

(6) [Vision]

Displays the image as viewed through the selected lens.

> Function keys at the bottom of the screen allow visions for other lens types to be displayed and compared.

> Press [↰↱] to return to the Range of Clear Vision screen.

Example when [F/N] is selected

(7) [Accommodation]

Displays the window for changing the type of accommodation used as the basis for calculation of the range of clear vision.

[ADD]: Conversion is made using the addition value as determined by the near cross grid which is considered to be half of full accommodation.

> Accommodation = ((1/WD) - ADD) x 2
> WD: Working Distance
> ADD: Addition measured by near cross grid

[NPA]: Measured value of NPA (near point of accommodation).

> See "4.10 Near Point of Accommodation (NPA) Test" (page 203).

[Age]: Use the accommodation suggested according to age.

> Pressing [Age] displays a numeric keypad. Input age and press [OK].
> Accommodation is suggested on the basis of the age if age is input when measuring the Addition.
> See "8.5 Relational Table of Age and Accommodation" (page 269).

[Manual]: Input the accommodation in diopter (D) units.

> Pressing [Manual] displays the Accommodation Input window. Input accommodation with the dial and press [OK].

Types of accommodation and values used for calculation are displayed to the right of this button.

(8) [LM]

Displays the graph for the range of clear vision for the input lensometry value.

The WD calculated while the graph for the range of clear vision is displayed is entered as the WD in LM mode. When the measurement screen is displayed again and the refractor head converges in LM mode, it converges at this WD.[22] When the data is printed, the WD is indicated in the <LM> field.

[LM] is indicated only when the lensometry data is input.

(9) [Subjective value]

Displays the graph for the range of clear vision for the input subjective value.

---

*22. The WD that can converge with the refractor mainbody is within range of 35 to 70 cm in 5 cm increments. Therefore, convergence of the refractor mainbody is performed in 5 cm increments of WD conversion. When WD is 35 cm or less or 70 cm or more, the convergence and near PD are set to the mainbody.

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(10) [Final prescription]

Displays the graph for the range of clear vision for the input final value.

The WD calculated while the graph for the range of clear vision is displayed is entered as the WD in FINAL mode. When the measurement screen is displayed again and the refractor head converges in FINAL mode, it converges at this WD.[*22] When the data is printed, the WD is indicated in the <FINAL> field.

(11) [Final prescription*]

The value can be changed based on the final prescription referring the graph for the range of clear vision.

See "3.5.1 Changing power while checking the range of clear vision" (page 108).

(12) [▼]
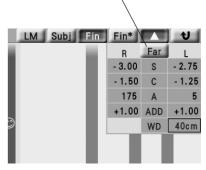
Displays the selected data (LM/Subj./Fin/Fin*).

When the data is displayed, the indication of the button changes to [▲] and pressing [▲] closes the indication of the data.

(13) [↻]

Returns to the main menu screen.

Indicates which Far power or Near power is displayed. Pressing here switches between Far power and Near power.

LM	Subj	Fin	Fin*	▲	↻
			R	Far	L
			- 3.00	S	- 2.75
			- 1.50	C	- 1.25
			175	A	5
			+1.00	ADD	+1.00
				WD	40cm
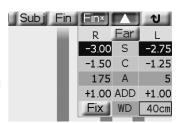
3.5.1 Changing power while checking the range of clear vision

When [Fin*] is selected in the Range of Clear Vision screen, SPH, CYL, ADD, and WD values can be changed. The change in value is reflected in the graph for range of clear vision.
Adjust the value to change the graph for range of clear vision suits patient's needs.

1 Press [Fin*] in the Range of Clear Vision test screen.

2 Touch [▼] to display the data window.

3 Select the desired item to change and change its value with the dial.

> *Because the near power is fixed, values other than those specified are also changed.
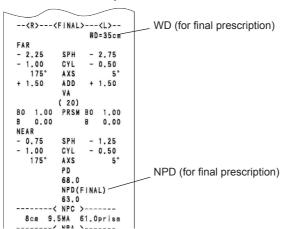
When changing the data without the near power fixed.

⇒ Press [Fix] to display [Fix] . When a value is changed in this status, the WD (for final prescription) and NPD (for final prescription) also change.

When the WD is changed, near power is changed not according to pressed or not pressed.

The values of WD (for final prescription) and NPD (for final prescription) are described in the <FINAL> field when the data is printed.

```
--<R>---<FINAL>---<L>--
                WD=35cm          WD (for final prescription)
FAR
- 2.25    SPH   - 2.75
- 1.00    CYL   - 0.50
   175°   AXS       5°
+ 1.50    ADD   + 1.50
          VA
          ( 20)
BO  1.00  PRSM BO  1.00
B   0.00       B   0.00
NEAR
- 0.75    SPH   - 1.25
- 1.00    CYL   - 0.50
   175°   AXS       5°
          PD
          68.0
          NPD(FINAL)          NPD (for final prescription)
          63.0
--------< NPC >-------
  8cm   9.5MA   61.0prism
--------< NRA >-------
```

📝 Note   • Near pupillary distance calculated here is the guide obtained by the following formula.
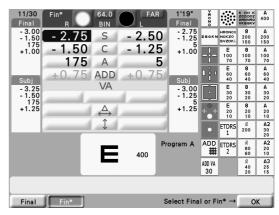
$$\text{Near PD (mm)} = \text{Far PD (mm)} \times \frac{\text{WD (mm)} - \text{VD (mm)}}{\text{WD (mm)} + \text{Cycloduction radius (mm)}}$$

$$\text{VD (Vertex distance)} = 12.00 \, \text{mm}$$
$$\text{Cycloduction radius} = 13.00 \, \text{mm}$$

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4 After adjusting the power, press [Menu] to return to the measurement screen.

> The value adjusted with the Range of Clear Vision test screen is set to [Fin*].

5 When checking the near power, press [ADD].

> The refractor head converges to the changed working distance.

> 📝Note　• When the refractor head is converging, have the patient off their face temporarily from the refracter head.
>
> • The WD that can converge with the refractor main body is within range of 35 to 70 cm in 5 cm increments.
>
> > Therefore, convergence of the refractor main body is performed in 5 cm increments of WD conversion.
> >
> > > Ex) When the WD is changed to 38 cm, the convergence and near PD is the same as for when WD=40.
> >
> > When WD is 35cm or less or 70cm or more, the convergence and near PD when WD is 35cm and 75cm are set to the main body.

6 If necessary, change values. If there are no problems, touch [OK].

> To adopt the final prescription data before change, touch [OK] after touching [Final].

3

3.6   Displaying Image Information for Explanation
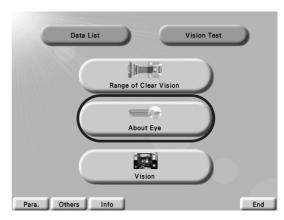
Various diagrams for explanation to the patient can be displayed.

3.6.1   Image information "About Eye"
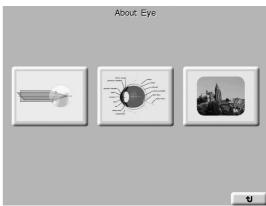
Refraction diagrams, Eye balls, and Vision diagrams used for explanation to the patient can be displayed.

1 Call up the main menu screen.
Press [Menu] .
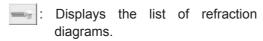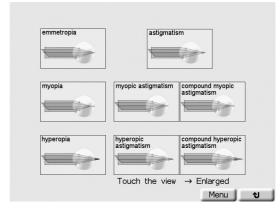
2 Display the About Eye screen.
Press [About Eye].
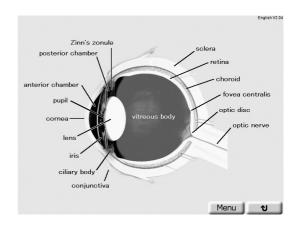
3 Press the icon of the desired diagram.

      : Displays the list of refraction diagrams.

Pressing the refraction diagram desired for explanation displays the enlarged diagram and the refraction diagram when corrected by glasses. See Step 2 of "3.3 Displaying Refraction Diagram" (page 99).

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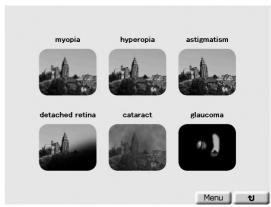
 : Display the Eye ball.

 : Display the Vision diagram.

These vision images are classified by type of visual impairment.

Pressing [Menu] returns to the main menu screen.
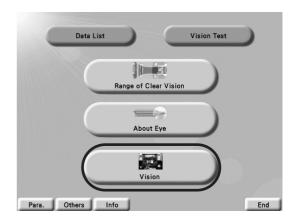
Pressing [↻] returns to the Menu screen of the About Eye screen.

3.6.2 Image information "Vision"

This is to display for informing and advising the patient as to which lens to select according to the purpose of use.

1 Call up the main menu screen.
Press (Menu).

2 Display the Vision screen.

Press [Vision].

The Vision screen is displayed. The vision for each lens type is shown in illustration. Function keys at the bottom of the screen allow visions with other lens types to be displayed.
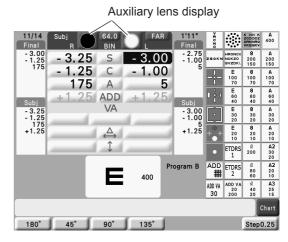
Press [↻] to return to the main menu screen.

3.7　Setting Auxiliary Lenses

Auxiliary lenses are automatically placed according to a selected chart. However, other lenses can also be set as follows:
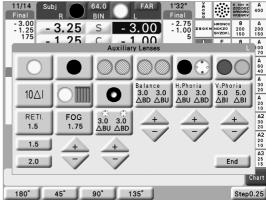
＊The lens power for retinoscope (+1.5/+2.0) can be switched and set the fog amount for both eyes open.

1 Open the Auxiliary Lenses window.

Press the auxiliary lens display at the top of the measurement screen.

Auxiliary lens display

2 Select the desired auxiliary lens with the corresponding button.

The selected auxiliary lenses are placed in the refractor head and the screen returns to the main measurement screen.

[○]: Open aperture

[●]: Occluder

[◎◎]: Polarizing filters (Right eye: 45°, Left eye: 135°)

[◎◎]: Polarizing filters (Right eye: 135°, Left eye: 45°)

[◌●]: Right eye: Fixed cross cylinder lens, Left eye: Occluder

[●◌]: Right eye: Occluder, Left eye: Fixed cross cylinder lens

[●○]: Right eye: Red filter, Left eye: Green filter

[RETI 1.5]: Spherical lenses for retinoscope

The lens power is selectable with [1.5] and [2.0].

[1.5]/[2.0]: Selects the spherical lens power for retinoscope between +1.5D and +2.0D.

[Fog 1.75]: Fogging

The fogging amount can be specified with the following [+] and [-].

[+]/[–]: Increases or decreases the fog amount.

[6ΔU]: Base up prism of 6Δ

[10ΔI]: Base in prism of 10Δ

[▤ ◯]: Right eye: Horizontal maddox rod, Left eye: Open aperture

[◯ ▥]: Right eye: Open aperture, Left eye: Vertical maddox rod

[⬤]: Pinhole plate (2 mm in diameter)

$\begin{bmatrix} \text{Balance} \\ 3.0 \quad 3.0 \\ \triangle BD \quad \triangle BU \end{bmatrix}$: Break prism of binocular balance

         The prism value can be changed with the following [+] and [-].

         The value can be changed for both eyes at the same time.

         Changeable range: R 3.0Δ BD/L 3.0Δ BU   to   R 10.0Δ BD/L 10.0Δ BU

$\begin{bmatrix} \text{H.Phoria} \\ 3.0 \quad 3.0 \\ \triangle BU \quad \triangle BD \end{bmatrix}$: Break prism of horizontal phoria

         The prism value can be changed with the following [+] and [-].

         The value can be changed for both eyes at the same time.

         Changeable range: R 3.0Δ BU/L 3.0Δ BD   to   R 10.0Δ BU/L 1.0Δ BD

$\begin{bmatrix} \text{V.Phoria} \\ 5.0 \quad 5.0 \\ \triangle BI \quad \triangle BI \end{bmatrix}$: Break prism of vertical phoria

         The prism value can be changed with the following [+] and [-].

         The value can be changed for both eyes at the same time.

         Changeable range: R 5.0Δ BI/L 5.0Δ BI   to   R 15.0Δ BI/L 15.0Δ BI

$\begin{bmatrix} 3.0 \quad 3.0 \\ \triangle BU \quad \triangle BD \end{bmatrix}$: Break prism of #15A horizontal phoria (according to #14A value) (only for Plus Package)

         The prism value can be changed with the following [+] and [-].

         The value can be changed for both eyes at the same time.
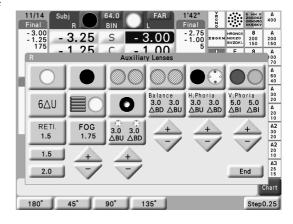
         ΔBUΔBD Changeable range: R 3.0Δ BU/L 3.0Δ BD to R 10.0Δ BU/L 10.0Δ BD

3.8   Fog Function with Both Eyes Open

A single eye can be tested while both measuring windows are open.
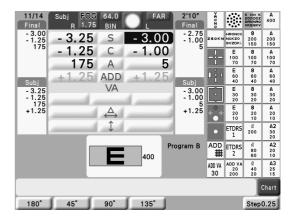
1   Press the auxiliary lens display at the top of the measurement screen to display the Auxiliary Lenses window.

2   Press [FOG].

3   Press Ⓡ or Ⓛ. The unselected side is fogged with the preset amount instead of the occluder.

> Perform one of the following operations to clear the fog. The occluder is placed in the measuring window.
>
> • Press [FOG] again.
>
> • Press (Clear) .
>
> • Turn the power off and on again.
>
> • Press any chart button which specifies auxiliary lenses other than open or occluder.
>
> • Select any auxiliary lens.
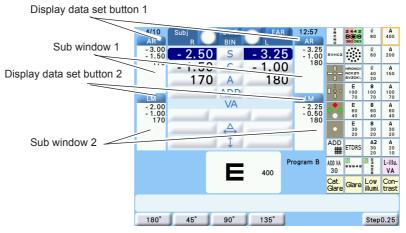
Pressing [+] or [–] in the Auxiliary Lenses window changes the fog amount. The variable range is from 0.00 D to +9.00 D. The factory setting is +1.75 D.

3.9　Specifying Sub Window Display Data

Items to be displayed in sub window 1 and 2 can be specified.
When no item is specified, the measurement data previously set in sub window 1 and measurement data set prior to previous one is displayed in sub window 2.
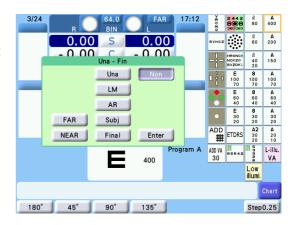
1　Press the display data set button.

When specifying the items to be displayed in sub window 1, press Display data set button 1, and when specifying the items to be displayed in sub window 2, press Display data set button 2.

"Una - Fin" window appears.

2　In the Una - Fin window, specify the items to be displayed in the sub window.

[FAR] : Selects Far mode.

[NEAR] : Selects Near mode.

[Una] : Selects Unaided data.

[LM] : Selects LM data.

[AR] : Selects AR data.

[Subj] : Selects Subj data.

[Final] : Selects Final data.

[Non] : Clears the sub window mode specification.

[Enter] : Closes the "Una - Fin" window and displays the specified data.

[☀] : Selects Day mode.

[🌙] : Selects Night mode.

*　[☀] and [🌙] are displayed when the Display Day/Night mode switching is set to "Yes" and when the Night data is entered.

Pressing [Una], [LM], [AR], [Subj], [Final], or [Non] closes Una - Final window and displays the specified data in sub window.

> 📝 Note　• The sub window display data setting is retained even if the power is turned off.

3.10 Changing ID No.
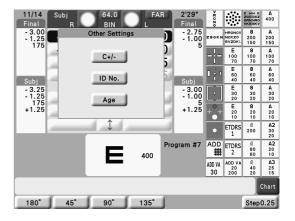
The ID No. at the top of the printout can be changed.

However, when the "AR port" parameter is set to "HDR", ID No. cannot be changed.

When the "AR port" parameter is set to other than "HDR", and ID No. is input from a computer, ID No. is locked and cannot be changed. To change the ID No., press (Clear) to release the lock.

1 Press the right side switch of the control box.

    The Other Settings window appears.

2 Press [ID No.].

    The numeric keypad appears.
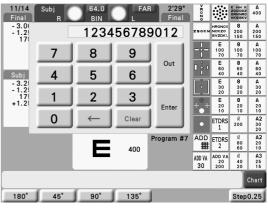
3 Enter the desired number with the numeric keys.

    The number can be entered up to 12 digits when "Standard" is selected, and up to 20 digits when "Expanded" is selected for the "ID No." parameter.

    To change the ID No., delete the desired digit by pressing [←] and then enter a new number.

4 Return to the normal measurement screen.

    Confirm the change. → Press [Enter].

    Cancel the change. → Press the right side switch of the control box.

    Confirm the change and export the data to a computer or OPD-Scan III (V1.05 or later). →Press [Out] and then [Enter] or right side switch of the control box.
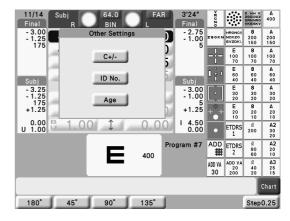
3.11　Age Input

A patient's age can be input with the following procedure.

The input age data is used for Preset ADD, Morgan analysis criterion adjustment power calculation, and range of clear vision [Accom.] → [Age]. The age is printed and exported to a computer.

1　Press the right side switch of the control box.

> The Other Settings window appears.

2　Press [Age].

> The numeric keypad appears.
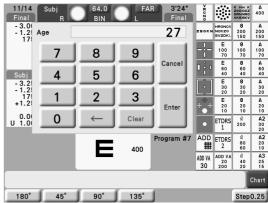
3　Enter the desired number with the numeric keys.

> To change age, delete the desired digit by pressing [←] and then enter a new number.

4　Return to the normal measurement screen.

> Press [Enter]. → Stores the input age.
>
> Press the right side switch of the control box, [Cancel] → The input age is not stored.

3.12　Calling Up Data
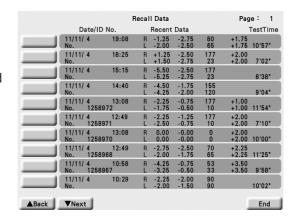
3.12.1　Calling up measurement data

The RT-5100 stores the last 50[23] measurement data. The data can be displayed.
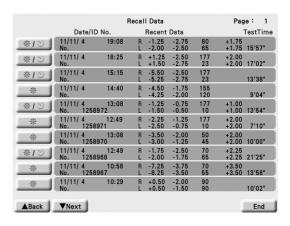
1 Display the Recall Data screen.
　1) Press (IN) .
　2) Press (Subj) .

2 Select the desired data.

　Press the far left button of the desired data.

　The whole data is read.

	Recall Data			Page： 1
	Date/ID No.	Recent Data		TestTime
	11/11/ 4　19:08 No.	R　-1.25　-2.75　80 L　-2.00　-2.50　65		+1.75 +1.75 10'57"
	11/11/ 4　18:25 No.	R　+1.25　-2.50　177 L　+1.50　-2.75　23		+2.00 +2.00 7'02"
	11/11/ 4　15:15 No.	R　-5.50　-2.50　177 L　-5.25　-2.75　23		8'38"
	11/11/ 4　14:40 No.	R　-4.50　-1.75　155 L　-4.25　-2.00　120		9'04"
	11/11/ 4　13:08 No.　1258972	R　-2.25　-0.75　177 L　-1.75　-0.50　10		+1.00 +1.00 11'54"
	11/11/ 4　12:49 No.　1258971	R　-2.25　-1.25　177 L　-2.50　-0.75　10		+2.00 +2.00 7'10"
	11/11/ 4　13:08 No.　1258970	R　0.00　-0.00　0 L　0.00　-0.00　0		+2.00 +2.00 10'00"
	11/11/ 4　12:49 No.　1258968	R　-2.75　-2.50　70 L　-2.00　-1.75　65		+2.25 +2.25 11'25"
	11/11/ 4　10:58 No.　1258967	R　-4.25　-0.75　53 L　-3.25　-0.50　33		+3.50 +3.50 9'58"
	11/11/ 4　10:29 No.	R　-2.25　-2.00　90 L　-2.00　-1.50　90		10'02"

▲Back　▼Next　　　　　End

When both day and night data are measured, the day data and night data are saved together. When night data exists with the day data, ☀ / 🌙 appears on the far left button. When the data is only the day data, ☀ appears on the far left button.

	Recall Data			Page： 1
	Date/ID No.	Recent Data		TestTime
☀/🌙	11/11/ 4　19:08 No.	R　-1.25　-2.75　80 L　-2.00　-2.50　65		+1.75 +1.75 15'57"
☀/🌙	11/11/ 4　18:25 No.	R　+1.25　-2.50　177 L　+1.50　-2.75　23		+2.00 +2.00 17'02"
☀/🌙	11/11/ 4　15:15 No.	R　-5.50　-2.50　177 L　-5.25　-2.75　23		13'38"
☀	11/11/ 4　14:40 No.	R　-4.50　-1.75　155 L　-4.25　-2.00　120		9'04"
☀/🌙	11/11/ 4　13:08 No.　1258972	R　-1.25　-0.75　177 L　-1.50　-0.50　10		+1.00 +1.00 13'54"
☀	11/11/ 4　12:49 No.　1258971	R　-2.25　-1.25　177 L　-2.50　-0.75　10		+2.00 +2.00 7'10"
☀	11/11/ 4　13:08 No.　1258970	R　-3.50　-2.00　50 L　-3.00　-1.25　45		+2.00 +2.00 10'00"
☀/🌙	11/11/ 4　12:49 No.　1258968	R　-1.75　-2.50　70 L　-2.00　-1.75　65		+2.25 +2.25 21'25"
☀	11/11/ 4　10:58 No.　1258967	R　-7.25　-3.75　70 L　-8.25　-3.50　55		+3.50 +3.50 13'58"
☀	11/11/ 4　10:29 No.	R　+0.50　-2.00　90 L　+0.50　-1.50　90		10'02"

▲Back　▼Next　　　　　End

---

*23.When the Night data is saved together, the data that can be saved is less than 50 people.
　As the Night data is counted as 1 data, when the Night data is saved together, it is counted as two people.
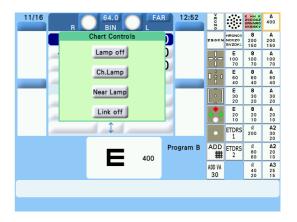
3.13   Link Off Function

This function prevents auxiliary lenses or mode (S/C/A) from being switched automatically when a chart is changed.

1   Press the left side switch of the control box.

   The Chart Controls window appears.

2   Press [Link off].

   The link off function makes the following possible even when any chart button is pressed.

   • The auxiliary lenses are not placed automatically.

   • The mode (S/C/A) is not switched.

   • The visual acuity is not entered automatically when any mask key is pressed.

   Pressing (Prog) or ⇨▯ switches the chart.

📝 Note

   • The link off function is not canceled even when (Clear) is pressed or power is turned off and on.

   • The linkage functions only for $^{ADD}_{VA}$ and $^{ADD}_{▦}$ even when the link off function is activated.

Pressing [Link off] on the Chart Controls window again cancels the function.

3.14   Programming

The RT-5100 has six programs of A, B, C, D, E, and ☀☽ .

The standard program has already been written in Programs A, B, and ☀☽ .as factory setting. Programs C, D, and E are empty. All programs (A, B, C, D, E, and ☀☽) are programmable.

See "2.5.1 Program A" (page 43) for the contents of Program A.

See "8.8 Standard Programs" (page 272) for the contents of Program B.

See "2.5.2 Program Day/Night" (page 53) for the contents of Program ☀☽ .

For the Plus Package, though Program #7 is added in addition to the program A to E and ☀☽ , delete, write, and operation can be performed as with the other programs.
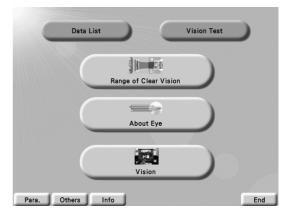
3.14.1   Clearing programs

The contents of each Program A, B, C, D, E, ☀☽ , or #7 are cleared. It is performed when each program is reprogrammed.
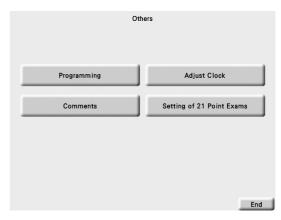
To clear Program A, B, ☀☽ , or #7, set the Program A, Program B, Program ☀☽ , or Program #7 parameter to User beforehand (see page 140). (#7 is only for Plus Package)

1   Display the Programming screen.

    1) Call up the main menu screen.

       Press Menu .

2) Press [Others].

[Setting of 21 Point Exams]
is only for Plus Package.

3) Press [Programming].

2 Select the program to be cleared.

Press either of [A], [B], [C], [D], [E], ☀☽ ,
or [#7].

[#7] is only for Plus Package
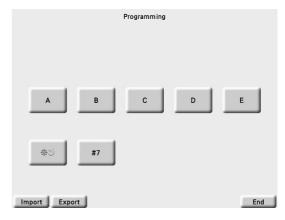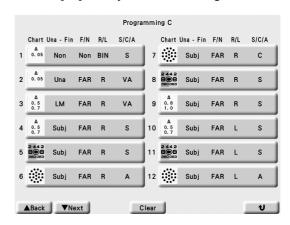
3 Press [Clear].
The confirmation message "Are you sure?"
appears.

4 Press [Yes].
All contents in the selected program are
cleared.

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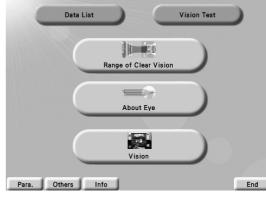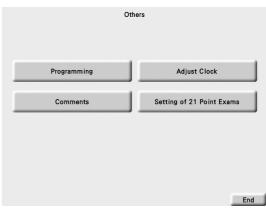
3.14.2 Programming

To program Program A, B, ☀☽ , or #7, set the Program A, Program B, Program ☀☽ , or Program #7 parameters to "User" beforehand (Program #7 is only for Plus Package).

1 Display the Programming screen.

  1) Call up the main menu screen.

    Press [Menu] .

  2) Press [Others].

[Setting of 21 Point Exams]
is only for Plus Package

  3) Press [Programming].

2 Select the program to be programmed.

  Press either of [A], [B], [C], [D], [E], ☀☽ , or [#7].
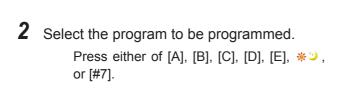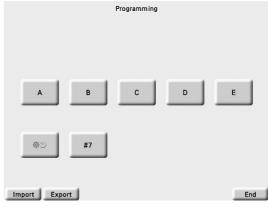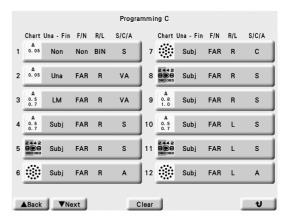
[#7] is only for Plus Package

The contents of the selected program are displayed. (When the program is empty, each step button is blank.)

3 Select the step button to be written or changed.

Pressing the desired button displays the input screen.

4 Select the desired chart to be programmed.

Select the chart with the chart button.

5 Select a mode and message to be set with the chart.

Press the desired items.
- Set the auxiliary lenses and fog amount.
- Also set the mask functions (horizontal and vertical lines, single letter) and the red-green filter.
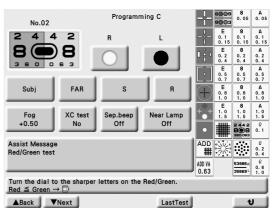
The following items are programmable.
- Chart (including the mask functions)
- Night brightness, Contrast, Glare lamp (depends on the chart presenting device)
- Data to be entered (Unaided to Final)
- Day/Night (depends on the chart presenting device)
- Far or near mode
- Data field (SPH, CYL, AXIS, VA)
- Eye to be measured (R, L, BIN)
- Auxiliary lenses
- Cross cylinder test
- Auto adjustment function (set in the mode)
- With or without beep sounds (The beep sounds can be audible in the end of each test.)
- Fog amount (Press [Fog] and turn the dial to enter the fog amount.)
- Whether the near point lamp lights up or goes out
- Sample instructions
     Pressing the item button displays the list. Select the desired instructions in the list.
- Select the comment at the bottom of the screen. (When it is not selected, the comment does not appear.)
     Pressing this comment item button displays the list. Select the desired comment in the list.
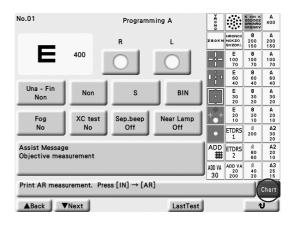
> 📝 Note
> - The cross cylinder setting cannot be selected between Flipped and Auto. Set the lens type with the "Cross cylinder (XC) test" parameter (see page 134).
> - The fog function can be added with both eyes open. Set the fog according to "3.8 Fog Function with Both Eyes Open" (page 115). The setting is programmed the same as other auxiliary lenses.
> - When the "Intelligent XC" parameter is set to "Yes" (default), the cross cylinder test may not be performed depending on the cylinder values (cylindrical power).

● For Plus Package, exam can be specified with the 21 Point Exams.

