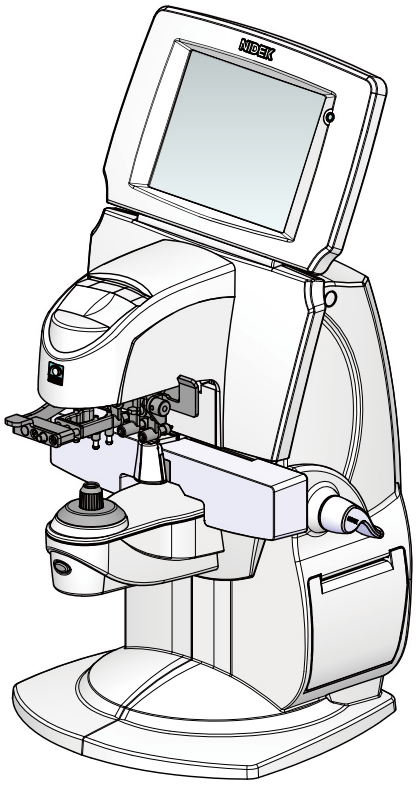
NIDEK

AUTO LENSMETER

LM-1800P/LM-1800PD

OPERATOR'S MANUAL



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

Original instructions

NIDEK CO., LTD.

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

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

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

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

7. TERMINATION

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

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

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

9.2. THE LIMITATIONS PROVIDED IN THE PROVISION OF 9.1. SHALL NOT APPLY IN THE CASE WHERE THE DAMAGES ARE ATTRIBUTABLE TO NIDEK OR NIDEK IS LIABLE FOR SUCH DAMAGES IN ACCORDANCE WITH THE LAWS. EVEN IN SUCH CASE, NIDEK SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, PUNITIVE OR SPECIAL LOSS OR DAMAGE. NIDEK'S TOTAL AGGREGATE LIABILITY FOR THE DAMAGES SHALL NOT EXCEED AN AMOUNT ACTUALLY PAID BY YOU FOR PURCHASE OF NIDEK PRODUCT; PROVIDED, HOWEVER, THAT THE LIMITATION OF THE AMOUNT SHALL NOT APPLY IN THE CASE WHERE THE APPLICABLE LAW PROHOBITS SUCH LIMITATION OR THE DAMAGES ARISING FROM NIDEK'S GROSS NEGLIGENCE OR WILLFUL MISCONDUCT.

10. GOVERNING LAW AND ARBITRATION

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

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

11. SEVERABILITY

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

12. SURVIVAL

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

13. ASSIGNMENT

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

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

14. ENTIRE AGREEMENT

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

15. NO WAIVER

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

16. NO THIRD PARTY RIGHTS

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

17. HEADINGS

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

18. LANGUAGE

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

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

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

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

Use this device properly and safely.

⚠ **BEFORE USE, READ THIS MANUAL.**

This operator's manual includes operating procedures, safety precautions, and specification for the NIDEK AUTO LENSMETER, LM-1800P/LM-1800PD.

Cautions for safety and operating procedures must be thoroughly understood before using this device.

Keep this manual handy for reference.

The device complies with ISO 8598:1996/C1:1998 (Optics and optical instruments - Focimeters).

There are no parts within the device that require servicing by the user other than printer paper.

This manual is described mainly using the screen samples of the LM-1800P.

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

CAUTION! Federal law restricts this device to sale by or on the order of a physician or other 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**" may result in serious injury under certain conditions. Safety precautions must be strictly followed at all times.

Usage precautions

Before use

⚠ **WARNING**

- **If any serious device-related incident occurs, report it to Nidek and the competent authority in the country where the user or patient, or both reside.**

⚠ **CAUTION**

- **Never use the device for other than its intended purpose.**
  NIDEK will not assume responsibility for accidents or malfunction caused by misuse.
- **Never modify or touch the internal structure of the device.**
  Electric shock or malfunction may result.
- **Install the device in an environment that meets the conditions listed below.**
  The following conditions must be maintained during use.
  Ambient temperature: 10 to 35ºC (50 to 95ºF)
  Humidity: 30 to 85% (Non-condensing)
  Atmospheric pressure: 800 to 1060 hPa
  Minimal dust in the air
  Protection from extraneous light sources
  Level and stable surface free from vibration and bumping
- **Install the device in an environment where no contaminant such as corrosive gas, acid, or salt is contained in the air.**
  Corrosion or malfunction of the device may result.
- **Avoid installing the device where it is exposed to direct air flow from an air conditioner.**
  Changes in temperature may result in condensation inside the device or adversely affect measurements.
- **Avoid installing the device where it is exposed to direct sunlight or near an incandescent lighting. A light-reflecting surface such as a glass showcase or a shiny table is not appropriate for precise work either.**
  Installing the device in such a place may cause the device to malfunction or issue error messages.
- **Be sure to use a power outlet which meets the specified power requirements.**
  If the supplied voltage is too high or low, the device may not perform up to specifications, and malfunction or fire may result.
- **Be sure to use a grounded power outlet.**
  Electric shock or fire may result in the event of malfunction or power leakage.
- **Insert the power plug fully into the power outlet.**
  Imperfect connection may result in fire
- **Never use power strips or extension cables for the power supply of the device.**
  Overloading the electric outlet may cause overheating and fire.

⚠ **CAUTION**

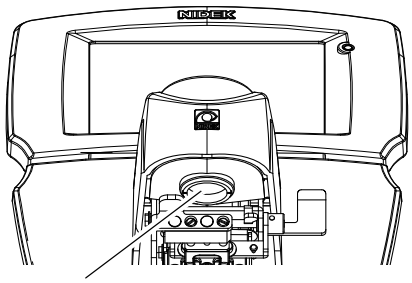
- **Do not use any power cord other than the one provided. Do not use the provided cord for any other instrument.**
  Malfunction or fire may result.
- **Install the device where the outlet that the power plug is inserted into is easily accessible during use. In addition, ensure that the power plug can be disconnected without the use of a tool.**
  Otherwise, it may interfere with disconnection the device from the input power source in case of abnormality.
- **Never crush or pinch the power cord with heavy objects.**
  Damage may result in electric shock or fire.
- **Before connecting any cable to the device, be sure to turn off power to the device and unplug the power cord.**
  Malfunction may result.
- **Before carrying the device to another location, use dedicated packaging materials to protect the device from impact of dropping.**
  Excessive vibration or impact to the device may cause malfunction.

During use

⚠ **CAUTION**

- **Immediately replace the power cord if the internal wires are exposed, the power turns on or off when the power cord is moved, or the cord or plug is too hot.**
  Failure to do so may result in electric shock or fire.
  Immediately remove the plug from the power outlet and contact NIDEK or your authorized distributor for replacement.
- **There may be a few "constantly-lit", "missing", or "dead" pixels in your LCD monitor which are a characteristic of the LCD monitor manufacturing process. This does not represent a failure of the LCD monitor, and the monitor can be used with no problem.**
- **During transmittance measurement, ultraviolet rays are emitted from the LED aperture. Do not look directly at the beam.**

[During transmittance measurement]



LED aperture

After Use

⚠ **CAUTION**

- **While the device is not in use, turn it off.**
- **The device uses a heat-sensitive printer paper. To keep the printed data for a long period of time, make copies of the printouts.**
  The paper degrades over time and the printed data may become illegible.
- **Always hold the power plug, not the cord, when removing it from the power outlet.**
  The metal core of the cord may be damaged and electric shock, malfunction, or fire may result.
- **Occasionally clean the prongs of the power plug with a dry cloth.**
  If dust settles between the prongs, the dust could collect moisture, and short circuit or fire may occur.
- **If the device will not be used for an extended period of time, disconnect the power cord from the power outlet.**
  Failure to do so may leave the device vulnerable to electric disturbances which may result in fire.
- **Maintain the ambient temperature and humidity in the following ranges during transport and storage of the system in the packed condition.**
  During transport
  Ambient temperature: -20 to 60ºC (-4 to 140ºF)
  Humidity: 10 to 85% (Non-condensing)
  Atmospheric pressure: 500 to 1060 hPa\
  During storage
  Ambient temperature: -10 to 55ºC (14 to 131ºF)
  Humidity: 10 to 85% (Non-condensing)
  Atmospheric pressure: 500 to 1060 hPa
  A location not exposed to water
  A location with low dust
  A location not exposed to direct sunlight
- **When transporting the device, use the special packing materials to protect the instrument from shock or impact.**
  Excessive vibration or impact to the instrument may cause malfunction.
- **Be sure to hold the device with both hands when lifting and carrying it.**

Maintenance

⚠ **CAUTION**

- **Only service personnel trained by NIDEK are allowed to repair and service the device.**
  NIDEK assumes no responsibility for any adverse events resulting from improper servicing.
- **When performing maintenance work, secure a sufficient maintenance space.**
  Maintenance work in an insufficient space may result in injury.
- **Take special care not to scratch the protective glass under the nosepiece.**
  Flaws on the glass substantially lower the reliability of measurement.
- **Clean the protective glass under the nosepiece every once in a while with a blower.**
  If dust settles on the protective glass, it may affect the measurement accuracy.
- **If you have doubts about the accuracy of measured values, measure a lens whose values are known (such as a trial lens).**
  If the measured results are substantially different from the known values of the lens, contact Nidek or your authorized distributor for calibration.

Disposal

⚠ **CAUTION**

- **Follow local governing ordinances and recycling plans regarding disposal or recycling of system components.**
  It is recommended to entrust 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 governing ordinances and recycling plans.**
  Inappropriate disposal may contaminate the environment.

Connection to Network

⚠ **CAUTION**

- **If the medical system is to be configured using an IT network, implement IT security measures with the network administrator, and check that the system operates properly.**
  Virus infection, unauthorized access, or data tampering may result.

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1 BEFORE USE

1.1 Device Outline

The NIDEK AUTO LENSMETER LM-1800P/LM-1800PD measures the optical performance of spectacle lenses such as single vision, bifocal (trifocal), and progressive power lenses or contact lenses.
This device has a measuring unit and a display unit in front, and a printer unit on the right side. The measuring unit is comprised of a nosepiece, lens table, lens holder, and lens marker. Below the nosepiece, there is a read button for reading measured data.

LM-1800P	Equipped with the printer
LM-1800PD	Equipped with the printer and PD measurement function

The display unit employs a sharp TFT color LCD, displaying touch panel buttons, measured data, alignment condition of a lens, and settings of the device.

The device also offers the following features as well as the above:

- Equipped with an Eye Care card writer that enables transfer of measured data to other devices with no cables.
- Equipped with a quiet, high-speed, and high-quality line printer that automatically cuts printouts.
- Utilizes a marker suitable for water-repellent or super water-repellent lenses.
- Connectable to a personal computer via USB and LAN interfaces in addition to the standard RS-232C communication protocol used by NIDEK optometry devices.
- Performs area measurement for the refractive power of the lens at multiple points simultaneously.

  Makes measurement easier and more accurate by detecting changes in the refractive power of a progressive power lens.

  Changes measurement mode automatically when a progressive power lens is detected.
- Measures the pupillary distance (PD) and lens diameter. (LM-1800PD only)
- Measures the progressive length and channel width of progressive power lenses. (LM-1800PD only)
- Measures the visible light (GREEN, center wavelength of 535nm) and ultraviolet rays (UV, center wavelength of 365 nm) transmittance.
- Measures the convex surface add power.
- Automatic functions such as auto read, auto R/L selection, and auto add measurement provide for easier and quicker measurement.
- Auto R/L selection and auto print functions are available for contact lenses.
- Indication position of R/L data on printouts can be changed.
- Software for easy measurement of the refractive index is available as option.
- Lens distortion can be checked easily.

1.2 Intended Use

This device is designed to measure vertex powers and prismatic effects of spectacle and contact lenses, to orientate and mark uncut lenses, and to verify the correct mounting of lenses in spectacle frames.

1.3 Intended User Profile

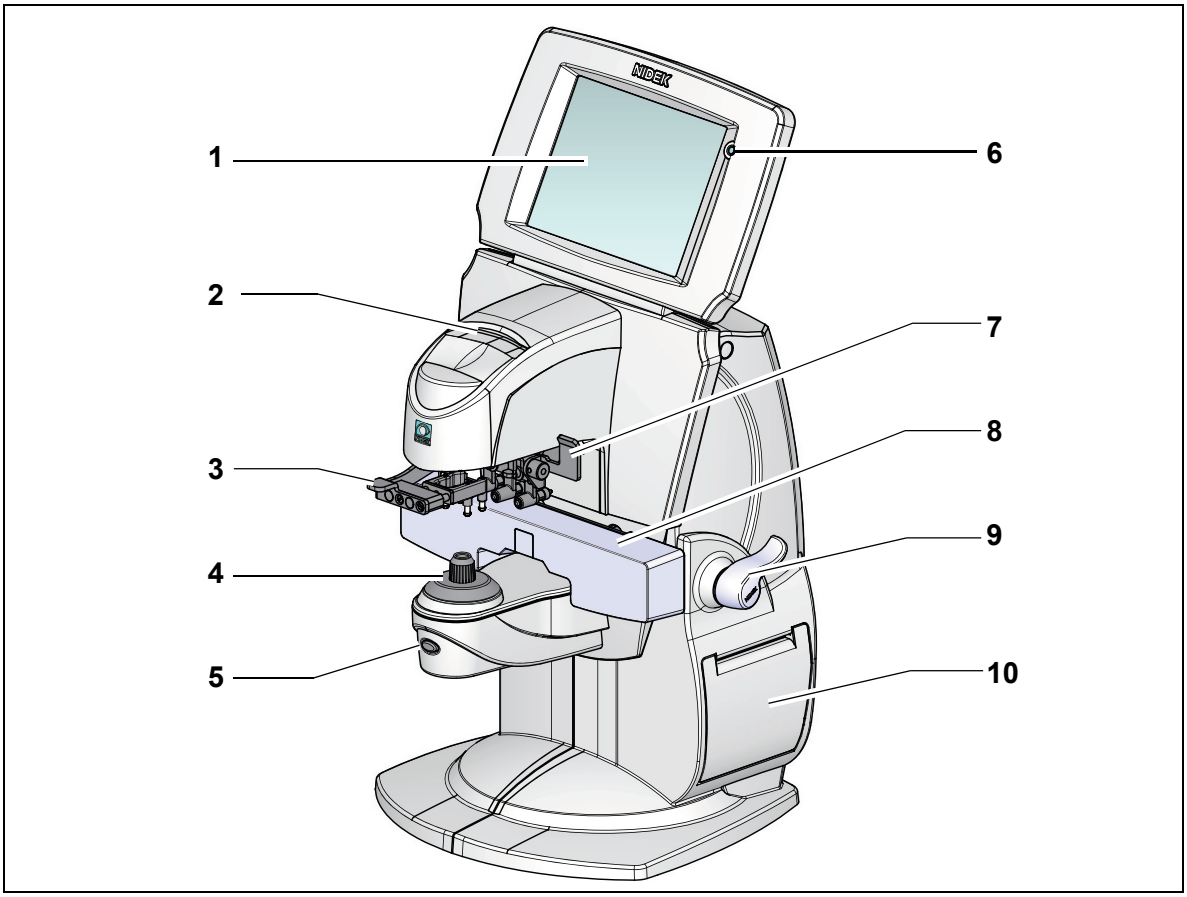
Any qualified personnel such as ophthalmologists, nurses, or optometrists (irrespective of nationality, culture, or style of dress)

1.4 Intended Use Environment

Medical facility, optical store, or optical lens laboratory

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

1.5 Device Configuration



1. Touch panel display

640 × 480 dots color liquid crystal display. The display angle can be changed by 30 degrees or less.

Adjust it to the desired angle.

2. Eye Care card slot

Used to save measured data.

Never remove the Eye Care card while it is being accessed.

When the Eye Care card is inserted while the measured data is saved in the memory of the LM-1800P/LM-1800PD, the data is automatically written to the card.

3. Lens holder lever

Used to operate the lens holder.

To secure a lens	Lift once and lower gently.
To release a lens	Lift until it clicks.

4. Nosepiece

A lens to be measured is placed on the nosepiece. This is the base point for measurements.

When measuring contact lenses, replace the standard nosepiece with the provided one for contact lenses.

Before measurement, make sure that the lens contact part has no foreign matters or scratches.

5. Read button 

Used to read measured data.

This button locks in the measurement data on the screen to be saved in the memory.
When a measurement error occurs, the read button becomes disabled.
Extended pressing of the button for about 1 second starts the transmittance measurement.

6. Pilot lamp

Indicates On or Off of the power to the device.

On	Power turned on
Off	Power turned off
Fast blinking	Extended pressing of a button enabled
Blinking	Display auto off mode

•Display auto off mode

When the device is idle for the time set with the Auto off parameter, the display auto off function works and then the display turns off automatically. The measurement light source also turns off.
To recover from auto off mode, press any button.
During lens measurement, the device will not be placed into display auto off mode.

7. Marking lever

Used to mark a lens by pushing the lever down.

8. Lens table

Touched to the bottom of the lens frames.

To display an uncut lens diameter, place the lens so that its edge comes into contact with the lens table.

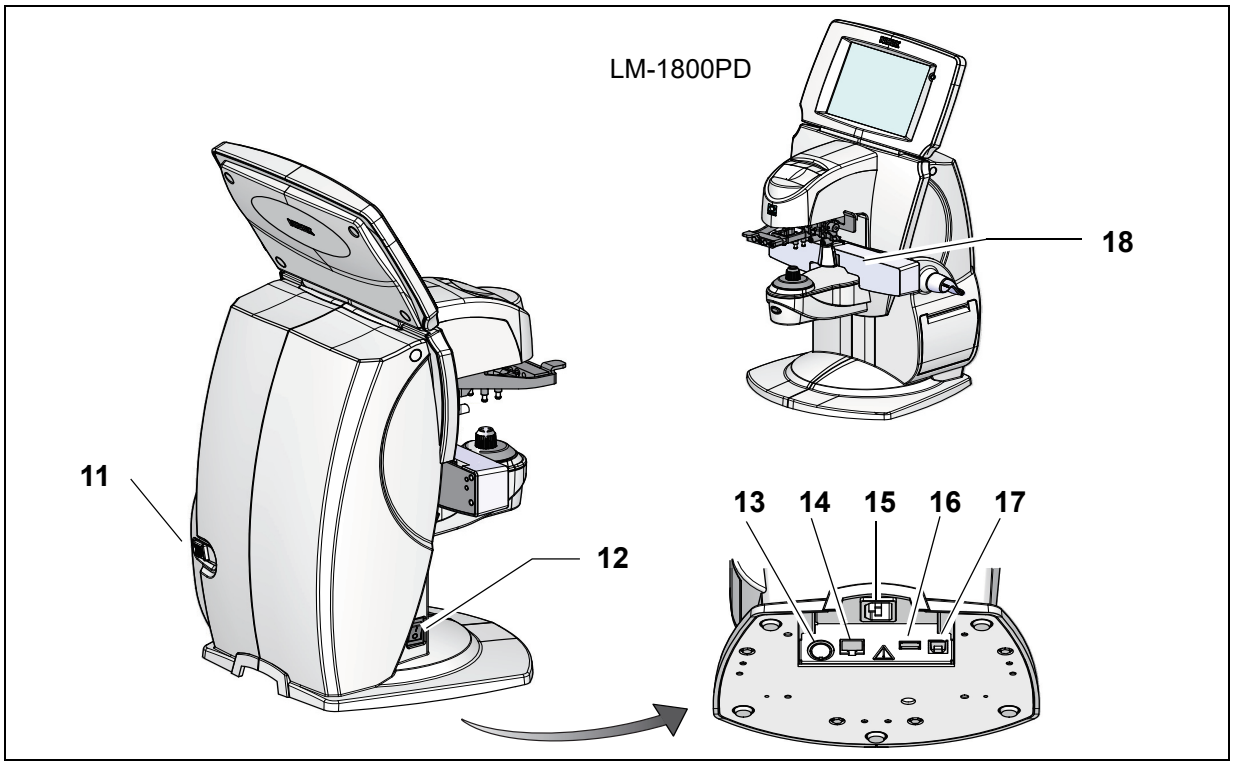
9. Lens table lever

Moves the lens table forward and backward.

To move the lens table forward => Pull the lens table lever forward.
To move the lens table backward => Push the lens table lever backward.

10. Printer cover

Opened by sliding the lever at the rear of the device to replace the printer paper.



11. Printer cover lever

Used to unlock the printer cover when replacing the printer paper.

12. Power switch

Used to turn on or off power to the device.

13. Interface port [*1]

Used for communication.

RS-232C interface port which connects to the AR, ARK, RT-2100/RT-5100, Eye Care card system, or a computer.

When the device is connected to the AR-600/330A series, AR-1 series, ARK-700/530A series, ARK-1 series, or RKT-7700/TONOREF II, the data measured with the LM-1800P/LM-1800PD can be printed with the connected device.

To connect the optional foot switch, also use this port.

To connect a computer, communication software needs to be installed in the computer.

Connectable devices:

AR-600/AR-330A series, AR-1 series, ARK-700/ARK-530A series, ARK-1 series
RKT-7700/TONOREF II
RT-2100 series, RT-5100 series

***1. Accessory equipment must be certified according to the representative appropriate national standards (for example, UL 1950 for Data Processing Equipment, UL 60601-1 for Medical Equipment, and CSA C22.2 No. 601-1, EN 60601-1, and IEC 60601-1.) 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 the system standard IEC 60601-1-1. If in doubt, consult the technical service department or your local representative.**

14. LAN cable port[*1]

Used for Ethernet LAN.

15. Power inlet

Used to connect a removal power cord.

16. USB port A (host)[*1]

Port for a USB flash drive, barcode scanner, or magnetic card reader.

17. USB port B (device)[*1]

USB port for transferring the measured data to a computer.

The port complies to USB 2.0. Connect to a computer using the optional USB cable.
The USB driver needs to be installed in the computer.
The communication software needs to be installed in the computer.

18. Nose slider (LM-1800PD only)

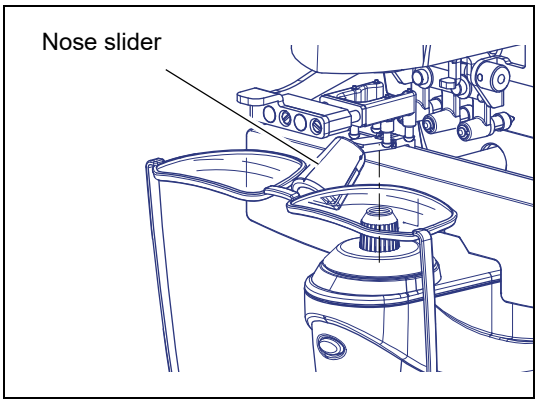
Used to measure the PD of mounted lenses.

Place the frames so that their nosepads straddle the nose slider.
The nose slider position determines the right of the left lens. The PD is measured from the nose slider position when the measured data is read.

When the state is changed from R/L to single  by pressing  , moving slightly the nose slider returns the state to R/L and displays the PD.

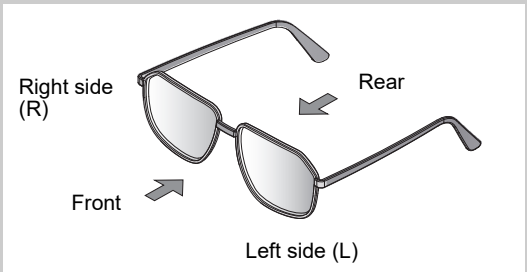
The nose slider functions when the lens table is positioned within 50 mm from the nosepiece center. When the nosepiece center is separated from the lens table by more than 50 mm, the slider automatically turns off.

When the slider is not in use, move it to the far left and lift it upright so that is does not obstruct measurement.



Note

- The illustration of the lens in the screen display is as viewed from the front side in the right figure.
- Viewed from the front the lenses are mirrored so that the (R) lens is displayed on the left and the (L) lens is on the right.



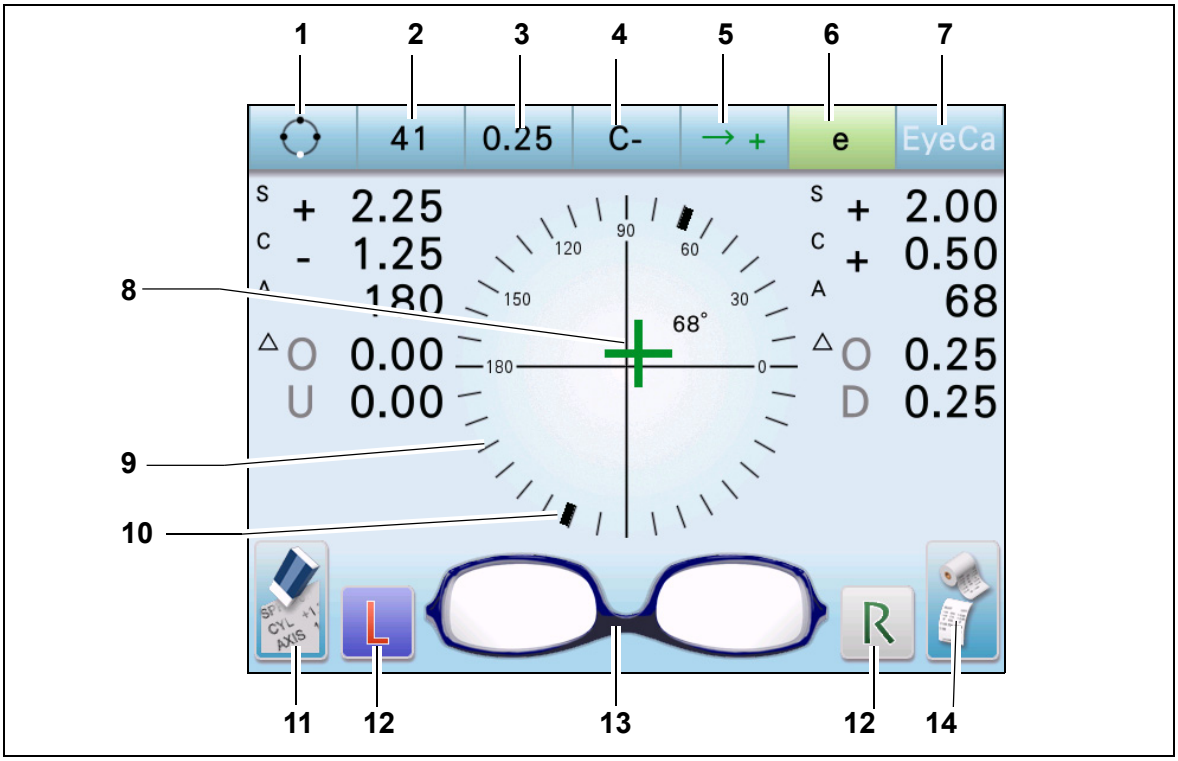
***1. Accessory equipment connected to the analog and digital interfaces must be certified according to the representative appropriate national standards (for example, UL 1950 for Data Processing Equipment, UL 60601-1 for Medical Equipment, and CSA C22.2 No. 601-1, EN 60601-1, and IEC 60601-1.) Furthermore, 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 the system standard IEC 60601-1-1. If in doubt, consult the technical service department or your local representative.**

1.6 Screen Configuration

1.6.1 Measurement screen

■ There are four measurement screens, Auto measurement screen, Normal measurement screen, Progressive power lens (PPL) measurement screen, and Contact lens (CL) measurement screen.

The screen below shows the normal measurement screen to measure single vision lenses or bifocal (trifocal) lenses.



1. Parameter button 

Extended pressing of the button for about 1 second switches to the parameter setting screen.

2. Abbe number button 

Extended pressing of the button for about 1 second changes the Abbe number of the lens material in the order of A, B, and C previously set within 20 to 60.

The number of each A, B, and C is changed on the parameter screen.
After the numbers are changed, data is cleared.

3. Step button 

Changes the increment for measured data among steps of 0.01, 0.06, 0.12, 0.25.

Pressing this button changes the increment normally. Extended pressing of the button for about 1 second returns to the increment set with the parameter.

4. CYL +/- value switching button C-

Changes the cylinder reading setting between positive (+) and negative (-).

Pressing this button again returns to the setting set with the parameter.

Pressing any button other than 0.25 , → + , , or also returns to the sign set with the parameter.

C- (light blue)	Indicates that data is displayed in the cylinder reading set with the Cylinder parameter.
C- (orange)	Indicates that the sphere, cylinder, and axis values are displayed with the cylinder reading sign inverted from the parameter setting.

When the Prism parameter is set to “P-B” or “BU/D BI/O”, this button is used to change the prism display setting.

Extended pressing of this button for about a second displays the icon (orange) of the prism setting while the button is pressed and held. Releasing the button changes the icon to the CYL +/- value switching button with the prism display switched. (When the parameter is set to “P-B”, the measured prism value is displayed in rectangular coordinates and in polar coordinates when set to “X-Y”.) Repeating the same operation returns to the original prism display.

When the Prism parameter is set to “P-B”

P-B (orange)	The prism value display is switched from polar coordinates set with the parameter to rectangular coordinates.
P-B (light blue)	The measured prism value is displayed in polar coordinates set with the parameter.

When the Prism parameter is set to “BU/D BI/O”

X-Y (orange)	The prism value display is switched from rectangular coordinates set with the parameter to polar coordinates.
X-Y (light blue)	The measured prism value is displayed in rectangular coordinates set with the parameter.

5. Auto read button → +

To change the setting temporarily, press this button. Extended pressing of the button for about 1 second returns to the setting set with the parameter.

Auto read	Setting state of auto read In the single state, the contents set by the Auto read S parameter are displayed. In the R/L state, the contents set by the Auto read R/L parameter are displayed. None: , [+]: → + , [+]: → +

In PD measurement with LM-1800PD, this parameter is automatically set to + .

- **Auto read**

  When the target is aligned, as well as when the read button is pressed, measured data is automatically saved in the memory and locked on the screen.

6. Reference wavelength button e

Extended pressing of the button for about 1 second toggles the reference wavelength between e-line e and d-line d .

After the numbers are changed, data is cleared.

7. Eye Care card button 

Indicates the Eye Care card state.

Extended pressing of this button for about 1 second clears the data on the card.

Eye Care card	 (White): The Eye Care card is not inserted.  (Black): The Eye Care card is inserted.  (Green): The Eye Care card is being accessed. Never touch the card.  (Red): An error occurs while the Eye Care card is being accessed.

8. Target

Indicates the optical center of a lens to be measured.

The target shape changes according to the Target parameter setting and alignment level.

Normal target	Prism target	Details of the target
○		Misaligned
＋ (cross)		Placed within approximately 0.5Δ. Measured data can be read. When auto read (＋) is set, the measured data is locked in.
＋ (large cross)		Aligned (marking point) When auto read (＋) is set, the measured data is locked in. When auto read (＋) is set, the measured data is automatically read again and locked in.

When the normal target set with auto read function changes to ＋ (cross) or ＋ (large cross), the current axis is displayed to the upper right of the target.

9. Alignment circle

The target is displayed on this circle. The center indicates the nosepiece center position.

10. Axis bar

The thick line displayed on the protractor of the alignment circle indicates the axis.

11. Clear button 

Erases the measured data that has been saved.

The locked data is released and the R/L indication returns to the single state  .

When the Single state parameter is set to “Off”, the R/L indication returns to  .

12. R/L indication

Specifies the right-eye, left-eye, or single state.

 (white)	The measurement is not performed yet.
 (green)	(Single) The lens side is not selected. The measurement is being performed.

(blue)	(Single) The lens side is not selected. The measurement has been performed.
(white)	The measurement is not performed yet.
(green)	The left-eye side is selected. The measurement is being performed.
(blue)	The left-eye side is selected. The measurement has been performed.
(white)	The measurement is not performed yet.
(green)	The right-eye side is selected. The measurement is being performed.
(blue)	The right-eye side is selected. The measurement has been performed.

To change the lens side, press L or R. The R or L indication of the side that is being selected will blink.

To change the state from R/L to single , press .

13. Measurement mode indication

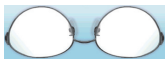
The measurement mode is shown with the icon of normal measurement, PPL measurement, CL measurement, or uncut lens measurement. Pressing this indication switches the modes.

When the lens side is not selected.

	Auto measurement of uncut lenses When the lens on the nosepiece is detected as a progressive power lens, the normal measurement screen changes to the PPL measurement screen automatically. When the distance portion of the progressive power lens is placed on the nosepiece, it may be not detected as progressive power lenses. In such a case, put the intermediate portion (progressive channel) or near portion area on the nosepiece. The icon changes to , which indicates the PPL measurement screen in auto measurement mode.
	Normal measurement of uncut lenses Measurement of single vision lenses or bifocal (trifocal) lenses
	Progressive power lens measurement of uncut lenses
	Contact lens measurement in normal measurement mode Measurement when the contact lens side (right or left) is not selected (single state).

When the lens side is selected

	Auto measurement of mounted lenses When the lens on the nosepiece is detected as a progressive power lens, the normal measurement screen changes to the PPL measurement screen automatically. When the distance portion of the progressive power lens is placed on the nosepiece, it may be not detected as progressive power lenses. In such a case, put the intermediate portion (progressive channel) or near portion area on the nosepiece. The icon changes to , which indicates the PPL measurement screen in auto measurement mode.

	Normal measurement of mounted lenses Measurement of single vision lenses or bifocal (trifocal) lenses
	Progressive power lens measurement of mounted lenses When it is detected that a lens is inverted,  is displayed on the right of the icon to call attention to it.
	Contact lens measurement with the contact lens side selected by L or R.

For the screens in auto measurement and measurement mode indications, see “OScreen change in auto measurement” (page 59). Each pressing of this indication changes the display in the order above.

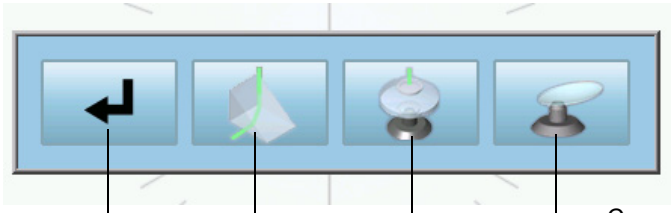
●Mode change window

Extended pressing of the measurement mode indication for about 1 second displays the mode change window.

Pressing each button below changes to corresponding mode.

This does not function in CL measurement mode.

Mode change window



Convex surface add button (changes to the convex surface add measurement screen)

Refractive index button (changes to the refractive index measurement screen)

Prism layout button (changes to the prism entry screen)

Return button: Returns to the previous measurement screen.

14. Print button 

Prints the locked data out. Holding this button for about 1 second cuts the paper and for 2 seconds or more feeds the paper.

When this button is pressed before the measured data is locked in, the data is locked in and printed.

When the LM-1800P/LM-1800PD is connected to an external device, the measured data is transmitted at the same time of printing.

When the Print, Com mode, and Network parameters are all set to “Off”, the icon indication is as  . It indicates that data is not transmitted and printing is not performed.

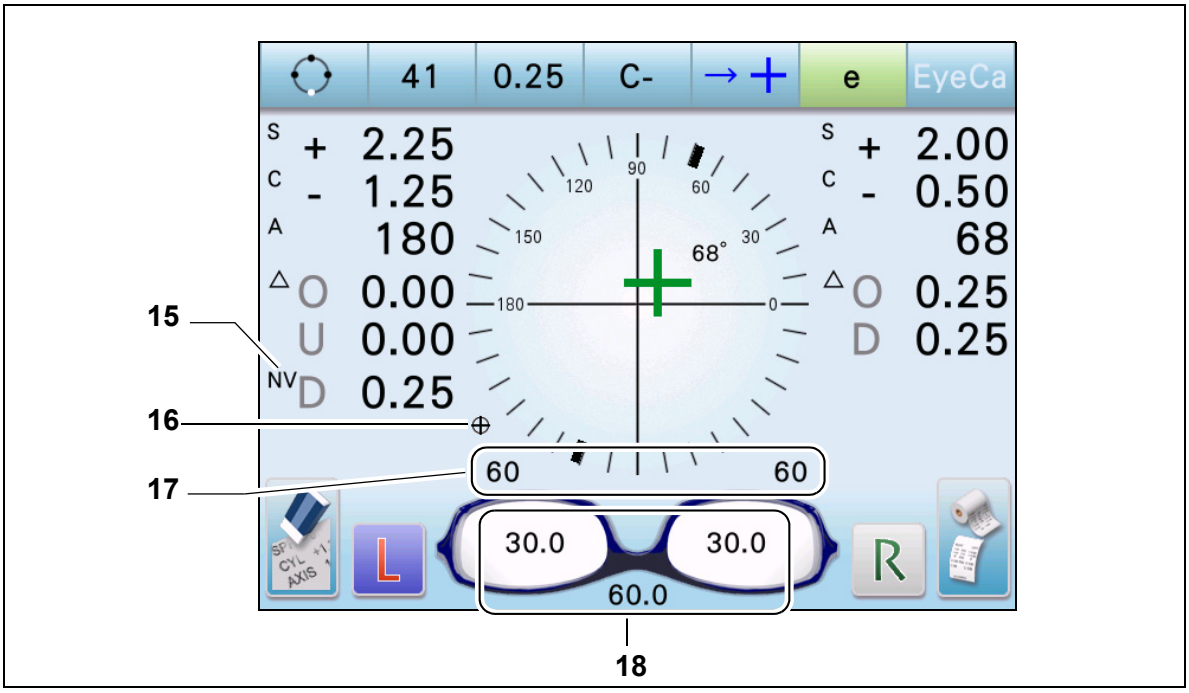
When the Printer parameter is set to “Off”, the icon indication is as  . It indicates that the data is transmitted without printing.

When the Printer parameter is set to “AR print”, the icon indication is as  . It means that the measured data is printed by the printer of the connected AR, ARK or RKT.

For details of AR print, see “2.11.1 Connecting to the AR, ARK or RKT and setting parameters” (page 105).

○ Other indications on the measurement screen

These indications are for measuring the PD (LM-1800PD only), lens diameter, or net vertical prism with the lens table or nose slider.



15. Net vertical prism (NV) (LM-1800PD only)

Indicates the net vertical prism (difference of the optical center or eyepoint level between the right and left lenses).

Only when the Net prism parameter is set to “On”, this icon is displayed.
The net horizontal prism is also measured simultaneously. Check the printed copy for the results.
For the details of net prism, see “2.9.2 Measuring the net prism (lens layout) (LM-1800PD only)” (page 78), “2.9.3 Measuring the net prism (eye point level) (LM-1800PD only)” (page 80).

16. Lens table position indicator (LM-1800PD only)

Indicates the lens table position.

Before net vertical prism measurement, check that the lens table has not moved from the position where the right-eye lens was measured. If the table is moved, place it to the original position (center of the indication) while checking the display.

17. Lens diameter (LM-1800PD only)

Indicates the lens diameter of uncut lenses (mm).

This value doubles the distance from the nosepiece center to the lens table.
Only when the Diameter parameter is set to “On”, this icon is displayed.
For the details of lens diameter, see “○Uncut lens diameter indication” (page 44).