1) Press [Chart] to display the 21 Point Exam button.

2) Select the exam to be stored with the 21 Point Exam button.

[#7 Subj (F)] cannot be selected.
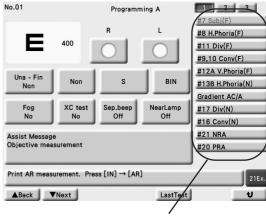
The contents of exam set (chart, auxiliary lens etc.) are written.

6 When the steps on the screen are programmed, go to the next page.

Press [▼Next].

When all steps are programmed, press [↻].

To clear the steps from the next to last for overwriting, press [LastTest].

21 Point Exams button

7 Repeat Steps 4 to 6 until the desired charts are programmed in the order desired to be measured.

It is possible to store up to 32 steps.

8 Exit from programming mode.

Press [↻] until the screen returns to the normal measurement screen.

3.14.3 Operating programs

The charts are presented in the programmed order.

1 Select the program to be used with (Shift) + (Prog).

2 Start the program.
Press (Prog).

The first chart in the program is presented and the refractor head is set as programmed.

3 Present the next chart.
Press [⇨🞵] . Each time the key is pressed, the chart is presented in the programmed order and the refractor is set as programmed.
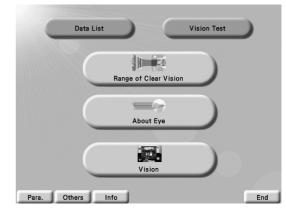
(Shift) + [⇨🞵] ⇒ Returns to the previous chart.

3.14.4　Importing or exporting programs

The contents of Programs A to E, ☀☽ , and #7 can be imported or exported from/to a CF card in the control box. (Program #7 is only for the Plus Package)

| ✎Note | • Program data written with Program RT-5100 cannot be read with Plus Package. |
| | • Program data written with Plus Package cannot be read with RT-5100. |

1 Display the Programming screen.

1) Call up the main menu screen.

Press [Menu] .

2) Press [Others].

[Setting of 21 Point Exams]
is only for Plus Package

3) Press [Programming].
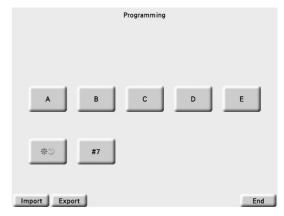
2 Pressing [Import] imports the programs A to E, ☀☽ , and #7 in the CF card. When no program has been exported, the data to be imported does not exist.
Pressing [Export] exports the current programs A to E, ☀☽ , and #7 to the CF card.

[#7] is only for Plus Package
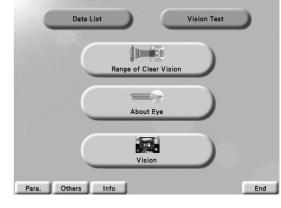
3.15 Entering Comments

Comments such as shop name can be printed together with the measured data.
Up to 24 characters can be entered in a line. Two lines are available for a total of 48 characters.

1 Display the Comments screen.

　1) Call up the main menu screen.

　　Press (Menu) .

　2) Press [Others].

　3) Press [Comments].

　　The Comments screen appears.

[Setting of 21 Point Exams]
is only for Plus Package

2 Press a box to be entered.

3 Press the desired character button.

　The character is entered and the highlight
　moves to the next box.

4 Repeat Steps 2 and 3 to enter the characters.
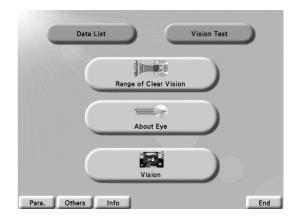
5 Return to the normal measurement screen.

　Press [End].

["
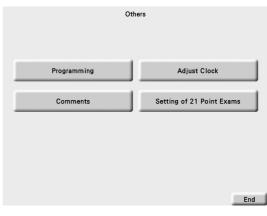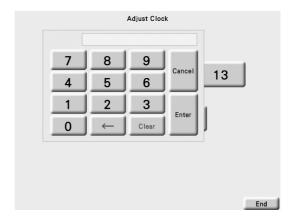
2 Press the item to be adjusted.

The numeric keypad appears.

3 Enter the desired number with the numeric keypad and press [Enter].

4 Repeat Steps 2 and 3 until the time and date are set.

5 Return to the normal measurement screen.

Press [End].

Adjust Clock

7	8	9	Cancel	13
4	5	6		
1	2	3	Enter	
0	←	Clear		

End

3.17 Controlling Backlight Brightness

Controls the control box screen brightness.
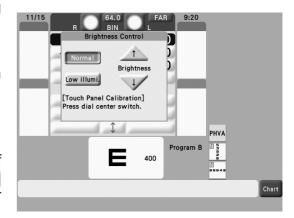
1 Display the Brightness Control windows.

> Press the right side switch of the control box while pressing (Shift) .

2 Control the (normal) screen brightness in Day mode.

> Control the brightness with [↑] or [↓].

3 When controlling the backlight brightness of the display in Night mode, press Low illumi. button and control the brightness with [↑] or [↓].

4 Return to the normal measurement screen.

> Press the right side switch of the control box.

📝 Note
• When linking with the chart presenting device without Night function, [[Normal] /Low illumi.] buttons are not displayed.
Brightness for normal environment is set.

3.18 Touch-screen Panel Calibration
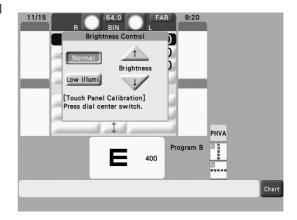
The touch-screen panel is calibrated.

When incorrect responses from the touch-screen panel are received, the detection point of the touch-screen panel may shift from the pressure point of the touch-screen pen. In this case, calibrate the touch-screen panel.

The calibration must be performed when the display is tilted to the operator's side.

1 Display the Brightness Control window.
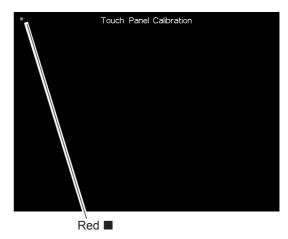
Press the right side switch of the control box while pressing (Shift) .

2 Press the dial switch to display the Touch Panel Calibration screen.

3 Press the red ■ in the upper-left corner of the screen with the touch-screen pen.

Pressing here changes the color of ■ to blue.

Red ■

4 Press the red ■ in the upper-right corner of the screen with the touch-screen pen.

5 Press the red ■ in the lower-left corner of the screen with the touch-screen pen.

6 Press the red ■ in the lower-right corner of the screen with the touch-screen pen.
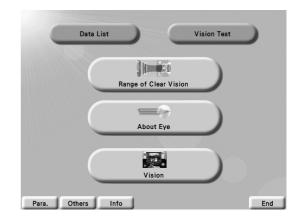
When the four ■ at each corner of the screen are pressed, the Completed the Touch Panel Calibration message appears and the screen returns to the normal measurement screen.

3.19 Parameter Settings

3.19.1 Parameter Settings

1 Display the parameter setting screen.

1) Call up the main menu screen.
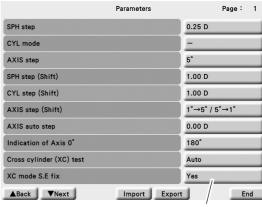
Press [Menu] .

2) Press [Para.].

2 Display the page in which the parameter to be changed is displayed with [▲Back] or [▼Next].

3 Pressing the setting field on the right side of the parameter to be changed toggles the setting.

In parameters such as AXIS auto step with many options, when the setting field is pressed, the field is framed in green. At this time, select the option with the dial.

4 Change the other parameter settings in the same manner as Steps 2 and 3.

5 Return to the normal measurement screen.

Press [End].

○ Detailed parameter options

SPH step: 0.12 D, 0.25 D

Factory setting: 0.25 D

Setting for the increment to adjust sphere values. Selectable between 0.12 D and 0.25 D.

CYL mode: –, +

Factory setting: **–**

Setting for the cylinder reading. Selectable between + and –.

AXIS step: 1°, 5°

Factory setting: 5°

Setting for the increment to adjust axis values. Selectable between 1° and 5°.

SPH step (Shift): 0.50 D to 3.00 D

Factory setting: 1.00 D

Setting for the increment to adjust sphere values with ⟨Shift⟩ .

CYL step (Shift): 1.00 D, 2.00 D, 3.00 D

Factory setting: 1.00 D

Setting for the increment to adjust cylinder values with ⟨Shift⟩ . Selectable among 1.00 D, 2.00 D, and 3.00 D.

AXIS step (Shift): 1° → 5°/5° → 1°, 1° → 5°/5° → 15°

Factory setting: 1° → 5°/5° → 1°

Setting for the increment to adjust axis values with ⟨Shift⟩ when the AXIS step parameter is set to 5.

1° → 5°/5° → 1° ⇒ In increments of 1° while pressing ⟨Shift⟩

1° → 5°/5° → 15° ⇒ In increments of 15° while pressing ⟨Shift⟩

When the AXIS step parameter is set to 1°, the increment to adjust axis values with ⟨Shift⟩ is 5°.

AXIS auto step: 0.00 D to 4.00 D

Factory setting: 0.00 D

In cylindrical axis measurement with a cross cylinder lens, the AXIS step becomes 5° when the obtained cylinder value is less than the setting. The AXIS step becomes 1° when the obtained cylinder value is the setting one or more. The setting value changes in 0.25 D increments.

When the setting is 0.00 D, the AXIS step does not change regardless of the cylinder value.

Indication of Axis 0°: 0°, 180°

Factory setting: 180°

Selection of whether to display "0°" or "180°" when the cylinder axis is in the horizontal direction. However, when the cylindrical power is 0 D, the cylinder axis is displayed as 0°.

180° ⇒ When cylindrical power and the cylinder axis are horizontal, the cylinder axis is displayed as 180° and printed.

0° ⇒ When the cylindrical power and when the cylinder axis is displayed as 0° and printed.

Cross Cylinder (XC) test: AUTO, ±0.25D, ±0.50D, ±0.25D/○

Factory setting: AUTO

Setting for the cross cylinder lens placed in the cross cylinder test.

AUTO ⇒ ±0.25 D Auto cross cylinder lens

±0.25D ⇒ ±0.25 D cross cylinder lens

±0.50D ⇒ ±0.50 D cross cylinder lens

±0.25D/○ ⇒Switches ±0.25D cross cylinder lens and open alternately. (When in AXIS mode, the lens cannot be changed)

XC mode S.E fix: Yes, No

Factory setting: Yes

Selection of whether or not to adjust sphere values for maintaining the spherical equivalency in the cross cylinder test.

CYL mode S.E fix: Yes, No

Factory setting: No

Selection of whether or not to adjust sphere values for maintaining the spherical equivalency in normal cylindrical power refinement.

XC mode AXIS 90° auto change: Yes, No

Factory setting: Yes

Selection of whether or not to automatically rotate the axis 90° when a positive response is given for CYL=0 in cross cylinder test (CYL power).

The above is when in - CYL mode. When in + CYL mode, the above is inverted.

Prism display format: X/Y, rθ

Factory setting: X/Y

Setting for the prism display format.

X/Y ⇒ Rectangular coordinates

rθ ⇒ Polar coordinates

Prism speed (0.1ΔRepeat): 1.0 sec, 0.7 sec, 0.5 sec, 0.2 sec

Factory setting: 0.7 sec (For Plus Package, 0.2 sec)

The prism value can be changed in 0.1Δ increments continuously while pressing $\oplus$ or $\ominus$.

This is the setting of the prism value changeover time.

According to the refractor main body version, 0.2 sec cannot be selected.

Prism step (Convergence/Divergence test): 0.20Δ, 1.00Δ

Factory setting: 0.20Δ

Setting for the prism step for the Convergence and Divergence tests. The set value is the value for the binocular eye.

Input prism from LM: Yes, No

Factory setting: No

Selection of whether or not to enter the prism value automatically when LM data is imported from a lensmeter.

Insertion of rotary prism (only for Plus Package): Prism mode, Always

Factory setting: Prism mode

Selection of whether to insert rotary prism only when in Prism mode or insert rotary prism always.

Fog for binocular balance: Yes, No

Factory setting: Yes

Selection of whether or not to fog the vision automatically so that the patient's visual acuity become 20/30 to 20/20.

VA format: Normal

Factory setting: Normal

Selection of the VA value display and print format.

Now, the option is Normal only.

Preset VA: 1 letter, H.line, No

Factory setting: H.line

Selection of whether to isolate a single letter or horizontal line on the letter chart whose visual acuity is estimated based on the AR or LM data. However, the estimated visual acuity chart is not presented when the data is entered in the final field.

1 letter $\Rightarrow$ Displays the estimated visual acuity chart with a single letter isolation.

H. line $\Rightarrow$ Displays the estimated visual acuity chart with a horizontal line isolation.

No $\Rightarrow$ The estimated visual acuity chart is not presented.

Preset ADD: Setting 1 (Low), Setting 2 (High), None

Factory setting: Setting 1 (Low)

Selection of whether or not to enter the patient's age and preset the estimated additional power when (ADD), ADD ⊞ , or ADD VA is pressed.

For the additional power to be preset, see "8.3 VA Conversion Table" (page 267).

SPH Far → Near: SPH, SPH + ADD

Factory setting: SPH + ADD

Setting for the sphere values when far mode is switched to near one.

SPH $\Rightarrow$ The sphere values in far mode are also used in near mode.

SPH + ADD $\Rightarrow$ The additional powers are added to the sphere values in far mode.

(–) ADD: Yes, No

Factory setting: No

Selection of whether or not to enter the negative value as additional power.

Working distance (WD): 35 cm to 70 cm

Factory setting: 40 cm

Setting for the working distance in 5 cm increments.

NPC calculation: Detail, Simple

Factory setting: Detail

For the near point of convergence, when calculating the meter angle (MA), setting for whether to include the distance between the base of patient's nose (the inner side of the lens) and the cycloduction (0.012 + 0.013 =0.025).

Detail $\Rightarrow$ calculate including 0.025

Simple $\Rightarrow$ calculate excluding 0.025

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Standard accommodation power display (only for Plus Package): Morgan, Hofstetter, No

Factory setting: No

Setting for the standard accommodation power to be displayed in the # 19 Near point of accommodation (NPA) window and the #19 Accommodation with addition of minus lens window.

Morgan⇒ Displays the range of Morgan's criterion

Hofstetter ⇒ Displays the maximum value, average value, and minimum value calculated by the Hofstetter formula

No ⇒ Criterion is not displayed.

Acomm. power for Range of Clear Vision: ADD/NPA/Age/Manual

Factory setting: Age

Setting for selecting which value is used for the accommodation power for the range of clear vision calculation.

Near indication link (Range of Clear Vision): Yes, No

Factory setting: Yes

Setting for whether or not to switch the far / near indication automatically along with the lens type when the lens type is changed with the data window displayed during the test for range of clear vision.

AC/A for Sheard/Percival SPH (only for Plus Package): Gradient AC/A, Heterophoria AC/A

Factory setting: Gradient AC/A

Setting for AC/A used for calculating the SPH adjustment value that satisfies Sheard/Percival's criterion.

Accomm. for Morgan's System (only for Plus Package): #19 NPA, #19 (-)lens

Factory setting: #19 NPA

Setting for accommodation used for comparison with Morgan's criterion.

Prism for Supra. and Infra. (only for Plus Package): R, L

Factory setting: R

Selection of which prism to be changed when in Supravergence test. For R, #12B and #18B result becomes right supravergence / infravergence test. For L, the result becomes left supravergence / infravergence test.

After measuring #12B or #18B, the setting cannot be changed.

Graph type (only for Plus Package): Type 1, Type 2

Factory setting: Type 1

Setting for the type of visual function analysis graph display.

Type 1 ⇒ #20 data is not reflected on the RCI line. #21 data is not reflected to the RCS line.

Type 2 ⇒ #20 data is reflected on the RCI line. #21 data is reflected to the RCS line.

*For details, see "5.3.2 Visual function analysis graph" (page 237).

Graph display (only for Plus Package): As - +13.00D, As - +3.0D

Factory setting: As - +13.00D

Setting for the graph display.

As - +13.00D $\Rightarrow$ Displays the graph of Vertical axis accommodation stimulus is 0 to +13.00D and Horizontal axis accommodation stimulus is 20 △ BI to 100 △ BO.

As - +3.0D $\Rightarrow$ Displays the graph of Vertical axis accommodation stimulus is 0 to +3.00D and Horizontal axis accommodation stimulus is 15 △ BI to 50 △ BO.

*As: accommodation stimulus

Graph print (only for Plus Package): As - +13.00D, As - +3.0D, No

Factory setting: No

Setting for the graph print.

As - +13.00D $\Rightarrow$ Prints the graph of Vertical axis accommodation stimulus is 0 to +13.00D and Horizontal axis accommodation stimulus is 20 △ BI to 100 △ BO.

As - +3.0D $\Rightarrow$ Prints the graph of Vertical axis accommodation stimulus is 0 to +3.00D and Horizontal axis accommodation stimulus is 15 △ BI to 50 △ BO.

No $\Rightarrow$ Visual function analysis graph is not be printed.

Print Morgan's System (only for Plus Package): Yes, No

Factory setting: No

Selection of whether or not to print the comparison with the Morgan's criterion.

Print CL data: Yes, No

Factory setting: No

Selection of whether or not to print the CL conversion value of the subjective data together with the others.

Print TL data: Yes, No

Factory setting: No

Selection of whether or not to print trial lens (TL) data for the final prescription. When the RT-5100 has no final prescription, the TL data for subjective data is printed.

Clear confirmation: Yes, No

Factory setting: No

Selection of whether or not to display the confirmation screen when $\boxed{\text{Clear}}$ is pressed.

Setting the parameter to Yes prevents data from being deleted by touching $\boxed{\text{Clear}}$ accidentally.

Clear after print: Yes, No

Factory setting: Yes

Selection of whether or not to clear measured data after printing.

Printer: Standard, Canon, HP, Off

Factory setting: Standard

Selection of whether or not to print the data.

Standard $\Rightarrow$ Line printer

Canon $\Rightarrow$ Bubble jet printer (Canon)

HP $\Rightarrow$ Desk jet printer (Hewlett Packard)

Off $\Rightarrow$ The data cannot be printed.

3

Print format (for Plus Package, Print format 1): All data, w/o AR, Unaided, Subj, Final

Factory setting: All data

Setting for the contents to be printed.

All $\Rightarrow$ All data

w/o AR $\Rightarrow$ All data except AR data

U.S.F. $\Rightarrow$ Unaided visual acuity, subjective refinement data, and final data

When the Printer parameter is set to Canon or HP:

Standard $\Rightarrow$ Data printed in the standard format

Short $\Rightarrow$ Data printed in the short format

Print format 2 (for Plus Package): 21 Point Exams, Standard

Factory setting: 21 Point Exams

Setting for the contents to be printed.

21 Point Exams $\Rightarrow$ Print the data for each examination of 21 Point Exams.

Standard $\Rightarrow$ Print the measurement result in a standard print format.

Date format for print: mm/dd/yyyy, dd/mm/yyyy, yyyy/mm/dd

Factory setting: mm/dd/yyyy

Setting for the data format to be printed.

mm/dd/yyyy $\Rightarrow$ AUG/20/2005

dd/mm/yyyy $\Rightarrow$ 20/ 8/2005

yyyy/mm/dd $\Rightarrow$ 2005. 8.20

QR code: QR1, QR2, Off

Factory setting: Off

Selection of whether or not to print QR code and of data to be printed with QR code.

QR1 $\Rightarrow$ The final data (subjective or prescription data) and the QR code are printed.

QR2 $\Rightarrow$ All data is printed along with the final data QR code.

Print list: Yes, No

Factory setting: Yes

When the setting is Yes, the data list is displayed automatically when (Print) is pressed.

Confirm that all necessary tests have been performed and press (Print) again to print the data.

When any test is omitted, press [End] on the screen and return to the measurement screen.

Operating timer: Prog., Subj, NO

Factory setting: Subj.

Selection of whether or not to display and print the elapsed time from data entry start in the subjective field. When the setting is Subj, it is displayed instead of the time in the upper-right of the screen. When the setting is Prog., the elapsed time from data entry start is displayed.

In addition, the elapsed time is displayed as test time on the Recall Data screen.

Program A: Fix, User

Factory setting: Fix

Selection of whether to use the default Program A or user-programmed one. Set the parameter to User when Program A is reprogrammed. The default Program A can be used by resetting to Fix and pressing the Clear button or turning on the power again.

Program B: Fix, User

Factory setting: Fix

Selection of whether to use the default Program B or user-programmed one. Set the parameter to User when Program B is reprogrammed. The default Program B can be used by resetting to Fix and pressing the Clear button or turning on the power again.

Program ☀☽ : Fix, User

Factory setting: Fix

Selection of whether to use the default Program ☀☽ or user-programmed one. Set the parameter to User when Program ☀☽ is reprogrammed. The default Program B can be used by resetting to Fix and pressing the Clear button or turning on the power again.

Program #7 (For Plus Package): Fix, User

Factory setting: Fix

Selection of whether to use the default Program #7 or user-programmed one. Set the parameter to User when Program #7 is reprogrammed. The default Program #7 can be used by resetting to Fix and pressing the Clear button or turning on the power again.

Adjust ADD Subj → Final: Yes, No

Factory setting: Yes

Selection of whether or not to set the additional power taken into consideration of the difference of between the subjective data and prescription S and C data in the prescription data automatically when (ADD) is pressed in the final field.

When there is no additional power data in the subjective field, this setting is disabled.

The data copying from Subj to Final → S/C/A, S/C/A/VA/ADD, S/C/A/VA/ADD/Prism, All data

Factory setting: S/C/A

Setting for the contents to be copied when copying the data from Subj to Final. The contents of copying is only for the Far point mode.

Preset power of Subj 1: AR, LM

Factory setting: AR

When both AR and LM data are input, the refractor head is initially set for subjective refinement for the selected setting.

The PD in the AR data is prioritized for use.

When only one of the two data is imported, the refractor is set with the imported data.

Preset power of Subj 2: All data, CYL=0, Clear

Factory setting: All data

Selection of whether or not to use the data entered in the Preset power of Subj 1 parameter without being corrected.

All data $\Rightarrow$ Uses all data without being corrected.

CYL=0 $\Rightarrow$ Uses only sphere data. (The cylindrical and axis values become 0.)

Clear $\Rightarrow$ Enters 0 in all data fields.

This function is not available for the data entered with the dial.

Copy LM/AR data when switching from Day to Night: Yes, No

Factory setting: No

Selection of whether or not to copy the day data to the night LM field or AR field that is not entered when Day mode is switched to Night mode. This parameter can be selected only when the RT is connected with a chart presenting device equipped with the night vision test function.

Intelligent XC: Yes, No

Factory setting: Yes

When the setting is Yes in the cross cylinder test, the test contents change depending on the cylinder values. It allows the test to be performed easily.

CYL=0: The message whether the cross cylinder test and previous red-green test are skipped or not appears.

CYL=0.25: The cross cylinder test is performed in the order of cylindrical power $\rightarrow$ cylindrical axis $\rightarrow$ cylindrical power.

When the cylinder value is 0 in the first cylindrical power measurement, the next cross cylinder test is not performed.

CYL$\geq$0.5: The cross cylinder test is performed in the order of cylindrical axis $\rightarrow$ cylindrical power.

When the setting is No, the cross cylinder test is performed in the programmed order regardless of the cylinder value.

Shift + Final: Final Fit, copy the data

Factory setting: Final Fit

Setting for the function when Final is pressed together with SHIFT.

Final Fit: Enters the far point auto adjustment mode. See "2.7.2 Auto adjustment of far powers (with Program B)" (page 84) and "2.7.3 Power adjustment without standard programs" (page 85).

copy the data: Copies the displayed numeric value to the prescription field regardless of the presence or absence of prescription mode data.

Dial switch: S→C→A, S→C→A→VA, S→A→C, S→A→C→VA

Factory setting: S→C→A

Setting for the function with the dial switch.

Each time it is pressed, the modes change in the selected order.

Lens for Retino: +1.50 D, +2.00 D

Factory setting: +1.50 D

Setting for the spherical lens for retinoscope.

Distance between the refractor head and retinoscope

+1.50 D: 67 cm

+2.00 D: 50 cm

Auto lamp off: Off, 5 min, 15 min, 30 min

Factory setting: 15 min

Selection of whether or not to use the power saving function. The setting time is also selectable.

The screen backlight and chart presenting device lamp go out in the power saving mode. Press any key to restore from the mode.

Near lamp link: Yes, Other than grid, No

Factory setting: Yes

Yes ⇒ The near point lamp lights up automatically in the ADD mode and near mode.

Other than grid ⇒ The near point lamp lights up automatically in the ADD mode and near mode but the near point lamp goes out when selecting the cross grid chart for near point.

No ⇒ The near point lamp does not light up automatically. When lighting up, it is necessary to press the left side switch of the control box to light up the Near point lamp.

Beep sound: High, Low, Off

Factory setting: High

Setting for the beep sound tone sounded by pressing any key.

Chart link: Yes, No (Other than SC series)

Factory setting: Yes

Selection of whether or not to use the chart presenting device other than NIDEK.

Select No to use the chart presenting device other than NIDEK.

Chart link: Cable, Wireless 1 to 8, No (SC series)

Sets the communication method with the SC series.

Cable ⇒ Connects the RT-5100 with the SC series by cable.

Wireless 1 to 8 ⇒ Communicates with the SC series by an optional infrared communication unit. The number from 1 to 8 indicates the communication channel. Set the same channel in the Remote channel parameter of the SC series.

Memory function: Yes, Memory box, No

Factory setting: Yes

Yes ⇒ Stores the last 150 data by pressing the print button of the auto refractometer or lensmeter connected to the RT-5100 with the cable directory.

Memory ⇒ Calls up AR or LM data from the optional memory box.

No ⇒ Calls up AR or LM data only once without pressing the print button from the auto refractometer or lensmeter connected to the RT-5100 with the cable directory.

AR port: AR, ARK, RKT, WF(OPD), HDR

Factory setting: AR

Setting for the device to be connected to the AR connector in the relay box.

When connecting the ARK-10000 (V2.11 or later) or OPD-Scan III to AR connector, set the parameter to "WF(OPD)".

When performing patient view simulation with RT data on the OPD-Scan III (V1.05 or later), set "HDR".

LM port: LM, ARK, RKT, AR, WF(OPD)

Factory setting: LM

Setting for the device to be connected to the LM connector in the relay box.

When connecting the ARK-10000 (V2.11 or later) or OPD-Scan III to LM connector, set the parameter to "WF(OPD)".

Display the Day/Night switching button: Yes, No

Factory setting: No

Selection of whether or not to input the day/night data. This parameter can be selected only when the RT is connected with a chart presenting device equipped with the night vision test function.

Program for WF data imported from OPD: A, B, C, D, E, ☀☽

Factory setting: B

Setting for the program to automatically be set when connected to the ARK-10000 (V2.11 or later) or OPD-Scan III and the Wave Front value is entered, with the "AR port" or "LM port" parameters set to "WF(OPD)".

The program ☀☽ appears only when the RT is connected with a chart presenting device equipped with the night vision test function.

Program for AR data imported from OPD: A, B, C, D, E, ☀☽

Factory setting: A

Setting for the program to automatically be set when connected to the ARK-10000 (V2.11 or later) or OPD-Scan III and the AR median value is entered, with the "AR port" or "LM port" parameters set to "WF(OPD)".

The program ☀☽ appears only when the RT is connected with a chart presenting device equipped with the night vision test function.

Program for Night data imported from OPD: A, B, C, D, E, ☀☽

Factory setting: A

Setting for the program to automatically be set when night data is entered from the connected ARK-10000 (V2.13 or later) or OPD-Scan III and the day and night data are entered at the same time, with the "AR port" or "LM port" parameters set to "WF(OPD)".

The program ☀☽ appears only when the RT is connected with a chart presenting device equipped with the night vision test function.

Data clear confirmation by EyeCare card insertion: Yes, No

Factory setting: No

Selection of whether to ask if data is entered after the data that is being measured is cleared when data is entered from the Eye Care card to the RG-5100.

Write to Eye Care card: Yes, No

Factory setting: No

Yes ⇒ When printing or when the Eye Care card is inserted, the examination data for one person is written to the Eye Care card.

No ⇒ Does not write to Eye Care card.

Input sequence from PC: Hold, Pass

Factory setting: Hold

Selection of whether to hold or overwrite the data imported from a computer (PC) when the RT-5100 already has data.

Hold ⇒ Holds the data imported from the PC temporarily.
Press (IN) and (AR) or [LM] to enter and overwrite the data.

Pass ⇒ Overwrites and clears the data already displayed in the RT-5100 when another data is imported from the PC.

* When the RT-5100 has no data, it functions as the same as Pass regardless of this parameter setting.

System No.: Off, 1 to 10

Factory setting: Off

Indicates which device measured the data.

1 to 10: The number is printed on the top line of print result. It is also output to the PC when the data is output.

Off: The system No. is not output.

Daisy chain communication: No, Server, Client 1 (to 4)

Factory setting: No

Selection of whether or not to daisy-chain an auto refractometer or a lensmeter to the several RT-5100 for data communication.

No ⇒ No daisy chain

Server ⇒ Daisy-chains the RT-5100 as a server. The AR or LM data of the auto refractometer or lensmeter can be sent connected to the server to the other client RT-5100.