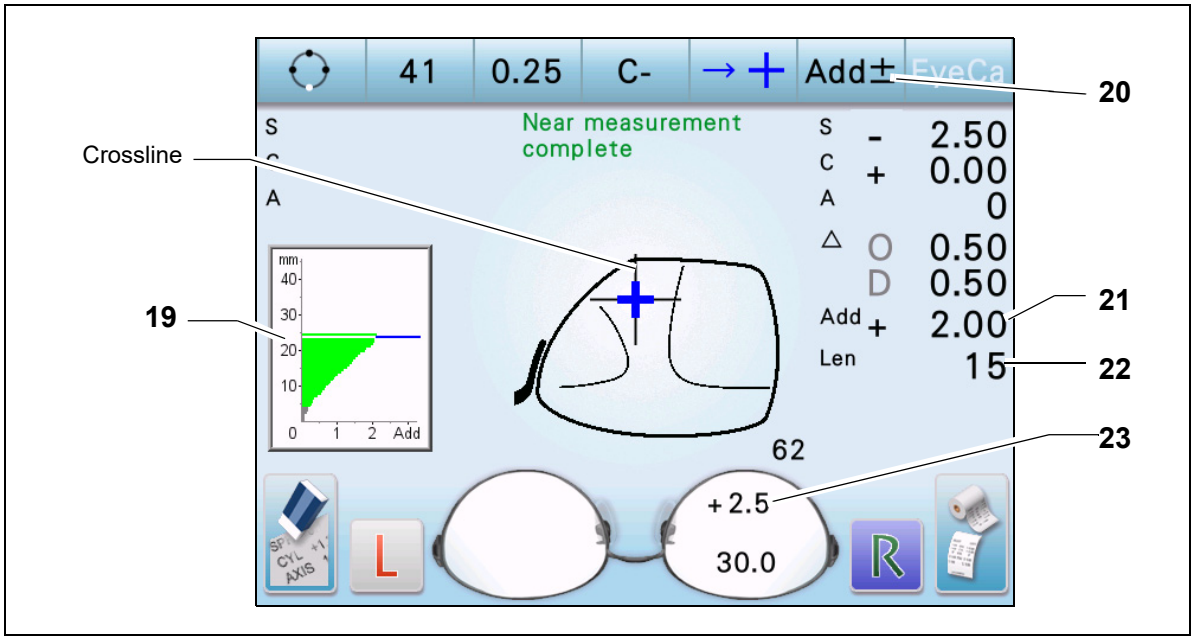
18. PD (LM-1800PD only)

Indicates the PD of mounted lenses (binocular PD, right PD, and left PD) in 0.5 mm increments.

The PD is measured in the nose slider position when the read button is pressed.
Only when the PD measurement parameter is set to “On”, this icon is displayed. However, the icon is not displayed when the nose slider is outside of the PD measurement range.

○ Progressive Power Lens (PPL) measurement screen

This is the screen to measure progressive power lenses.



19. Add graph (LM-1800PD only)

Indicates the transition of the add power from distance to near portion in graph.

Only when the Add graph parameter is set to “On”, this icon is displayed.

20. Add power +/- value switching button Add±

This button is displayed after add power measurement. Each pressing of the button toggles the +/– value of add power. For example, the display toggles between SPH-2.50 Add +2.00 and SPH -0.50 Add -2.00.

21. Near add power (Add)

Indicates the near portion power by the add power.

Note

- “Ad” is displayed instead of “Add” depends on measurement indication.

22. Progressive length (Len) (LM-1800PD only)

Indicates the progressive length (distance from the add power start point to near portion).

Only when the Length parameter is set to “On”, this icon is displayed.

For the details of progressive length measurement, see “2.6.3 Measuring the progressive length (LM-1800PD only)” (page 61).

23. Near portion inside amount (LM-1800PD only)

Indicates whether the near portion is inside to the distance portion (mm).

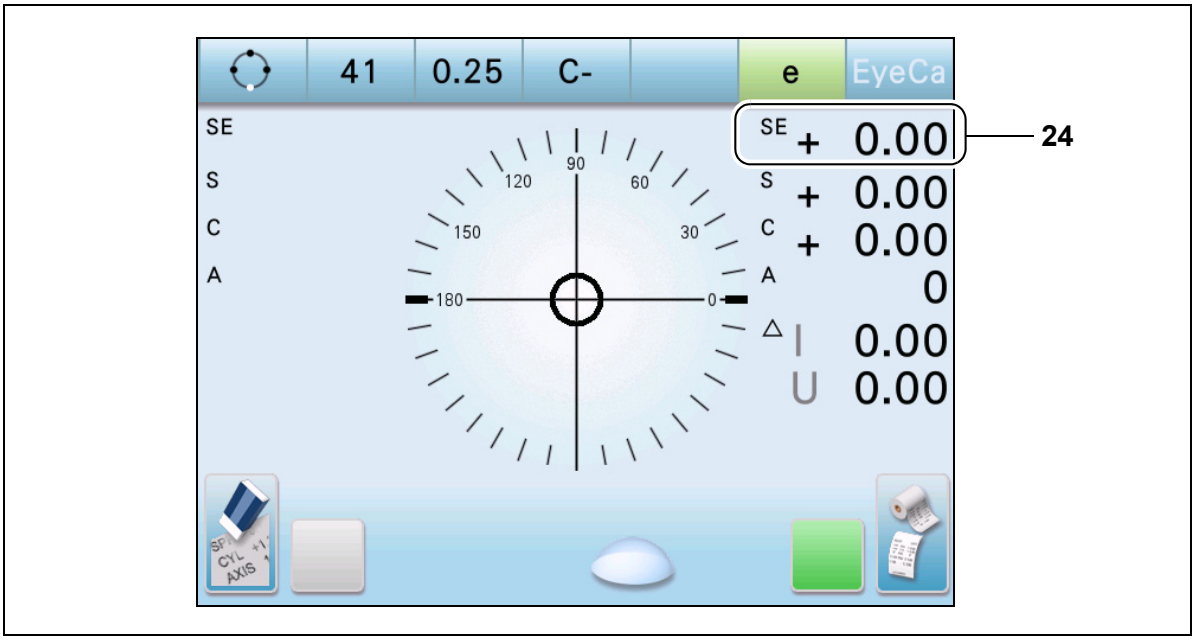
To display the near portion inside amount, set the Inside parameter to “On”.

Note

- For the details of channel width measurement, see “2.6.4 Measuring the channel width (LM-1800PD only)” (page 62).

○ Contact Lens (CL) measurement screen

This is the screen to measure contact lenses.

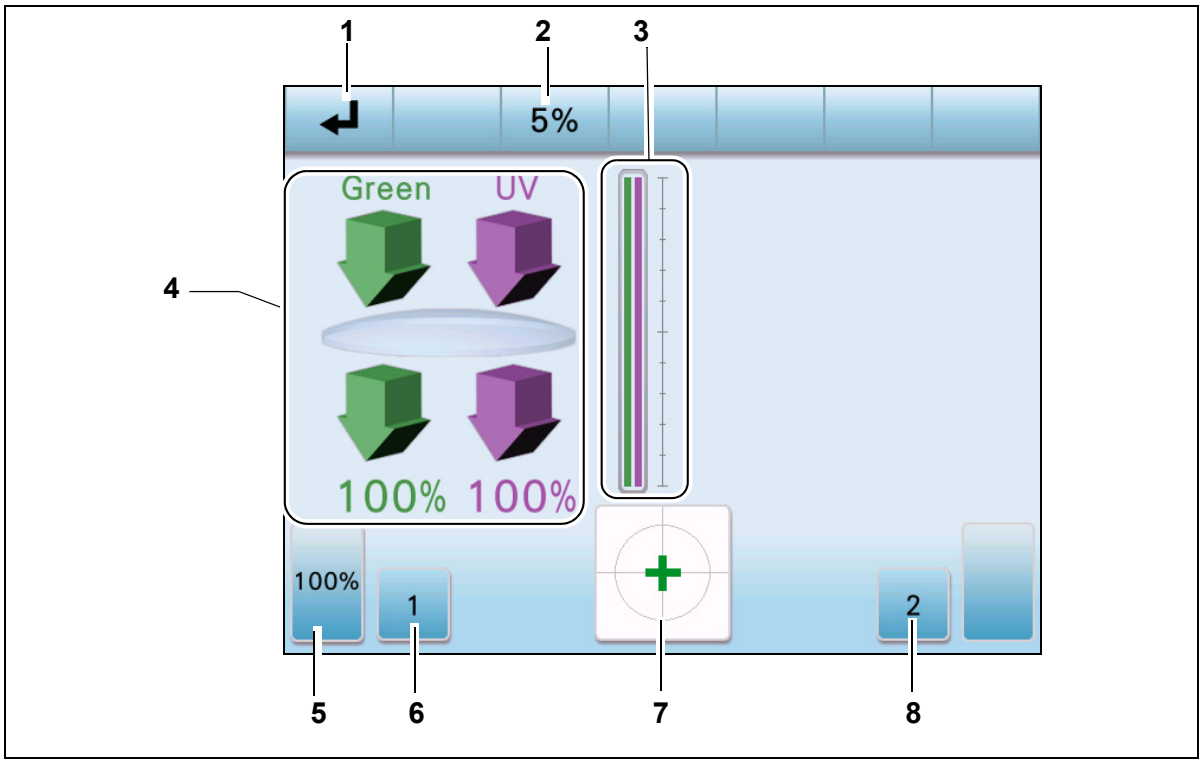


24. SE value

A SE (spherical equivalent) value is displayed in addition to lens measured data.

1.6.2 Transmittance screen

- This is the screen to display the GREEN (visible light) and the UV (ultraviolet rays) transmittance. This screen is displayed only when the Transmittance parameter is set to “On” or “With”.
- The transmittance measured results are displayed visually and emphatically. In addition, the transmittance can be compared after additional measurement.



1. Exit button 

Returns to the original measurement screen from the Transmittance screen.

2. Transmittance step button 

This is the increment to display the transmittance in percentages.

The increments of 5% or 1% (according to the parameter setting) are available.

3. Transmittance graph

The transmittance is displayed as graphs.

4. Transmittance indication

The transmittance is displayed in percentages.

It is displayed in the range of 0 to 100% in 5% increments (or 1% according to the parameter setting).

5. Transmittance 100% correction button

Used to correct the transmittance to 100%. This button is used when 100% is not displayed without any lens on the nosepiece.

When no lens is placed on the nosepiece, extended pressing of the button for about 1 second starts correction. The correction is not renewed when the lens is set.

6. Retry button

Measures the transmittance of the same lens again.

7. Target indication

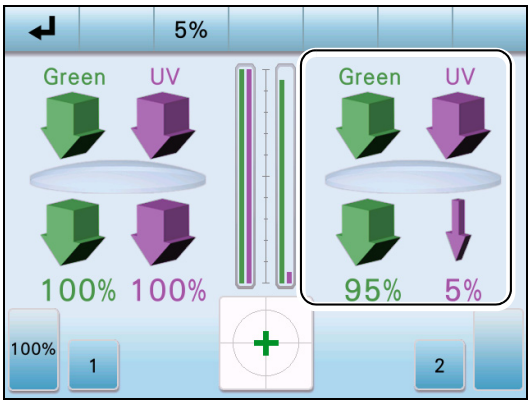
The target is displayed for lens alignment.

The range inside the circle is within 4Δ. When the target is in circle, its shape changes from circle to cross.

8. Compare measurement button

Measures the transmittance of other lenses.

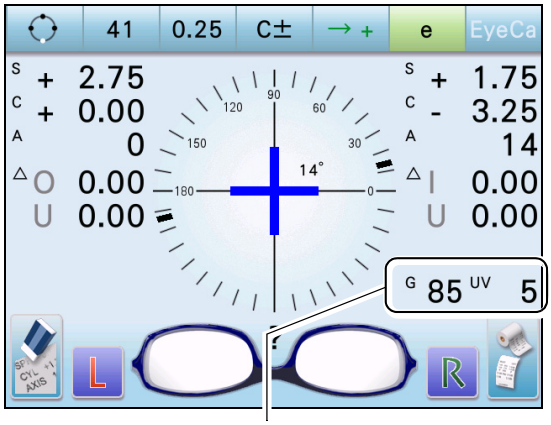
When a new lens is placed on the nosepiece and compare measurement button is pressed, the comparison screen is displayed.
As an example, the right side of the screen as shown to the right is the additional measured result (GREEN=95%, UV=5%).
Additional measurement can be performed repeatedly.



○ When the Transmittance display parameter is set to “Simple”

The measured result (%) of GREEN transmittance (G) and UV transmittance (UV) is displayed on the lower part of the screen.

It is not possible to change from this screen to the comparison screen.



Transmittance measured result (%)

1.6.3 Prism layout measurement screen

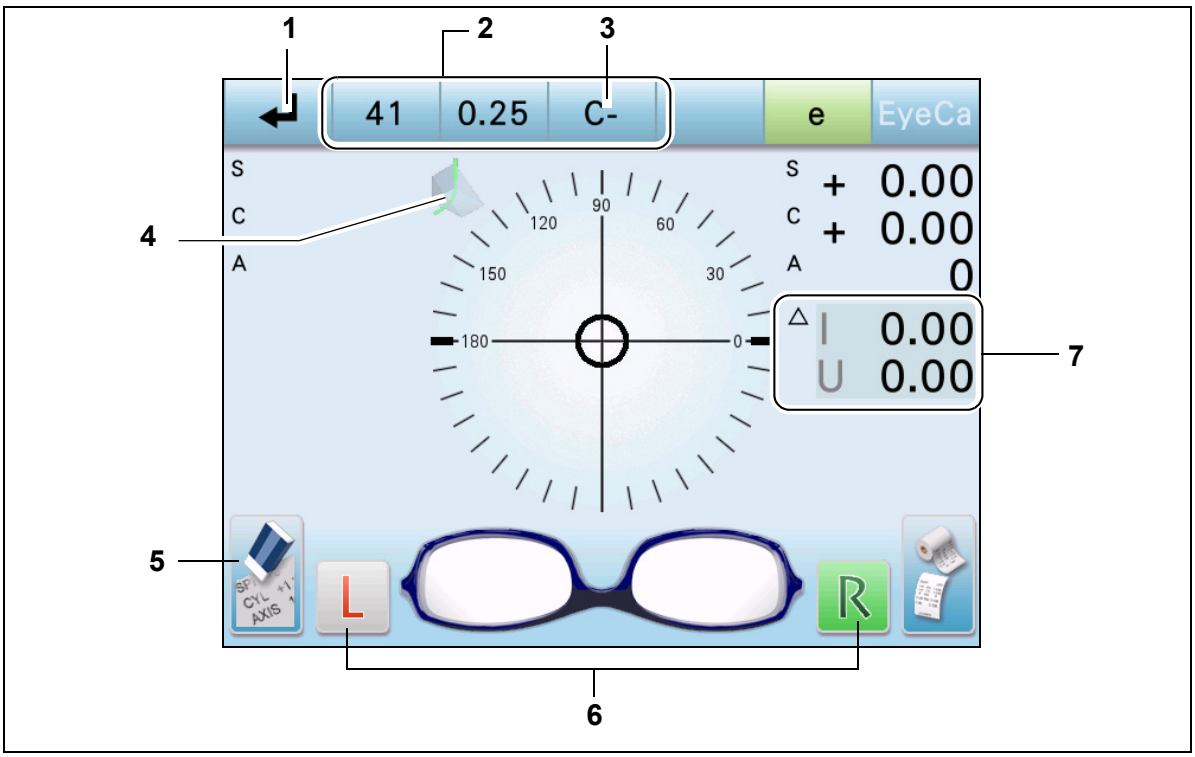
- This is the screen to mark lenses for heterophoria prescriptions using the prism layout function. As with the measurement screen, transmittance can be measured. However, it is not possible to measure Add powers.
- With the prism layout function, the on-screen position of the target is shifted based on the entered prism prescriptions. Easy alignment of lenses is allowed only by aligning the target to the center of the alignment circle.
- The target changes according to the alignment conditions in the same manner as the measurement screen: ○ → ＋ (cross)→ ✚ (large cross). Therefore, an alignment error can be reduced compared to the marking of lenses for prism prescriptions using the measurement screen.

○ Prism layout measurement screen

This screen is used for entering prism prescriptions. To display this screen, press  on the mode change window displayed by pressing and holding the measurement mode indication for about 1 second.

This screen allows the operator to mark lenses and to measure lenses with limited functions. The auto read function is disabled.

When lenses are measured on the prism entry screen, the auto read function is disabled.



1. Exit button 

Returns to the original measurement screen.

As soon as the screen returns to the measurement screen, the saved measured data and preset prism prescriptions are cleared.

2. Setting indications

The auto read settings are not displayed.

On the prism layout screens, auto read is disabled regardless of the setting.

The indications of the Abbe number, step, cylinder reading, reference wavelength, and Eye Care card are displayed in the same manner as those on the measurement screen.

3. Prism data button C-

Changes the prism display setting.

Extended pressing of C- for about 1 second or more switches between the rectangular coordinate and polar coordinate displays.

4. Prism layout indication

This icon represents the prism layout screen.

5. Clear button

Erases the measured data that has been saved. However, pressing this button after measurement on the prism layout screen does not clear the prism value.

6. R/L selection button

Selects whether the entered prism prescriptions are for the right-eye or the left-eye lens.

R	The entered prescription is for the right-eye lens.
L	The entered prescription is for the left-eye lens.

7. Preset prism prescription

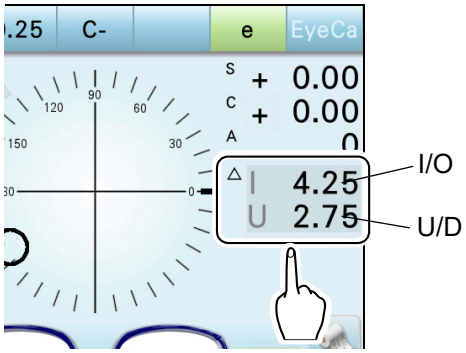
Entered prism prescriptions are displayed.

As soon as prism prescriptions are entered, the target moves opposite to the direction of the entered prism data.

●To enter prism prescriptions in rectangular coordinates

The figure to the right is a display sample of rectangular coordinates.

To enter prism prescriptions, select the U/D (Base up/down) or I/O (Base in/out) value to display the numerical keypad.



Rectangular coordinates	U/D	Enter prism prescriptions in the base up/down direction.
	I/O	Enter prism prescriptions in the base in/out direction.

The figure to the right is a display sample of the numerical keypad for rectangular coordinates.

To enter prism prescriptions, select U or D for base up/down or I or O for base in/out first and enter the values.

Examples:

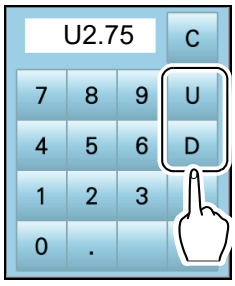
Base up (U#. ##)

Base down (D#.##)

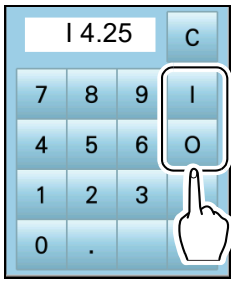
Base in (I#.##)

Base out (O#.##)

(Base up/down)



(Base in/out)

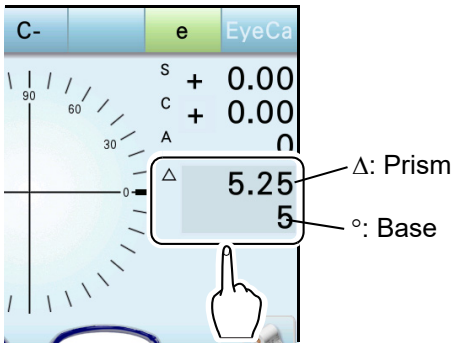


Enter prism prescriptions with the numeric keypad for rectangular coordinates

● To enter prism prescriptions in polar coordinates

The figure to the right is a display sample of polar coordinates.

To enter prism prescriptions, select the Δ: prism (absolute prism value) or °: base (base direction) value to display the numerical keypad.

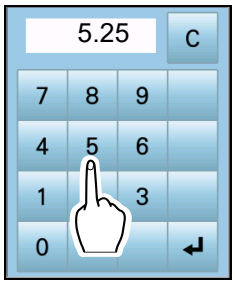


Polar coordinates	Δ: Prism	Enter prism prescriptions by absolute prism value.
	°: Base	Enter prism prescriptions by prism base direction.

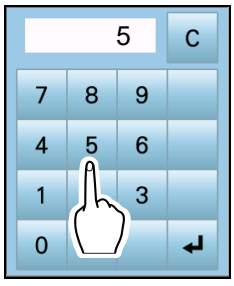
The figure to the right is a display sample of polar coordinates.

To enter prism prescriptions, enter the absolute prism value (Δ) and angle (°).

Δ: Prism (absolute prism value)



°: Base (prism base direction)

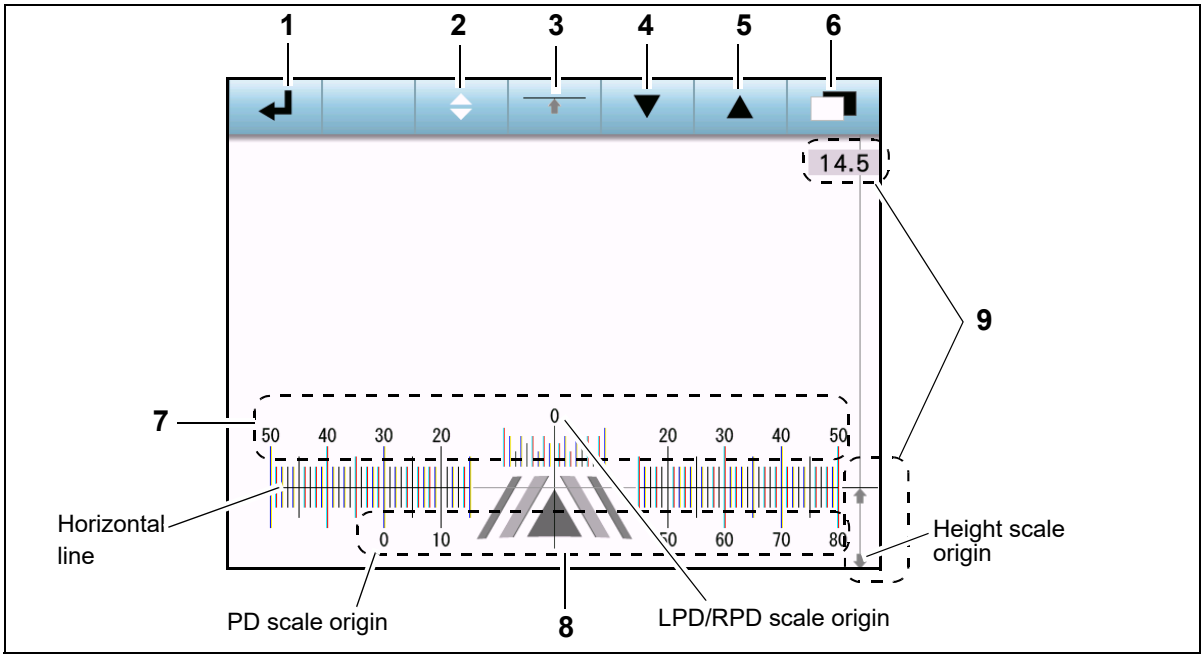


1.6.4 Measurement using scale mode function

■ The values of the LPD/RPD (1/2 PD), PD, and height can be measured easily by aligning the marked lenses to the scale displayed on the screen.

○ Scale mode screen

When the PD measurement parameter is set to “On”, the following screen is displayed.



1. Exit button 

Returns to the original measurement screen.

2. Scale touch lock/enable button  

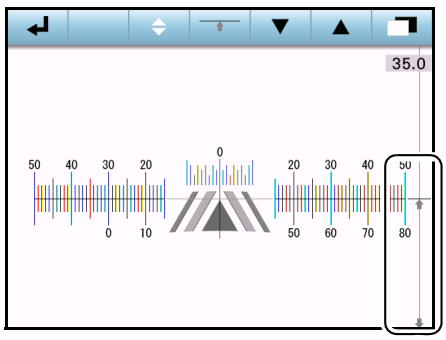
 Scale touch lock button: Indicates that the scale position is locked to touch movement.

 Scale touch enable button: Scale jumps to the level where the screen is touched.

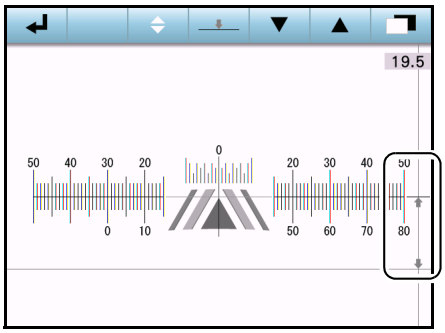
3. Scale origin switching button  

Determines the scale or the height scale origin to be moved using the  and  buttons.

 allows the scale to be moved. The movable range is above the height scale origin.



allows the height scale origin line to be moved. When the height scale origin line is moved near the scale, the scale is automatically moved as well.



4. Scale down button

Moves the scale down. When the button is held, the scale moves down continuously.

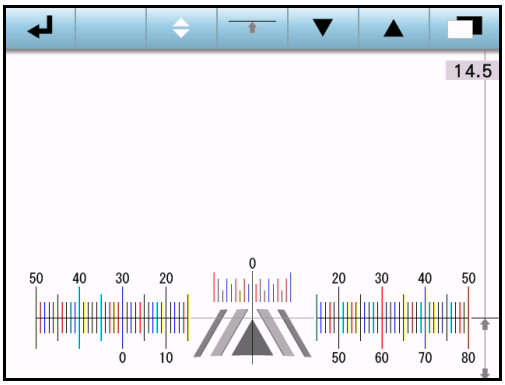
5. Scale up button

Moves the scale up. When the button is held, the scale moves up continuously.

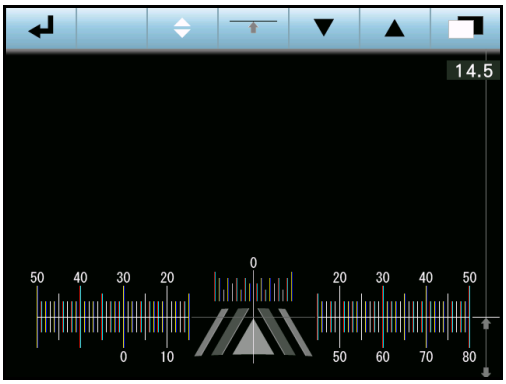
6. Inversion button

Inverts the scale display area from black-on-white to white-on-black. Select the display that provides the easiest viewing of the markings.

Pressing saves the setting.



White display screen



Black display screen

7. LPD/RPD scale (1/2PD scale)

The LPD and/or RPD (1/2PD) can be measured by aligning the frame center position to the LPD/RPD scale origin.

8. PD scale

The PD can be measured by aligning the optical center marking to the PD scale origin.

9. Height scale

The distance between the height scale origin and horizontal line is measured.

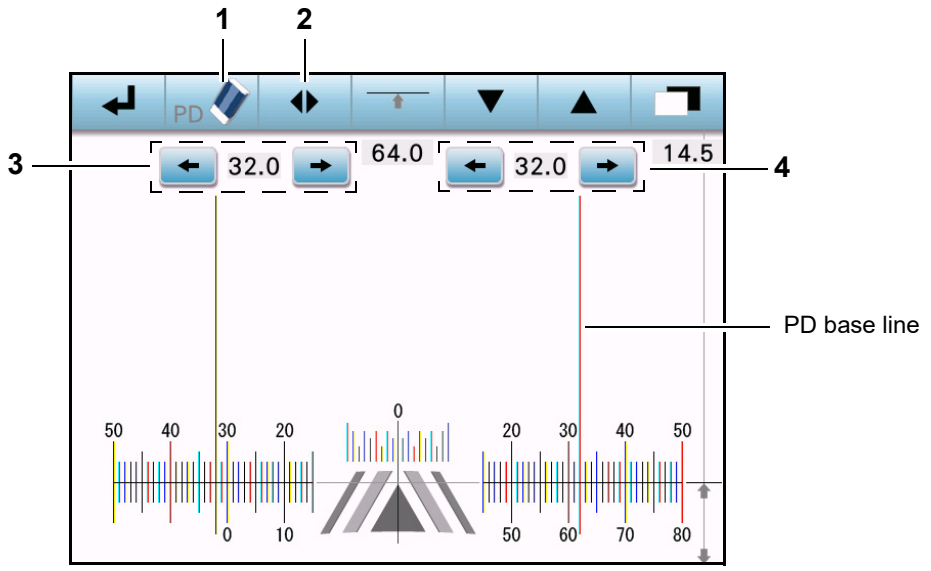
The BT, height PD or such can be measured by aligning the bottom of the frames to the height scale origin.

Note

- All settings other than display inversion are cleared after the power is turned off.

○ Scale mode screen (When the PD measurement parameter is set to “Off” or “R/L only”)

When the PD measurement parameter is set to “Off” or “R/L only”, or when using the LM-1800P, the following screen is displayed.



1. PD value clear button 

Clears the PD value on the screen.

2. PD base line /scale rough adjustment buttons  

 PD base line adjustment button:

Pressing the display area within the 15 to 50 mm scale quickly moves the PD base line from side to side to the pressed position.

 Scale adjustment button: Pressing the display area quickly moves the scale up and down to the pressed position.

“PD base line adjustment button” and “Scale adjustment button” toggles with each press of the button.

3. Left side PD base line fine adjustment buttons

 PD base line adjustment button (left): Moves the PD base line to the left. Holding this button continuously moves the base line to the left.

 PD base line adjustment button (right): Moves the PD base line to the right. Holding this button continuously moves the base line to the right.

The displayed PD value moves in 0.5 mm increments.

4. Right side PD base line fine adjustment buttons

 PD base line adjustment button (left): Moves the PD base line to the left. Holding this button continuously moves the base line to the left.

 PD base line adjustment button (right): Moves the PD base line to the right. Holding this button continuously moves the base line to the right.

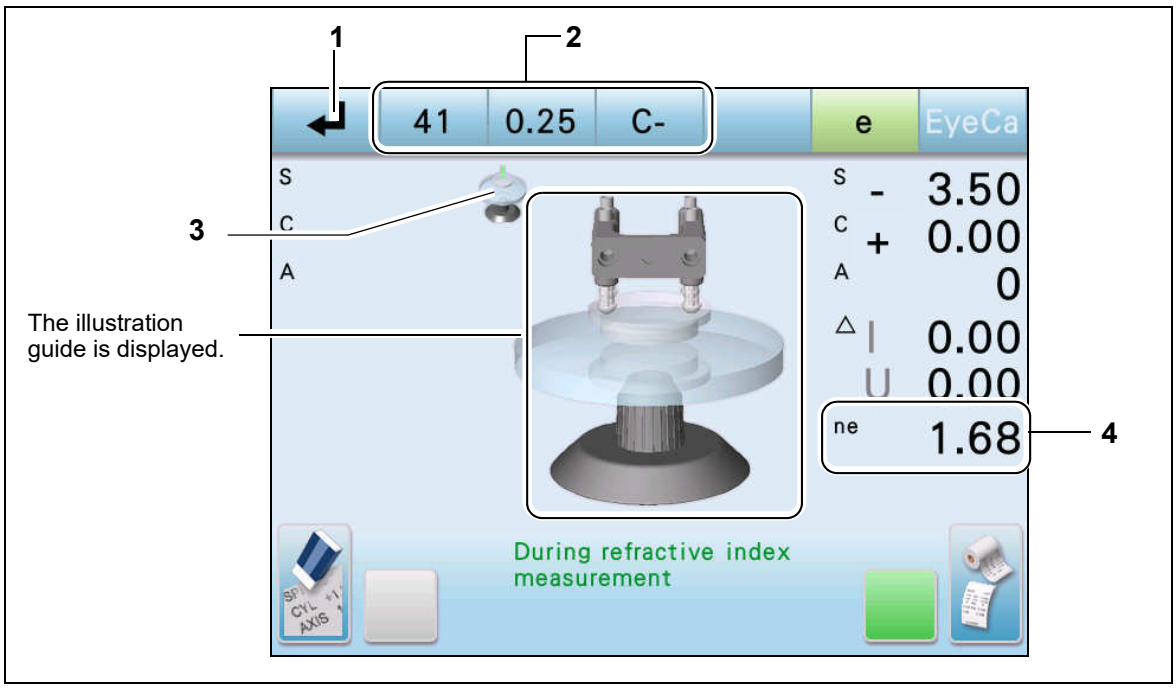
The displayed PD value moves in 0.5 mm increments.

1.6.5 Refractive index measurement screen

- This is the screen to measure the refractive index of lenses. The optional software of simple refractive measurement system for eyeglass lenses, (GO-MEISAN[*1]) is necessary.

  The refractive index measurement screen is switched from each measurement screen other than CL measurement screen.

- The auto read does not function in refractive index measurement.



1. Exit button 

Returns to the original measurement screen.

As soon as the screen returns to the measurement screen, the saved measured data and refractive index are cleared.

2. Setting indications

The auto read settings are not displayed.

On the refractive index measurement screen, auto read is disabled regardless of the setting.

The indications of the Abbe number, step, cylinder reading, reference wavelength, and Eye Care card are displayed in the same manner as those on the measurement screen.

3. Refractive index measurement icon

This icon represents the refractive index measurement screen.

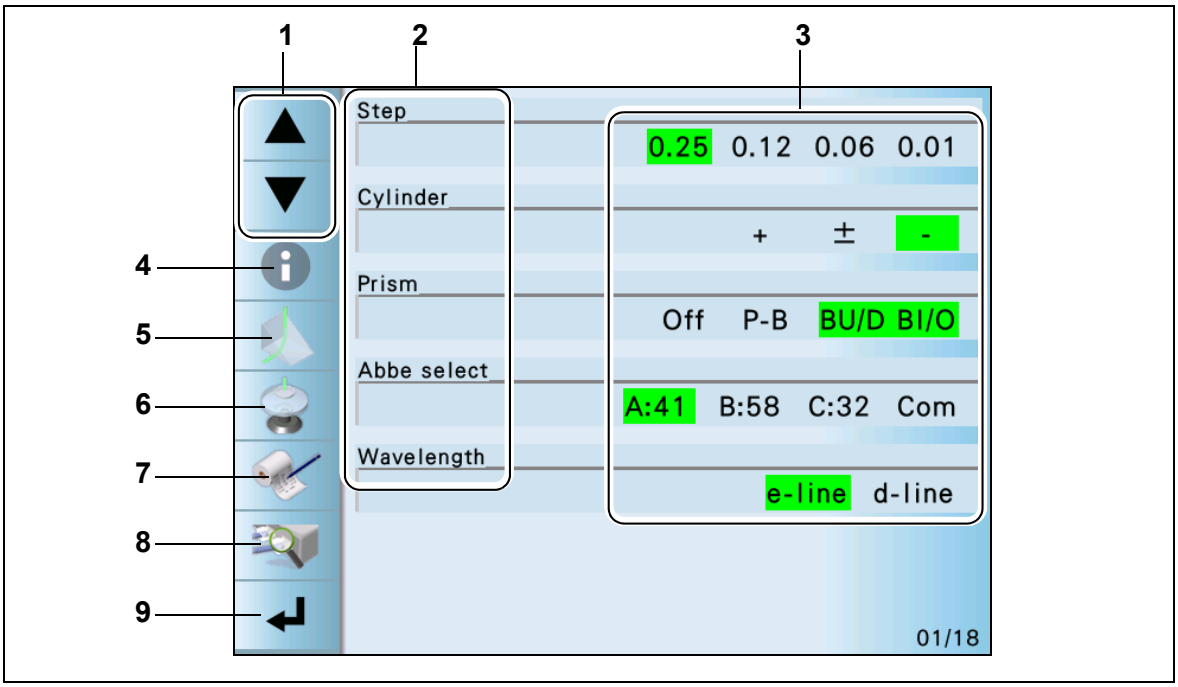
4. Refractive index

Indicates the measured refractive index.

***1. GO-MEISAN is manufactured by TOKAI OPTICAL CO., LTD.**

1.6.6 Parameter screen

■ This is the screen to set parameters related to each setting of the device.



1. Page change buttons ▲ ▼

Display the next or previous page of the parameter screen.

2. Parameter names

Parameter names are displayed.

3. Parameter settings

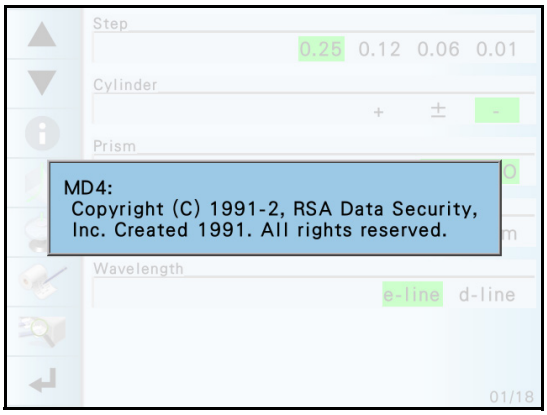
Parameter settings are displayed and changed.

Select the setting to be changed. To change a value, the numerical keypad is displayed.
For the Abbe select or Color parameters, extended pressing of the item to be changed displays the numerical keypad.

4. Information button

Displays the license information of MD4.

Pressing inside the MD4 license information window returns to the original screen.



5. Prism button

The current parameter settings are saved and the screen changes to the prism entry screen.

6. Refractive index button

The current parameter settings are saved and the screen changes to the refractive index measurement screen.

7. Comments button 

Changes to the comments screen.

8. Network communication test button 

Extended pressing the button for 1 or more seconds initiates the checking function in the order: network connection, file saving, file deletion, and network shutoff.

* Be sure to exit any software in the receiver side.