Client 1 to 4 ⇒ Daisy-chains the RT-5100 as a client.

I/F Mode: NIDEK, NIDEK 2

Factory setting: NIDEK

Selection of whether or not to increase the time-out limit for the communication between the RT and an external device such as the AR or LM. If the time-out occurs with the factory setting "NIDEK" due to the communication environment, select "NIDEK2".

Communication Sequence for PC: Type1, Type2

Factory setting: Type1

Setting of the communication sequence with a computer.

ID No.: Standard, Expanded

Factory setting: Standard

Selection of the number of digits that can be input for the ID No.

Standard: 12 digits

Expanded: 20 digits

With this setting, the output format to the computer changes. For details, see the interface manual.
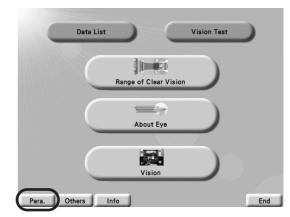
3.19.2 Writing/Reading parameter setting

The parameter settings can be wrote to or read from a CF (Compact Flash) card.

> *Note*   • The parameter setting written with the standard RT-5100 cannot be read with the Plus Package.
> • The parameter setting written with the Plus Package cannot be read with the standard RT-5100.

1 Display the Parameter setting screen.

    1) Call up the main menu screen.

      Press (Menu) .

3
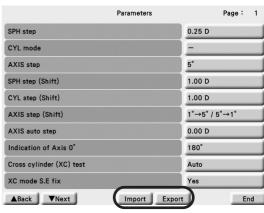
    2) Press [Para.].

2 Write or read the parameter setting.

    [Import] ⇒ Reads the parameter setting written to the CF card. However, when no data has been written to the CF card, no data can be read out.

    [Export] ⇒ Write the current parameter settings to CF card.

3.20 Clearing Stored Data
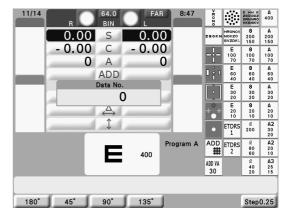
All AR and LM data stored in the relay box are cleared.

1 Press (IN).

The Data No. of the last data read from an auto refractometers or a lensmeter appears.

2 Change the Data No. to 0.

Turn the dial until the displayed Data No. becomes 0. (The data No. is changed in 100 increments by turning the dial while pressing (Shift).)

3 Press (Clear).

All of the AR and LM data stored in the relay box are cleared and then "Memory data is erased" is printed out.

3.21 Exporting Data to Computer or OPD-Scan III

Pressing (Print) exports the displayed data to a computer that is connected via PC connector upon printing.

When the "AR port" parameter is set to "HDR", data is exported to the OPD-Scan III (V1.05 or later) that is connected via AR connector.

When a computer could not receive data or the message "RT data can be received only by the Summary window or the Verify Examination Quality window." indicating data reception failure is displayed on the screen of the OPD-Scan III (V1.05 or later), the data needs to be exported again. When this message is displayed in the OPD-Scan III, change the OPD-Scan III to the Summary window, and then export the data again. Follow Steps 1 to 4 to export the data again.

> If measured data on the RT-5100 has been cleared upon printing, call up data as described in "3.12 Calling Up Data", and then export the data.

> To not clear data at the time of printing, set the "Clear after print" parameter to "No".

The data can be exported without printing by the following procedure.

1 Press the right side switch of the control box.

> The Other Settings window appears.

2 Press [ID No.].
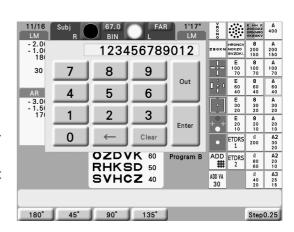
> The numeric keypad is displayed.

3 Check the ID No. and press [Out].

> The data is written to the Eye Care card.

4 Press [Enter] or right side switch of the control box.

> The screen returns to the measurement screen.

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3.22　Exporting Data to Eye Care Card

The displayed patient's refraction data can be exported to the optional Eye Care card (IC card).
When the Eye Care card is inserted when printing or exporting the data to the computer, refraction data for one person is wrote to the Eye Care card. (When night data is saved, another EyeCare card is necessary for the night data.)

> 🖉 Note
> • The "Write to Eye Care Card" parameter must be set to "Yes" beforehand.
>   See "3.19.1 Parameter Settings" (page 133).
> • Do not write measurement data from refractometers or lensmeters to the Eye Care card which contains data from the RT-5100.
>   > Data becomes mixed up and becomes improper.
>   > To write measurement data from auto refractometers or lensmeters to the Eye Care card, clear the data in the Eye Care card in advance. By inserting the Eye Care card into the Eye Care card reader of the control box, the data stored in the card is read by the RT-5100 and cleared from the card at the same time.

A. When the data printout is necessary

1 Insert the Eye Care card.

2 Measure with the RT-5100.

The data must be entered to either of Unaided, LM, AR, Subj, or Final.
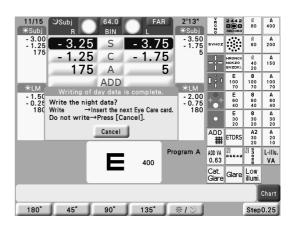
3 Press (Print).

The data is printed.

The data is wrote to the Eye Care card.

For day/night data, day data is written first and then the message, "Writing of day data is complete. Write the Night data?" is displayed.

To write the night data, night data is written after the EyeCare card is switched. To not write the night data, press [Cancel].

B. When the data printout is unnecessary

1 Insert the Eye Care card.

2 Measure with the RT-5100.

The data must be entered into either of Unaided, LM, AR, Subj, or Final.

3 Press the right side switch of the control box.

The Other Settings window appears.

4 Press [ID No.].
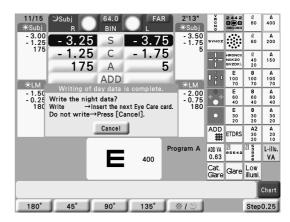
The ID No. can be set.

5 Check the ID No. and press [Out].

The data is exported.

For the Day/Night data, day data is written first and then the message, "Writing of day data is complete. Write the Night data?" is displayed.

To write the Night data, Night data is written after the EyeCare card is switched. To not write the Night data, press [Cancel].

6 Press [Enter] or right side switch of the control box.
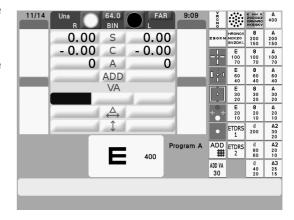
The window closes.

3.23 Displaying Images (SC series)

The images in the SC series can be displayed on the SC LCD.

1 Pressing 〔3〕 displays the third page of the chart buttons.

The image operation buttons such as ▶ are displayed in the upper-right of the screen.

2 Pressing ▶ displays images in the SC series as a slide show.

A slide show is a looped display of a series of images.

The screen changes every 5 seconds.

〔1〕 to 〔18〕 : The images registered in the SC is displayed directly.

3 Press any chart button to stop the slide show.

> ✎ Note • There is a pause of a few seconds between pressing any image operation button and display of the image. The SC series cannot respond to any operation from the control box during this time. However, this is not an error.

4. TEST METHOD

4.1 Visual Acuity Test

4.1.1 Unaided Visual Acuity Test

1 Press $\boxed{\text{Un-aided}}$.

The unaided visual acuity (VA) test starts.

2 Press $\boxed{R}$.

The left measuring window is occluded.

According to the entered AR data, the estimated VA chart is presented automatically.[*24] See "8.6 Estimated Visual Acuity Table" (page 270).

3 Obtain the unaided VA for the right eye.

Obtain the best possible VA.

Change the chart with $\boxed{\ominus}$ or $\boxed{\ominus}$.

The VA of the last presented chart is in the VA field.

4 Press $\boxed{L}$.

The left measuring window is opened and the right one is occluded.

According to the entered AR data, the estimated VA chart is presented automatically.

5 Obtain the unaided VA for the left eye.

Follow the same procedure as Step 3.

6 Press $\boxed{\text{BIN}}$.
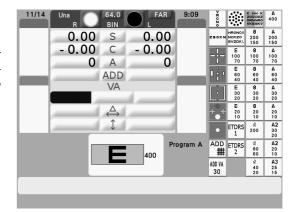
Both measuring windows are opened.

7 Obtain the binocular unaided VA.

Follow the same procedure as Step 3. The higher VA chart between both eyes is presented automatically.

The unaided VA test is completed.

---

*24. The estimated VA chart is not presented when the "Preset VA" parameter is set to "No" or the data has already been entered in the final field.

4.1.2　Aided Visual Acuity Test

The aided VA can be measured when LM data is entered.

1 Press (LM).

The aided VA test starts.

According to the LM data, the corrective lenses are placed in the measuring windows.

2 Press (VA) to test the right, left, and binocular VA.

The VA chart estimated from the difference between the AR and LM data is presented automatically.[25]

Follow the same procedures as Steps 2 to 7 of "4.1.1 Unaided Visual Acuity Test".

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[25]. **The estimated VA chart is not presented when the "Preset VA" parameter is set to "No" or the data has already been entered in the final field.**

4.1.3   Visual Acuity Test with Addition Powers

The VA can be measured with addition powers when the addition powers are entered.

1 Measure the addition powers.

> See Steps 23 to 25 in Page 51.
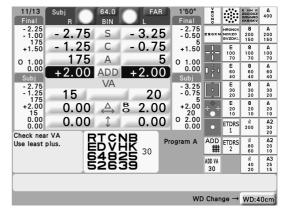
2 Pull down the near point rod and set the near point chart.

> Standard: Set either of the near point chart 1 (standard), 5: Letters chart, or 4: Landolt's rings.

> Plus Package: Set the near point chart II A: Letters chart or E: Landolt's rings.

3 Press [ADD VA] .

> Check the near VA (see Step 26 in Page 51).

4 Press [ADD VA] again.

> The VA test with the addition powers starts and the VA display changes to A-VA.
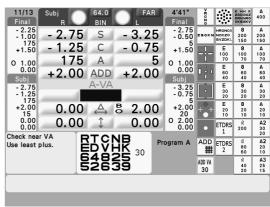
> When the addition powers are not entered, the test does not start.

> Measure the near visual acuity.

5 Test the right, left, and binocular VA.

> Press (R), (L) or (BIN) and turn the dial to enter each VA.

> The VA cannot be entered with the mask keys such as ⬡ or ⬡.

> When LM, AR, Subj, or Final mode is switched during ADD power VA measurement mode, the mode switches with the VA measurement mode in the ADD power. However, when the add power is not entered in the specified mode, the mode leaves VA measurement mode in the ADD power.

6 When any of the operations below is performed, Add power VA measurement mode is finished.

　　　・Press 　ADD VA　 .

　　　・Switches to the other mode (S/C/A etc.)

4.1.4　Visual Acuity Test using pin hole

The VA can be measured using pin hole of the auxiliary lens.

1 Press 　PHVA　 .
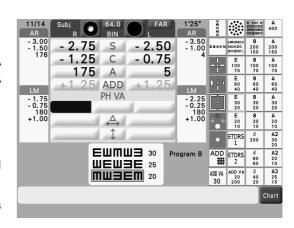
The pin hole of the auxiliary lens is set.

For the measurement screen, the VA mode switches to PHVA and enters VA measurement mode using pin hole.

2 Test the right, left, and binocular VA.

Press ⓇR , ⓁL or BIN and turn the dial to enter each VA.

The VA can be entered with the mask keys such as ⌷ or ⌷ .

3 By switching to the other mode, VA mode using the pin hole is finished.

4.1.5　Input method of the correct character and incorrect character

Pressing Shift during VA mode displays the +/- function keys. For the entered VA value, +2, +1, -1, -2 can be added with +/-.

With this function, the character number that can be read or the character number that cannot be read can be input.

　　　ex) When the VA chart is 4 characters per line,

　　　　For the VA 20, if 3 out of 4 characters could be read, → 20/20 - 1

　　　　For the VA 15, if 1 out of 4 characters could be read, → 20/20 + 1

　　　ex) When the VA chart is 5 characters per line,

　　　　For the VA 20, if 3 out of 5 characters could be read, → 20/20 - 2

　　　　For the VA 15, if 3 out of 5 characters could not be read, → 20/20 + 2

4.1.6　VA measurement of day data in brightness for Night mode

Measure VA in night mode with the day corrective lens inserted. This data can be used as reference when the day glasses are used in night.

| 📝 Note | • To measure the day data in night brightness, a chart presenting device with Night measurement function (SSC-350/SSC-370/SC-1600/SC-1600Pola) is necessary. |

1 Press [L-illu. VA] .
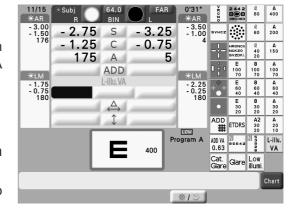
> The chart becomes night mode.
>
> The measurement screen switches from VA mode to "L-illu.VA" and becomes VA measurement mode in night brightness.

2 Measure VA for right eye, left eye, and both eyes.

> Press (R)/(L)/(BIN) and turn the dial to input the VA value.
>
> The VA value can be input either with (⊖)/(⊟) .

3 VA measurement mode in night brightness can be left by switching to the other modes (S/C/A etc.)

4.2　Astigmatism test

4.2.1　Astigmatism test with astigmatism clock dial

Chart: Astigmatism clock dial
Ideal appearance: The sharpness of all bars is equal.

[Procedure example]

1 Press ⓇR or ⓁL to occlude either measuring window.

2 Present the astigmatism clock dial chart.

Press ❋. The RT-5100 goes into CYL mode.

When the cylinder value is not 0, change it to 0.

3 Fog the vision until the VA becomes about 20/200.

1) Press ⓈS to go into SPH mode.

2) Turn the dial counterclockwise and add positive lenses.

4 Reduce the fogging until the VA becomes about 20/40.[26]

Turn the dial clockwise.

5 Ask the patient, "Does any bar appear especially sharper than the others? Or, are they about the same?"

All the bars appear equal. → No astigmatism. The test is completed.

One of the bars appears sharper. → Obtain the cylindrical axis in minus reading by multiplying the smaller number (1 to 6) next to the bar by 30°.

For example: When Bar 2 appears sharper: 2 × 30°= 60°

6 Set the axis of the minus cylindrical lens to the value obtained is Step 5.

Press ⒶA and turn the dial.

7 Add minus cylinder in 0.25 D increments so that all the bars appear equal.

Press ⒸC and turn the dial clockwise.

When adding the cylindrical power changes the sharper bar:

When the sharpest bar moves in the counterclockwise direction → Decrease the axis value.

When the sharpest bar moves in the clockwise direction → Increase the axis value.

---

[26]. The numbers (1 - 12) beside the bars correspond to the VA of 20/40.

4.2.2   Astigmatism test with cross cylinder lens
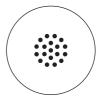
Use: Cylindrical axis and power refinement with the cross cylinder lens
Chart: Dots
Auxiliary lens: Cross cylinder lens
Ideal appearance: The sharpness of dots does not change even though the
cross cylinder lens is flipped.

[Procedure example]

1 Set the refractor according to the AR data and occlude either measuring window.

2 Perform the red-green test.

When the patient cannot see the red and green sides equally, make the green side sharper slightly.

See "4.3.1 Red-green test" (page 161).

3 Present the dots chart.

Press ▦ .

The RT-5100 goes into AXIS mode. The cross cylinder lens is set.

4 Measure the cylindrical axis.

See 2) of Step 12 of "2.5.1 Program A" (page 43).

5 Go into CYL mode.

Press ⎡ C ⎤ .
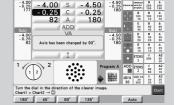
The axis of the cross cylinder lens changes.

6 Measure the cylindrical power.

See 2) of Step 13 of "2.5.1 Program A" (page 43).

4

Note
- When measuring the CYL power using cross cylinder, if CYL=0 and the dial is turned to+ direction, the AXIS is shifted 90° to be the same power as when +CYL is added and CYL and SPH are changed. In this case, "Axis has been changed by 90° " is displayed. (when in - CYL mode)
- The SPH changed value is changed according to the "XC mode S.E fix" parameter setting.
- When AXIS 90° automatic change is not desired to be performed, set the "XC mode AXIS 90° auto change" parameter to "No".
- When the cylindrical power is 0, it can be reconfirmed using the following procedure.

    When the cylindrical power is 0, proceeding the program displays the message "No Cylinder power. Skip the Cylinder test? Press [YES] or [NO]." (Note 1). Select "NO".

    1) After performing the red-green test, measure the cylindrical power.

    2) Set a cylindrical power of 0.25 D.

    3) Check the cylindrical power in the order of axis 180°, 45°, 90°, and 135°. If the patient indicates that chart 1 looks clearer for all axes, set the cylindrical power as 0. This is the end of the astigmatism test. If the patient indicates that chart 2 looks clearer for any axis, proceed to the cylinder axis measurement for the axis in which the patient indicated that chart 2 was clearer.

    Note 1: When the "Intelligent XC" parameter is set to "Yes" (factory setting), the message is displayed.

4.2.3 Astigmatism power test with cross cylinder lens (hold and remove cross cylinder testing method)
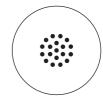
Use: Cylindrical power refinement with the cross cylinder lens

Chart: Dots

Auxiliary lens: Cross cylinder lens

Ideal appearance: The dots chart when the cross cylinder lens is not set is seen sharper.

[Procedure example]

1 Detect the cylindrical axis in the same manner of procedures 1 to 4 of "4.2.2 Astigmatism test with cross cylinder lens" (page 157). See "2.5.1 Program A" (page 43).

2 Enter CYL mode.

> Press the C button.
>
> The cross cylinder axis is changed.

3 Press the cross cylinder lens switching button to set "±0.25/ ○ ".
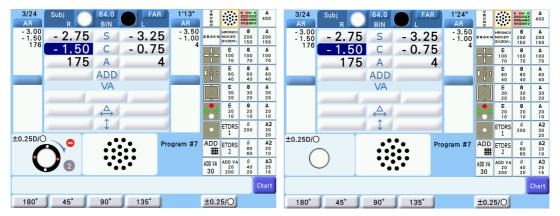
> When the "Cross cylinder" parameter setting is "±0.25D/ ○ ", the cross cylinder lens does not need to be switched.
>
> For AXIS, the minus cylinder axis is the same and the 0.25 cross cylinder lens is inserted.

Cross cylinder lens switching button

4 Press ⊚ to insert and remove the cross cylinder lens and ask the patient which is sharper. Adjust the astigmatism power by turning the dial until the chart is seen sharper when the cross cylinder lens is removed.

(1) When the chart is seen sharper while the cross cylinder lens is inserted

> 1) Turn the dial clockwise one increment.
>
> 2) Press ⊚ to insert and remove the cross cylinder lens while turning the dial clockwise in 1 increments until the chart is seen sharper when the cross cylinder lens is removed.

When the cross cylinder lens is inserted   When the cross cylinder lens is removed
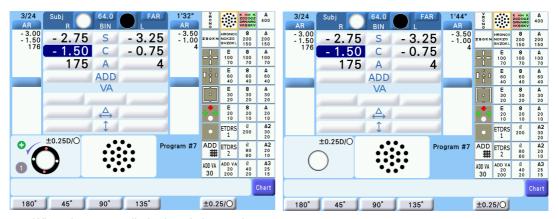
> 3) When the chart is seen sharper while the cross cylinder lens is removed, this test is finished.

(2) When the chart is seen sharper if the cross cylinder lens is removed

> When the chart is seen more sharply when the lens is removed at the first, change the direction of the cross cylinder lens and make adjustments. (If in Procedure (1) above, after turning the dial to the right when the chart is seen more sharply without the cross cylinder lens inserted, then the test is finished.)
>
> 1) Press ⊚ to change the direction of the lens.
>
> 2) Press ⊚ to insert and remove the cross cylinder lens while turning the dial counterclockwise in 1 increments until the chart is seen sharper when the cross cylinder lens is removed.

4

TEST METHOD：Astigmatism test

When the cross cylinder lens is inserted

When the cross cylinder lens is removed

3)

When the chart is seen sharper while the cross cylinder lens is removed, this test is finished.
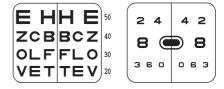
4.3 Spherical Refinement

4.3.1 Red-green test

Chart: Red-green
Ideal appearance: The sharpness of the letters on the red and green sides appears equal.

[Procedure example]

1 Press Ⓡ or Ⓛ to occlude either measuring window.

2 Present the red-green chart.

Press ▦ or ▦ .

The RT-5100 goes into SPH mode.

3 Fog the vision.

Turn the dial counterclockwise two increments to add SPH + 0.50 D.

4 Reduce fogging gradually until the sharpness of the letters on the red and green sides appears equal.

Turn the dial clockwise.

The letters on the red side are sharper. → Turn the dial clockwise.

The letters on the green side are sharper. → Turn the dial counterclockwise.

4.3.2 Cross grid test for far vision
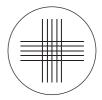
Use: Spherical refinement
Chart: Cross-grid
Applicable model: CP series T, P, F, SC series T and P
Auxiliary lens: ±0.50 D cross cylinder lens (Fixed with the axis set at 90º.)
Ideal appearance: The sharpness of the horizontal and vertical lines appears equal.

[Procedure example]

1 Press (Subj) .

2 Press (R) or (L) to occlude either measuring window.

3 Present the cross-grid chart.

Press ▦ .

The cross cylinder lens of ±0.50 D is placed in the specified measuring window.

4 Ask a patient, "Which are sharper, the horizontal or vertical line?"

The horizontal and vertical lines appear equal. → The spherical power is properly refined.

The horizontal lines are sharper. → In the case of myopia, the spherical power is overminused. In the case of hyperopia, the spherical power is undercorrected.

The vertical lines are sharper. → In the case of myopia, the spherical power is underminused. In the case of hyperopia, the spherical power is overcorrected.

4.4 Binocular Visual Function Test

4.4.1 Binocular balance test

Use: To adjust the accommodation balance if necessary when the best possible visual acuity is equal in the right and left eyes.

Chart: Binocular balance

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters

(SC-2000, SC-1600: 3∆BD to the right eye, 3∆BU to the left eye

Prism value can be changed. See "3.7 Setting Auxiliary Lenses" (page 113).

Ideal appearance:

Right eye	Left eye	Binocular ideal	
H B C P Z E F U A T	E F U A T D Z L E V	H B C P Z E F U A T D Z L E V	The sharpness of the top and bottom lines is equal.

Right eye	Left eye	Binocular ideal	
5 3 9 8 6	3 5 8 6 9	5 3 9 8 6 3 5 8 6 9	The sharpness of the top and bottom lines is equal.

Right eye	Left eye	Binocular ideal	
9 8 3 6 8 9 3	6 3 8 9 3 6 8	9 8 3 6 8 9 3 6 3 8 9 3 6 8	The sharpness of the top and bottom lines is equal.

Right eye	Left eye	Binocular ideal	
5 3 9 8 6	5 3 9 8 6	5 3 9 8 6 5 3 9 8 6	The sharpness of the top and bottom lines is equal.

Right eye	Left eye	Binocular ideal	
H R O N C	H R O N C	H R O N C H R O N C	The sharpness of the top and bottom lines is equal.

4

[Procedure example]

1 Present the binocular balance chart.

Press ▢ , ▢ , ▢ , ▢ , or ▢ .

The polarizing filters are placed in the measuring windows. (The prisms are entered for the SC-2000, SC-1600.)

The RT-5100 goes into SPH mode.

2 Fog the binocular vision.

Press (BIN) and turn the dial counterclockwise so that the binocular VA becomes between 20/30 and 20/25.

The VA of each letter on the chart is 20/50, 20/40, 20/30, 20/25, and 20/20 moving from the left to right.

3 Ask the patient, "Which is sharper, the top or bottom line?"

The top line is sharper. → Press (R) and add SPH +0.25 D. (Turn the dial counterclockwise.)

The bottom line is sharper. → Press (L) and add SPH +0.25 D. (Turn the dial counterclockwise.)

The top and bottom lines should appear equal. When the patient cannot see them equally, determine with which eye they view the binocular balance chart more clearly while referring to the LM data or dominant eye.

4 Clear fogging applied in Step 2.

Press (BIN) and turn the dial.

4.4.2　Binocular red-green test

Use: To check equality of accommodation in both eyes
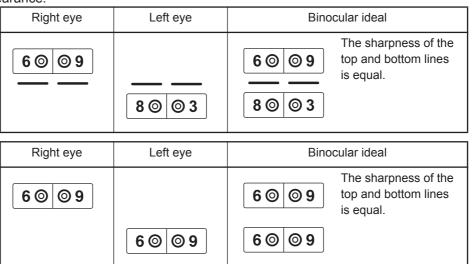
Chart: Binocular red-green

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters

　　　　　　(SC-2000, SC-1600: 3△BD to the right eye, 3△BU to the left eye

　　　　　　The prism value can be changed. See "3.7 Setting Auxiliary Lenses" (page 113).)

Ideal appearance:

Right eye	Left eye	Binocular ideal	
6 ◎ ◎ 9 ___ ___	___ ___ 8 ◎ ◎ 3	6 ◎ ◎ 9 ___ ___ 8 ◎ ◎ 3	The sharpness of the top and bottom lines is equal.

Right eye	Left eye	Binocular ideal	
6 ◎ ◎ 9	6 ◎ ◎ 9	6 ◎ ◎ 9 6 ◎ ◎ 9	The sharpness of the top and bottom lines is equal.

[Procedure example]

1　Present the binocular red-green chart.

Press ▦ or ▦.

The polarizing filters are placed in the measuring windows. (The prisms are placed for the SC-2000, SC-1600.)

The RT-5100 goes into SPH mode.

2　Ask the patient, "How do the four numbers and double circles appear?".

(a) The sharpness of all four double circles are equal.

(b) The sharpness of two double circles on the red side are equal.

(c) The sharpness of two double circles on the green side are equal.

　→ Binocularly well balanced[27]

(d) The top line is sharper on the green side and the bottom line is sharper on the red side.

　→ Press ⓡ and add SPH +0.25 D. (Turn the dial counterclockwise.)

(e) The top line is sharper on the red side and the bottom line is sharper on the green side.

　→ Press Ⓛ and add SPH +0.25 D. (Turn the dial counterclockwise.)

*27.　In the case of (c), both powers are overcorrected even though well balanced. Therefore, it is recommended to add positive powers to both eyes until the chart appears as (a) or (b).

4.4.3 Phoria test

Use: To detect exophoria, esophoria, hypophoria, and hyperphoria
Chart: Phoria
Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism
(SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye, binocular rotary prism)

○ Type U

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)

[Procedure example]

1 Present the phoria chart.

Press ⊞ .

The polarizing filters are placed in the measuring windows.

The base in/out prism powers can be entered.

When ⊞ is pressed again, the base up/down prism powers can be entered.

2 Ask the patient, "Can you see the four bars?"

Yes → Go to the next step.

No → The test cannot be continued.

3 Ask the patient, "Do the vertical and horizontal bars form a cross?"

Yes → Orthophoria

No → Heterophoria - Go to the next step.

4 Ask the patient, "Do the vertical bars line up?"

Yes → No esophoria nor exophoria

No → Esophoria or exophoria

5 Ask the patient, "Is the top bar shifted to the left or right?"

Right → Esophoria

Left → Exophoria

6 Ask the patient, "Do the horizontal bars line up?"

Yes → No hyperphoria nor hypophoria

No → Hyperphoria nor hypophoria

Appearance of chart	Phoria	Correction
<1>	Esophoria	Turn the dial clockwise to add the BO prism powers until a cross is formed.
<2>	Exophoria	Turn the dial counterclockwise to add the BI prism powers until a cross is formed.
<3>	Left eye hyperphoria	Press $\boxed{\updownarrow|\theta}$. Turn the dial clockwise until a cross is formed. (Add BU to the right eye and BD to the left eye.)
<4>	Right eye hyperphoria	Press $\boxed{\updownarrow|\theta}$. Turn the dial counterclockwise until a cross is formed. (Add BD to the right eye and BU to the left eye.)
<5>	Esophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <4>.
<6>	Esophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <3>.
<7>	Exophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <4>.
<8>	Exophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <3>.

🖉 Note

- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.

  ex.When $\boxed{\overset{\leftrightarrow}{\underset{\Delta}{}}}$ is pressed in the base in/out prism, the rotary prism lenses are removed.

- Use $\boxed{+}$ or $\boxed{-}$ instead of the dial for fine adjustment.

- When prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for a single-eye only, rather than for both eyes.

Dial	$1.0\Delta \rightarrow 0.5\Delta$
$\boxed{+}, \boxed{-}$	$0.2\Delta \rightarrow 0.1\Delta$

4

○ Types G, G+, T, and F

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)
I I	— —	—┼—

[Procedure example]

1 Present the phoria chart.

Press ✛ .

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base in/out prism powers can be entered.

When ✛ is pressed again, the base up/down prism powers can be entered.

2 Ask the patient, "Can you see the four bars?"

Yes → Go to the next step.

No → The test cannot be continued.

3 Ask the patient, "Do the vertical and horizontal bars form a cross?"

Yes → Orthophoria

No → Heterophoria - Go to the next step.

4 Ask the patient, "Is the vertical bar shifted to the left or right?"

Right → Esophoria

Left → Exophoria

The vertical line is in the center. → No exophoria nor esophoria

5 Ask the patient, "Is the horizontal bar shifted up or down?"

Up → Right eye hyperphoria

Down → Left eye hyperphoria

The horizontal line is in the center. → No hyperphoria nor hypophoria

Appearance of chart	Phoria	Correction
<1>	Esophoria	Turn the dial clockwise to add the BO prism powers until a cross is formed.
<2>	Exophoria	Turn the dial counterclockwise to add the BI prism powers until a cross is formed.
<3>	Left eye hyperphoria	Press $\boxed{\updownarrow\mid\theta}$. Turn the dial clockwise until a cross is formed. (Add BU to the right eye and BD to the left eye.)
<4>	Right eye hyperphoria	Press $\boxed{\updownarrow\mid\theta}$. Turn the dial counterclockwise until a cross is formed. (Add BD to the right eye and BU to the left eye.)
<5>	Esophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <4>.
<6>	Esophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <3>.
<7>	Exophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <4>.
<8>	Exophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <3>.

✐Note
- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
  ex.When [⇄/△] is pressed in the base in/out prism, the rotary prism lenses are removed.
- Use ⊕ or ⊖ instead of the dial for fine adjustment.
- When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

Dial	$1.0\Delta \rightarrow 0.5\Delta$
⊕, ⊖	$0.2\Delta \rightarrow 0.1\Delta$

4

4.4.4   Phoria with fixation test

Use: To detect heterophoria by giving stimuli for fusion

Chart: Phoria with fixation

Applicable model: CP series T, U, ISO, and M / SSC-330 (300) U / SSC-350 T and TCG / SC series T, M, and UK

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism

(SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye, binocular rotary prism)

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)

Right eye	Left eye	Binocular vision (Orthophoria)

Right eye	Left eye	Binocular vision (Orthophoria)

[Procedure example]

1 Present the phoria with fixation chart.

Press ⊞ or ⊞ .

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base in/out prism powers can be entered.

When ⊞ or ⊞ is pressed again, the base up/down prism powers can be entered.

2 Ask the patient, "Can you see the four bars?"

Yes → Go to the next step.
No → The test cannot be continued.

3 Ask the patient, "Do the vertical and horizontal bars form a cross?"

Yes → Orthophoria
No → Heterophoria – Go to the next step.

4 Ask the patient, "Do the vertical bars line up?"

Yes → No exophoria nor esophoria
No → Exophoria or esophoria

5 Ask the patient, "Is the top bar shifted to the left or right?"

       Right → Esophoria

       Left → Exophoria

6 Ask the patient, "Do the horizontal bars line up?"

       Yes → No hyperphoria nor hypophoria

       No → Hyperphoria or hypophoria

When a cross is not formed, correct it as follows:

Appearance of chart	Phoria	How to correct phoria
<1>	Esophoria	Turn the dial clockwise to add the BO prism powers until a cross is formed.
<2>	Exophoria	Turn the dial counterclockwise to add the BI prism powers until a cross is formed.
<3>	Left eye hyperphoria	Press $\boxed{\updownarrow|\theta}$. Turn the dial clockwise until a cross is formed. (Add BU to the right eye and BD to the left eye.)
<4>	Right eye hyperphoria	Press $\boxed{\updownarrow|\theta}$. Turn the dial counterclockwise until a cross is formed. (Add BD to the right eye and BU to the left eye.)
<5>	Esophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <4>.
<6>	Esophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <1> and the vertical phoria in the same manner as for <3>.
<7>	Exophoria + Right eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <4>.
<8>	Exophoria + Left eye hyperphoria	Correct the horizontal phoria in the same manner as for <2> and the vertical phoria in the same manner as for <3>.

Note
- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
  ex. When $\boxed{\leftrightarrow/\triangle}$ is pressed in the base in/out prism, the rotary prism lenses are removed.
- Use ⊕ or ⊖ instead of the dial for fine adjustment.
- When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.
  Dial   1.0Δ → 0.5Δ
  ⊕, ⊖   0.2Δ → 0.1Δ

4.4.5　Mallet test (horizontal phoria)

Use: To detect heterophoria by giving stimuli for fusion
Chart: Mallet (vertical bars)
Applicable model: CP-770PhM, SC series PhM
Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism
(SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye, binocular rotary prism)
Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)

[Procedure example]

1 Present the Mallet chart (vertical bars).

Press ⊙.

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base in/out prism powers can be entered.

2 Patient focuses on the center X.

3 Ask the patient, "Can you see the two vertical bars?"

Yes → Go to the next step.
No → The test cannot be continued.

4 Ask the patient, "Do the vertical bars line up?"

Yes → Orthophoria (No exophoria nor esophoria)
No → Exophoria or esophoria – Go to the next step.

5 Ask the patient, "Is the top bar shifted to the left or right?"

Right → Esophoria → Turn the dial clockwise to add the BO prism power until the two bars line up.

Left → Exophoria → Turn the dial counterclockwise to add the BI prism powers until the two bars line up.

📝 Note
- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
  ex.When ⇄ is pressed in the base in/out prism, the rotary prism lenses are removed.
- Use ⊕ or ⊖ instead of the dial for fine adjustment.
- When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

  Dial　　　　　1.0Δ → 0.5Δ
  ⊕, ⊖　　　　0.2Δ → 0.1Δ

4.4.6 Mallet test (vertical phoria)

Use: To detect heterophoria by giving stimuli for fusion

Chart: Mallet (horizontal bars)

Applicable model: CP-770PhM, SC series PhM

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism

(SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye, binocular rotary prism)

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)	
			(Orthophoria)

[Procedure example]

1 Present the Mallet chart (horizontal bars).

Press .

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base up/down prism powers can be entered.

2 Patient focuses on the center X.

3 Ask the patient, "Can you see the two horizontal bars?"

Yes → Go to the next step.
No → The test cannot be continued.

4 Ask the patient, "Do the horizontal bars line up?"

Yes → Orthophoria (No hyperphoria nor hypophoria)
No → Hyperphoria or hypophoria– Go to the next step.

5 Ask the patient, "Is the right bar shifted to the up or down?"

Up → Left eye hyperphoria: Turn the dial clockwise until the two bars line up.

(Add BU to the right eye and BD to the Left eye.)

Down → Right eye hyperphoria: Turn the dial counterclockwise until the two bars line up.
(Add BD to the right eye and BU to the Left eye.)

> 🖉 Note
>
> • The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
>
>   ex.When is pressed in the base in/out prism, the rotary prism lenses are removed.
>
> • Use or instead of the dial for fine adjustment.
>
> • When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.
>
>   Dial   1.0Δ → 0.5Δ
>   ⊕, ⊖   0.2Δ → 0.1Δ

4.4.7 Von Graefe test (horizontal phoria)

Use: To detect horizontal phoria

Chart: Vertical line

Applicable model: CP series U and M / SSC-330 (300) U / SSC-350 M / SC series M [For the other types, use the highest VA letter chart or the letter chart which is little higher than the patient's VA.]

Auxiliary lens: 6△BU to the right eye, rotary prism to the left eye

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)
L P N E H (lower)	L P N E H	L P N E H / L P N E H

Right eye	Left eye	Binocular vision (Orthophoria)
V R C N O (lower)	V R C N O	V R C N O / V R C N O

[Procedure example]

1 Present the vertical line chart.

Press ⊞ or ⊞ . For the near point, press ⊞ and set the chart manually.

6△BU is placed in the right measuring window.

The base in/out prism powers can be entered.

2 Press 🌓 to occlude the left measuring window.

3 Press 🌓 to open the left measuring window.

4 Ask the patient, "Can you see two circles with a column of letters in each of them? Do the letters line-up, like buttons on a shirt?"

When they are not in line, correct them so that they appear in line at the instant the occluder is removed. (Use the Flashing Technique as shown in Steps 2 and 3.)

> 📝 Note • The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
> ex. When ⇄ is pressed in the base in/out prism, the rotary prism lenses are removed.

Appearance of chart	Phoria	Correction
<1> The upper column is on the left.	Esophoria	Turn the dial clockwise to add the BO prism powers until the two columns line up.
<2> The upper column is on the right.	Exophoria	Turn the dial counterclockwise to add the BI prism powers until the two columns line up.

Use (+) or (−) instead of the dial for fine adjustment.

4

4.4.8   Von Graefe test (vertical phoria)

Use: To detect vertical phoria

Chart: Horizontal line

Applicable model: CP series U and M / SSC-330 (300) U / SSC series M / SC series M [For the other types, use the highest VA letter chart or the letter chart which is little higher than the patient's VA.]

Auxiliary lens: Rotary prism to the right eye, 10ΔBI to the left eye

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)
FADTN	FADTN	FADTN FADTN

Right eye	Left eye	Binocular vision (Orthophoria)
ZSOKN	ZSOKN	ZSOKN ZSOKN

[Procedure example]

1 Present the horizontal line chart.

Press FADTN or ZSOKN . For the near point, press and set the chart manually.

10ΔBI prism lens is placed in the left measuring window.

The base up/down prism powers can be entered.

2 Ask the patient, "Can you see two circles with a row of letters in each of them? Do the letters line-up, like headlights on a car?"

When they are not in line, correct them as follows:

Note
• The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
  ex. When ⬍|θ is pressed in the base up/down prism, the rotary prism lenses are removed.

Appearance of chart	Phoria	Correction
<1> The left row is higher. (F A D T N) (F A D T N) ZSOKN ZSOKN	Right eye hyperphoria	Turn the dial counterclockwise until the two rows line up.
<2> The right row is higher. (F A D T N) (F A D T N) ZSOKN ZSOKN	Left eye hyperphoria	Turn the dial clockwise until the two rows line up.

Use (+) or (−) instead of the dial for fine adjustment.

4

4.4.9　Maddox test (horizontal phoria)

Use: To detect horizontal phoria

Chart: Fixation

Auxiliary lens: Horizontal maddox rod to the right eye, rotary prism to the left eye

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)
	○	

1 Present the fixation chart.

Press ▪ .

The horizontal maddox rod is placed in the right measuring window.

The base in/out prism powers can be entered.

2 Ask the patient, "Is the white spot shifted to the left or right? Or, it is overlaid on the red bar?"

When the spot is shifted to the left or right, correct it as follows:

Appearance of chart	Phoria	Correction
<1> The white spot is at the left of the red bar.	Esophoria	Press (L). Turn the dial clockwise to add the BO prism power until the spot is overlaid on the bar.
<2> The white spot is at the right of the red bar.	Exophoria	Press (L). Turn the dial counterclockwise to add the BI prism power until the spot is overlaid on the bar.

🖉 Note
- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.

  ex.When ⇄ is pressed in the base in/out prism, the rotary prism lenses are removed.

- Use (+) or (−) instead of the dial for fine adjustment.

- When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

  Dial　　　　1.0Δ → 0.5Δ

  (+), (−)　　0.2Δ → 0.1Δ

4.4.10 Maddox test (vertical phoria)

Use: To detect vertical phoria

Chart: Fixation

Auxiliary lens: Rotary prism to the right eye, vertical maddox rod to the left eye

Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)
○	▬	▬○▬

1 Present the fixation chart.

Press ▫ .

The horizontal maddox rod is set in the right measuring window.

The base in/out prism powers can be entered.

2 Press ▫ again.

The maddox rod is removed from the right measuring window and the vertical maddox rod is placed in the left measuring window.

The base up/down prism powers can be entered.

3 Ask the patient, "Is the white spot above or below the red bar? Or, it is overlaid on the red bar?"

When the spot is shifted upward or downward, correct it as follows:

Appearance of chart	Phoria	Correction
<1> The white spot is above the red bar. ○ ▬	Left eye hyperphoria	Press (R). Turn the dial clockwise to add the BU prism power until the white spot is overlaid on the red bar.
<2> The white spot is below the red bar. ▬ ○	Right eye hyperphoria	Press (R). Turn the dial counterclockwise to add the BD prism power until the white spot is overlaid on the red bar.

<table>
<tr><td rowspan="4">✐ Note</td><td>• The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.</td></tr>
<tr><td>ex.When ⬍|θ is pressed in the base up/down prism, the rotary prism lenses are removed.</td></tr>
<tr><td>• Use ⊕ or ⊖ instead of the dial for fine adjustment.</td></tr>
<tr><td>• When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

Dial   1.0Δ → 0.5Δ
⊕, ⊖   0.2Δ → 0.1Δ</td></tr>
</table>

4.4.11 Vertical coincidence test

Use: To detect aniseikonia and to correct vertical phoria

Chart: Vertical coincidence

Applicable model: CP series T, U, P, F, ISO, and M / SSC-330 (300) T and U / SC series G, G+, T, M, and P

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism

   (SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye)

Ideal appearance:

Right eye	Left eye	Binocular vision (No vertical coincidence, Orthophoria)

○ Aniseikoia detection

1 Present the vertical coincidence chart.

Press 🔳 .
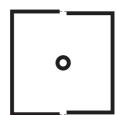
The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

2 Ask the patient, "Can you see a square with a dot in the center? Are the left and right frames the same size? Or, is one smaller than the other?"

Ex.)

3.5% aniseikonia

The width of a line corresponds to 3.5% aniseikonia.

The "Sides equal?" message appears. The test result (Yes or No) can be selected with a corresponding function button and print it with the other data.

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

○ Vertical phoria correction

1 Present the vertical coincidence chart.

Press ▣ .

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base up/down prism powers can be entered.

2 Ask the patient, "Can you see a square with a dot in the center? Are the left and right frames aligned? Or, is one higher than the other?"
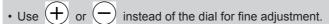
When they are not aligned, correct them as follows:

Appearance of chart	Phoria	Correction
<1> The left frame is higher.	Right eye hyperphoria	Press (BIN) . Turn the dial counterclockwise until the left and right frames are aligned. (Add BD to the right eye and BU to the left eye.)
<2> The right frame is higher.	Left eye hyperphoria	Press (BIN) . Turn the dial clockwise until the left and right frames are aligned. (Add BU to the right eye and BD to the left eye.)

📝 Note

• The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.

ex.When ⬍|θ is pressed in the base up/down prism, the rotary prism lenses are removed.

• Use ⊕ or ⊖ instead of the dial for fine adjustment.

• When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

Dial $1.0\Delta \rightarrow 0.5\Delta$

⊕, ⊖ $0.2\Delta \rightarrow 0.1\Delta$

4.4.12 Horizontal coincidence test

Use: To detect aniseikonia and to correct horizontal phoria

Chart: Horizontal coincidence

Applicable model: CP series P and F/SC series P/SC-1600Pola G+

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters, binocular rotary prism

(SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye)

Ideal appearance:

Right eye	Left eye	Binocular vision (No vertical coincidence, Orthophoria)

○ Aniseikoia detection

1 Present the horizontal coincidence chart.

Press ▣.

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base in/out prism powers can be entered.

2 Ask the patient, "Can you see a square with a dot in the center? Are the top and bottom frames the same size? Or, is one smaller than the other?"

Ex.)

3.5% aniseikonia

The width of a line corresponds to 3.5% aniseikonia

The "Top and bottom equal?" message appears. Test result (Yes or No) can be selected with a corresponding function button and print it with the other data.

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

○ Horizontal phoria correction

1 Present the horizontal coincidence chart.

Press 🔲 .

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

The base in/out prism powers can be entered.

2 Ask the patient, "Can you see a square with a dot in the center? Are the top and bottom frames aligned? Or, is one to the left or right of the other?"

When they are not aligned, correct them as follows:

Appearance of chart	Phoria	Correction
<1> The top frame is shifted to the left.	Exophoria	Press (BIN) . Turn the dial counterclockwise until the top and bottom frames are aligned.
<2> The top frame is shifted to the right.	Esophoria	Press (BIN) . Turn the dial clockwise until the top and bottom frames are aligned.

✎ Note
- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.

  ex. When ⇆ is pressed in the base in/out prism, the rotary prism lenses are removed.

- Use ⊕ or ⊖ instead of the dial for fine adjustment.

- When the prism power is added, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

  Dial $\qquad$ 1.0Δ → 0.5Δ

  ⊕, ⊖ $\qquad$ 0.2Δ → 0.1Δ

4.4.13 Schober test

Use: To correct heterophoria
Chart: Schober
Applicable model: CP series T, P, and F, and ISO / SSC-330 (300) T / SC series G, G+, T and P
Auxiliary lens: Red filter on the right eye, green filter on the left eye, binocular rotary prism
Ideal appearance:

Right eye	Left eye	Binocular vision (Orthophoria)

Right eye	Left eye	Binocular vision (Orthophoria)

[Procedure example]

1 Present the Schober chart.

Press ⊕ or ⊕ .

The red filter is placed in the right measuring window and the green filter is placed in the left measuring window.

The base in/out prism powers can be entered.

When ⊕ or ⊕ is pressed again, the base up/down prism powers can be entered.

2 Ask the patient, "Can you see a green circle and red cross?"

Yes → Go to the next step.

No → The test cannot be continued.

3 Ask the patient, "Is the cross in the center of the circle?"

Yes → Orthophoria

No → Heterophoria – Go to the next step.

4 Ask the patient, "Is the cross shifted to the left or right?"

Right → Esophoria

Left → Exophoria

The cross is in the center. → No horizontal phoria

4

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5 Ask the patient, "Is the cross shifted upward or downward?"

Upward → Left eye hyperphoria

Downward → Right eye hyperphoria

The cross is in the center. → No vertical phoria

When the cross is shifted from the center, correct it as follows:

Appearance of chart	Phoria	Correction
<1> The cross is shifted to the right.	Esophoria	Turn the dial clockwise to add the BO prism powers until the cross comes to the center of the circle.
<2> The cross is shifted to the left.	Exophoria	Turn the dial counterclockwise to add the BI prism powers until the cross comes to the center of the circle.
<3> The cross is shifted upward.	Left eye hyperphoria	Press [↕|θ] . Turn the dial clockwise until the cross comes to the center of the circle. (Add BU to the right eye and BD to the left eye.)
<4> The cross is shifted downward.	Right eye hyperphoria	Press [↕|θ] . Turn the dial counterclockwise until the cross comes to the center of the circle. (Add BD to the right eye and BU to the left eye.)

📝 Note

- The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.

  ex.When [↔/△] is pressed in the base in/out prism, the rotary prism lenses are removed.

- Use (+) or (−) instead of the dial for fine adjustment.

- When adding the prism power, the prism power can be added in 0.5 D increments by adding the prism power for single-eye compared to both eyes.

  Dial   1.0Δ → 0.5Δ

  (+), (−)   0.2Δ → 0.1Δ

4.4.14　Stereo test
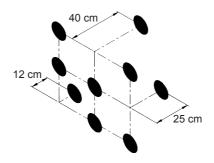
○**For SSC-350T and TCG**

Use: To detect stereoscopic vision
Chart: Stereo
Auxiliary lens: None
Ideal appearance:

1 Present the stereo chart.
Press [⠿].

2 Confirm that the patient can see the nine black dots arrayed in three lines with one dot from each line at a different depth.

Top line: Center dot .... Approximately 40 cm away

Center line: Right dot............ Approximately 25 cm away

Bottom line: Left dot.............. Approximately 12 cm away

The stereoparallax of each line is 3′, 2′, and 1′ from the top to bottom.

4

○ Stereo test (triangle test)

Use: To detect exophoria or esophoria

Chart: Stereo triangle

Applicable model: SC Pola series G+

Auxiliary lens: Right eye 135º, left eye 45º, polarizing filters

Ideal appearance:

Right eye	Left eye	Binocular ideal	
▼ ● ▲	▼ ● ▲	▼ ● ▲	The upper and lower triangles appear closer than the central circle.

1 Present the stereo test (triangle test) chart.

Press ⧗ .

The polarizing filters are set in the measuring windows (right eye 135º, left eye 45º).

2 Confirm that the upper and lower triangles appear to the patient to be closer.

The stereoparallax is 10' 30" (when the refraction distance is 5 m and the PD value is 60 mm, the upper and lower triangles appear to be approximately 101 cm closer to the patient).

The test result OK or NG can be entered by the function button.

3 Press ⧗ again.

The direction of the polarizing filters changes (right eye 45º, left eye 135º).

4 Confirm that the upper and lower triangles appear to the patient to be farther away.

They appear to be approximately 171 cm away from the patient (when PD is 60 mm).

5 Repeat Steps 1 to 4 to alternate the triangle appearance.

Only pop-out is slow. → Exophoria tendency

Only recession is slow. → Esophoria tendency

Both pop-out and recession are slow. → Vertical phoria tendency

○ **Precise four-line stereo test**

Use: To detect stereoscopic vision

Chart: Stereo four lines

Applicable model: SC Pola series G+

Auxiliary lens: Right eye 135º, left eye 45º, polarizing filters

Ideal appearance:

Right eye	Left eye	Binocular ideal	
+ + + + + □ □ □ □ □ ▽ ▽ ▽ ▽ ▽ ❘ ❘ ❘ ❘ ❘	+ + + + + □ □ □ □ □ ▽ ▽ ▽ ▽ ▽ ❘ ❘ ❘ ❘ ❘	+ + + + + □ □ □ □ □ ▽ ▽ ▽ ▽ ▽ ❘ ❘ ❘ ❘ ❘	The plus mark second from the left, square fourth from the left, triangle third from the left, and bar fourth from the left appear closer than the other shapes.

1 Present the stereo four lines chart.

Press ⌗ .

The polarizing filters are set in the measuring windows.

2 Confirm that one of the shapes in each row appears to the patient to be closer.

The stereo parallaxes are 4', 2', 1', 40" from the top.

The test result 40", 1', 2', 4', or NG can be entered by the function button.

4

○ Stereo balance test

Use: To test prevalency of the eye

Chart: Stereo balance

Applicable model: SC Pola series G+

Auxiliary lens: Right eye 135º, left eye 45º, polarizing filters

Ideal appearance:

Right eye	Left eye	Binocular ideal	
			The upper and lower triangles appear closer than the central circle.

1 Present the stereo balance chart.

Press .

The polarizing filters are set in the measuring windows (right eye 135º, left eye 45º).

2 Confirm that the upper and lower triangles appear to the patient to be closer.

The stereoparallax is 13' 45" (when the refraction distance is 5 m and the PD value is 60 mm, the upper and lower triangles appear to be approximately 125 cm closer to the patient).

3 Press again.

The direction of the polarizing filters reverses (right eye 45º, left eye 135º).

4 Confirm that the upper and lower triangles appear to the patient to be farther away.

They appear to be approximately 250 cm away from the patient (when PD is 60 mm).

5 Check the displacement between the upper and lower triangles and the central circle.

Displacement of pop-out > Displacement of recession → Exophoria tendency

Displacement of pop-out < Displacement of recession → Esophoria tendency

Displacement of pop-out = Displacement of recession → Vertical phoria tendency

Note
- In reference to the middle one lateral removed observation of the merged triangles until the first (inside), second (thin) or rather third (outside) scale line means an prevalence of the corresponding eye of 20%, 60% or rather 100%.

○**For the other types**

Use: To detect stereoscopic vision

Chart: Stereo

Auxiliary lens: Right eye 135°, left eye 45°, polarizing filters
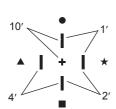
(SC-2000, SC-1600: Red filter on the right eye, green filter on the left eye)

Ideal appearance:

Right eye	Left eye	Binocular ideal
● ▲ + ★ ■	● ▲ + ★ ■	● ▲ + ★ ■ The vertical bars appear closer than shapes.

Right eye	Left eye	Binocular ideal
+ ▲ ● ★ ■	+ ▲ ● ★ ■	+ ▲ ● ★ ■ The vertical bars appear closer than shapes.

The bar with the triangle appears closest and then in the order of the square, star, and circle.

Stereoparallax between the plus mark and the bar with the circle: 10′

Stereoparallax between the bar with the circle and the one with the star: 1′

Stereoparallax between the bar with the star and the one with the square: 2′

Stereoparallax between the bar with the square and the one with the triangle: 4′

1 Present the stereo chart.

Press ▐▐▐.

The polarizing filters are placed in the measuring windows. (The red and green filters are placed for the SC-2000, SC-1600.)

2 Confirm that the patient can see four bars stereoscopically and can see them at a different depth.

The test result (1′, 2′, 4′, 10′, or NG) can be entered with the function buttons.

4.4.15 Worth test

Use: To detect fusion and suppression
Chart: Worth
Auxiliary lens: Red filter on the right eye and green filter on the left eye
Ideal appearance:

Right eye	Left eye	Binocular ideal
◆ ●	✚ ✚ ●	◆ — Red ✚ ✚ — Green ● — Pink or Red/Green
◆ and ● : Red	✚ and ● : Green	

1 Present the worth chart.

Press ⊡ .

The red filter is placed in the right measuring window and the green one is placed in the left measuring window.

2 Ask the patient, "How many figures can you see? What colors are they?"

Appearance of chart	Symptom	Correction
<1> Four spots ◆ ✚ ✚ ●	Fusion	◆ : Red, ✚ : Green, ● : Pink or Red/Green alternately However, when the patient has an obvious dominant eye, Right dominant eye → ● : Red Left dominant eye → ● : Green
<2> Three spots ✚ ✚ ●	Right eye suppression	The two green ✚ and ● are seen.
<3> Two spots ◆ ●	Left eye suppression	The red ◆ and ● are seen.
<4> Five spots at the same time ◆ ✚ ✚ ● ●	Diplopia	The red ◆ and green ✚ ✚ are seen at the same time. ● ●
<5> Five spots <2> and <3> blink alternately.	Alternate suppression	The red ◆ and green ✚ ✚ blink alternately. ● ●

Test result can be selected with a corresponding function button and print it with the other data.

4.4.16　Pointer test

Use: To measure cyclophoria
Chart: Pointer
Applicable model: SC Pola G+
Auxiliary lens: Right eye 135º, left eye 45º, polarizing filters

Ideal appearance:

Right eye	Left eye	Binocular ideal	
			(No fixation disparity)

1 Present the pointer chart.

Press 🔲.

The polarizing filters are set in the measuring windows.

2 Ask the patient, "Can you see the upper and lower hands and scales?"

Yes → Testing can be continued.

No → Testing cannot be continued.

3 Ask the patient, "Do the upper and lower hands point to the middle of the scale?"

Yes → No fixation disparity

No → Phoria. Continue testing.

4 Ask the patient, "Are the upper and lower hands at an angle?"

Yes → Functional cyclophoria or optical cyclophoria

No → Esophoria or Exophoria

Appearance of chart	Phoria	Correction
Hands at an angle	Functional cyclophoria or optical cyclophoria	Functional cyclophoria or optical cyclophoria is suspected but further examination cannot be performed in this testing.
Hands shifted to right	Esophoria	Turn the dial clockwise until the hands point to the middle of the scale to add the BO prism powers.
Hands shifted to left	Exophoria	Turn the dial counterclockwise until the hands point to the middle of the scale to add the BI prism powers.

4.4.17 Double pointer test

Use: To test fixation disparity
Chart: Double pointer
Applicable model: SC Pola series G+
Auxiliary lens: Right eye 135º, left eye 45º, polarizing filters

Ideal appearance:

Right eye	Left eye	Binocular ideal
		(No fixation disparity)

1 Present the double pointer chart.

Press ⊕ .

The polarizing filters are set in the measuring windows.

2 Ask the patient, "Can you see the upper, lower, left, and right hands and scales?"

Yes → Testing can be continued.

No → Testing cannot be continued.

3 Ask the patient, "Do the upper, lower, left, and right hands point to the middle of the scale?"

Yes → No fixation disparity

No → Phoria. Continue testing.

4 Ask the patient, "Are the upper, lower, left, and right hands at right angles?"

Yes → Horizontal/vertical phoria or functional cyclophoria. Continue testing.

No → Optical cyclophoria

5 Ask the patient, "Are the upper, lower, left, and right hands at angles?"

Yes → Functional cyclophoria or optical cyclophoria

No → Horizontal or vertical phoria

Appearance of chart	Phoria	Correction
Both hands angled uniformly	Functional cyclophoria	Dysfunction of extraocular muscle is suspected. Correction with glasses is not possible.
One hand angled	Optical cyclophoria	This may occur at the time of oblique astigmatism correction or due to optical cause. • Reduce the cylindrical power. • Bring the cylindrical axis close to the horizontal or vertical direction.
Hands shifted to upper right	Esophoria + Left eye hyperphoria	Horizontal phoria: Turn the dial clockwise until the vertical hands point to the middle of the scale to add the BO prism powers. Vertical phoria: Press [↕]. Turn the dial clockwise until the horizontal hands point to the middle of the scale.

4

4.5　Divergence Test

Use: To test divergence ability of the eye
Chart: Vertical line
Applicable model: CP series U and M / SSC-330 (300) U / SSC series M / SC series M [For other types, use the highest VA letter chart or the letter chart which is little higher than the patient's VA.]
Auxiliary lens: Binocular rotary prism

For Plus Package, see "5.2.4 #11 Divergence (Far), #17 Divergence (Near)" (page 214).

1　Present the vertical line chart.

Press ⊞ or ⊞. For the near point, press ⊞ and set the chart manually.

The 6△BU dissociation prism is placed in the right measuring window.

The base in/out prism powers can be entered.