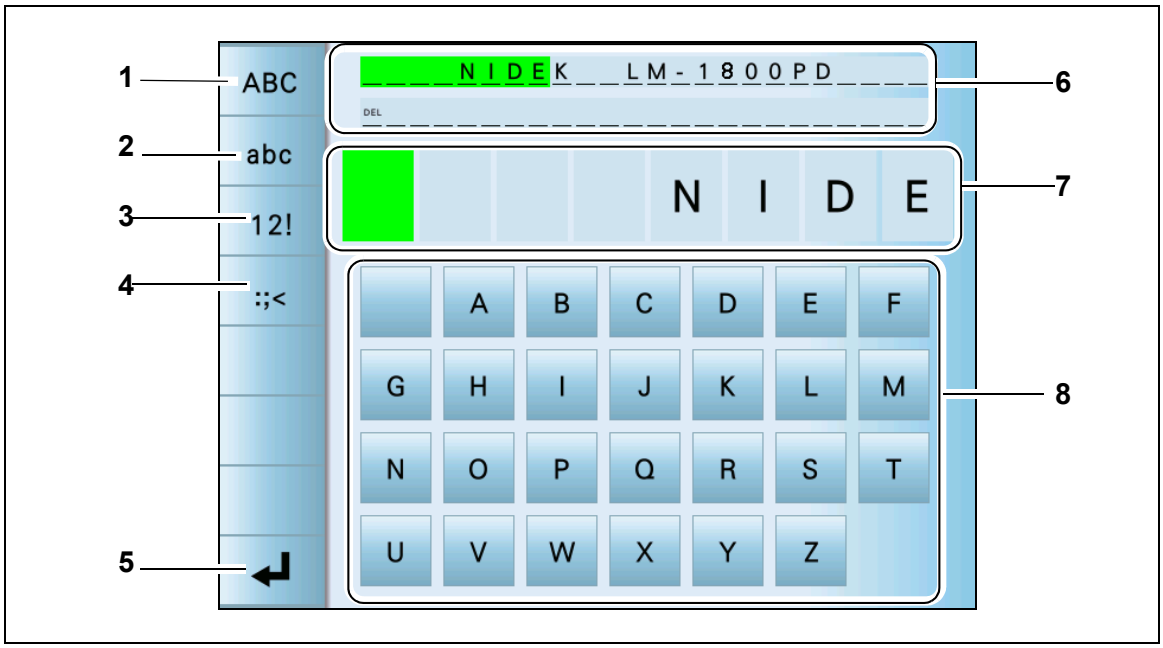
Error name	Error details
DHCP error	No response from the DHCP server. Check the DHCP server or set the IP address, subnet mask, and Default Gateway manually.
Share file access error	Shared folders cannot be found in the PC side. Confirm that the folder name on the device side is the same as that on the PC side.
Network access error	The device cannot be connected to the network. Check the network cable connection or IP address, subnet mask, and Default Gateway settings.
File save error	Files cannot be saved in the shared folder. Confirm that the shared folder is not write-protected.
Network configuration error	The domain and user names are not correct.
Connection limit error	The number of the connectable shared folders has been exceeded. If available, increase the number of connectable shared folders or retry to connect to the network after a short wait.
Password error	The password is not correct. Confirm that the user name is correct. Enter the password again.
Disk full	No free drive space.
Network test completed successfully	

9. Exit button 

Saves the current parameter settings and changes the parameter screen to the measurement screen.

1.6.7 Comments screen

■ This is the screen to enter comments displayed in the printout.



1. **Uppercase alphabet button** ABC

   Uppercase alphabet letters are entered.

2. **Lowercase alphabet button** abc

   Lowercase alphabet letters are entered.

3. **Numeric button** 12!

   Numeric characters are entered.

4. **Symbol button** :;<

   Symbols are entered.

5. **Exit button** ↵

   The window for selecting among data save, data clear, back screen is displayed. When data save or data clear is selected, the screen returns to the menu screen.

6. **Overall display field**

   The overall comments are displayed. The fields are divided into three columns and two lines (per eight characters). The parts in green are displayed in the partial display field also.

7. **Partial display field**

   The selected eight letters are displayed. The green cell is for the letter to be entered using the keyboard.

8. **Keyboard**

   The letter selected with the keyboard is entered in the cell of the partial display field and the green cell is shifted to the right automatically.

1.7 Labels and Symbols

To call attention to operators, some labels and indications are provided on the device.
If labels are curling up or characters fade and become barely legible, contact NIDEK or your authorized distributor.

	Indicates that the operator is advised to refer to the related instructions in the operator's manual.
	Indicates the state of the power switch. If the symbol side of the switch is pressed down, power is not supplied to the device.
	Indicates the state of the power switch. If the symbol side of the switch is pressed down, power is supplied to the device.
	Indicates that the device must be supplied only with alternating current.
	Indicates the date of manufacture.
	Indicates the manufacturer.
	Indicates that this product must be disposed of in a separate collection of electrical and electronic equipment in "EU".
MD	Medical device
EC REP	EU Authorized Representative
SN	Serial number
CH REP	Swiss authorized representative

1.8 Packed Contents

Unpack the contents from the shipping carton and check them.

The following are included in the standard configuration.

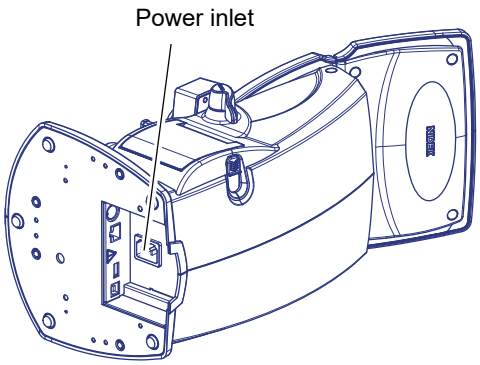
- Main body
- Nosepiece for contact lenses
- Printer paper (three rolls)
- Power cord
- Dust cover
- Operator’s manual (this book)
- Measuring Progressive Power Lenses explanation guide

1.9 System Setup

1.9.1 Connecting cables and starting the device

1 Put the device on a stable table.

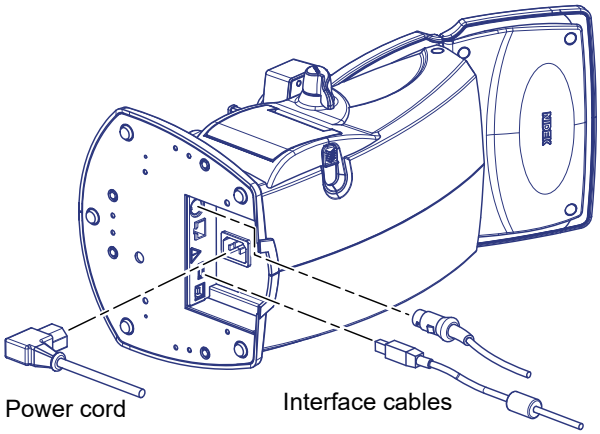
2 Lay the device down gently.



3 Connect with the peripheral devices if necessary.

For details of connecting peripheral devices, see “3 OPERATION WHEN PERIPHERAL DEVICES ARE CONNECTED” (page 129).

4 Connect the power cord to the power inlet.

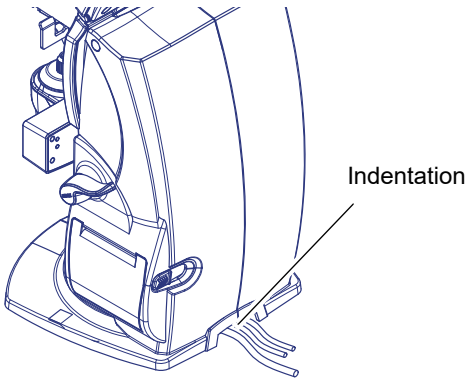


⚠ **CAUTION** • **Be sure to use a grounded power outlet.**

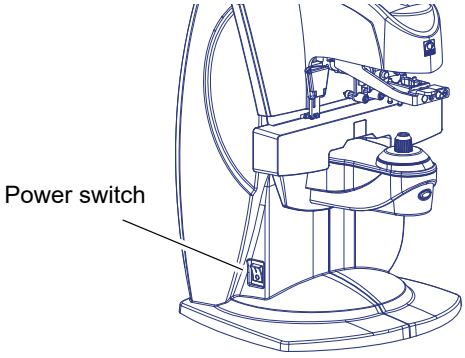
Electric shock or fire may result in the event of malfunction or power leakage.

5 Stand up the device.

Draw the power cord and connecting cables from the indentation at the rear of the device so as not to be caught.



6 Make sure that the power switch is turned off (○) and plug the power cord in the wall outlet.



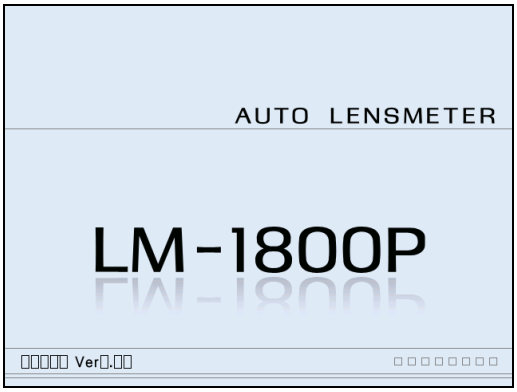
7 Turn the power switch on (|).

The initial screen is displayed on the display and the device is initialized.

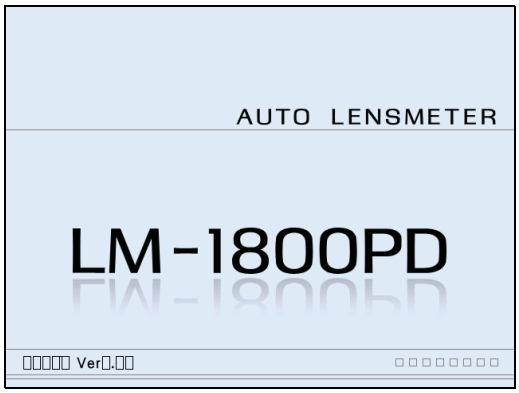
Wait for a while until the screen is changed to the measurement screen.

At first use, the time and date setting screen are displayed after the initial screen. Set the time and date as necessary.

See “1.9.2 Setting date and time” (page 32).



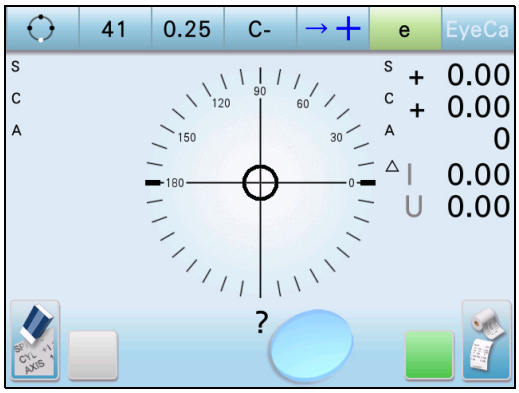
LM-1800P initial screen



LM-1800PD initial screen

8 Confirm that the measurement screen is displayed.

The measurement screen displayed at power-on can be set with the Initial screen parameter.



Auto measurement

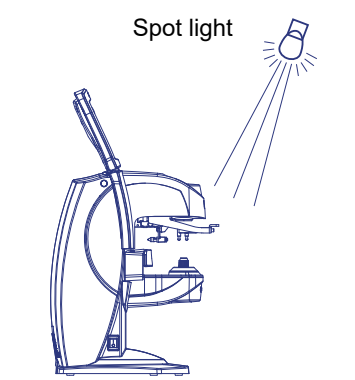
Note

- If an error appears, it may be due to disturbance light. Avoid installing the device on a place where it is exposed to direct sunlight or near the illumination. In particular, ensure that the device is not illuminated by a spot light from the upper front.

  In particular, measured data of lenses of 10Δ or more is likely to be affected adversely by disturbance light.

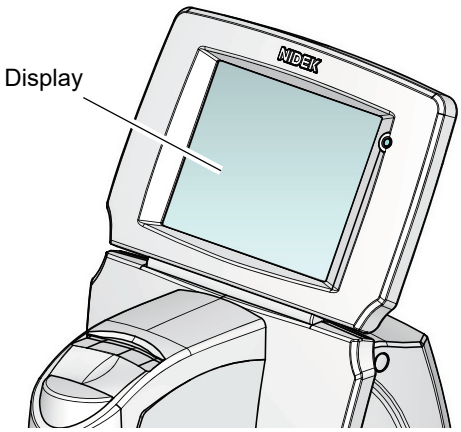
  In such cases, relocate or reorient the device.
- Before putting the device on a light-reflecting surface such as a glass showcase or a shiny table, put a cloth on it.

  Reflected light such as illumination may adversely affect measurements.



9 When the screen is too bright or dark, select the contrast level among “High”, “Middle”, and “Low” from the Contrast parameter.

After setting the display at the desired angle, adjust the contrast.



Note

- Ink is not contained in the ink bottle of the ink pad type. Fill the ink before using the device.

This is all you have to do before use.

Note

- Set the parameters to suit operator’s needs or preferences.

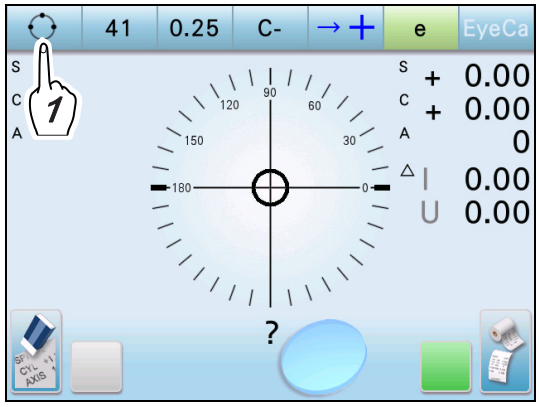
  For details of the parameters and their setting procedure, see “2.14 Setting Parameters” (page 111).
- For details of connecting peripheral devices, see “3 OPERATION WHEN PERIPHERAL DEVICES ARE CONNECTED” (page 129).

1.9.2 Setting date and time

In the parameter setting screen, set the date and time, and the order of display for them to be printed.

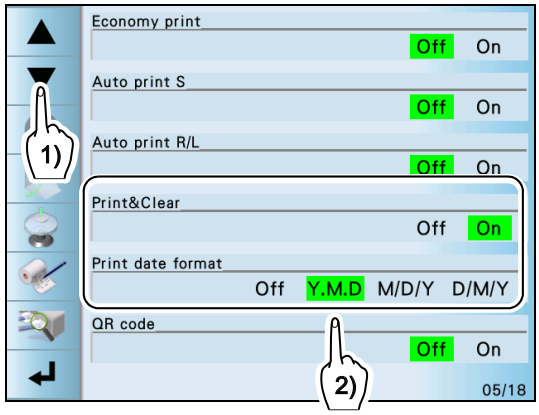
1 Display the parameter setting screen.

Press and hold [⌖] for about 1 second in the measurement screen.



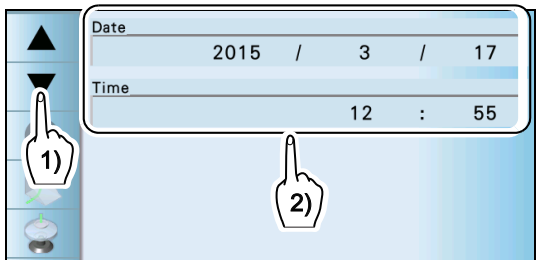
2 Select the order of year, month, and day to be printed.

1) Display “Print date format” with [▼] or [▲].
2) Select the desired order.

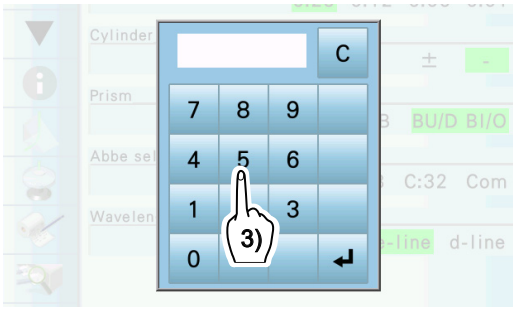


3 Set the date and time.

1) Display “Date” and “Time” with [▼] and [▲].
2) Select any item of “Date” or “Time” to be changed.

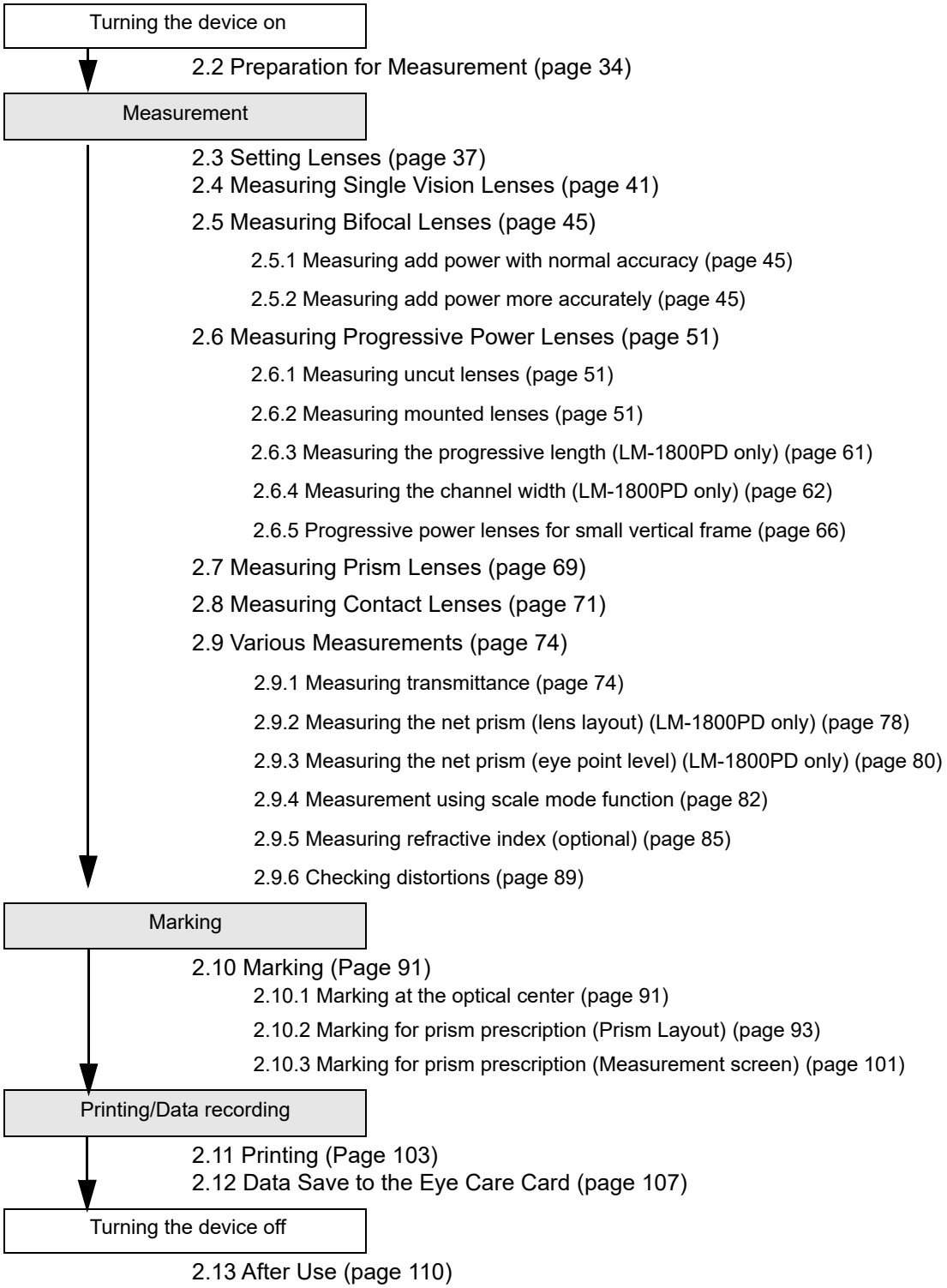


3) Selecting any item displays the numeric keypad. Input the desired numbers and press [↵].
4) Repeat Step 3) until setting of date and time is complete.



2 OPERATING PROCEDURE

2.1 Operation Flow



2.2 Preparation for Measurement

1 Make sure that the power switch is turned off (○) and plug the power cord in the wall outlet.

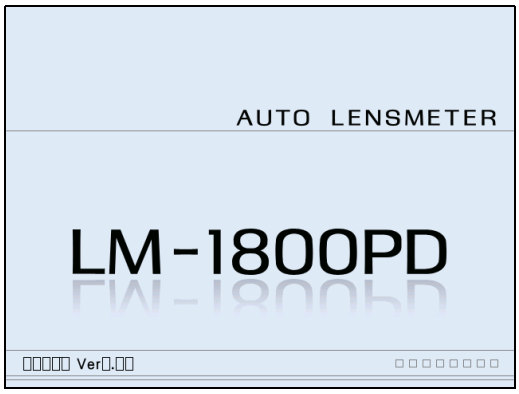
⚠ CAUTION **•Be sure to use a grounded power outlet.**
Electric shock may occur in the event of trouble or power leak.