2　Press [Phoria] to display the Divergence test window.
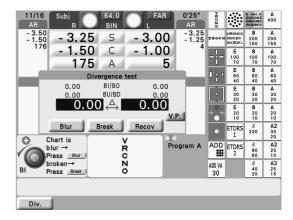
The 6△BU dissociation prism is removed from the right measuring window and both windows are opened.

[Div.], [Blur], [Break], and [Recov] appear.

Pressing V.P. sets the vertical prism corresponding to the vertical phoria. Press V.P. as necessary.

3　Turn the dial counterclockwise to add the BI prism powers to both eyes until the binocular view becomes blur.

Also possible by pressing ⊕.

4　Press [Blur] when the chart appears blur.

The prism powers are stored as blur point.

The [Blur] indication is highlighted. It means that the prism powers have been entered.

When highlight [Blur] is pressed again, the entered prism powers are cleared.

(In far mode, the chart seldom appears blur. At this time, go to the next step.)

5　Turn the dial counterclockwise to add the BI prism powers to both eyes until the chart appears dissociated.

Also possible by pressing ⊕.

6 Press [Break] when the chart appears dissociated.

The prism powers are stored as break point.

The [Break] indication is highlighted. It means that the prism powers have been entered.

When highlight [Break] is pressed again, the entered prism powers are cleared.

7 Turn the dial clockwise to reduce the BI prism powers from both eyes until the chart appears one again.

Also possible by pressing $\ominus$.

8 Press [Recov] when the chart appears one.

The prism powers are stored as recovery point.

When this test is performed after the Von Graefe test, the prism powers for correcting horizontal or vertical phoria are cleared by pressing [Phoria]. Then the negative relative convergence test starts.

4

4.6   Convergence Test

Use: To test convergence ability of the eye

Chart: Vertical line

Applicable model: CP series U and M / SSC-330 (300) U / SSC series M / SC series M [For other types, use the highest VA letter chart or the letter chart which is little higher than the patient's VA.]

Auxiliary lens: Binocular rotary prism

For the Plus Package, see "5.2.5 #9,10 Convergence (Far), #16 Convergence (Near)" (page 216).

1 Present the vertical line chart.

Press ▯ or ▯ . For the near point, press ▯ and set the chart manually.

The 6△BU dissociation prism is placed in the right measuring window.

The base in/out prism powers can be entered.

2 Press [Phoria] twice to display the Convergence test.
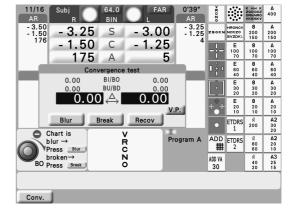
The 6△BU dissociation prism is removed from the right measuring window and both windows are opened.

[Conv], [Blur], [Break], and [Recov] appear.

Pressing **V.P.** sets the vertical prism corresponding to the vertical phoria. Press **V.P.** as necessary.

3 Turn the dial clockwise to add the BO prism powers to both eyes until the binocular view becomes blur.

Also possible by pressing ⊖ .

4 Press [Blur] when the chart appears blur.

The prism powers are stored as blur point.

The [Blur] indication is highlighted. It means that the prism powers have been entered.

When highlighted [Blur] is pressed again, the entered prism powers are cleared.

(In far mode, the chart seldom appears blur. At this time, go to the next step.)

5 Turn the dial clockwise to add the BO prism powers to both eyes until the chart appears dissociated.

Also possible by pressing ⊖ .

6 Press [Break] when the chart appears dissociated.

> The prism powers are stored as break point.
>
> The [Break] indication is highlighted. It means that the prism powers have been entered.
>
> When highlighted [Blur] is pressed again, the entered prism powers are cleared.

7 Turn the dial counterclockwise to reduce the BO prism powers from both eyes until the chart appears one again.

> Also possible by pressing $\oplus$.

8 Press [Recov] when the chart appears one.

> The prism powers are stored as recovery point.

4

4.7   Supravergence Test for Final Prescription (only for Plus Package)

Use: Supravergence test for final prescription
Chart: Horizontal line
Auxiliary lens: Binocular rotary prism

1 Press [Final].

To perform this test, final prescription must be entered beforehand.

To perform this test with a subjective value (#7 value), see "5.2.16 #12B Supravergence (Far), #18B Supravergence (Near)" (page 230).

2 Press `FADTN` or `ZS0KN` to present the horizontal line chart. For the near point chart, press `N 6S642` and set the near point horizontal chart manually.

The 10ΔBI dissociation prism is placed in the left measuring window.

The base up/down prism powers can be entered.

3 Press [Phoria] to display the Supravergence test.

[Phoria] is displayed only when in FINAL mode.

For the initial state, horizontal prism corresponding to the horizontal phoria is set. If it is not necessary, press `H.P.` to clear the data.

4 Turn the dial counterclockwise to add the BD prism powers to the single eye until the chart appears dissociated.

Also possible by pressing ⊕ .

5 Press [Break] when the chart appears dissociated.

The prism powers are stored as break point.

The [Break] indication is highlighted. It means that the prism powers have been entered.

When highlight [Break] is pressed again, the entered prism powers are cleared.

6 Turn the dial counterclockwise to reduce the BD prism powers from the single eye until the chart appears one again.

Also possible by pressing ⊖ .

7 Press [Recov] when the chart appears one.

The prism powers are stored as recover point.

The [Recov] indication is highlighted. It means that the prism powers have been entered.

4.8 Infravergence Test for Final Prescription (only for Plus Package)

Use: Infravergence test for final prescription

Chart: Horizontal line

Auxiliary lens: Binocular rotary prism

1 Press [Final].

> To perform this test, the final prescription must be entered beforehand.

> To perform this test with a subjective value (#7 value), see "5.2.17 #12B Infravergence (Far), #18B Infravergence (Near)" (page 232).

2 Press [FADTN] or [ZSOKN] to present the horizontal line chart. For the near point chart, press [N 86642] and set the near point horizontal chart manually.

> The 10ΔBI dissociation prism is placed in the left measuring window.

> The base up/down prism powers can be entered.

3 Press [Phoria] to display the Supravergence test.
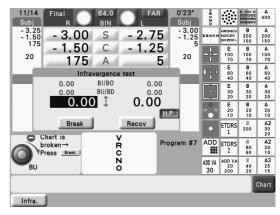
> [Phoria] is displayed only when in FINAL mode.

4 When [Phoria] indication is changed to [Supravergence test], press [Supravergenece] to display the Infravergence test.

> For the initial state, horizontal prism corresponding to the horizontal phoria is set. If it is not necessary, press [H.P.] to clear the data.

5 Turn the dial clockwise to add the BU prism powers to the single eye until the chart appears dissociated.

> Also possible by pressing ⊖ .

6 Press [Break] when the chart appears dissociated.

> The prism powers are stored as break point.

> The [Break] indication is highlighted. It means that the prism powers have been entered.

> When highlight [Break] is pressed again, the entered prism powers are cleared.

7 Turn the dial counterclockwise to reduce the BU prism powers from the single eye until the chart appears one again.

> Also possible by pressing ⊕ .

8 Press [Recov] when the chart appears one.

> The prism powers are stored as recover point.

> The [Recov] indication is highlighted. It means that the prism powers have been entered.

4.9　Near Point of Convergence (NPC) Test

This test does not require the refractor. Let the patient wear his/her glasses when he/she wears them usually.

> Use: To measure the break point
>
> Chart: No chart is used in this test. Use a fixation point such as the tip of a pencil or pen that helps to determine whether the patient has diplopia.

For the Plus Package, see "5.2.14 Near point of convergence (NPC)" (page 227).

1 Press (ADD) while pressing (Shift).
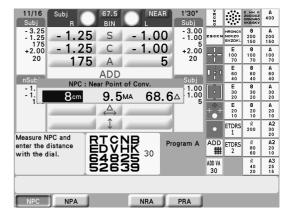
> [NPC], [NPA], [NRA], and [PRA] appear.
>
> The near point of convergence test starts.
>
> When far mode is selected, it switches to near mode.

2 Gradually bring a fixation such as a tip of a pen closer to the patient's eyes and measure the distance from the pen tip to the root of the nose (posterior surface of the lens) at the point where the image appears dissociated (split in two).

3 Enter the distance with the dial.

> Also possible by pressing (+) or (−).
>
> The distance from 1 to 100 cm can be entered in 1 cm increments.
>
> The meter angle (MA) and prism power are calculated and displayed automatically.
>
> For example: Enter 7 cm as the distance when PD = 6.4 cm.
>
> 1) When the "NPC calculation" parameter is set to "Detail":
>
> $MA = 1/(0.07 + 0.025) = 10.5$
>
> $\Delta = MA \times 6.4 = 67.4$
>
> NPC = 7 cm: 10.5 MA, 67.4Δ
>
> 2) When the "NPC calculation" parameter is set to "Simple":
>
> $MA = 1/0.07 = 14.3$
>
> $\Delta = MA \times 6.4 = 91.4$
>
> NPC = 7 cm: 14.3 MA, 91.4Δ

4 Press any mode switch such as (S), (C), or (A) to finish the test.

> The near mode remains selected.

4.10   Near Point of Accommodation (NPA) Test

Use: To measure the near point of accommodation

Chart: The highest VA letter chart that the patient can read correctly at the position of 40 cm away from the near point chart

Confirm that the "SPH Far → Near" parameter is set to SPH + ADD.

For the Plus Package, see "5.2.13 #19 Near point of accommodation (NPA)" (page 225).

1 Press [ADD] while pressing [Shift].

[NPC], [NPA], [NRA], and [PRA] appear.

When the NPC test has been completed just before, skip this step.
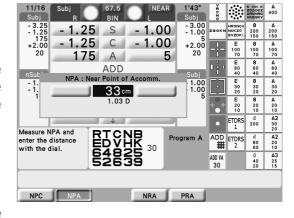
2 Press [NPA].

Both measuring windows are opened.[28]

3 Gradually bring the chart closer to the patient's eye and measure the distance from the chart to the root of the nose at the point where the chart appears blur.

4 Enter the distance with the dial.

Also possible by pressing (+) or (−).

The distance from 1 to 100 cm can be entered in 1 cm increments.

The accommodation is calculated automatically and the result is printed with the other data.

For example: Enter 33 cm as the distance when ADD = +2.0 D (addition powers are entered in far mode)

Accommodation power = 1/0.33 − (+2.0) = 1.03 D

NPA = 33 cm: 1.03 D

---

[28].   Occluding either measuring window with (L) or (R) measures the near point of accommodation for either eye.

4.11 Negative Relative Accommodation (NRA) Test

Use: To measure the negative relative accommodation when both eyes are converged at a specified working distance

Chart: Near letter chart with a horizontal line isolation at 40 cm away from the patient's eye (near point chart 7)

Confirm that the "SPH Far → Near" parameter is set to SPH + ADD.

For the Plus Package, see "5.2.6 #21 Negative relative accommodation (NRA)" (page 218).

1 Press ⌊ADD⌋ while pressing ⌊Shift⌋ .

[NPC], [NPA], [NRA], and [PRA] appear.

When the NPA test has been completed just before, skip this step.

2 Press [NRA].

Both measuring windows are opened.[29]

The NRA window is displayed.

3 Gradually turn the dial counterclockwise and press [Blur] when the chart appears blur.

The [Blur] indication is highlighted. It means that the value has been stored.

4 Gradually turn the dial clockwise and press [Recov] when the chart appears clearly again.

The [Recov] indication is highlighted. It means that the value has been stored.

Pressing [Blur] or [Recov] again clears the stored data.

---

*29. Occluding either measuring window with ⓛ or ⓡ measures the near point of accommodation for either eye.

4.12 Positive Relative Accommodation (PRA) Test

Use: To measure the positive relative accommodation when both eyes are converged at a specified working distance

Chart: Near letter chart with a horizontal line isolation at 40 cm away from the patient's eye (near point chart 7)

Confirm that the "SPH Far → Near" parameter is set to SPH + ADD.

For the Plus Package, see "5.2.7 #20 Positive relative accommodation (PRA)" (page 219).

1 Press (Shift) while holding (ADD) down.

[NPC], [NPA], [NRA], and [PRA] appear.

When the NRA test has been completed just before, skip this step.
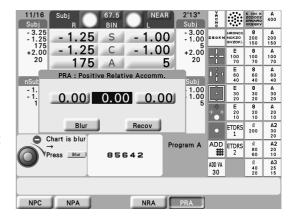
2 Press [PRA].

Both measuring windows are opened.[30]

The PRA window is displayed.

3 Gradually turn the dial clockwise and press [Blur] when the chart appears blur.

The [Blur] indication is highlighted. It means that the value has been stored.

4 Gradually turn the dial counterclockwise and press [Recov] when the chart appears clearly again.

The [Recov] indication is highlighted. It means that the value has been stored.

Pressing [Blur] or [Recov] again clears the stored data.

---

*30. Occluding either measuring window with Ⓛ or Ⓡ measures the near point of accommodation for either eye.

4.13 Visual Acuity Test by ETDRS chart

When the M chart (SSC-350, SSC-350CG, SC-1700Pola, SC-2000, SC-1600, CP-770, or CP-690) is connected, there is a special mode to test the visual acuity using the ETDRS chart.

ETDRS (Early Treatment Diabetic Retinopathy Study), invented by ETDRS Research Group (that U.S.A acts as leader) is the chart for studying each eye treatment.
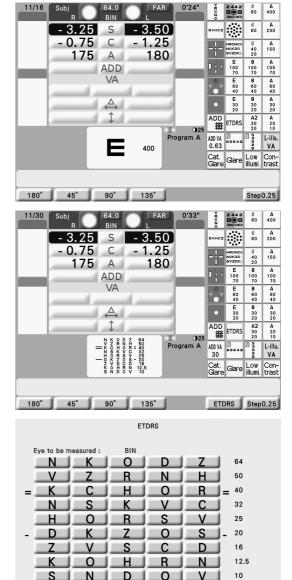
1 Make the low illumination, glare lamp, or contrast function available as needed.

> See "2.6.3 Low illumination, glare lamp, and contrast functions (SSC series)" (page 43).

2 Press [ETDRS] to present the ETDRS chart.

3 Press [ETDRS] function button.

> The ETDRS VA test screen is displayed.
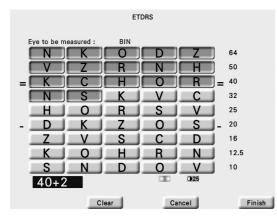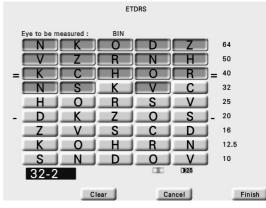
4 Ask the patient to read the chart down from the upper-left letter. Press the keys of the letters that could be correctly identified.

The result is displayed in the lower-left corner of the screen.

The visual acuity is determined by how many letters could be correctly identified. The result indicates the number of letters read by the line (VA) with plus or minus signs.

When the number of letters correctly read on a VA line is three or more, the number of incorrect answers is indicated by a minus sign. When the number of letters correctly read is less than three, the number of correct answers is indicated by a plus sign.

| The number of correct answers in the VA 32 line is two. The result is displayed as 40+2. | The number of incorrect answers in the VA 32 line is two (three correct answers). The result is displayed as 32-2. |

5 Press [Finish] to end the test.
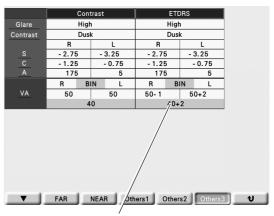
The measured VA, each function settings, SPH, CYL, and AXIS for the test are stored.

[Clear] $\Rightarrow$ Clears the measurement results.

[Cancel] $\Rightarrow$ Clears the measurement results and returns to the normal measurement screen.

The results in this mode can be checked on the Others2 screen in the data list.

1) Press [Menu] to call up the main menu screen.

2) Press [Data List].

3) Press [Others3].

When the low illumination function is selected, "Dusk" is displayed in the ETDRS field.

TEST METHOD: Visual Acuity Test by ETDRS chart

5. 21 Point Exams (only for Plus Package)

5.1 Switching for 21 Point Exams list (only for Plus Package)

1 For the chart list display, press the Chart / 21 Ex. switching button.

The display switches to the 21 Point Exams display and the indication of the Chart / 21 Ex. switching button switches from Chart to 21 Ex.

Pressing the Chart / 21 Ex. switching button again returns to the Chart list display.
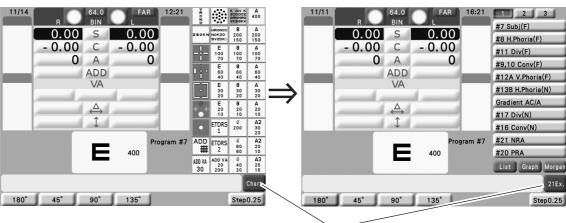
Chart / 21 Ex. switching button

2 Switch the 21 Point Exams page to be displayed with the [1] to [3] buttons in the upper right of the screen.

Display the page which indicates the desired exam.

#12A V.Phoria(F) is displayed both on pages 1 and 3.

3 Select the desired exam from the 21 Ex. buttons.

The mode changes to the selected exam.

Note • For the 21 Point Exams, night data (🙂) cannot be measured.

5.2　21 Point Exams (only for Plus Package)

The RT-5100 assigns the subjective (far) value to #7.
The initial value for the subjective (near) value is the subjective (far) value + ADD value.
The RT-5100 indicates the name of exam simply.
The indication and contents of exam on the RT-5100 are as follows:

Exam No.	Indication on the RT-5100	Contents of measurement
#7	Subj(F)	Perform subjective measurement and obtain the full corrective power.
#8	H.Phoria(F)	Far horizontal phoria measurement
#9,10	Conv(F)	Far convergence power measurement
#11	Div(F)	Far divergence power measurement
#12A	V.Phoria(F)	Far vertical phoria measurement
#12B	Supra(F)	Far supravergence power measurement
	Infra(F)	Far infravergence power measurement
#13B	H.Phoria(N)	Near horizontal phoria measurement
#14A	C.Cyl(Mon)	Monocular accommodative lag measurement using cross cylinder
#14B	C.Cyl(Bin)	Binocular accommodative lag measurement using cross cylinder
#15A	H.Phoria(#14A)	Near horizontal phoria measurement using monocular accommodative lag (#14A)
#15B	H.Phoria(#14B)	Near horizontal phoria measurement using binocular accommodative lag (#14B)
#16	Conv(N)	Near convergence power measurement
#17	Div(N)	Near divergence power measurement
#18A	V.Phoria(N)	Near vertical phoria measurement
#18B	Supra(N)	Near supravergence power measurement
	Infra(N)	Near infravergence power measurement
#19	(-)lens	Accommodation measurement with the addition of minus lens
	NPA	Measurement of near point of accommodation
#20	PRA	Positive relative accommodation measurement
#21	NRA	Negative relative accommodation measurement

📝 Note　• For #13B to #21 exams, set the working distance (WD) to 40 cm.
When the working distance is other than 40 cm, proper analysis cannot be obtained.

5.2.1　#7 Subjective value

Pressing [#7 Subj(F)] starts a program to achieve the best possible binocular visual acuity with the most plus power.

See "2.5.3 Program #7 (only for Plus Package)" (Page 66).
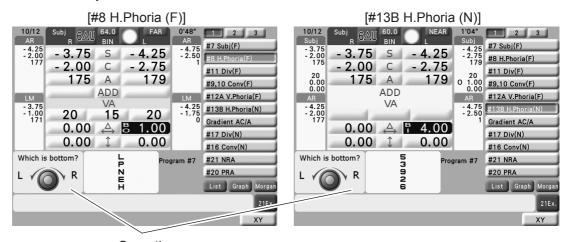
5.2.2　#8 Horizontal phoria (Far), #13B Horizontal phoria (Near)

Setting contents:

	#8 H.phoria (Far)	#13B H.phoria (Near)
Use chart	Far point vertical line chart For the model other than CP series, SSC series, SC series U and M, the chart is vertical line isolated VA chart.	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	6Δ BU/open (rotary prism)	6Δ BU/open (rotary prism)
Set power	Subj (F)	Subj (N)

[Procedure example]

1 Press [#8 H.Phoria(F)] or [#13B H.Phoria(N)] with the #7 Subjective value entered.

For [#13B H.Phoria(N)], set H (VA1.0) or G (VA0.63) of near point chart II in the 40 cm position manually.

[#8 H.Phoria (F)]　　　　　　　　　[#13B H.Phoria (N)]

Operation message

2 Press (L) to occlude the patient's left eye.

3 Press (L) to uncover the left eye.

4 Ask the patient, "Can you see the two vertical letters? Do the letters line-up, like buttons on a shirt?"

When they are not in line, correct them so that they appear in line at the instant the occluder is removed. (Use the Flashing Technique as shown in Steps 2 and 3.)

| Note | • The rotary prism lenses are removed from the measuring windows when the already selected button is pressed again in prism mode.
ex.When ⇆ is pressed in the base in/out prism, the rotary prism lenses are removed. |

Appearance of chart	Phoria	Correction
<1> The upper column is on the left. 5 3 9 2 6 5 3 9 2 6	Esophoria	Turn the dial clockwise to add the BO prism powers until the two columns line up.
<2> The upper column is on the right. 5 3 9 2 6 5 3 9 2 6	Exophoria	Turn the dial counterclockwise to add the BI prism powers until the two columns line up.

*Turning the dial changes the value in 0.5Δ increments for single eye.

*Use ⊕ or ⊖ instead of the dial for changing the prism value in 0.1Δ increments for single eye.

5.2.3　Gradient AC/A

Setting contents:

Use chart	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	6△ BU/open (rotary prism)
Set power	Subj (N) + Prism value of #13B H.Phoria (N) + (S+1.00)

[Procedure example]
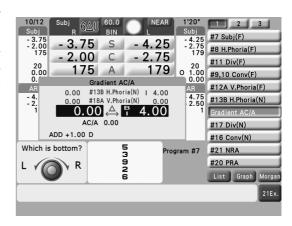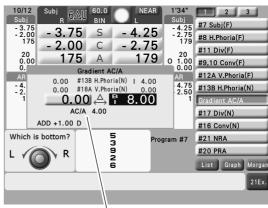
1 After measuring #13B H.Phoria(Near point), press [Gradient AC/A].

> The value becomes S+1.00D added power automatically and #13B H.Phoria (Near point) value is set to the rotary prism only for the first time.

2 Set the near point chart II H (VA1.0) or G (VA0.63) manually at the 40cm position.

3 Measure the Gradient AC/A with the same procedures as Steps 2 to 4 in "#13B H.Phoria(N)."

> Gradient AC/A is calculated according to the measured Horizontal Phoria value and displayed on the bottom center of the window.

Gradient AC/A

5.2.4   #11 Divergence (Far), #17 Divergence (Near)
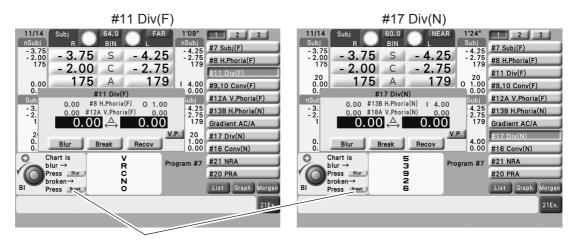
Setting contents:

	#11 Div(F)	#17 Div(N)
Use chart	Far point vertical line chart For the model other than CP series, SSC series, SC series U and M, the chart is vertical line masked VA chart.	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	Binocular open (rotary prism)	Binocular open (rotary prism)
Set power	Subj (F)	Subj (N)

[Procedure example]

1 Press [#11 Div(F)] or [#17 Div(N)] with the #7 Subjective value is entered.

For [#17 Div(N)], set the near point chart II H (VA1.0) or G (VA0.63) manually at the 40 cm position.

Operation message

Pressing V.P. sets the vertical prism corresponding to the vertical phoria. Press V.P. as necessary.

2 According to the operation message on the left bottom of the screen, turn the dial counterclockwise to add the BI prism powers to both eyes until the chart becomes blur.[31]

Also possible by pressing $\oplus$.

3 Press [Blur] when the chart appears blur.

The prism powers are stored as blur point.

The [Blur] indication is highlighted. It means that the prism powers have been entered.

When highlighted [Blur] is pressed again, the entered prism powers are cleared.

When the chart is not blur, go to the next step.

---

*31. Turning the dial changes the value in 0.2△ increments (0.1△ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0△ increments (0.5 D for single eye).

4 Turn the dial counterclockwise to add the BI prism powers to both eyes until the chart appears dissociated.[*32]

Also possible by pressing $\oplus$.

5 Press [Break] when the chart appears dissociated.

The prism powers are stored as break point.

The [Break] indication is highlighted. It means that the prism powers have been entered.

When highlighted [Break] is pressed again, the entered prism powers are cleared.

6 Turn the dial clockwise to reduce the BI prism powers from both eyes until the chart appears one again.[*25]

Also possible by pressing $\ominus$.

7 Press [Recov] when the chart appears one.

The prism powers are stored as recovery point.

5

32. **Turning the dial changes the value in 0.2Δ increments (0.1Δ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0Δ increments (0.5Δ for single eye).**

5.2.5 #9,10 Convergence (Far), #16 Convergence (Near)
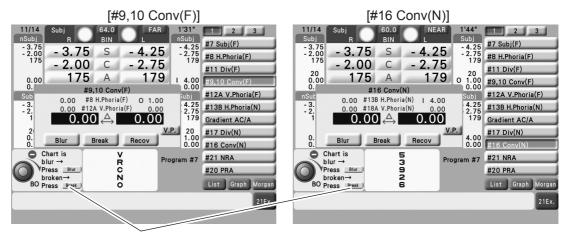
Setting contents:

	#9,10 Conv(F)	#16 Conv(N)
Use chart	Far point vertical line chart For the model other than CP series, SSC series, SC series U and M, the chart is vertical line masked VA chart.	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	Binocular open (rotary prism)	Binocular open (rotary prism)
Set power	Subj (F)	Subj (N)

[Procedure example]

1 Press [#9,10 Conv(F)] or [#16 Conv(N)] with the #7 Subjective value entered.

For [#16 Conv(N)], set the near point chart II H (VA1.0) or G (VA0.63) manually at the 40 cm position.

[#9,10 Conv(F)]   [#16 Conv(N)]

Operation message

Pressing V.P. sets the vertical prism corresponding to the vertical phoria. Press V.P. as necessary.

2 According to the operation message on the left bottom of the screen, turn the dial clockwise to add the BO prism powers to both eyes until the chart becomes blur.[33]

Also possible by pressing (−) .

3 Press [Blur] when the chart appears blur.

The prism powers are stored as blur point.

The [Blur] indication is highlighted. It means that the prism powers have been entered.

When highlight [Blur] is pressed again, the entered prism powers are cleared.

---

[33]. Turning the dial changes the value in 0.2△ increments (0.1 △ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0△ increments (0.5 △ for single eye).

---

4 Turn the dial clockwise to add the BO prism powers to both eyes until the chart appears dissociated.[34]

Also possible by pressing ⊖ .

5 Press [Break] when the chart appears dissociated.

The prism powers are stored as break point.

The [Break] indication is highlighted. It means that the prism powers have been entered.

When highlighted [Break] is pressed again, the entered prism powers are cleared.

6 Turn the dial counterclockwise to reduce the BO prism powers to both eyes until the chart appears one.[27]

Also possible by pressing ⊕ .

7 Press [Recov] when the chart appears one.

The prism powers are stored as recovery point.

5

---

[34]. **Turning the dial changes the value in 0.2Δ increments (0.1 Δ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0Δ increments (0.5 Δ for single eye).**

5.2.6　#21 Negative relative accommodation (NRA)
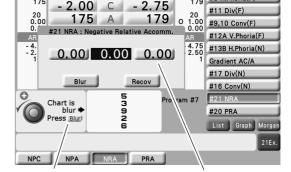
Setting contents:

Use chart	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	Binocular open
Set power	Subj (N)

[Procedure example]

1　With the #7 Subjective value entered, press [#21 NRA].

2　Set the near point chart II H (VA1.0) or G (VA0.63) manually at the 40cm position.

3　According to the operation message on the left bottom of the screen, gradually turn the dial counterclockwise and press [Blur] when the chart appears blur.

Operation message　　Numeric value field

>　The spherical powers are stored as blur point.
>
>　The [Blur] indication is highlighted. It means that the spherical powers have been entered.
>
>　When highlight [Blur] is pressed again, the entered spherical powers are cleared.

4　According to the operation message on the left bottom of the screen, gradually turn the dial clockwise and press [Recov] when the chart appears clearly again.

>　The spherical powers are stored as recovery point.
>
>　Pressing ⓛ, ⓡ, or numeric value field to cover the measuring window measures the negative relative accommodation for single eye.

5.2.7 #20 Positive relative accommodation (PRA)
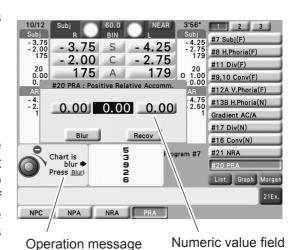
Setting contents:

Use chart	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	Binocular open
Set power	Subj (N)

[Procedure example]

1 With the #7 Subjective value entered, press [#20 PRA].

2 Set the near point chart II H (VA1.0) or G (VA0.63) manually at the 40cm position.

3 Present the vertical line chart and let the patient read the highest VA letter chart that the patient can read correctly. According to the operation message on the left bottom of the screen, gradually turn the dial clockwise and press [Blur] when the chart appears blur.

Operation message   Numeric value field

> The spherical powers are stored as blur point.
>
> The [Blur] indication is highlighted. It means that the spherical powers have been entered.
>
> When highlight [Blur] is pressed again, the entered spherical powers are cleared.

4 According to the operation message on the left bottom of the screen, gradually turn the dial counterclockwise and press [Recov] when the chart appears clearly again.

> The spherical powers are stored as recovery point.

> Pressing (L) or (R), or numeric value field to cover the measuring window measures the Positive relative accommodation for single eye.

5.2.8 #14A Cross cylinder (monocular)

Setting contents:
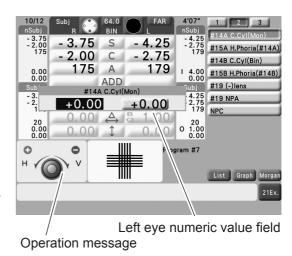
Use chart	Near point cross grid Set the near point chart II B manually.
Auxiliary lens (R/L)	Fixed cross cylinder lens (±0.5)/Occluder
Set power	Subj (F) + initial addition value

*The initial addition value must be set separately. "I Setting for [#14A C.Cyl(Mon)]" (Page 248)

[Procedure example]

1 With the #7 Subjective value entered, press [#14A C.Cyl(Mon)].

2 Set the near point chart II B manually at the 40cm position.

3 According to the operation message on the left bottom of the screen, make the sharpness of horizontal and vertical lines appear equal with the dial.

> When the vertical line is sharp, turn the dial clockwise and when the horizontal line is sharp, turn the dial counterclockwise.

Left eye numeric value field

Operation message

4 As the initial value is the right eye, press (L) or left eye value numeric field after measuring the right eye and measure the left eye in the same manner.

> The value displayed in the window is the added power.

5.2.9   #15A Horizontal phoria (according to #14A)

Setting contents:
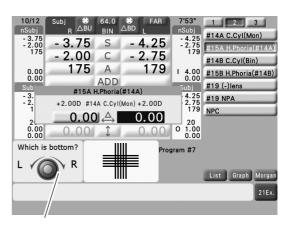
Use chart	Near point cross grid Set the near point chart II B manually.
Auxiliary lens (R/L)	Fixed cross cylinder lens + Break rotary prism (measurement rotary prism)
Set power	Subj (F) + #14A C.Cyl (Mon)

[Procedure example]

1 After measuring #14A, press [#15A H.Phoria(#14A)].

2 Set the near point chart II B manually at the 40cm position.

3 Measure the horizontal phoria of #14A.

For the measurement method, see "5.2.2 #8 Horizontal phoria (Far), #13B Horizontal phoria (Near)" (Page 211).

Operation message

5.2.10 #14B Cross cylinder (binocular)

Setting contents:
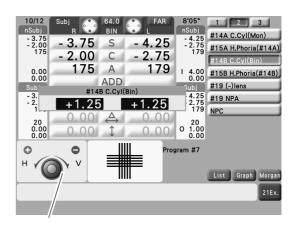
Use chart	Near point cross grid Set the near point chart II B manually.
Auxiliary lens (R/L)	Fixed cross cylinder lens (±0.5) / Fixed cross cylinder lens (±0.5)
Set power	Subj (F) + #14A C.Cyl (Mon)

[Procedure example]

1 With the #7 Subjective value entered, press [#14B C.Cyl(Bin)].

When #14A Cross cylinder (single eye) is measured, the initial set value is Subj(F) + #14A.

2 Set the near point chart II B manually at the 40cm position.

Operation message

3 According to the operation message on the left bottom of the screen, make the sharpness of horizontal and vertical lines appear equal with the dial.

When the vertical line is sharp, turn the dial clockwise and when the horizontal line is sharp, turn the dial counterclockwise.

The value displayed in the window is the added power.

## 5.2.11 #15B Horizontal phoria (according to #14B)

Setting contents:
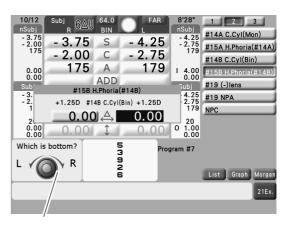
Use chart	Near point vertical line chart Set the near point chart II H (VA1.0) or G (VA0.63) manually.
Auxiliary lens (R/L)	6△ BU/open
Set power	Subj (F) + #14B C.Cyl (Bin)

[Procedure example]

1 After measuring #14B cross cylinder (binocular), press [#15B H.Phoria(#14B)].

2 Set the near point chart II H (VA1.0) or G (VA0.63) manually at the 40cm position.

3 Measure the horizontal phoria of #14B.

For the measurement method, see "5.2.2 #8 Horizontal phoria (Far), #13B Horizontal phoria (Near)" (Page 211).

Operation message

5
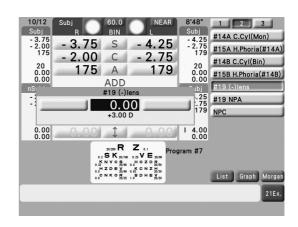
5.2.12 #19 Accommodation with addition of minus lens

Setting contents:

Use chart	Near point VA chart Set the near point chart II A manually.
Auxiliary lens (R/L)	Binocular open
Set power	Subj (N)

[Procedure example]
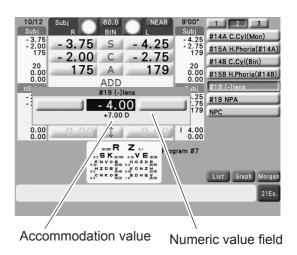
1 With #7 Subjective value entered, press [#19 (-) lens].

2 As the test is performed at near working distance of 33 cm, set the near point chart II A VA chart manually at the 33cm position.

3 Let the patient read the highest VA letter chart that the patient can read correctly and turn the dial clockwise until the chart appears blur.

> The value displayed small under the lens value is an accommodation value. As this test is WD=33cm, accommodation value is +3.00D with the addition 0.

> If the calculated accommodation value is a minus value, the accommodation value becomes 0.00 D.

Accommodation value   Numeric value field

Pressing Ⓛ , Ⓡ , or numeric value field to cover the measuring window measures the accommodation for single eye.

> 📝 Note
> • According to the "Standard accommodation power display" parameter, Morgan's criterion or the maximum value, average value, and minimum value calculated by the Hofstetter formula can be displayed on the accommodation measurement window.
> See "○ Standard accommodation power display (Page 226)" for details.
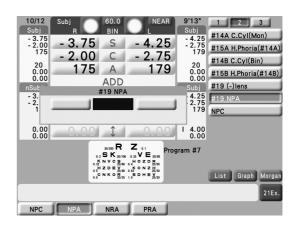
5.2.13 #19 Near point of accommodation (NPA)

Setting contents:

Use chart	The highest VA letter chart that the patient can read correctly at the 40 cm distance
Auxiliary lens (R/L)	Binocular open
Set power	Subj (N)

[Procedure example]
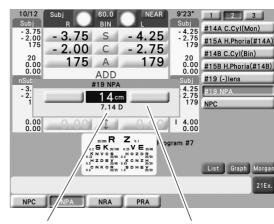
1 With the #7 Subjective value entered, press [#19 NPA].

2 Gradually bring the chart closer to the patient's eye and measure the distance from the chart to the root of the nose at the point where the chart appears blur.

> The value displayed small under the measurement distance is an accommodation value.

> Pressing (L), (R), or numeric value field to cover the measuring window measures the near point of accommodation for single eye.

Accommodation value   Numeric value field

3 Enter the distance with the dial.

Also possible by pressing (+) or (−).

It is possible to enter the distance from 1 to 100 cm in 1 cm increments.

The accommodation is calculated automatically and the results are printed with the other data.

For example: Enter 33 cm as the distance when ADD = +2.0 D (addition powers are entered in far mode)

Accommodation power = 1/0.33 - (+2.0) = 1.03 D

NPA = 33 cm: 1.03 D

○ **Standard accommodation power display**

According to the "Standard accommodation power display" parameter, the maximum value, average value, and minimum value calculated by the Morgan's criterion or Hofstetter formula can be displayed on the accommodation measurement window. To display this value, patient's age must be entered beforehand. For details, see "3.11 Age Input" (Page 118).

Specify the accommodation power to be displayed with the "Standard accommodation display" parameter.

● When the "Standard accommodation power display" parameter is set to "Morgan"

Displays the range of Morgan's criterion calculated by age.

#19 NPA
14 cm
7.14 D
Morgan   4.10D — 8.10D — Morgan's criterion accommodation power

*When the accommodation power is below the range of criterion, or the value is 0(D), the accommodation power is displayed in pink.

● When the "Standard accommodation power display" parameter is set to "Hofstetter"

Displays the minimum value, average value, and maximum value calculated by Hofstetter formula.

#19 NPA
14 cm
7.14 D
Hofstetter Min.: 6.75D Ave.: 8.60D Max.:11.80D — Minimum value, average value, maximum value

*When the accommodation power (D) is below the minimum value, or the value is 0(D), the accommodation power is displayed in pink.

5.2.14 Near point of convergence (NPC)
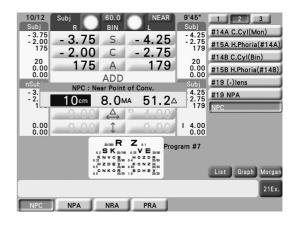
This test does not require the refractor. Let the patient wear his/her glasses when he/her wears them usually.

Chart: Fixation like a tip of a pen which causes double vision easily.

[Procedure example]

1 Press [NPC].

2 Gradually bring a fixation like a tip of a pen closer to the patient's eyes and measure the distance from the pen tip to the root of the nose (posterior surface of the lens) at the point where the image appears dissociated (split in two).

3 Enter the distance with the dial.

Also possible by pressing $\oplus$ or $\ominus$.

It is possible to enter the distance from 1 to 100 cm in 1 cm increments.

The meter angle (MA) and prism power are calculated and displayed automatically.

For example: Enter 7 cm as the distance when PD = 6.4 cm.

1) When the "NPC calculation" parameter is set to "Detail":

MA = 1/(0.07 + 0.025) = 10.5

Δ = MA × 6.4 = 67.4

NPC = 7 cm: 10.5 MA, 67.4Δ

2) When the "NPC calculation" parameter is set to "Simple":

MA = 1/0.07 = 14.3

Δ = MA × 6.4 = 91.4

NPC = 7 cm: 14.3 MA, 91.4Δ

5.2.15 #12A Vertical phoria (Far), #18A Vertical phoria (Near)

Setting contents:

	#12A V.Phoria (F)	#18A V.Phoria (N)
Use chart	Far point horizontal line chart For the model other than CP series, SSC series, SC series U and M, the chart is horizontal line masked VA chart.	Near point horizontal line chart Set the near point chart II C (VA0.63) or D (VA1.0) manually.
Auxiliary lens (R/L)	Open (rotary prism)/10Δ BI	Open (rotary prism)/10Δ BI
Set power	Subj (F)	Subj (N)

[Procedure example]

1 Press [#12A V.Phoria(F)] or [#18A V.Phoria(N)] with #7 Subjective value entered.

For [#18A V.Phoria(N)], set the near point chart II C (VA0.63) or D (VA1.0) manually at the 40 cm position.

[#12A V.Phoria (F)]　　　　　　　　[#18A V.Phoria (N)]

Operation message

2 Ask the patient, "Can you see two circles with a row of letters in each of them? Do the letters line-up, like headlights on a car?"

When they are not in line, correct them following the operation message on the left bottom of the screen or table below.

Appearance of chart	Phoria	Correction
<1> The left frame is higher.	Right eye hyperphoria	Turn the dial counterclockwise to add the BD prism powers to the right eye until the two columns line up.

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<2> The right frame is higher.	Left eye hyperphoria	Turn the dial clockwise to add the BU prism powers to the right eye until the two columns line up.

*Use ⊕ or ⊖ instead of the dial for fine adjustment.

5

5.2.16 #12B Supravergence (Far), #18B Supravergence (Near)

Setting contents:

	#12B Supra(F)	#18B Supra(N)
Use chart	Far point horizontal line chart For the model other than CP series, SSC series, SC series U and M, the chart is horizontal line masked VA chart.	Near point horizontal line chart Set the near point chart II C (VA0.63) or D (VA1.0) manually.
Auxiliary lens (R/L)	Binocular open (rotary prism)	Binocular open (rotary prism)
Set power	Subj (F) + #8 H.Phoria (F)	Subj (N) + #13 H.Phoria (N)

* The RT-5100 is set to add prism to the right eye as default. Therefore, right supravergence test is set as a default. Setting the "Prism for Supra. and Infra." parameter to "L" adds prism to the left eye and sets to the left supravergence test. However, only one test can be stored.

[Procedure example]
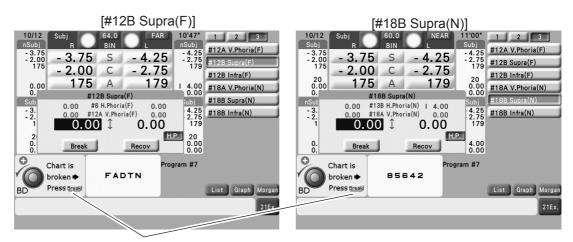
The following describes the right superavergence test. When setting the Prism for Supra. and Infra. to "L" and performing the left supravergence, the dial rotation is reversed.

1 With #7 Subjective value entered, press [#12B Supra(F)] or [#18B Supra(N)].

For the initial state, horizontal prism corresponding to the horizontal phoria value is set. If the horizontal prism is not necessary, press [H.P] to clear the prism.

For [#18B Supra(N)], set the near point chart II C (VA0.63) or D (VA1.0) manually at the 40 cm position.

Operation message

2 According to the operation message on the left bottom of the screen, turn the dial counterclockwise to add the BD prism powers to the single eye until the chart appears dissociated.[35]

Also possible by pressing ⊕ .

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[35]. Turning the dial changes the value in 0.2△ increments (0.1△ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0△ increments (0.5△ for single eye).

3 Press [Break] when the chart appears dissociated.

>The prism powers are stored as break point.

>The [Break] indication is highlighted. It means that the prism powers have been entered.

>When highlighted [Break] is pressed again, the entered prism powers are cleared.

4 Turn the dial clockwise to reduce the BD prism powers from the single eye until the chart appears one again.[36]

>Also possible by pressing $\ominus$.

5 Press [Recov] when the chart appears one.

>The prism powers are stored as recovery point.

>The [Recov] indication is highlighted. It means that the prism powers have been entered.

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[36]. *Turning the dial changes the value in 0.2∆ increments (0.1∆ for single eye). Turning the dial with pressing [Shift] changes the value in 0.1∆ increments (0.5∆ for single eye).

5.2.17 #12B Infravergence (Far), #18B Infravergence (Near)

Setting contents:

	#12B Infra(F)	#18B Infra(N)
Use chart	Far point horizontal line chart For the model other than CP series, SSC series, SC series U and M, the chart is horizontal line masked VA chart.	Near point horizontal line chart Set the near point chart II C (VA0.63) or D (VA1.0) manually.
Auxiliary lens (R/L)	Binocular open (rotary prism)	Binocular open (rotary prism)
Set power	Subj (F) + #8 H.Phoria (F)	Subj (N) + #13B H.Phoria (N)

*The RT-5100 is set to add a prism value to the right eye as a default. Therefore, right infravergence test is set as a default. Setting the Prism for Supra. and Infra. parameter to "L" adds a prism value to the left eye and sets the left infravergence test. However, only one test can be stored.

[Procedure example]
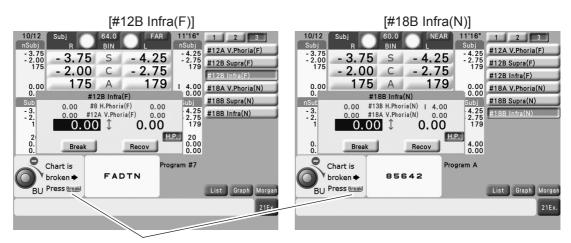
The following describes the right infravergence test. When setting "Prism for Supra. And Infra." to "L" and performing the left infravergence, the dial rotation is reversed.

1 With #7 Subjective value entered, press [#12B Infra(N)] or [#18B Infra(N)].

For the initial state, a horizontal prism value corresponding to the horizontal phoria value is set. If the horizontal prism value is not necessary, press [H.P] to clear the prism value.

For [#18B Infra(N)], manually set the near point chart II C (VA0.63) or D (VA1.0) at the 40 cm position.

[#12B Infra(F)]   [#18B Infra(N)]

Operation message

2 According to the operation message on the left bottom of the screen, turn the dial clockwise to add the BU prism powers to the single eye until the chart appears dissociated.[*37]

Also possible by pressing (−).

*37. *Turning the dial changes the value in 0.2△ increments (0.1△ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0△ increments (0.5△ for single eye).

3 Press [Break] when the chart appears dissociated.

> The prism powers are stored as break point.

> The [Break] indication is highlighted. It means that the prism powers have been entered.

> When highlight [Break] is pressed again, the entered prism powers are cleared.

4 Turn the dial counterclockwise to reduce the BU prism powers from the single eye until the chart appears one again.[38]

> Also possible by pressing $\oplus$.

5 Press [Recov] when the chart appears one.

> The prism powers are stored as recovery point.

> The [Recov] indication is highlighted. It means that the prism powers have been entered.

5

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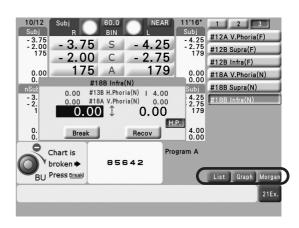
[38]. **Turning the dial changes the value in 0.2Δ increments (0.1Δ for single eye). Turning the dial with pressing [Shift] changes the value in 1.0Δ increments (0.5Δ for single eye).**

5.3   21 Point Exams Result (only for Plus Package)
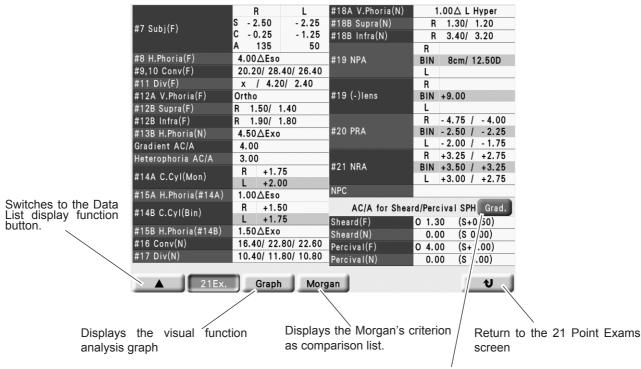
Measurement results are displayed in the format selected among List, Graph, or Morgan located at bottom right on the 21 Point Exams test screen.

The display format can also be selected using the function buttons of the 21 Point Exams, 21 Ex., Graph, and Morgan are displayed by pressing [▼] in the Data List screen (see " All measured data can be displayed by a list." (Page 97).

5.3.1   21 Point Data List

Pressing [List] or [21 Ex.] displays a list of measurement results for Heterophoria AC/A, prism values and spherical values that satisfy the Sheard's criterion, and prism values and spherical values that satisfy the Percival's criterion with the Test No. and Test name.

Switches to the Data List display function button.

Displays the visual function analysis graph

Displays the Morgan's criterion as comparison list.

Return to the 21 Point Exams screen

Switches AC/A used for SPH adjustment values that satisfy the Sheard and Percival's criterion. AC/A currently used is displayed as button.
Grad. : Gradient AC/A
Hetero. : Heterophoria AC/A

● Heterophoria AC/A

The Heterophoria AC/A value is automatically calculated and displayed when values for "#8 H.Phoria(F)" and "#13B H.Phoria(N)" are entered. This value is calculated by the formula below.

AC / A = PD - d x (Phoria(Far) - Phoria(Near))

PD(cm): pupillary distance   d(m): near point phoria measurement distance

Phoria: Exophoria (-), Esophoria (+)

● Sheard (F), Sheard (N)

Prism values and SPH adjustment values that satisfy the Sheard's criterion.

The RT-5100 automatically calculates and displays the prism value necessary to satisfy the criterion necessary for Sheard's criterion calculation when values for phoria and fusional convergence reserve or fusional divergence reserve are entered. In addition, with AC/A, the SPH adjustment value is calculated and displayed in parentheses. The SPH adjustment value is the value for how much to increase/decrease the value against #7 Subjective value. The SPH adjustment value is displayed in pink when the value is negative.

When the criterion is satisfied, 0.00 is displayed. If there is no necessary data so calculation is not possible, the field is blank.

The value is calculated by the following formulas.

$$\Delta= \frac{2P-R}{3} \qquad SPH= \frac{\Delta}{AC / A}$$

Δ: Necessary prism value for satisfying the criterion

P: Phoria value

R: Fusional convergence reserve or fusional divergence reserve

•Fusional convergence reserve basically uses blur value (Far point: #9, Near point: #16) for calculation. If there is no blur value, use the break value (Far point: #10Break, Near point: #16Break) to calculate.

•For fusional divergence reserve, break value (#11Break) is used basically for far point to calculate. For near point, blur value (#17) is used for calculation. If there is no blur value, use the break value (#17Break) for calculation.

SPH: Necessary SPH adjustment value for satisfying the criterion

AC/A: The default setting is calculated with Gradient AC/A. It can be changed to Heterophoria AC/A with the "AC/A for Sheard/Percival SPH" parameter.

*Criterion: To maintain the normal binocular vision, values for fusional convergence reserve or fusional divergence reserve must be two times or greater than those for phoria.

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● Percival (F), Percival (N)

Prism values or SPH adjustment values that satisfy the Percival's criterion.

The RT-5100 automatically calculates and displays the prism values necessary for satisfying the criterion when fusional convergence reserve or fusional divergence reserve necessary for Percival's criterion calculation are entered. In addition, with AC/A, SPH value is calculated and displayed in parentheses. The SPH is the value for how much to increase/decrease the value against #7 Subjective value. The SPH adjustment value is displayed in pink when the value is negative.

When the criterion is satisfied, 0.00 is displayed. If there is no necessary data so calculation is not possible, the field is blank.

The value is calculated with the following formula.

$$\Delta = \frac{L-2S}{3} \qquad SPH = \frac{\Delta}{AC/A}$$

Δ: Necessary prism value for satisfying the criterion

L: Relative fusion value greater in value

S: Relative fusion value less in value

•Fusional convergence reserve is normally calculated using blur value (Far point: #9, Near point: #16) for calculation. However, if there is no blur value, break value (Far point: #10 Break, Near point: #16 Break) is used for calculation.

•For fusional divergence reserve, generally break value (#11Break) is used as the far point for calculation. For near point, blur value (#17) is used for calculation. If there is no blue value, break value (#17Break) can be used for calculation.

SPH: Necessary SPH adjustment value to satisfy the criterion

AC/A: For the default setting, calculate with Gradient AC/A. This can be changed to Heterophoria AC/A with the "AC/A for Sheard/Percival SPH" parameter.

*Criterion: To maintain normal binocular vision, a Donders line must pass through the central 1/3 area of the total relative convergence range.

5.3.2 Visual function analysis graph

Displays the visual function analysis graph based on the measurement results. The measurement values used for the graph are #8, #9,10, #11, #13B, #17, #16, #20, and #21.

The "Graph type" parameter selects which of the two graph types to use. This parameter setting is reflected to the print. For details, see "3.19.1 Parameter Settings" (Page 133).

Type 1 → #20 data is not reflected to the RCI line. #21 data is not reflected to the RCS line.
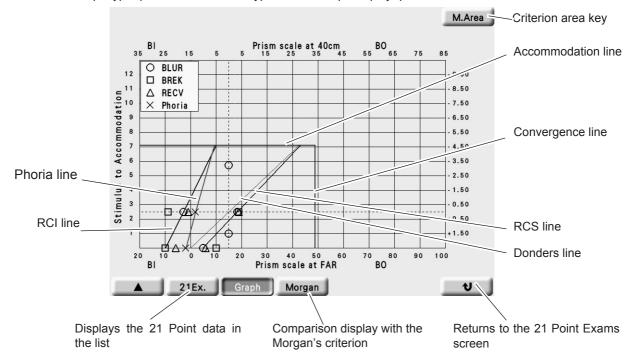
Type 2 → #20 data is reflected to the RCI line. #21 data is reflected to the RCS line.

For the graph display range, there are two types, a graph for accommodation stimulus of +13D or less and a graph for accommodation stimulus of +3D or less. The graph type can be selected by the "Graph display" parameter. To have the range of the graph reflected in the print, set the "Graph print" parameter. For details, see "3.19.1 Parameter Settings" (Page 133).
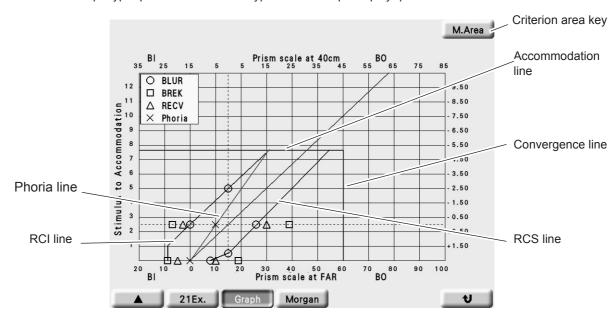
As - +13.00D → Vertical axis accommodation stimulus is 0 to +13.00D, Horizontal axis convergence stimulus is 20Δ BI to 100Δ BO

As - +3.00D → Vertical axis accommodation stimulus is 0 to +3.00D, Horizontal axis convergence stimulus is 15Δ to BI to 100Δ to BO
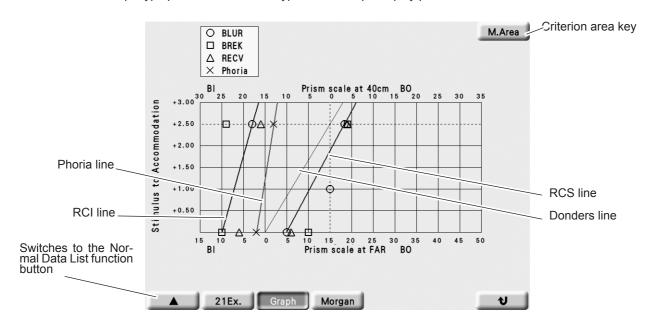
○ When the "Graph type" parameter is set to "Type 1" and "Graph display" parameter is set to "As - +13.00D"
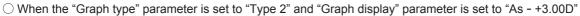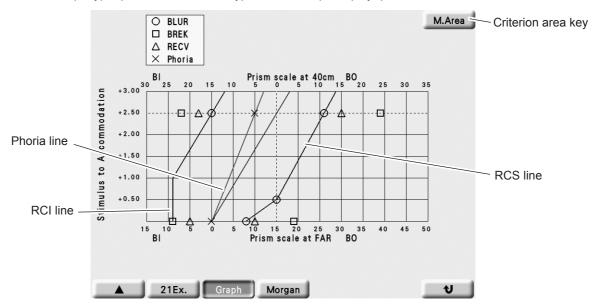
○ When the "Graph type" parameter is set to "Type 2" and "Graph display" parameter is set to "As‑+13.00D"

○ When the Graph type parameter is set to "Type 1" and Graph display parameter is set to "As‑+3.00D"

○ When the "Graph type" parameter is set to "Type 2" and "Graph display" parameter is set to "As－+3.00D"

● Donders line

Line indicating the linear relationship between focusing ability (accommodation) and the amount of convergence required to maintain binocular fixation on an object as its distance from the eyes varies. Always displayed as a continuous straight line.

● Accommodation line

A horizontal line drawn to the #19 NPA value. When there is no NPA value, the line is drawn using the value obtained from #19 (-) lens added accommodation.

● Convergence line

A vertical line drawn to the NPC value.

● Phoria line

A line from #8H.Phoria(F) to #13B H.Phoria(N). This line is drawn when #8 and #13B data are entered.

● RCI line

When the "Graph type" parameter is set to "Type 1".

A line from break point of #11Div(F) to the blur point of #17Div(N).

When there is no blur point for #17Div(N), the line is drawn to the break point.

When the "Graph type" parameter is set to "Type 2".

A line from the break point of #11Div(F) to the blur point of #17Div(N) and the blur point of #20PRA.

When there is no blur point for #17Div(N), the line is drawn to the break point. Basically, the line is drawn from #17 to #20 and from #11, another line is drawn horizontally for the X-axis. If a horizontal line from #11 cannot be drawn, draw the line with the Type 1 procedure.

● RCS line

When the "Graph type" parameter is set to "Type 1".

A line from the blur point of #9 Conv(F) to #16 Conv(N). When there is no blur point for #9 Conv(F), the line is drawn to the break point of #10 and when there is no blur point for #16, the line is drawn to the break point of #16.

When the "Graph type" parameter is set to "Type 2".
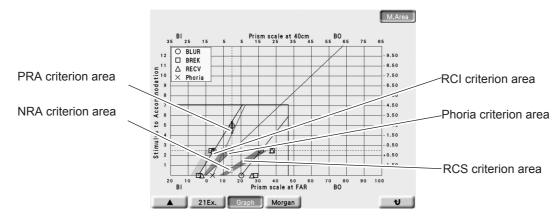
A line from the blur point of #9 Conv(F) to #16 Conv(N) and the blur point of #21NRA. When there is no blur point for #9 and #16, use the break point. When the #9 blur point exceeds 15△, draw the line with the Type 1 procedure.