2 Turn the power switch on (|).

The initial screen appears.

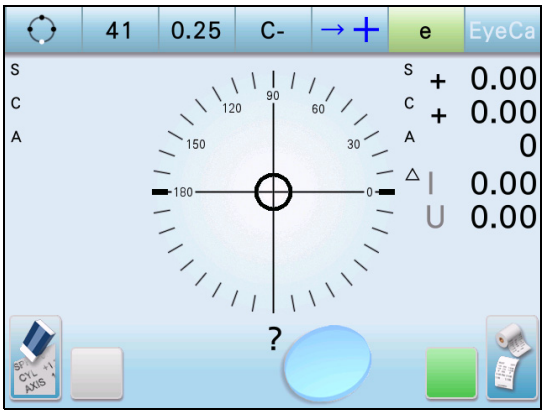
Wait for a while until the screen changes to the measurement screen.

LM-1800P initial screen



LM-1800PD initial screen

3 After initialization, the screen changes to the measurement screen.



Auto measurement screen

Note

- The measurement screen initially displayed when power is turned on can be set with the Initial screen parameter.
- Do not turn on the power with a lens on the nosepiece.
  If the lens is on the nosepiece before the measurement screen appears, “Please remove lens from nosepiece” is displayed. In such a case, remove the lens and turn on the power again.

○ Measurement screen at power-on

According to the Initial screen and Contact measurement parameters, and the type of the attached nosepiece, the measurement screen displayed after initialization differs.

• Settings of the Initial screen parameter

Parameter settings	Measurement screen to be displayed at start-up
Auto	Normal measurement screen in auto measurement
Normal	Normal measurement screen
Progressive	Progressive power lens (PPL) measurement screen
Contact	Contact lens (CL) measurement screen

* The factory setting is “Auto”.

* According to the setting of the Contact measurement parameter, any different measurement screen may appear.

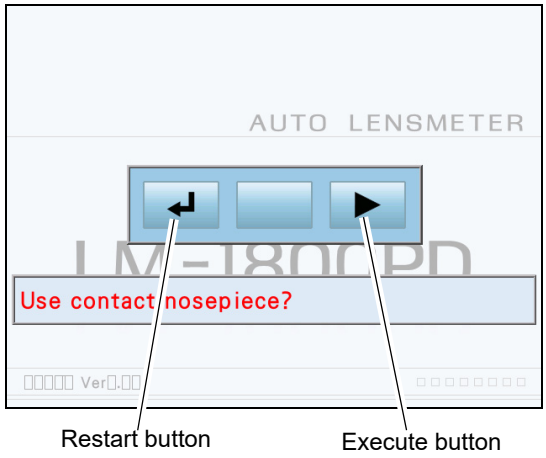
• Settings of the Contact measurement parameter

• When the parameter is set to “On” or “Off”

Except for the following cases, the measurement screen set with the Initial screen parameter appears.

• When the Contact measurement parameter is set to “Off” and the Initial screen parameter is set to “Contact”, the auto measurement screen appears.

• When the Initial screen parameter is set to other than “Contact”, and the power is turned on with the nosepiece for contact lenses placed, the “Use contact nosepiece?” message appears on the initial screen.

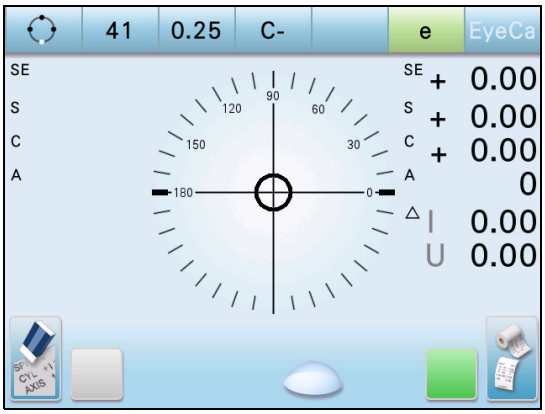


To measure eyeglass lenses	Replace the nosepiece with the standard one, then press ↵. The measurement screen set with the Initial screen parameter appears.
To measure contact lenses only	Press ▶ to change the screen to the CL measurement screen. In such a case, the CL measurement screen cannot be changed to the auto measurement screen, normal measurement screen or PPL measurement screen unless the nosepiece is replaced and the power is turned off and on again.

• When the parameter is set to “only”:

Regardless of the Initial screen parameter setting, the CL measurement screen appears.

Confirm that the nosepiece is for contact lenses.



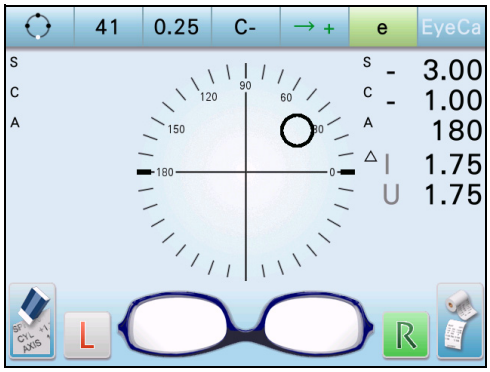
Contact Lens (CL) measurement screen

○ Details of target

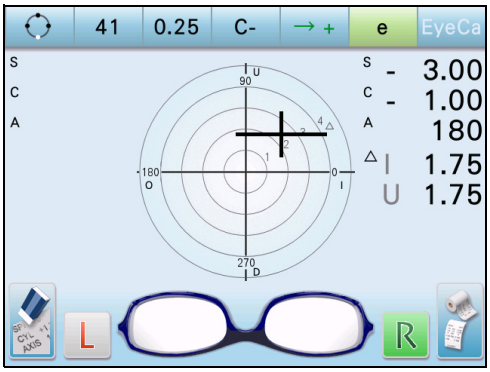
The target form displayed on the measurement screen can be selected with the Target parameter.

• **Settings of the** Target **parameter**

Option	Details of target to be displayed
○ (Normal target)	The target indicates the distance and direction from the nosepiece center. The direction and movement distance are constant regardless of the refractive power of lenses. The target changes “ ○ ” → “ ＋ ” (within 0.5Δ) → “ ＋ ” (within ø0.8 mm) as it gets close to the center.
＋ (Prism target)	The target moves based on prisms as with the eyepiece-type or projection-type lensmeter. The target indicates the axis while rotating. The target changes “ ― ” → “ ⊙ ” (within 0.5Δ) → “ ⊕ ” (within ø0.8 mm) as it gets close to the center. For progressive power lens measurement, the target is always displayed with “ ○ ”.



○ is selected



＋ is selected

Note

• This operator’s manual describes each screen with the Target parameter set to “ ○ ”.

2.3 Setting Lenses

Note

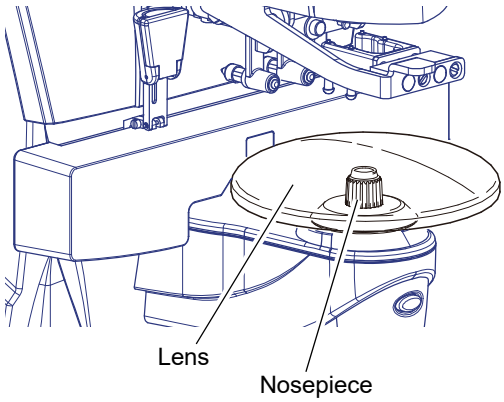
- Confirm that there is no dust on the top of the nosepiece and lens holder before setting lenses. It may damage the lenses.

  When a lens is smeared after cleaning of the nosepiece and lens holder, request maintenance such as part replacement.

2.3.1 Setting uncut lenses

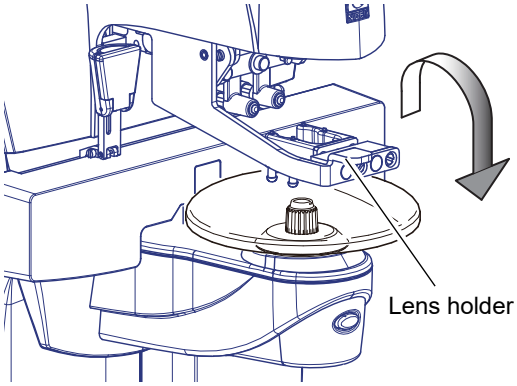
1 Set the lens on the nosepiece.

Place the lens center on the nosepiece with the convex side up.



2 Secure the lens with the lens holder.

Lift the lens holder lever to unlock, then lower it slowly to secure the lens.

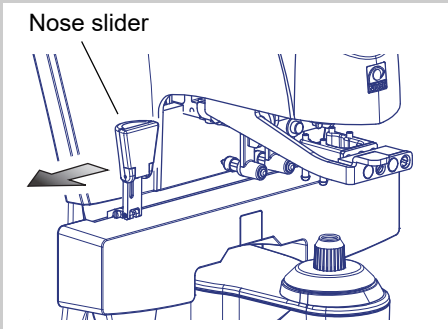


Note

- When an uncut lens is set, the lens table is not used. However, the table is necessary for lens diameter measurement.
- Check that the nose slider is lifted upright on the far left.

  When the nose slider is not positioned at the far left, L or R is disabled.
- Set the lens with the top of the lens forward.

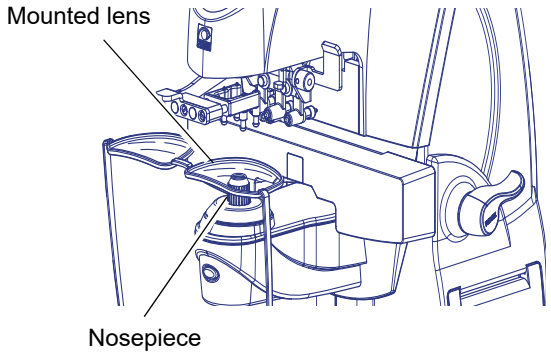
  For the LM-1800PD, the zero degree direction of the prism base is on the operator's left as viewed from the front. This is opposite to the orientation of the lens with a manual lensmeter or blocker.



2.3.2 Setting mounted lenses

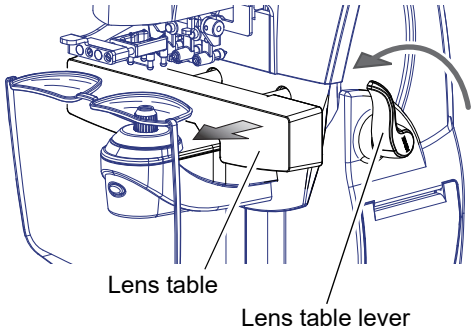
1 Set mounted lenses on the nosepiece.

Place the frames with the front surface up on the nosepiece.



2 Set the lens table.

Pull the lens table lever forward until the lens table comes into contact with the bottom of the frames.



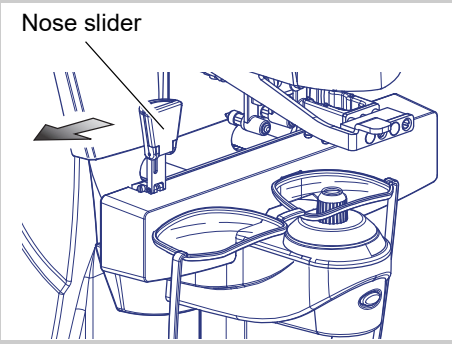
Note

- Make sure that the bottom of both frames comes into contact with the lens table.

  If the frames are off the lens table, an error may occur in the axis value.

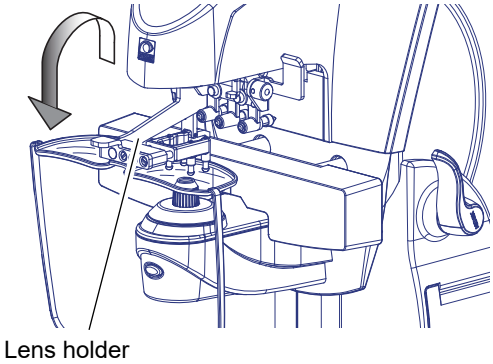
- Check that the nose slider is lifted upright on the far left.

  If the nose slider is not positioned at the far left, L or R is disabled.



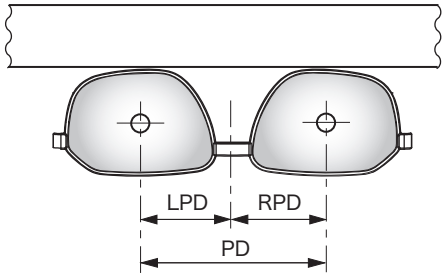
3 Secure the lens with the lens holder.

Lift the lens holder lever to unlock, then lower it slowly to secure the lens.



2.3.3 Lens setting for PD measurement (LM-1800PD only)

For mounted lenses, the optical center distance between the right and left lenses can be measured.

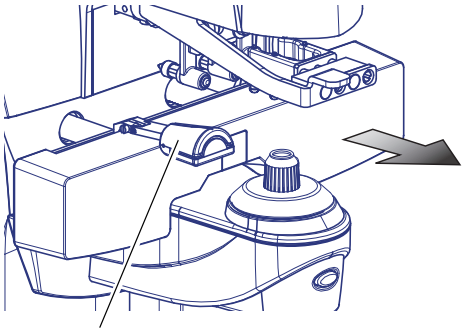


Note

- For cylinder-only lenses, high power lenses, or sharply warped frames, the PD measurement accuracy may be lowered.

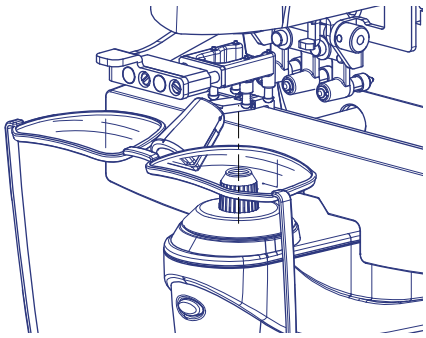
1 Set the nose slider.

Pull the lens table lever forward to move the lens table forward, then pull down the nose slider.



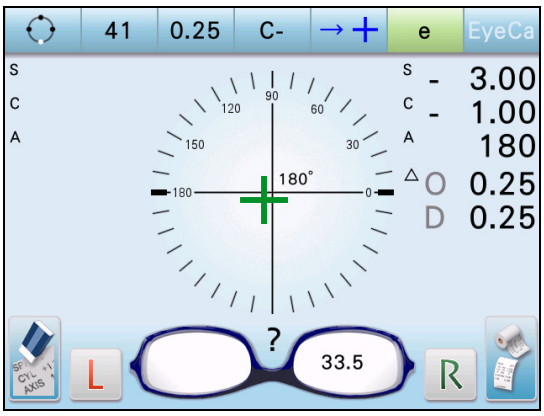
2 Place the frames on the nose slider.

Place the nosepads of the frames on the nose slider.



3 Set the lens on the nosepiece.

The left-eye or right-eye lens is automatically detected by the nose slider position. Blinking L or R indicates which side is being measured.



4 Set the lens table.

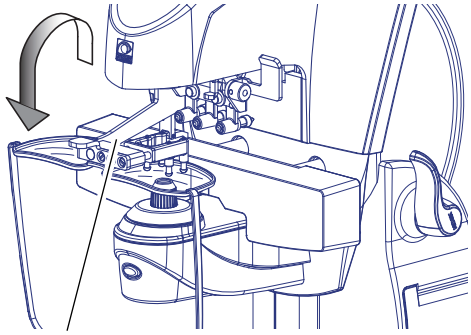
Pull the lens table lever forward until the lens table comes into contact with the bottom of the frames.

Note

- Make sure that the bottom of both frames comes into contact with the lens table.
  If the frames are off the lens table, an error may occur in the axis value.

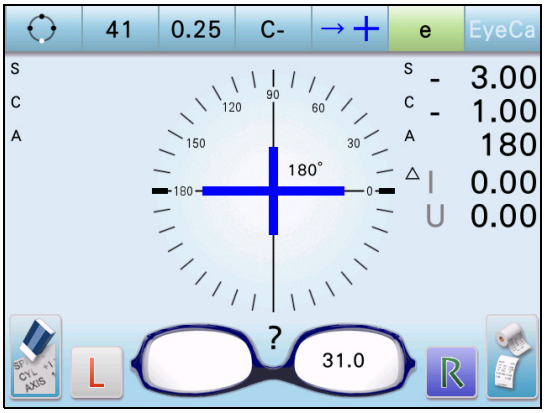
5 Secure the lens with the lens holder.

Lift the lens holder lever to unlock, then lower it slowly to secure the lens.



Lens holder

6 Press ⬭ after lens alignment or perform measurement with the auto read function to lock in the PD value.

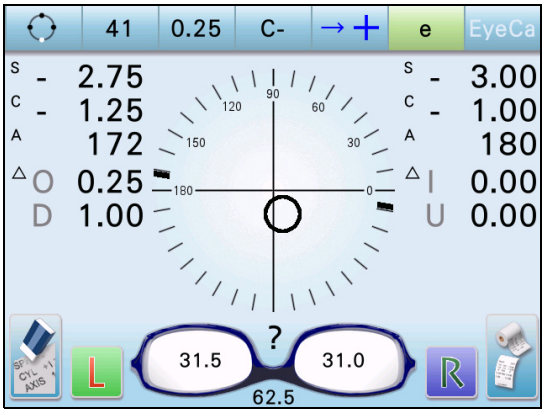


Note

- When the Auto read R/L parameter is set to ＋ (cross) in PD measurement, the target shape changes to ✚ (large cross) automatically.

7 Change the lens side to display the binocular PD.

8 Press ⬭ after lens alignment or perform measurement with the auto read function to lock in the PD value.



Note

- For a printout sample of PD measurement, see “2.11 Printing” (page 103).

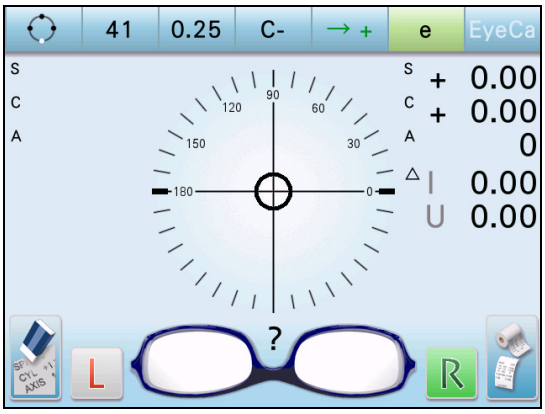
2.4 Measuring Single Vision Lenses

■ Single vision lenses are measured in the auto measurement screen or normal measurement screen.

1 Specify the lens side if necessary.

Press L or R to specify the left-eye lens or right-eye lens.

The R or L indication blinks indicating the measuring lens side.



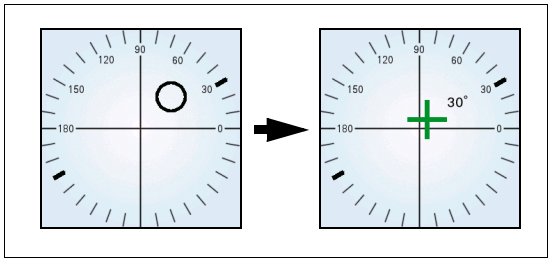
Note

- When the lens side is specified after measurement in the single state (R/L not specified), the measured data is cleared. Specify the lens side before measurement.

2 Perform alignment of a lens.

Move the lens to bring the target (○) close to the center of the alignment circle.

When the lens is in the range within about 0.5Δ from the center, the target changes from ○ to ＋ (cross).



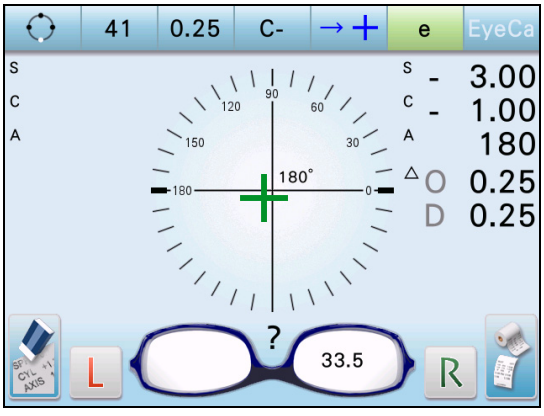
For mounted lenses, move the lens table along the frames. When alignment is complete, make sure that the bottom of the frames comes into contact with the lens table.

Note

- When the target changes from ○ to ＋ (cross), correct measurement can be performed in normal measurement.
  When marking a lens, perform more accurate alignment until ＋ (large cross) appears.

3 Press  .

The measured data is locked in.



Note

- The auto read function can be selected with the Auto read S or Auto read R/L parameter.

●Locking in measured data

The measured data on the screen is locked in and saved in the memory. The R/L indication becomes blue.

R/L indication when data is locked in

(Blue)	Indicates that the measured data of the lens in the single state is saved in the memory.
L (Blue)	Indicates that the measured data of the left-eye lens is saved in the memory.
R (Blue)	Indicates that the measured data of the right-eye lens is saved in the memory.

Since the target is not fixed, measurement can be performed by aligning the target and pressing again.

Cylinder mode can be changed with C- even after data is locked in.

●Locking in measured data with the auto read function

When the Auto read S or Auto read R/L parameter is set to " + " or " + ", the data is automatically locked in after the target is aligned as well as when is pressed.

Auto read S	Auto read function in the single state
Auto read R/L	Auto read function in the R/L state

To retry measurement, align the target and press again.

When the Auto read S or Auto read R/L parameter is set to " + ", the measured data is automatically locked in after the target changes to + . If alignment is performed until the target changes to + (large cross), auto read is performed again.

4 Measure the other lens if necessary (in the R/L state).

Press L or R to specify the left-eye lens or right-eye lens.

Follow the same steps as the first lens.

Note

- In the R/L state, when the Auto R/L parameter is set to "On", R and L are changed automatically when the lens is removed after the measured data is locked in.

5 Press to print the measured results.

For details of the printing, see "2.11 Printing" (page 103).

Note

- In the single state, when the Auto print S parameter is set to "On", printing is automatically performed when the lens is removed after the measured data is locked in.
- When the Auto print R/L parameter is set to "On", printing is automatically performed when the lens is removed after the measured data of both eyes is locked in.

○ Changing the cylinder reading

Pressing C- toggles the sign of the cylinder value between positive (+) and negative (-).

C-	Indicates that the cylinder value is displayed in the cylinder reading set with the Cylinder parameter.
C- (Orange)	Indicates that the cylinder value is displayed with opposite sign of the cylinder reading setting set with the Cylinder parameter.

○ Changing the prism indication

To display the prism value, set the Prism parameter to “P-B” or “BU/D BI/O”.
When this parameter is set to “Off”, the measured prism value is not displayed.

P-B	The measured prism value is displayed by polar coordinates. Absolute value of prism (Δ) Direction of base (°)
BU/D BI/O	The measured prism value is displayed by rectangular coordinates. Base In Base Out Base Up Base Down
Off	The measured prism value is not displayed.

When marking with the prism prescription, follow the prescription.

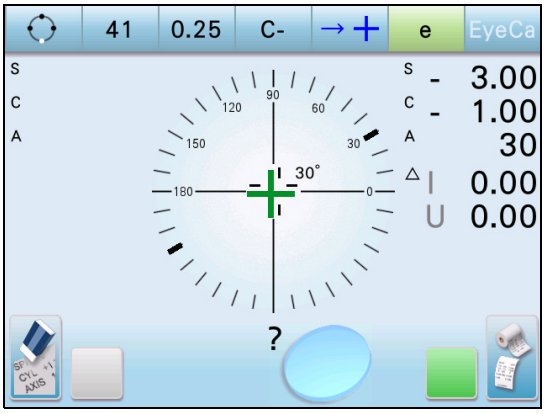
○ Guide mark

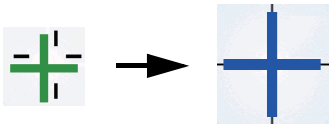
To align the target precisely, a guide mark ( ) is displayed in the alignment circle.

It is displayed by setting the Guide parameter to “On”.

The spacing between the target and guide shows the position of the target in the center of the alignment circle.

Proper alignment makes each spacing between the target and guide even.





○ Uncut lens diameter indication

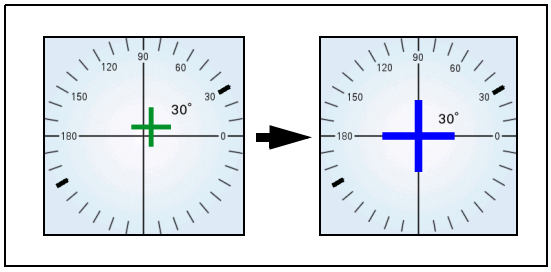
To display the lens diameter, set the Lens diameter measurement parameter to “On”.
This value doubles the distance from the nosepiece center to the lens table.

Note

- When the Lens diameter measurement parameter is set to “On”, the lens diameter is always displayed depending on the lens table position.
  The same applies to the mounted lens.

1 Align the lens.

Move the lens to align the target to the center of the alignment circle until the target changes from ○ to ＋ (cross) and then changes from ＋ (cross) to ✚ (large cross).



2 Set the lens table.

Pull the lens table lever forward until the lens table comes into contact with the outer diameter of the lens.

3 Press  .

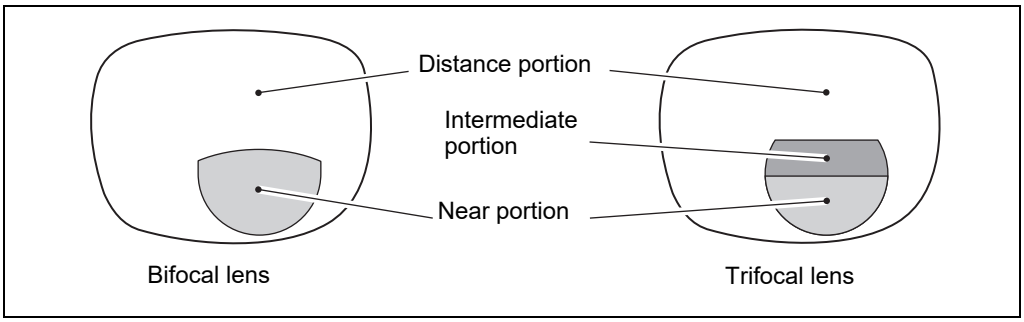
The measured data is locked in.

Note

- When the measured data is locked in by the auto read function, the lens diameter calculated by the position of the lens table at the time of lens alignment is locked in. Lock in the proper lens diameter by pressing  to measure the lens again.
- The measured result of the lens diameter is not printed, so it must be recorded by hand.

2.5 Measuring Bifocal Lenses

- Bifocal lenses (or trifocal lenses) can be measured sequentially in the order of the distance portion → near portion (for trifocal lenses, distance portion → intermediate portion → near portion).
- Measure the lens in the auto measurement screen or normal measurement screen.

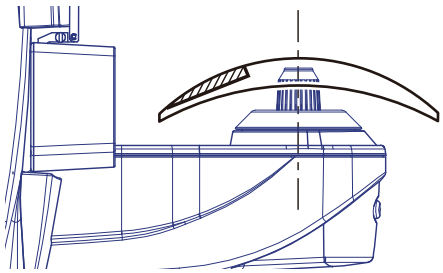


2.5.1 Measuring add power with normal accuracy

1 Specify the lens side if necessary.

Press L or R to specify the left-eye lens or right-eye lens.

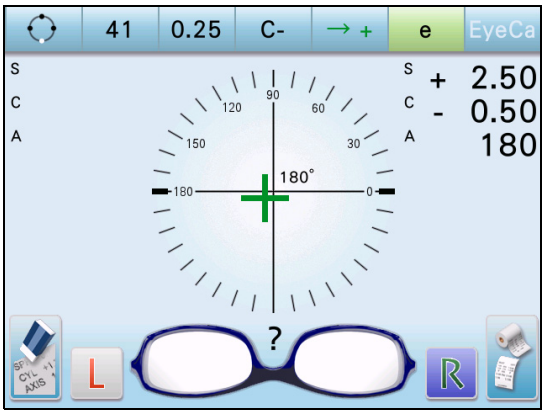
2 Bring the distance portion onto the nose-piece with the concave side down.



3 Measure the distance power.

After the target changes from ○ to ＋ (cross), press ⬭.

The distance power is locked in.



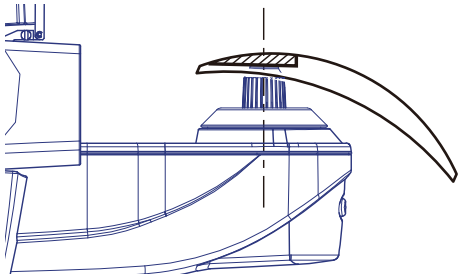
Note

- In measurement of the distance portion, auto read works according to the setting of the Auto read S or Auto read R/L parameter.

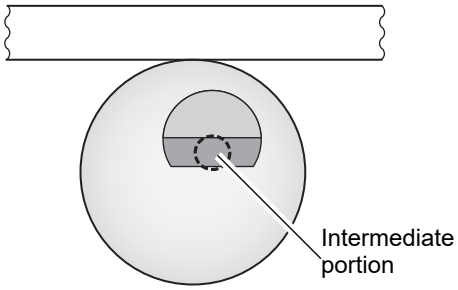
4 Measure the near add power (Add: 1st add power).

Pull the lens forward to bring the near portion onto the nosepiece.

When the add power is detected, the auto add measurement function places the device into add power measurement.



For trifocal lenses, bring the intermediate portion onto the nosepiece.



Trifocal lens

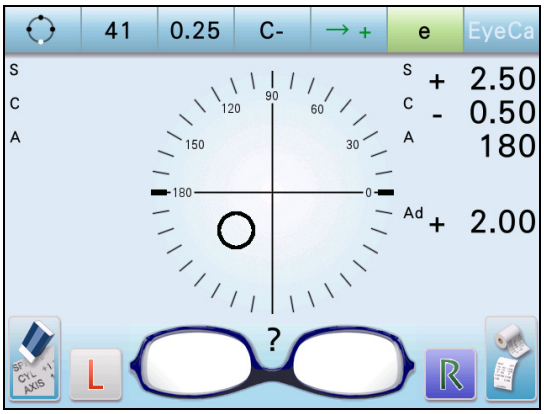
Note

- It is not necessary to align the target.
- Measure the near add power without removing the lens from the nosepiece.
  If the lens has been removed once, restarting distance measurement is necessary.
- For trifocal lenses, when the vertical length of the intermediate portion is narrow, the measuring beam may interrupt the boundary and correct measurement may not be performed.

5 Press  .

The measured data of the near add power (Add) is locked in.

Auto read function is disabled so press  to lock in the measured data.

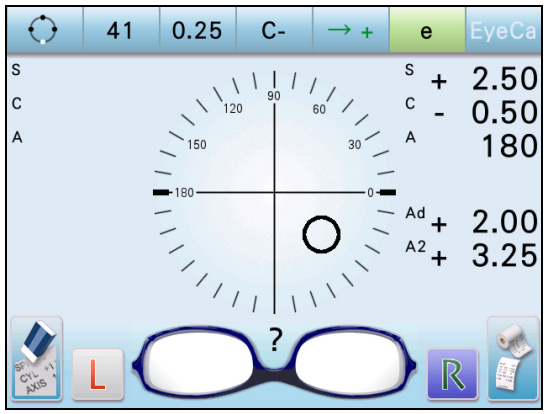


For bifocal lenses, measurement is complete.

For trifocal lenses, perform Steps 6 and 7 to measure the near add power (2nd add power).

6 Bring the near portion onto the nosepiece.

The near add power (A2: 2nd add power) appears on the screen.



Note

- It is not necessary to align the target.

7 Press  .

The near add power (A2) is locked in.

Auto read function is disabled so press  to lock in the measured data.

8 Measure the other lens if necessary (in the R/L state).

Press L or R to specify the left-eye lens or right-eye lens.

Follow the same steps as the first lens.

9 Press  to print the measured results.

For details of the printing, see “2.11 Printing” (page 103).

Note

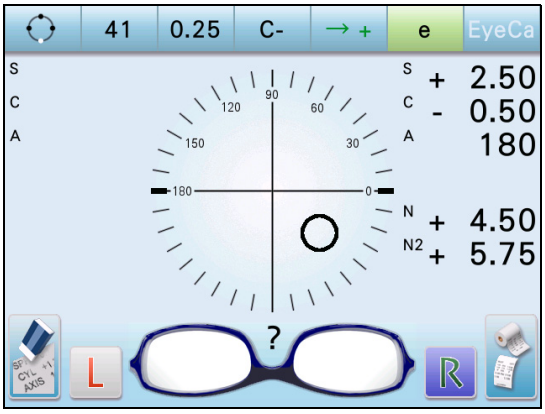
- Auto R/L selection and auto print work as in the same case with single vision lenses.

○ Sphere indication for near portion

By setting the Near parameter to “Near Sph”, the measured data of the near portion (Add) is displayed by sphere value instead of near add power (Add).

N: 1st near power (distance power + 1st add power)

N2: 2nd near power (distance power + 2nd add power)



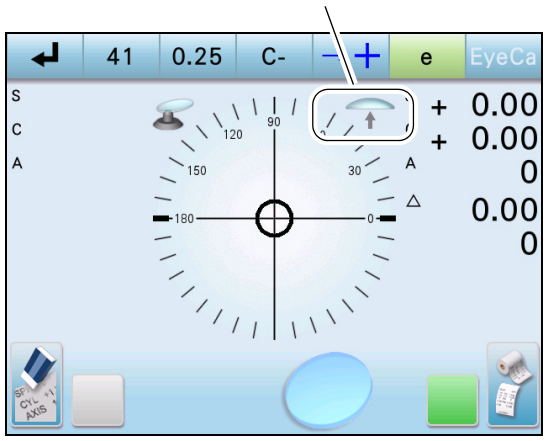
2.5.2 Measuring add power more accurately

■ Measurement error occurs due to the lens thickness between the segment and nosepiece. Measure the add power in the way to correct the error. It is especially effective when the base lens is thick.

1 Press and hold the measurement mode indication for about 1 second to display the mode change window.

2 Press  to display the concave surface add measurement screen.

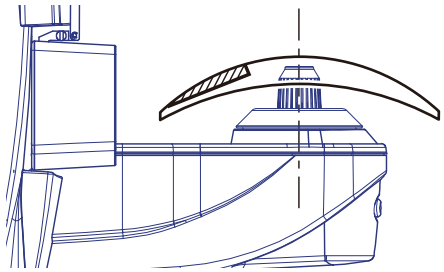
Concave surface add measurement icon



3 Specify the lens side if necessary.

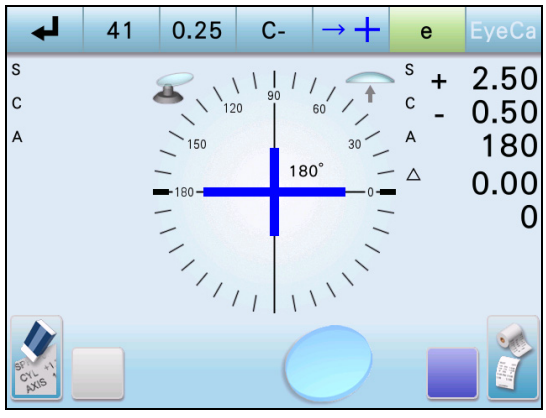
Press L or R to specify the left-eye lens or right-eye lens.

4 Bring the distance portion onto the nose-piece with the concave side down.



5 Press  .

The distance power is locked in.



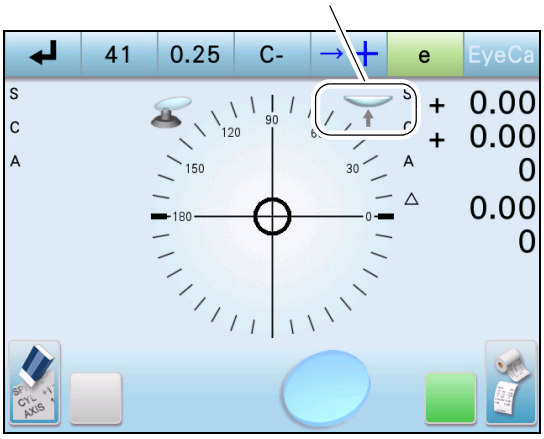
Note

- In the convex surface add measurement, auto read works according to the setting of the Auto read S or Auto read R/L parameter.

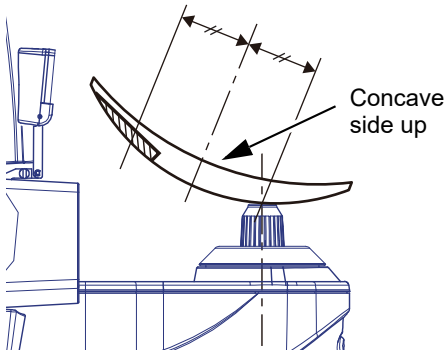
6 Set the distance portion with the concave side up as shown on the right.

When the lens is removed, the screen changes to the convex surface add measurement screen.

Convex surface add measurement icon



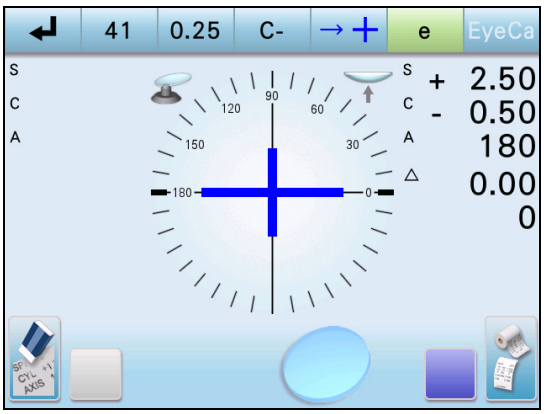
Bring the opposite side of the segment position from the midpoint of the lens center onto the nosepiece.



7 Press  .

The distance power is locked in.

Auto read function is disabled so press  to lock in the measured data.



Note

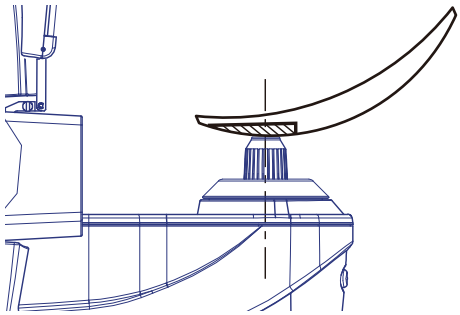
- It is not necessary to align the target.
- The distance power is the value from the concave side in the convex surface add measurement screen.

  Record the distance power in normal measurement with the concave side down.

8 Set the near portion.

Pull the lens forward to bring the near portion onto the nosepiece.

The near add power (Add) is displayed.