● Criterion area key
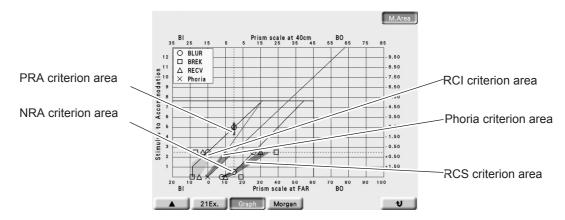
Pressing this key displays the Morgan's criterion area on the graph.

The patient's visual function can be compared visually to the Morgan's criterion.
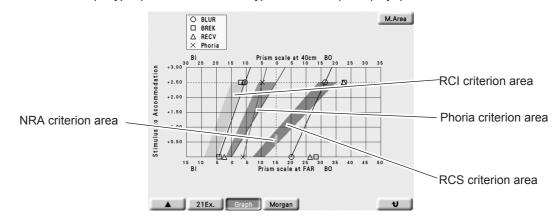
○ When the "Graph type" parameter is set to "Type 1" and "Graph display" parameter is set to "As - +13.00D"
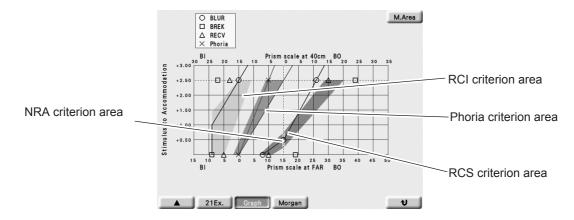
○ When the "Graph type" parameter is set to "Type 2" and "Graph display" parameter is set to "As - +13.00D"

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○ When the "Graph type" parameter is set to "Type 1" and "Graph display" parameter is set to "As‐+3.00D"

RCI criterion area

Phoria criterion area

NRA criterion area

RCS criterion area

○ When the "Graph type" parameter is set to "Type 2" and "Graph display" parameter is set to "As‐+3.00D"

RCI criterion area

NRA criterion area

Phoria criterion area

RCS criterion area

5
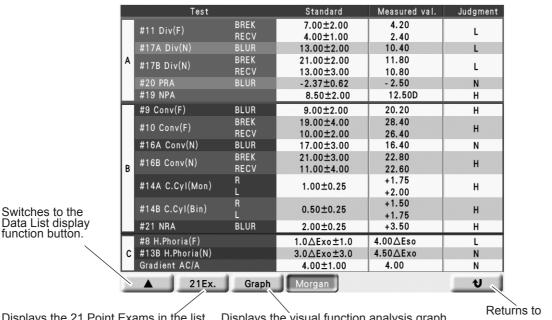
5.3.3　Comparison display with the Morgan's criterion
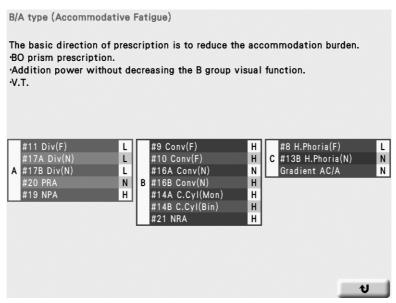
Pressing [Morgan] displays the comparison display with the Morgan's criterion.

	Test		Standard	Measured val.	Judgment
A	#11 Div(F)	BREK	7.00±2.00	4.20	L
		RECV	4.00±1.00	2.40	
	#17A Div(N)	BLUR	13.00±2.00	10.40	L
	#17B Div(N)	BREK	21.00±2.00	11.80	L
		RECV	13.00±3.00	10.80	
	#20 PRA	BLUR	-2.37±0.62	- 2.50	N
	#19 NPA		8.50±2.00	12.50D	H
B	#9 Conv(F)	BLUR	9.00±2.00	20.20	H
	#10 Conv(F)	BREK	19.00±4.00	28.40	H
		RECV	10.00±2.00	26.40	
	#16A Conv(N)	BLUR	17.00±3.00	16.40	N
	#16B Conv(N)	BREK	21.00±3.00	22.80	H
		RECV	11.00±4.00	22.60	
	#14A C.Cyl(Mon)	R	1.00±0.25	+1.75	H
		L		+2.00	
	#14B C.Cyl(Bin)	R	0.50±0.25	+1.50	H
		L		+1.75	
	#21 NRA	BLUR	2.00±0.25	+3.50	H
C	#8 H.Phoria(F)		1.0△Exo±1.0	4.00△Eso	L
	#13B H.Phoria(N)		3.0△Exo±3.0	4.50△Exo	N
	Gradient AC/A		4.00±1.00	4.00	N

Switches to the Data List display function button.

▲　21Ex.　Graph　Morgan　↻

Displays the 21 Point Exams in the list　　Displays the visual function analysis graph

Returns to the 21 Point Exams screen

* #5 Dynamic retinoscopy is excluded.

* "#19 NPA" or "#19 (-) lens" can be set with "Accomm. for Morgan's System" parameter for data determined with #19. Compare these data with the accommodation data (±2.00D) for age. See "8.4 Preset Addition Power" (Page 268).

* #19 cannot be determined when age and measurement value are not entered.

With the necessary data collected, pressing Help justifies the group (A/B) and displays the direction of the prescription.

B/A type (Accommodative Fatigue)

The basic direction of prescription is to reduce the accommodation burden.
·BO prism prescription.
·Addition power without decreasing the B group visual function.
·V.T.

A				B				C		
#11 Div(F)	L		#9 Conv(F)	H		#8 H.Phoria(F)	L	
#17A Div(N)	L		#10 Conv(F)	H		#13B H.Phoria(N)	N	
#17B Div(N)	L		#16A Conv(N)	N		Gradient AC/A	N	
#20 PRA	N		#16B Conv(N)	H			
#19 NPA	H		#14A C.Cyl(Mon)	H			
			#14B C.Cyl(Bin)	H			
			#21 NRA	H			

↻
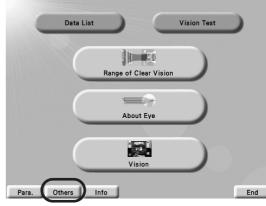
For determination to occur, three or more readings of any one of H, L, or N are necessary for the A group and four or more for the B group. When the A group has three or more H readings and B group four or more L readings, the type is determined as A/B type (Convergence Fatigue) conversely, when the A group has three or more L readings, and the B group four or more H readings, the type is determined as B/A type (Accommodation Fatigue). For any condition other than those two, determination is not performed.

5.4   Changing 21 Point Exams Setting (only for Plus Package)

Settings for the chart or auxiliary lens when the 21 Point Exams button is pressed can be changed.

1 Select Programming.

1) Display the main menu screen.

Press (Menu).

2) Press [Others].

3) Press [Settings of 21 Point Exams].

Setting of 21 Point Exams screen is displayed.

2 Select the test for which the settings are to be changed.

Settings for the test displayed in gray cannot be changed.

* Settable items for each test are as in the following table.

Test	Chart	Auxiliary lenses	R/L/Binocular	Others
#7 Subj(F)	Select the programmed refraction to be performed.			
#8 H.Phoria(F)	○	○	○	
#11 Div(F)	○	×	×	
#9,10 Conv(F)	○	×	×	
#13B H.Phoria(N)	×	○	○	
Gradient AC/A	×	○	○	
#17 Div(F)	Settings cannot be changed.			
#16 Conv(N)	Settings cannot be changed.			
#21 NRA	○	×	○	
#20 PRA	○	×	○	
#14A C.Cyl(Mon)	×	×	○	Initial addition power is settable
#15A H.Phoria (#14A value)	×	○	○	
#14B C.Cyl(Bin)	Settings cannot be changed.			
#15B H.Phoria (#14B value)	×	○	○	
#19 (-)lens	×	×	○	
#19 NPA	×	×	○	
Near Point of Convergence (NPC)	Settings cannot be changed.			
#12A V.Phoria(F)	○	○	○	
#12B Supra(F)	○	×	×	
#12B Infra(F)	○	×	×	
#18A V.Phoria(F)	×	○	○	
#18B Supra(N)	Settings cannot be changed.			
#18B Infra(N)	Settings cannot be changed.			

○ : Settable   × : Unsettable (fixed according to the test contents)

3 Setting screen for each test is displayed. Change the setting with the button on the screen.
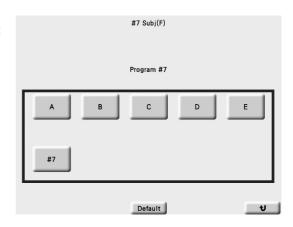
[↩]: Returns to the Setting of 21 Point Exams screen.

[Default]: Setting for each test returns to the default setting.

● Setting of [#7 Subj(F)]

Sets the program to be started when [#7 Subj(F)] is pressed in the measurement screen. The program can be selected from A to E and #7.

Factory setting: #7

● Setting of [#8 H.Phoria(F)] and [#12A V.Phoria(F)]

Auxiliary Lenses selection button→
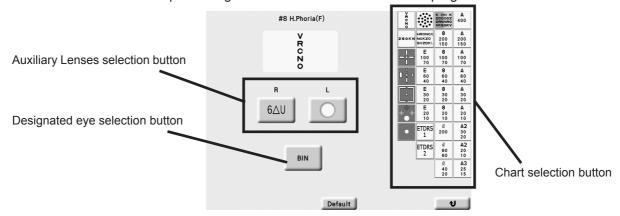
Auxiliary Lenses selection window is displayed and auxiliary lens can be selected.

Designated eye selection button→

Eye for which the prism value is to be increased/decreased (R/L/Binocular) can be selected.

Chart selection button→

Select the presenting chart. A masked VA chart can be programmed.
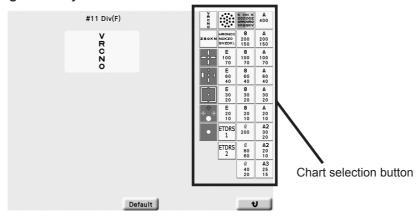
Factory setting of [#8 H.Phoria(F)]:

    Chart: Vertical line   Auxiliary lens: R 6 △ BU,   L open   Designated eye: L

Factory setting of [#12A V.Phoria(F)]:

    Chart: Horizontal line Auxiliary lens: R open,   L 10 △ BI Designated eye: R

● Only the set chart for [#11Div(F)], [#9,10 Conv(F)], [#12B Supra(F)], or [#12B Infra(F)] can be changed the settings. The auxiliary lens is fixed as binocular open and designated eye is fixed as binocular.

Chart selection button

Factory setting of [#11Div(F)] and [#9,10 Conv(F)]

Chart: Vertical line

Factory setting of [#12B Supra(F)], or [#12B Infra(F)]:

Chart: Horizontal line
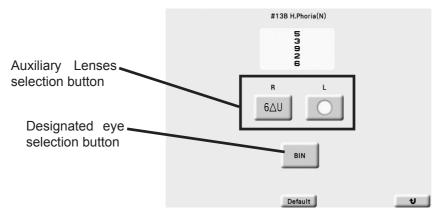
● Settings for [#13B H.Phoria(N)], [Gradient AC/A], [#15A H.Phoria(#14A)], [#15B H.Phoria(#14B)], and [#18A V.Phoria(N)]

Auxiliary Lenses selection button→

Auxiliary Lenses selection window is displayed and auxiliary lens can be selected.

Designated eye selection button→

Eye for which the prism value (R/L/Binocular) can be selected is to be increased/decreased.

Auxiliary Lenses selection button

Designated eye selection button

Factory setting of [#13B H.Phoria(N)], [Gradient AC/A], [#15B H.Phoria(according to #14B value)]:

Auxiliary Lenses: R 6 ∆BU, L open   Designated eye: L

*The chart is fixed as Near point vertical line chart.

Factory setting of [#15A H.Phoria(#14A)]:

Auxiliary Lenses: R/L Fixed cross cylinder + Break prism   Designated eye: BIN

*The chart is fixed as Near point cross grid chart.

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Factory setting of [#18A V.Phoria(N)]:
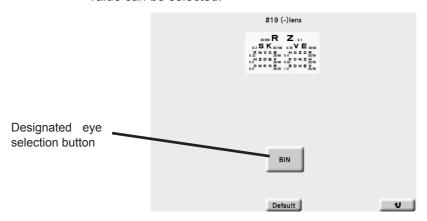
Auxiliary Lenses: R open, L 10 △ BI   Designated eye: R

*The chart is fixed as Near point horizontal line chart.

● Settings of [#19 (-)lens], [#19 NPA]

Only the designated eye can be selected. The chart and auxiliary lens are fixed.

Designated eye selection button→The (R/L/Binocular) increases/decreases the spherical value can be selected.

Designated eye selection button

Factory setting:

Designated eye: Binocular eye
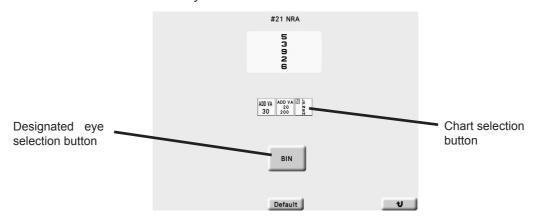
*The chart is fixed as Near point VA 20 - 200, the auxiliary lens is binocular open.

● Settings of [#21 NRA] and [#20 RPA]

Only chart and designated eye can be selected. Auxiliary lens is fixed.

Designated eye selection button→The eye (R/L/Binocular) increases/decreases the spherical value can be selected.

Chart selection button→Near point VA0.63, Near point VA 20 ～ 200, or Near point vertical line chart can be selected. Though the set chart is displayed on the screen, present the chart manually.

Designated eye selection button

Chart selection button

Factory setting:

Chart: Near point vertical line   Designated eye: Binocular eye

*The auxiliary lens is binocular open.

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● Setting for [#14A C.Cyl(Mon)]

Designated eye and Initial add power can be selected.

Initial add power setting button→Sets the initial add power for examination. Pressing the button displays the green frame. Turn the dial to set the initial add power with the green frame displayed. The value can be set in the range of -5.00D to +5.00D.

Designated eye selection button→The eye to be measured (R/L) can be selected.

Initial add power set button

Designated eye selection button

#14A C.Cyl(Mon)

0.00

R

Default

Factory setting:

Initial add power: 0.00D   Designated eye: R

*The chart is near point cross grid, the auxiliary lens is fixed as binocular fixed cross cylinder.

6. MAINTENANCE

6.1 Troubleshooting

In the event that the RT-5100 does not work correctly, check the problem according to the following table before contacting your authorized distributor.

Symptom	Action
The refractor does not start even though the power is turned on.	• Confirm that the power cord is connected to a wall outlet. • Confirm that the system table is turned on.
"Warning!! Memory failure on RB" is printed.	• The interior battery in the relay box is low on power. This is printed after the equipment is idle for an extended period. AutoRef, Lens Meter measurement values stored in the Relay box are deleted. $\Rightarrow$Supply electrical power to the equipment for several hours to recharge the battery.
"Setup data is initialized" is displayed.	• The interior battery in the control box is low on power. This is displayed after the equipment is idle for an extended period. Refraction program and parameters are return to the initial values. Chart model settings may be changed. $\Rightarrow$Supply electrical power to the equipment for several hours to recharge the battery and contact NIDEK or your authorised distributor.
The display and presented chart disappear suddenly.	• The RT-5100 goes into power saving mode. Press any key to restore the display (see page 27).
None of the keys on the control box function.	• Any abnormalities occurs. Turn the main switch of the system table off and then turn it on again.
Pressing [Print] does not feed printer paper.	• Replace the printer paper (see page 251). • Confirm that the "Printer" parameter is not set to "Off".
Pressing [Print] does not print the result.	• Check that the printer paper is set with the correct side up.
Incorrect responses from the touch-screen panel are received.	• Calibrate the touch-screen panel (see page 132).
Data cannot be read even though the Eye Care card is inserted.	• If an auto ref/keratometer or such has no AR measurement data, data cannot be read. • If the right or left is not specified with a lensmeter, data cannot be read. • The contact of the Eye Care card reader may be dirty. Clean it. See "6.8 Cleaning Eye Care Card Reader" (page 255). • If any error occurs while data is written with an auto refractometer or lensmeter, clean its card reader.

If the symptom cannot be corrected with the above actions, contact your authorized distributor.

6

6.2　Cleaning Forehead Rest

Clean the forehead rest before each refraction.

⚠ **WARNING** • **Be sure to secure the refractor head before removing or attaching the forehead rest.**
If the refractor head is moved carelessly, it may bump against someone or something and injury may occur.

1 Remove the forehead rest.

　　1) Tilt the forehead rest upward.

　　2) Pull it at an angle.

2 Wipe the forehead rest with a clean cloth.

For stubborn dirt, wash the forehead rest with dilute neutral detergents.

📝Note | • Be sure to wipe the forehead rest with a dry cloth.
It protects the forehead rest from rust.

3 Attach the forehead rest in the original position.

Insert the forehead rest at an angle.

6.3　Cleaning Face Shields

Clean the face shields before each refraction.

⚠ **WARNING** • **Be sure to secure the refractor head before removing or attaching the face shields.**
If the refractor head is moved carelessly, it may bump against someone or something and injury may occur.

1 Remove the face shields from the refractor head.

The face shields can be easily removed as they are fixed by magnets.

2 Wipe the face shields with a clean cloth.

For stubborn dirt, soak a cloth in a dilute neutral detergent, wring well, and wipe. Finally wipe with a dry and soft cloth.

📝Note | • Do not wipe the inner surface of the face shields with neutral detergents.
Doing so could make the inner surface becomes rust.

3 Attach the face shields in the original position.

6.4　Replacing Printer Paper

When a red line appears on the side of the printer paper, it means that the paper is running short. In such a case, stop using the paper and replace the roll with a new one.
The printer is installed in the system table (not included in the RT-5100 package) normally.
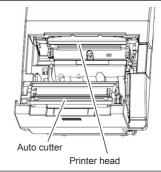
⚠ **CAUTION** ・ **Do not touch the auto cutter.**

The auto cutter may hurt fingers.

・ **Do not touch the printer head.**

The hot printer head immediately after printing may cause a burn.

If the printer head is ruined or soiled, printing quality may be reduced.

Auto cutter

Printer head
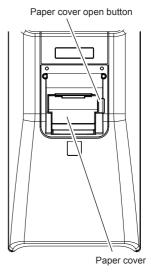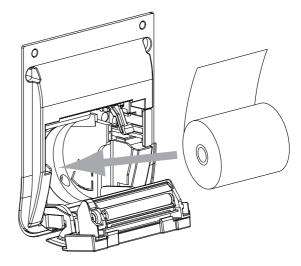
✎Note ・ Do not pull the printer paper with the paper cover closed.

　　Doing so could cause malfunction of the printer.

・ When the printer paper gets jammed, remove the paper by the same procedure as when replacing the printer paper, cut the crumpled paper, and then set the printer paper again.

1 Press the paper cover open button to open the paper cover.

Paper cover open button

2 Remove the used printer paper.

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Paper cover

3 Set the printer paper as shown in the right figure.

When the roll is set upside down, the data is not printed correctly.
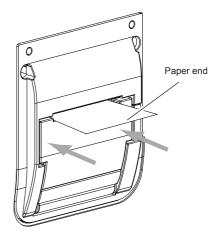
Note	• Be sure to take up slack in the printer paper.
	Failure to do so could cause printer failure.
	• Make sure that the printer paper does not tilt and a roll shaft is not misaligned.
	Otherwise, the paper cannot be properly fed.

4 Pass the paper through the paper outlet and close the paper cover.

Press both top sides of the paper cover to surely close the cover.

Paper end

Note	• Make sure that the cover is surely closed.
	Otherwise, the auto cutter may not work normally.

6.5　Cleaning the Printer

After repeated usage, the paper slot of the auto cutter of the printer may become soiled with paper residue. If this residue accumulates, malfunction of the auto cutter may result. Periodically clean the cutter.
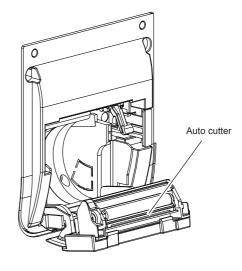
1 Open the printer cover and remove the printer paper roll.

> See "6.4 Replacing Printer Paper" (page 251).

2 Apply the nozzle of a vacuum cleaner to the auto cutter to remove powdery paper.

> Never blow off powdery paper with a blower. If powdery paper settles on the internal working structure, malfunction may result.

3 Supply the printer paper as it was.

Auto cutter

⚠ **CAUTION** • **Do not touch the auto cutter.**

> The auto cutter may hurt fingers.

• **Do not touch the printer head.**

> The hot printer head immediately after printing may cause a burn.
>
> If the printer head is ruined or soiled, printing quality may be reduced.

6

6.6　Cleaning Measuring Windows

Fingerprints, oil from eyelashes, or dusts on the measuring windows affect the measurement accuracy.
Be sure to check the windows before each refraction. When the windows are dirty, remove any dust on the measuring window with a blower brush. For more persistent stains, lightly wipe with a clean and soft cloth.
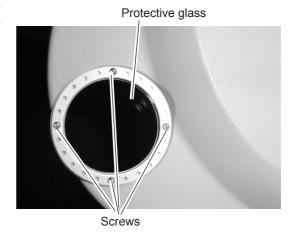
　　Be sure to wipe lightly so as not to scratch the glass of the measuring window.

If condensation forms inside the measuring windows, remove the protective glasses and wipe the inside.

　　The protective glasses of the operator and patient sides are removed by unscrewing the four screws with a precise screwdriver.

　　Remove the face shields before removing the patient's side protective glasses.

Protective glass

Screws

📝 Note	• Attach the protective glasses with the screws just after cleaning.
	Failure to do so could allow dusts to be settled inside the RT-5100. It may affect the viewability or cause malfunction.

6.7　Cleaning Exterior

When the cover or panel becomes dirty, clean it with a soft cloth.
For stubborn stains, soak the cloth in a neutral detergent, wring well, and wipe. Finally dry with a soft, dry cloth.

📝 Note	• Never use an organic solvent such as paint thinner.
	It may ruin the surface of the refractor.

6.8　Cleaning Eye Care Card Reader

After the device is used for an extended period of time, dirt may become adhered to the contact of the Eye Care card reader.

When the Eye Care card is used for data communication between devices, clean the Eye Care card reader with the contact cleaner (optional part No.: 34086-7110) as necessary.

Clean the contact of the Eye Care card as well with a soft cloth as necessary. (For severe dirt, soak the cloth in a dilute neutral detergent, wring well, and wipe. Finally, dry with a soft, dry cloth.)

📝Note
- Be sure to turn off power to the device before cleaning.
- For the usage of the contact cleaner, refer to "Directions for Use" attached to the cleaner.
- The Eye Care card reader contacts are on the lower surface. Repeatedly insert the contact cleaner with the wiper part (cloth-attached surface) facing downward several times to clean the reader contacts.

6.9　Retightening Near Point Chart Holder

When the near point rod is operated frequently for a long period of time, the near point chart holder may become loose and the near point rod may rattle. In such a case, retighten the screw on the near point chart holder with the procedure below.

1 Lower the near point rod.

2 If the screw is loose, tighten it with a hexagonal wrench (2.5 mm).

3 Raise the near point rod back to the vertical position.

Screw

6.10　List of Replacement Parts

Part name	Part number	Remarks
Printer paper	806-20-00001	
Contact cleaner	34086-7110	

7. SPECIFICATIONS AND ACCESSORIES

7.1 Classifications

[Classification under the provision of 93/42/EEC (MDD)]

The RT-5100 is classified as a Class I device.

[Form of protection against electrical shock]

The RT-5100 is classified as Class I.

A Class I device provides protection against electric shock and does not rely on basic insulation only, but which includes additional safety grounding of accessible conductive parts in the fixed wiring in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation.

Use a power outlet which is equipped with a grounding terminal.

[Degree of protection against electrical shock]

The RT-5100 is classified as a device with a Type B applied part.

The Type B applied part provides an adequate degree of protection against electrical shock, particularly regarding the following: - Allowable leakage currents - Reliability of the ground connection (if applicable)

[Degree of protection against liquid entry]

The RT-5100 is classified as IPX0[*39]

The RT-5100 is a normal device, as such does not provide protection with respect to harmful effects due to the ingress of water although it is protected against access to hazardous parts with a solid matter such as a finger of 12.5 mm in diameter.

Avoid exposing water or other liquids to the device.

[Degree of protection against flammability]

The RT-5100 is not suitable for use in a flammable atmosphere.

Do not operate the device near flammable type materials.

[Method(s) of sterilization or disinfection recommended by the manufacturer]

The RT-5100 does not have any part to be sterilized or disinfected.

[Mode of operation]

Continuous operation

[Mode of transport]

Stationary equipment

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*39. **In accordance with IEC 60529.**

7.2　Specifications

○ Measurable range

•	Spherical power	–29.00 to +26.75 D (In increments of 0.12 D/0.25 D/0.5 D to 3.0 D)
		–19.00 to +16.75 D (Cross cylinder test, prism test)
•	Cylindrical power	0.00 to ±8.75 D (In increments of 0.25 D/1 D/2 D/3 D)
•	Cylindrical axis	0 to 180° (In increments of 1°/5°/15°)
•	Pupillary distance	48 to 80 mm (Far mode)
		50 to 74 mm (Near working distance of 35 cm)
		54 to 80 mm (Far PD possible for 100% convergence)
•	Prism	0 to 20∆ (In increments of 0.1∆/0.5∆/2∆)

○ Refractor head

• Auxiliary lens

Cross cylinder lens (±0.25 D, ±0.50 D, ±0.25 D auto-cross cylinder lens)
Occluder
Pinhole plate (φ2 mm)
Red-green filter (Right eye: red, Left eye: green)
Polarizing filters (Right eye: 135°/Left eye: 45°, Right eye: 45°/Left eye: 135°)
Fixed cross cylinder lens (±0.50 D)
Spherical lenses for retinoscope (+1.5 D, +2.0 D)
Red maddox rod (Right eye: horizontal, Left eye: vertical)
Fixed dissociation prism (Right eye: 6∆BU, Left eye: 10∆BI)
Dissociation prism for binocular balance (Right eye: 3 to 10∆BD, Left eye: 3 to 10∆BU)*
Dissociation prism for horizontal phoria (Right eye: 3 to 10∆BU, Left eye: 3 to 10∆BD)*
Dissociation prism for vertical phoria (Right eye: 5 to 15∆BI, Left eye: 5 to 15∆BI)*
Fixed cross cylinder + Dissociation prism for horizontal phoria (Right eye: 3 to 10∆BU, Left eye: 3 to 10∆BD)*
Binocular open fog
*Changeable in 0.5∆ increments for single eye

•	Visual field	40° (VD = 12 mm)
		39° (VD = 13.75 mm)
•	Refraction distance for near vision	350 to 700 mm (Selectable in 50 mm increments)
•	Forehead rest adjustment range	14 ±2 mm
•	Vertex distance marking	12 mm, 14 mm (13.75 mm), 16 mm, 18 mm, 20 mm
•	Level adjustment	±2.5°

○ Control box

•	Display	Dot-matrix screen, color LCD (8.4-inch) with touch panel
•	Eye Care card Reader/Writer	Built-in

○ Power specifications

•	Power source	AC 100 to 240 V (±10%)
•	Frequency	50/60 Hz
•	Power consumption	80 VA

○ Dimensions

•	Refractor head	405 (W) × 102 (D) × 276 (H) mm (Including bracket: 325 (H) mm)
•	Control box	220 (W) × 206 (D) × 200 (H) mm
•	Relay box	194 (W) × 227 (D) × 72 (H) mm
•	Printer	102 (W) × 86 (D) × 121 (H) mm

○ Mass

•	Refractor head	3.5 kg
•	Control box	1.9 kg
•	Relay box	2.2 kg
•	Printer	0.3 kg

○ Environmental conditions (during transport and storage)

•	Temperature	–10 to 55°C (14 to 131°F)
•	Humidity	10 to 85% (No condensation)
•	Pressure	700 to 1060 hPa (during storage), 500 to 1060 hPa (during transport)

○ Environmental conditions (during use)

•	Temperature	10 to 35°C (50 to 95°F)
•	Humidity	30 to 85% (No condensation)
•	Pressure	800 to 1060 hPa
•	Installation location	Interior

○ Others

•	Class of protection for applied part	Type B
•	Class of protection against electric shock	Class I
•	Expected service life (defined by manufacturer)	
		8 years from the date of initial operation
		* Proper maintenance is necessary.
•	Packing unit	1 unit

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7.3 Standard Configuration

7.3.1 Standard configuration

• Refractor head	1 unit
• Control box	1 unit
• Relay box	1 unit
• Printer	1 unit
• Near point chart	1 unit
• Near point rod	1 unit
• Forehead rest	1 unit
• Face shield	1 unit
• Touch-screen pen	1 unit
• Dust cover	1 unit
• Communication cable (MB - RB)	1 unit
• Communication cable (CB - RB)	1 unit
• Printer paper	3 rolls
• Power cord	1 unit
• Ferrite core (only unit and stand types)	3 units
• Hexagonal wrench (2.5 mm)	1 unit
• Operator's manual	1 volume

7.3.2 Optional accessories

- Mirror for examiner
- Eye Care card – a set of five cards
- EyeCa–RW2 (Eye Care card reader/writer)
- Memory box
- Contact cleaner
- Plus Package
- Infrared communication unit

8. APPENDIX

8.1 Descriptions of Power Adjustment

The RT-5100 has the auto and semi-auto adjustment functions. They function depending on refractive errors.

[Auto adjustment] explains how the binocular full correction is adjusted.

[Semi-auto adjustment] explains the semi-auto adjustment after the auto adjustment. The semi-auto adjustment is operated by pressing (symbol)₁ or (symbol)₂ according to the patient's response.

The Final Fit value calculated with the auto adjustment function (Final Fit) is lower than an average prescription. It avoids overcorrecting the patient. Be sure to adjust the value with the semi-auto adjustment function.

In addition, the semi-auto adjustment function should be used depending on a patient's purpose. When the patient use glasses for driving or at night, use (symbol)₂ .

A. Myopia

When the spherical powers of both eyes are negative, or when the spherical power of one eye is negative and the other is 0 D:

A.1 First glasses

For the patient who has not worn glasses. (This adjustment is applicable when the patient does not bring his/her glasses or LM data is not entered in the refractor.)

[Auto adjustment]

- A certain power is reduced from each spherical power.
- The difference between the left and right eyes shall be within 0.75 D.

[Semi-auto adjustment]

(symbol)₂ ⇒ Add –0.25 D to the spherical powers.

Adjustable within the full correction. When the spherical powers are tried to be changed out of the range, short beeps are audible and they do not change.

(symbol)₁ ⇒ Reduce –0.25 D from the spherical powers.

Adjustable within 0 of spherical powers. When the spherical powers are tried to be changed out of the range, short beeps are audible and they do not change.

* When the difference between the left and right spherical powers is large, the powers may be changed up to –0.25 D only. This is because the patient eyes do not adjust to the glasses well with 0 D of monocular vision.

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A.2 With glasses

For the patient who has his/her glasses.

[Auto adjustment]

- A certain power is reduced from each spherical power.
- When the lensometry data is overcorrected, the full correction is selected.
- The difference between the left and right eyes shall be within 0.75 D. However, when the difference in the LM data is large, the adjusted one may be over 0.75 D.
- The amount increased from the LM data shall be within 0.75 D. However, when the difference between the left and right spherical powers in the LM data is large, the increased amount may be over 0.75 D.

[Semi-auto adjustment]

⊘₂ ⇒ Add –0.25 D to the spherical powers.

Adjustable within the full correction. However, the spherical powers can be adjusted within the lensometry data over the full correction only when the LM data is overcorrected.

⊘₁ ⇒ Same as [Semi-auto adjustment] of A.1 First glasses.

B. Hyperopia

When the spherical powers of both eyes are positive, or when the spherical power of one eye is positive and the other is 0 D:

B.1 First glasses

[Auto adjustment]

- The full correction remains as it is basically.
- The difference between the left and right eyes shall be within 0.75 D.

[Semi-auto adjustment]

⊘₂ ⇒ Add –0.25 D to the spherical powers.

Adjustable within the range that the spherical powers are not negative.

⊘₁ ⇒ This key does not function basically.

B.2 With glasses

[Auto adjustment]

- The full correction remains as it is basically.
- The difference between the left and right eyes shall be within 0.75 D. However, when the difference in the LM data is large, the adjusted one may be over 0.75 D.

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[Semi-auto adjustment]

⊘₂ ⇒ Add –0.25 D to the spherical powers.

Adjustable within the range that the spherical powers are not negative.

⊘₁ ⇒ This key does not function basically.

However, the spherical powers can be adjusted to the LM data only when the data is larger than the full correction to positive.

C. Astigmatism

C.1 First glasses

[Auto adjustment]

- A certain power is reduced from each cylindrical power.
- The difference between the left and right eyes shall be within 0.75 D.

[Semi-auto adjustment]

⊘₂ ⇒ Add –0.25 D to the cylindrical powers.

Adjustable within the full correction. When the cylindrical powers are tried to be changed out of the range, short beeps are audible and they do not change.

⊘₁ ⇒ Reduce –0.25 D from the cylindrical powers.

Adjustable within 0 of cylindrical powers. When the cylindrical powers are tried to be changed out of the range, short beeps are audible and they do not change.

* When the difference between the right and left cylindrical powers is large, the powers may be changed up to –0.25 D only. This is because the patient eyes do not adjust to the glasses well with 0 D of monocular vision.

C.2 With glasses

When the LM data has been entered:

[Auto adjustment]

- A certain power is reduced from each cylindrical power.
- When the lensometry data is overcorrected, the full correction is selected.
- The difference between the left and right eyes shall be within 0.75 D. However, when the difference in the LM data is large, the adjusted one may be over 0.75 D.
- The amount increased from the LM data shall be within 0.75 D. However, when the difference between the left and right cylindrical powers in the LM data is large, the increased amount may be over 0.75 D.

[Semi-auto adjustment]

⊘₂ ⇒ Add –0.25 D to the spherical powers.

Adjustable within the full correction. However, the cylindrical powers can be adjusted within the lensometry data over the full correction only when the LM data is overcorrected.

⊘₁ ⇒ Same as [Semi-auto adjustment] of C.1 First glasses.

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D. Oblique Astigmatism

When the cylindrical axis is 16° to 74° or 106° to 164°:

D.1 First glasses

[Auto adjustment]

- The cylindrical powers are set to 0 for the patient who has slight astigmatism in both eyes (C: –0.25 D, –0.50 D).
- A certain power is reduced from each cylindrical power of –0.50 D or more. However, the difference between the left and right eyes shall be within 0.75 D.

[Semi-auto adjustment]

(icon) $\Rightarrow$ Add –0.25 D to the cylindrical powers.

Adjustable within the full correction.

(icon) $\Rightarrow$ The cylindrical powers and axis are adjusted in the following order:

- Reduce –0.25 D from the cylindrical powers.
- Change the axis to either 90° or 180° (closer one).
- Reduce certain powers from the cylindrical ones and change the axis.

* When the difference between the right and left cylindrical powers is large, the powers may be changed up to –0.25 D only. This is because the patient eyes do not adjust to the glasses well with 0 D of monocular vision.

D.2 With glasses

When the LM data has been entered:

[Auto adjustment]

- A certain power is reduced from each cylindrical power.
- When the lensometry data is overcorrected, the full correction is selected.
- The difference between the left and right eyes shall be within 0.75 D. However, when the difference in the LM data is large, the adjusted one may be over 0.75 D.
- The amount increased from the LM data shall be within 0.75 D. However, when the difference between the left and right cylindrical powers in the LM data is large, the increased amount may be over 0.75 D.

[Semi-auto adjustment]

Same as [Semi-auto adjustment] of D.1 First glasses.

E. Myopia/Hyperopia and Astigmatism in Combination

The spherical and cylindrical powers are adjusted respectively as described in A. Myopia to D. Oblique Astigmatism.

F. Anisometropia

Based on the concept that the difference between left and right powers is within 0.75 D, the patient who has the difference of 1 D or more is regarded as anisometropia. The higher power is adjusted close to the lower one as described in A. Myopia to D. Oblique Astigmatism.

When the LM data is entered in the refractor, the auto adjustment function adds 0.75 D to the higher power side of the lensometry data.

G. One is Myopia and the Other is Hyperopia

The auto adjustment is not performed. The "Dominant far: + S → 0 Dominant near: − S → 0" message appears.

When the right and left powers are low, correction may be not necessary. However, it is recommended to adjust the powers depending on the patient's purpose.

For the patient who uses glasses for distance (far) correction

→ Adjust the positive spherical power close to 0.

For the patient who uses glasses for near correction

→ Adjust the negative spherical power close to 0.

For example: SPH R +1.00 D, L −1.00 D, To correct the powers for distance:

Press ⬡S .
Press Ⓡ .

Then turn the dial clockwise until the best VA is obtained.

This adjustment should be performed manually by the operator. Copy the full correction and compare the viewability for easy adjustment.

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8.2   Linkage between Charts and Auxiliary Lenses

The following table shows the auxiliary lenses linked to the charts when the Chart link parameter is set to Yes.

Chart	Auxiliary lens		Mode
	Right eye	Left eye	
VA charts	◯ or ●		S
Astigmatism clock dial	◯ or ●		C/A
Red-green	◯ or ●		S
Dots	◯ or ●		A/C (XC mode)
Binocular balance	◍ Polarizing filters ◍ [*1]		S
Binocular red-green	◍ Polarizing filters ◍ [*1]		S
Phoria	◍ Polarizing filters ◍ [*2]		Prism H/V
Phoria with fixation	◍ Polarizing filters ◍ [*2]		Prism H/V
Vertical coincidence Mallet (horizontal bars)	◍ Polarizing filters ◍ [*2]		Prism V
Horizontal coincidence Mallet (vertical bars)	◍ Polarizing filters ◍ [*2]		Prism H
Stereo	◍/◍ Polarizing filters ◍/◍ [*2]		—
Worth	Red filter ●	Green filter ◔	—
Vertical line	6△BU prism	◯	Prism H
Horizontal line	◯	10△BI prism	Prism V
Fixation	Horizontal maddox ▤/◯	◯/Vertical maddox ▥	Prism H/V
Schober	Red filter ●	Green filter ◔	Prism H/V
Cross grid for near point	Fixed cross cylinder lens ◌ or ●		ADD
VA chart for near point	◯		ADD

*   The slash "/" indicates that the auxiliary lens changes alternately each time the chart button is pressed. The lens on the right side is placed in the first pressing of the chart button.

*   The Prism H indicates base in/out prism (BI/BO) and V indicates base up/down prism (BU/BD).

*   In the SSC-350T and TCG, the auxiliary lenses corresponding to the stereo test are open.

*1 The auxiliary lenses (3△BD to the right, 3△BU to the left eye) are inserted when the SC-2000 or the SC-1600 is connected.

*2 The auxiliary lenses (red filter on the right, green filter on the left) are inserted when the SC-2000 or the SC-1600 is connected.

8.3   VA Conversion Table

Decimal	Fraction (feet)	Fraction (meters)
0.03		6/200
0.032	20/600	
0.04	20/500	6/150
0.05	20/400	6/120
0.06		6/100
0.063	20/320	
0.08	20/250	6/75
0.1	20/200	6/60
0.125		6/48
0.15	20/150	
0.16		6/38
0.2	20/100	6/30
0.25	20/80	6/24
	20/70	
0.3		6/20
0.32	20/60	
0.4	20/50	6/15
0.5	20/40	6/12
0.6		6/10
0.63	20/30	
0.7		
0.8	20/25	6/7.5
0.9		
1.0	20/20	6/6
1.2		6/5
1.25		
	20/15	
1.5		6/4
1.6		
2.0	20/10	6/3
2.5		

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8.4   Preset Addition Power

The preset addition (ADD) powers are lower than the expected ones corresponding to the patient's age by three increments (0.75 D).

Age	Expected ADD power (D)	RT-5100		
			Preset ADD power (D)	
		Age	When "Preset ADD" parameter is set to "Setting 1(Low)"	When "Preset ADD" parameter is set to "Setting 2(High)"
45	1.5	45 or younger	0.75	1.00
50	2.00	− 50	1.25	1.75
55	2.25	− 55	1.50	2.00
60	2.50	− 60	1.75	2.25
65	2.75	− 65	2.00	2.50
70	3.00	66 or older	2.25	3.00
75	3.25			

*When the "Preset ADD" parameter is set to "Non", the add power is not preset.

8.5 Relational Table of Age and Accommodation

For an accommodation used as the basis for calculation of the range of clear vision, accommodation suggested according to the age can be used.

Age	Accommodation (D)
10	13.2
15	11.2
20	9.8
25	8.5
30	7.3
35	6.1
40	4.9
45	3.4
50	2.3
55	1.6
60	1.2
65	0.7
70	0.3

*Reference: Sakuyama, Fujio ed. and Izumi, Yukio, *Ippankussetsukensa*

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8.6   Estimated Visual Acuity Table

The estimated unaided VA is calculated from the AR (objective) data. The estimated aided VA is calculated by subtracting the LM data from the AR data. For the patient who has cylindrical powers, add –CYL to the spherical power.

The unaided VA is minimum and the aided VA is 20/30 without the AR data.

Spherical power (D)	Estimated VA value		
	Decimal	Fraction (feet)	Fraction (meters)
From –7.25	0.03	20/600	6/200
	0.032		
–6.25 to –7.00	0.04	20/500	6/150
–5.25 to –6.00	0.05	20/400	6/120
–4.25 to 5.00	0.06	20/320	6/100
	0.063		
–3.25 to –4.00	0.08	20/250	6/75
–2.25 to –3.00	0.1	20/200	6/60
–2.00	0.2	20/100	6/30
–1.75	0.3	20/60	6/20
	0.32		
–1.50	0.4	20/50	6/15
–1.25	0.5	20/40	6/12
–1.00	0.6	20/30	6/10
	0.63		
–0.75	0.7		6/7.5
–0.50	0.8	20/25	
–0.25	0.9	20/20	6/6
0	1.0		

*   The table may not correspond to the VA depending on the chart type.

8.7 Fog Amount in Binocular Balance

The vision is fogged automatically during the binocular balance test when the Fog for binocular balance parameter is set to Yes.

VA value (subjective)			Binocular fog amount (D)
Decimal	Fraction (feet)	Fraction (meters)	
Up to 0.8	Up to 20/25	Up to 6/7.5	0
0.9	–	–	+0.25
1.0	20/20	6/6	+0.25
1.2	–	6/5	+0.50
1.25	–	–	+0.50
–	20/15	–	+0.50
1.5	–	6/4	+0.50
1.6	–	–	+0.50
2.0	20/10	6/3	+0.75
2.5	–	–	+0.75

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8.8   Standard Programs

The RT-5100 has five programs of A, B, C, D and E, which can be programmed by the user.
The following standard programs have already been written in Programs A and B as factory setting.

○ Program A: Precision course 1

The final prescription is obtained after the monocular full correction (subjective data) is stored. The binocular balance test and auto adjustment are performed in the final field. Then the precise addition power is measured with the cross grid for near point in the subjective field.
(R: right eye, L: left eye, B: binocular eye)

1. AR data entry	Enter the AR data.
<Unaided field>	
2. Unaided VA test	Measure the unaided VA.
<Aided field>	
3. LM data entry	Enter the LM data.
4. Aided VA entry	Measure the aided VA.
<Subjective field>	
5. R: AR data check	Check that the VA is about 20/30 in the AR data.
6. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
7. R: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
8. R: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
9. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
10. R: Best possible VA check (monocular full correction)	
	Best possible VA on the chart with the most plus power
11. L: AR data check	Check that the VA is about 20/30 in the AR data.
12. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
13. L: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
14. L: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
15. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
16. L: Best possible VA check (monocular full correction)	
	Best possible VA on the chart with the most plus power
<Final field>	
17. B: Binocular balance test	Test the binocular balance.
18. B: Stereo test	Check the steroscopic vision and enter the stereoparallax
19. B: Power adjustment (auto)	Power adjustment depending on the purpose (auto adjustment)

<Subjective field>

20. B: Addition power measurement

Measure the addition power with the cross grid chart for near point

<Final field>

21. B: Addition power check   Check the addition power with the near VA chart.

○ Program B: Precision course 2

The unaided and aided VA tests and auto adjustment are omitted from Program A.
It is necessary to enter the objective and subjective (copied from the objective) data with an auto refractometer before Program B.

<Subjective field>

1. R: AR data check   Check that the VA is about 20/30 in the AR data.

2. R: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

3. R: Cross cylinder test (axis)   Measure the cylindrical axis with the cross cylinder lens.

4. R: Cross cylinder test (power)   Measure the cylindrical power with the cross cylinder lens.

5. R: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

6. R: Best possible VA check (monocular full correction)

Best possible VA on the chart with the most plus power

7. L: AR data check   Check that the VA is about 20/30 in the AR data.

8. L: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

9. L: Cross cylinder test (axis)   Measure the cylindrical axis with the cross cylinder lens.

10. L: Cross cylinder test (power)   Measure the cylindrical power with the cross cylinder lens.

11. L: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

12. L: Best possible VA check (monocular full correction)

Best possible VA on the chart with the most plus power

<Final field>

13. B: Binocular balance test   Test the binocular balance.

14. B: Stereo test   Check the steroscopic vision and enter the stereoparallax

15. B: Power adjustment   Power adjustment depending on the purpose (auto adjustment)

<Subjective field>

16. B: Addition power measurement

Measure the addition power with the cross grid chart for near point

<Final field>

17. B: Addition power check   Check the addition power with the near VA chart.

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○ Programs C to E: Empty

○ Program ☀☽ : Day/Night measurement course

☀☽ (Day/Night measurement course) is a course performing night measurement after the day measurement.
The Day course is a course to achieve the best possible visual acuity with the most plus power based on the objective measurement data. The Night course is a course to achieve the best possible visual acuity with the most plus power for night vision based on the full correction value for daytime vision.
It is necessary to enter the objective and subjective (copied from the objective) data with an auto refractometer before Program ☀☽ .

<For Day>

1. R: AR data check	Check that the VA is about 20/30 in the AR data.
2. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
3. R: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
4. R: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
5. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
6. R: Best possible VA check (monocular full correction)	
	Best possible VA on the chart with the most plus power
7. L: AR data check	Check that the VA is about 20/30 in the AR data.
8. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
9. L: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
10. L: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
11. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
12. L: Best possible VA check (monocular full correction)	
	Best possible VA on the chart with the most plus power
13. B: Binocular balance test	Test the binocular balance.
14. B: Stereo test	Check of stereophonic vision and input of stereoparallax
15. B: Best possible VA check Power adjustment	
	Best possible VA on the chart with the most plus power
16. B: Addition power measurement	
	Measure the addition power with the cross grid chart for near point
17. B: Addition power check	Measure the VA in the addition power with the near VA chart

<For Night>

18. R: VA measurement using day data in Night mode	
	Measure the VA with the day data in night brightness
19. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
20. R: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.

21. R: Cross cylinder test (power)   Measure the cylindrical power with the cross cylinder lens.

22. R: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

23. R: Best possible VA check (monocular full correction)

    Best possible VA on the chart with the most plus power

24. L: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

25. L: Cross cylinder test (axis)   Measure the cylindrical axis with the cross cylinder lens.

26. L: Cross cylinder test (power)   Measure the cylindrical power with the cross cylinder lens.

27. L: Red-green test   Spherical refinement with the red-green chart (fog + 0.5)

28. L: Best possible VA check (monocular full correction)

    Best possible VA on the chart with the most plus power

29. B: Binocular balance test   Test the binocular balance.

30. B: Stereo test   Check of stereophonic vision and input of stereoparallex

31. B: Best possible VA check power adjustment

    Best possible VA on the chart with the most plus power

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○ Program #7: Full correction measurement course (only for Plus Package)

#7 (full correction measurement course) is a course to achieve the best possible visual acuity with the most plus power based on the objective measurement data.

It is necessary to enter the objective and subjective (copied from the objective) data with an auto refractometer before Program #7.
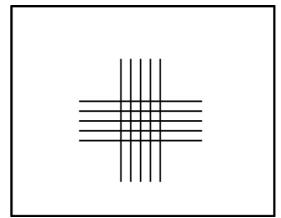
<Subjective field>

|		
1. R: AR data check	Check that the VA is about 20/30 in the AR data.
2. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
3. R: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
4. R: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
5. R: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
6. R: Best possible VA check (monocular full correction)	
	Best possible VA on the chart with the most plus power
7. L: AR data check	Check that the VA is about 20/30 in the AR data.
8. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
9. L: Cross cylinder test (axis)	Measure the cylindrical axis with the cross cylinder lens.
10. L: Cross cylinder test (power)	Measure the cylindrical power with the cross cylinder lens.
11. L: Red-green test	Spherical refinement with the red-green chart (fog + 0.5)
12. L: Best possible VA check (monocular full correction)	
	Best possible VA on the chart with the most plus power
13. B: Binocular balance test	Test the binocular balance.
14. B: Best possible VA check Power adjustment	
	Best possible VA on the chart with the most plus power
15. B: Addition power measurement	
	Measure the addition power with the cross grid chart for near point
16. B: Addition power check	Measure the VA in the addition power with the near VA chart

8.9 Near Point Chart (Standard)

V R Z
0.1   20/200

D S K E R O V
0.2   20/100

C V K O Z V C K S N
R S E D H O H Z D R
0.25   20/80 0.32   20/60
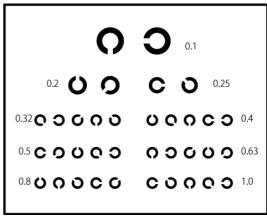
1: Letters 0.1 - 0.32

2: Cross Grid

8 5 6 4 2

3: Numbers(H) 0.63 (40 cm)

0.1
0.2   0.25
0.32   0.4
0.5   0.63
0.8   1.0
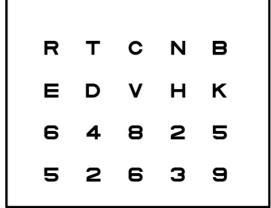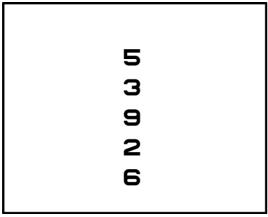
4: Landolt's rings (40 cm)
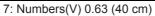
S C H O   V Z D   N R K E
O Z R E   C H S   D K V N
0.4   20/50
H C Z D   N E V   K R S E
Z D E V   O S H   R C N K
0.5   20/40
K C N D   V Z R   H S E O
V H S C   D E Z   D N K R
0.63   20/30
CNKO RVD ESHZ SEON RCH KZVD
ERHZ KDN COVS DVCK ZNE OHSR
0.8   20/25 1.0   20/20

5: Letters 0.4 - 1.0

R   T   C   N   B

E   D   V   H   K

6   4   8   2   5

5   2   6   3   9
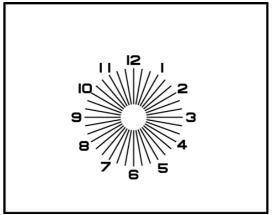
6: Letters&Numbers 0.63 (40 cm)

8

7: Numbers(V) 0.63 (40 cm)

8: Astigmatism

8.10 Near Point Chart II

A: Letters (40 cm)

B: Cross Grid

C: Numbers(H) 0.63 (40 cm)

D: Numbers(H) 1.0 (40 cm)

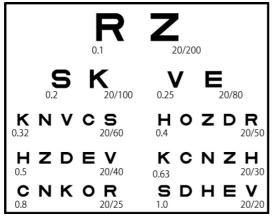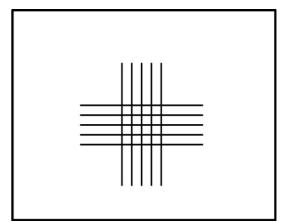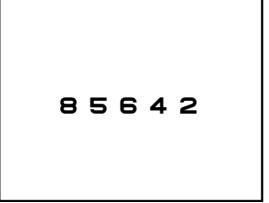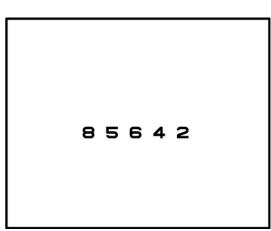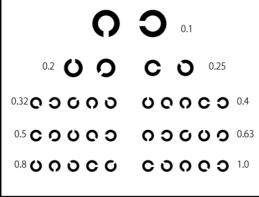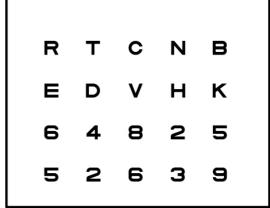E: Landolt's rings (40 cm)

F: Letters&Numbers 0.63 (40 cm)

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G: Numbers(V) 0.63 (40 cm)

H: Numbers(V) 1.0 (40 cm)

9. EMC (ELECTROMAGNETIC COMPATIBILITY)

The device complies with the International Electrotechnical Commission standards (IEC 60601-1-2:2007) for electromagnetic compatibility.

⚠ WARNING

- Use the specified accessories, optional accessories, and cables.
  Otherwise increased emissions or decreased immunity of the device may result.

- Do not use the device near, on, or under other electronic equipment.

⚠ CAUTION

- The device needs special precautions regarding EMC.
  The device needs to be installed and used in accordance with the EMC information provided in this manual.

- Portable and mobile RF communications equipment can affect the device.

O Specified cable

Part name	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
Power cable	No	No	No	2.5
Cable MB	Yes	Yes	No	7.0
Cable CB	Yes	Yes	No	5.0
Cable PR	Yes	Yes	No	2.0
Communication cable (AR)	Yes	Yes	Yes	15.0
Communication cable (LM)	Yes	Yes	Yes	15.0
Communication cable (CP)	Yes	Yes	Yes	15.0
Communication cable (PC)	Yes	Yes	Yes	15.0
Power cable (AR)	No	No	No	2.5
Power cable (LM)	No	No	No	2.5
Power cable (CP)	No	No	No	2.5
DC cable (PC)	No	No	No	1.8
Power cable (PC)	No	No	No	0.7

O Essential performance

Subjective refraction function

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EMC (ELECTROMAGNETIC COMPATIBILITY):

Guidance and manufacturer's declaration - electromagnetic emissions		
The device is intended for use in the electromagnetic environment specified below. The customer or the user of the device should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The device uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The device is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	*1	
Voltage fluctuations/ Flicker emissions IEC 61000-3-3	*2	

* 1   For the regions where the rated voltage is 220 V or greater, this device complies with class A. For the regions where the rated voltage is 127 V or less, this standard is not applicable.

* 2   For the regions where the rated voltage is 220 V or greater, this device complies with this standard. For the regions where the rated voltage is 127 V or less, this standard is not applicable.

Guidance and manufacturer's declaration - electromagnetic immunity			
The device is intended for use in the electromagnetic environment specified below. The customer or the user of the device should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floor should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage, dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 sec	<5% U_T (> 95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the device requires continued operation during power mains interruptions, it is recommended that the device be powered from an uninterruptible power supply or a battery.
Power frequency (50/ 60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration - electromagnetic immunity			
The device is intended for use in the electromagnetic environment specified below. The customer or the user of the device should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 Vrms $(V_1=3)$ 3 V/m $(E_1=3)$	Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d=1.2\sqrt{P}$ 150 kHz to 80 MHz $d=1.2\sqrt{P}$ 80 MHz to 800 MHz $d=2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the device.			
[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Recommended separation distances between portable and mobile RF communications equipment and the device			
The device is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the device as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**		
	150 kHz to 80 MHz $d=1.2\sqrt{P}$	**80 MHz to 800 MHz** $d=1.2\sqrt{P}$	**800 MHz to 2.5 GHz** $d=2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

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EMC (ELECTROMAGNETIC COMPATIBILITY):

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10. INDEX

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│　　　IMPORTANT—READ CAREFULLY
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│ THIS AGREEMENT APPLIES TO THE NIDEK SOFT-
│ WARE AND ACCOMPANYING DOCUMENTS. PLEASE
│ READ THIS AGREEMENT CAREFULLY AND THOR-
│ OUGHLY BEFORE USING SOFTWARE.
└───┘

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3.8. You may not use NIDEK's trademarks or trade names without prior written consent of NIDEK.

4. EXPORT RESTRICTIONS

4.1. If you export or re-export, directly or indirectly, the Software, you must comply with applicable export laws and regulations of Japan and other countries, and obtain any licenses or approvals required by governmental authorities.

5. UPDATES

5.1. The Software and/or the Third-Party-Software may be, at NIDEK's own discretion, changed, updated or modified from time to time without any prior notice to you. If such changes, updates, and modifications are applied to the Software licensed to you under this Agreement, such changes, updates, and modifications will be deemed a constituent part of the Software, and the terms and conditions of this Agreement will apply to such changes, updates, and modifications.

5.2. NIDEK may, at its own discretion, make amendments to any provisions of this Agreement ("Amendments"), if NIDEK deems (a) that such Amendments are appropriate in terms of interests for customers of this Software, or (b) that such Amendments are commercially reasonable and not contrary to the objective of this Agreement. 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. TERMINATION

6.1. 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.

6.2. If this Agreement is terminated for any cause, 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.

7. NO WARRANTIES

7.1. NIDEK MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE SOFTWARE AND THE THIRD-PARTY-SOFTWARE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, INCLUDING, WITHOUT LIMITATION, THIRD PARTY INTELLECTUAL PROPERTY RIGHTS, ACCURACY, RELIABILITY OR AVAILABILITY, ABSENCE OF OR RECOVERY FROM ANY INTERRUPTION, ERROR-FREE OPERATION OR CORRECTION OF DEFECTS.

8. LIMITATION OF LIABILITY

8.1. 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. 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, LOSS, CLAIMS OR COSTS.

9. GOVERNING LAW AND ARBITRATION

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

9.2. 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.

10. SEVERABILITY

10.1.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.

11. SURVIVAL

11.1.The provisions of 2, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17 and this provision will survive the termination of this Agreement and will be binding after the termination of the Agreement.

12. ASSIGNMENT

12.1.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.

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

13. ENTIRE AGREEMENT

13.1.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.

14. NO WAIVER

14.1.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.

15. NO THIRD PARTY RIGHTS

15.1.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.

16. HEADINGS

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

17. LANGUAGE

17.1.In any countries outside Japan, this Agreement has been executed and delivered in a text using the English language. If translations into languages other than Japanese are attached with the English language, the text using the English language shall be controlling.