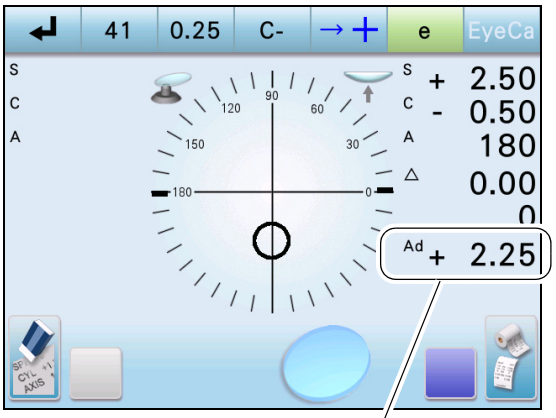
Note

- It is not necessary to align the target.

9 Press .

The measured data of the near add power (Add) is locked in.

Auto read function is disabled so press to lock in the measured data.

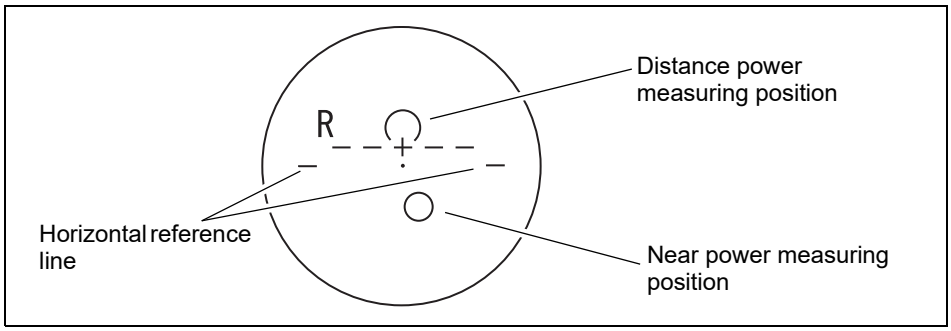


Measurement value of add power (Add).

2.6 Measuring Progressive Power Lenses

2.6.1 Measuring uncut lenses

Measure a lens at the marks of the distance portion and near portion printed on the lens in the same manner as “2.5 Measuring Bifocal Lenses” (page 45).



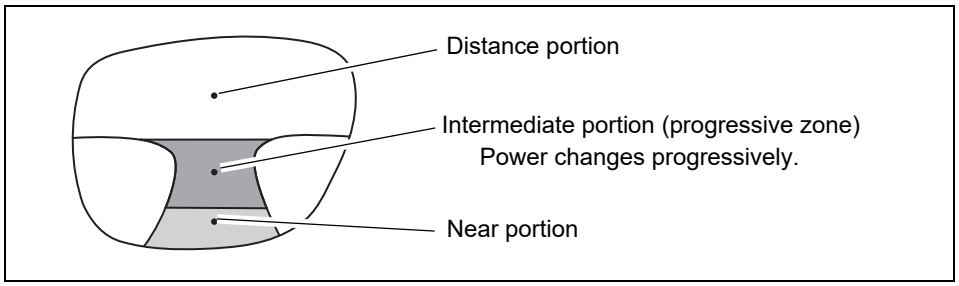
Note

- A lens must be placed with its horizontal reference line parallel to the lens table.
- If the marks printed on the lens interrupt the measuring beam, the target may wiggle.
  In such a case, measure the lens when the target stabilizes by moving the lens slightly.

2.6.2 Measuring mounted lenses

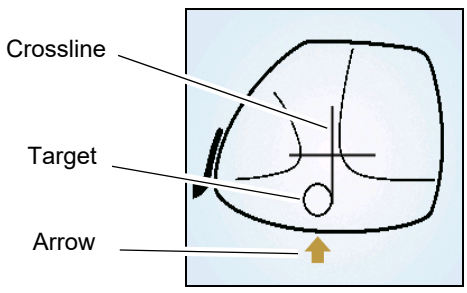
Measure a lens on the PPL measurement screen or auto measurement screen.

On the auto measurement screen, when the lens on the nosepiece is detected as a progressive power lens, the screen changes to the PPL measurement screen automatically.



After the distance and near portions are detected according to power changes in the progressive power lens, the guides (target and arrow) to align the lens appear on the screen.

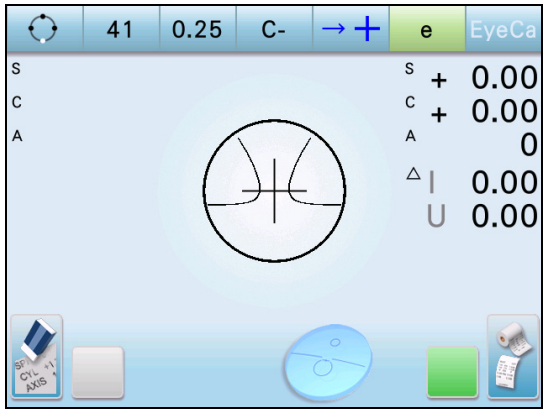
1) Move the lens in the direction of the arrow to roughly align the lens position.
2) Precisely align the target with the crossline.



1 Change the screen to the PPL measurement screen.

Press the measurement mode indication on the normal measurement screen to display the PPL measurement screen.

To switch from the auto measurement screen to the PPL measurement screen, see “○ Screen change in auto measurement” (page 59).



2 Set mounted lenses.

See “2.3.2 Setting mounted lenses” (page 38).

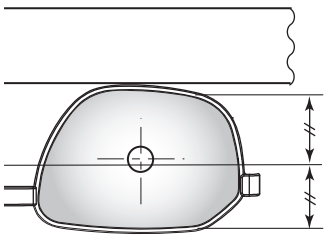
When the PD measurement parameter is set to “Off”, press L or R to specify the left-eye or right-eye lens.

●Measurement procedure for the right-eye lens

3 Measure the distance power.

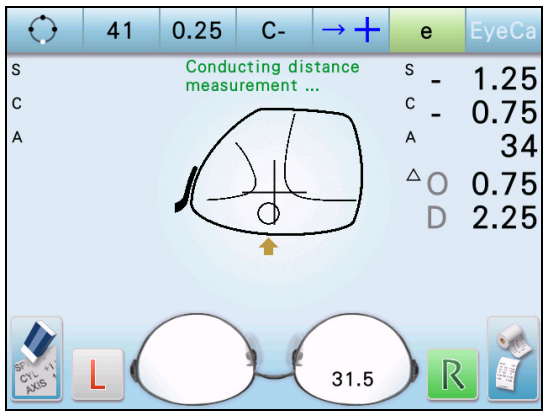
1) Bring the intermediate portion (progressive zone) onto the nosepiece.

Place a portion that is slightly lower than the center of the lens on the nosepiece.



The target (◯) indicating the distance portion is displayed.

The arrow shows the direction in which the lens should be moved.



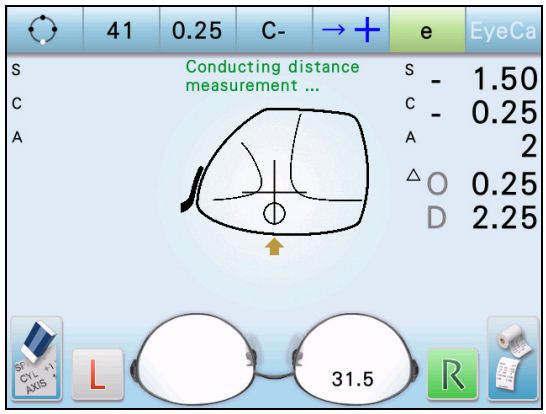
Note

- Tips on moving the lens:

  To measure the progressive power lenses accurately, pay attention to the following:

  - Move the lens vertically after horizontal alignment of the lens.
  - Move the lens while the frames are constantly in contact with the lens table.
  - Ensure that the lens rear surface is constantly in contact with the nosepiece.

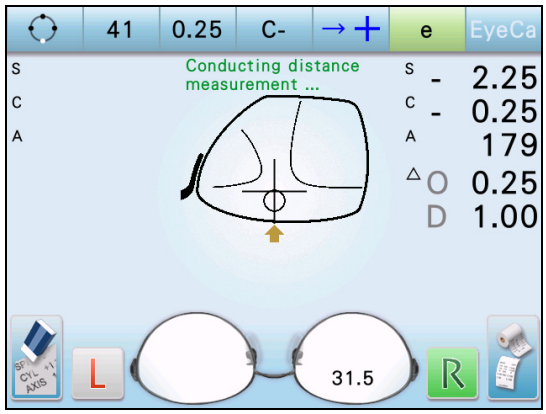
2) Move the lens in the horizontal direction to align the target with the vertical line of the crossline.



3) Slowly move the lens toward the device (upward on the screen) referring to the target to align it with the crossline.

When the target is off the vertical line of the crossline in the horizontal direction while the lens is moved, move the lens in the horizontal direction.

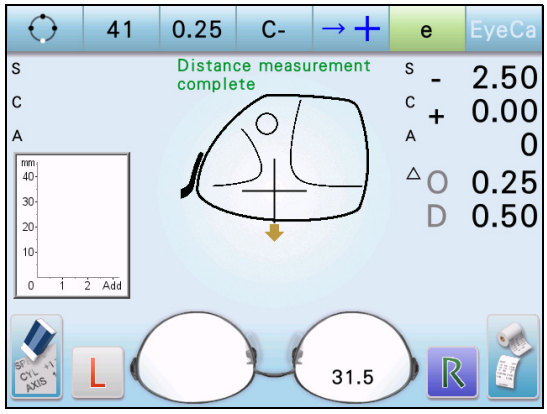
When the vertical position is roughly aligned, the arrow disappears.



4) Precisely adjust the lens vertically and horizontally to align the target with the crossline until the target changes from ○ to ＋ (cross).

5) When the target changes to ＋ (cross) and the measured data stabilizes, the measured data is automatically locked in.

The “Distance Measurement complete” message appears. The screen changes to add power measurement for the near portion automatically.



Note

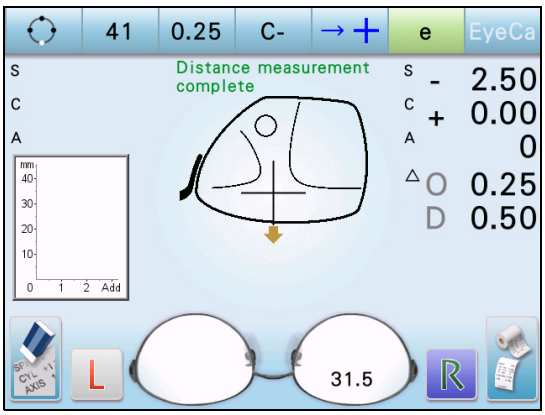
- When the Distance auto read parameter is set to “Off”, press ⬭ when the target changes to ┼ (cross) in Step 5) and the measured data stabilizes.
- When the distance portion cannot be detected in normal measurement, bring the distance portion onto the center of the nosepiece, and then press ⬭.
- For progressive power lenses corrected with the horizontal prism, the position 3 mm upper from the pupil for the distance vision with glasses is marked as distance portion. In such a case, press ⬭ manually.

  The near portion can be measured in the normal procedure.
- The displayed PD in distance power measurement is corrected to make alignment easy. Therefore, marking is performed when the target becomes ┼ (cross) in distance measurement and it may not correspond to the PD value acquired by actual measurement.

4 Measure the near add power.

1) The target indicating the near portion appears.

   The arrow shows the direction in which the lens should be moved.



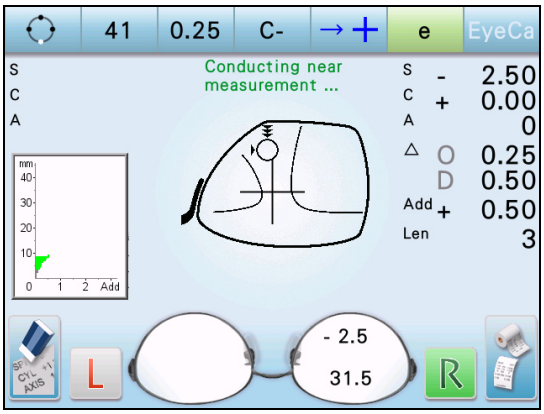
2) Move the lens slowly in the direction of the arrow (toward the operator).

   When the intermediate portion (progressive zone) is detected, the “Conducting distance measurement…” message appears and the current add power (Add) appears.

   The indicator for near portion (▼) appears above, below, on the right of, or on the left of the target, which shows the direction and movement distance to move the lens.

   Move the lens in the direction of (▼).

   The number of indicators for near portion (up to three) shows how much the lens should be moved.

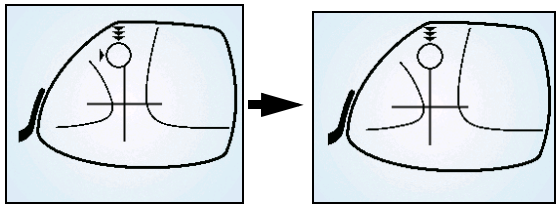


3) Align the lens horizontally.

   Move the lens in the horizontal direction until the indicator for near portion (▶) on the left and right of the target disappears.

4) Align the lens vertically.

   Move the lens in the vertical direction until the indicator for near portion (▼) above or below the target disappears.



Move the lens in the vertical direction after horizontal alignment of the lens.

Note

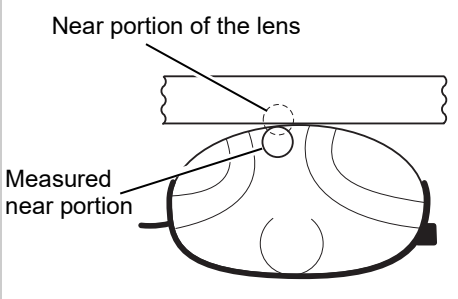
- If the indicator for near portion (▶) appears while aligning the lens vertically, align the lens horizontally again.

  Align the lens vertically without indicator for near portion (▶) displayed.

- When the indicator for near portion (▼) above the target does not disappear:

  For small vertical frames, the indicator for near portion may not disappear due to steep variations in lens powers even though the lens is moved toward the operator.

  In such cases, press  to measure the lens with the lens table at the far front. However, as the measured near portion is moved from the projected position, the near portion power may be reduced. (When two indicators for the near portion (▼) are displayed, the power may be reduced by 1 step.)

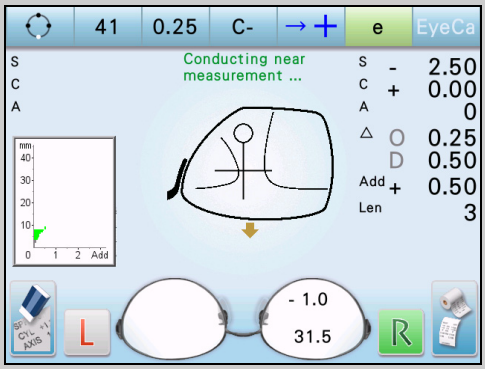


- Whether to display the indicator for near portion (▼) can be set with the Indicator parameter.

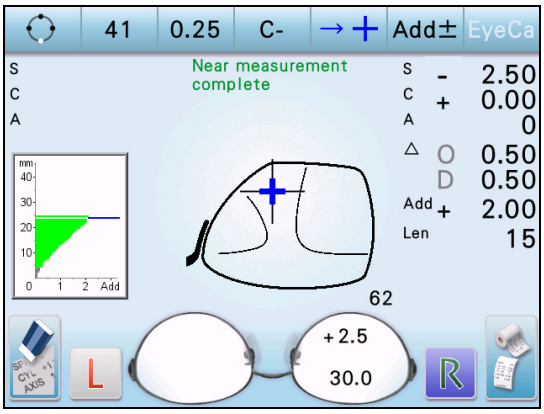
  When the Indicator parameter is set to "Off", align the lens referring to the target.

  When the vertical position is aligned, the arrow disappears.

  After horizontal and vertical alignment of the lens, the target changes from ○ to ＋ (cross).



5) Precisely make vertical and horizontal adjustments of the lens to align the target to the crossline until the target changes from ○ to ＋ (cross).

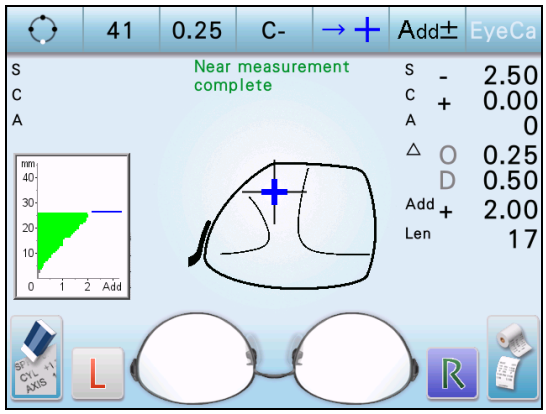


6) Lock in the measured data.

●When PD has not been measured

When the target changes to ＋ (cross) and the measured data stabilizes, the measured data is automatically locked in.

The “Near measurement complete” message appears.



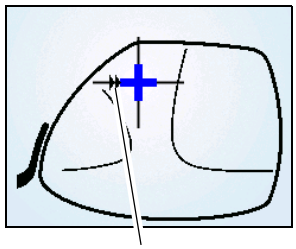
Note

- When the near portion cannot be detected in normal measurement, place the near portion on the center of the nosepiece and then press ⬭ .

●When PD has been measured

The near portion inside amount (Ins) is displayed.

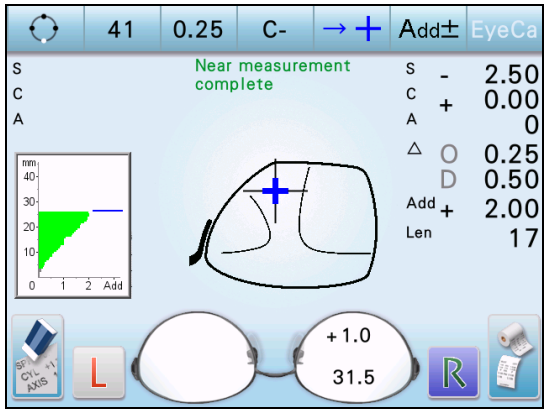
For correct alignment, the indicator (▶) appears on the right or left of the target ＋ (cross) to indicate the direction in which the lens should be moved and its movement distance in PD measurement.



Indicator for near portion

Move the lens until the indicator (▼) disappears. When the measured data stabilizes, it is locked in.

The “Near measurement complete” message appears.



Note

- When the Near auto read parameter is set to “Off”, press ⬭ when the target changes to ＋ (cross) in Step 6) and the measured data stabilizes.
- Even if the indicator (▼) is displayed in Step 6), near measurement can be completed by pressing ⬭ when PD (near portion inside amount) measurement is not performed.
  In such a case, the displayed near portion inside amount is not correct.

5 Measure the other lens if necessary (in the R/L state).

When the PD measurement parameter is set to “Off”, press L or R to specify the left-eye or right-eye lens.

Follow the same steps as the first lens.

6 Press  to print the measured results.

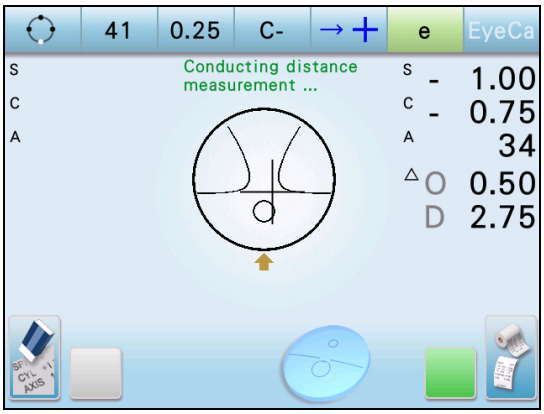
For details of the printing, see “2.11 Printing” (page 103).

Note

- Auto R/L selection and auto print work after add power measurement.

○ Measurement screen in the single state

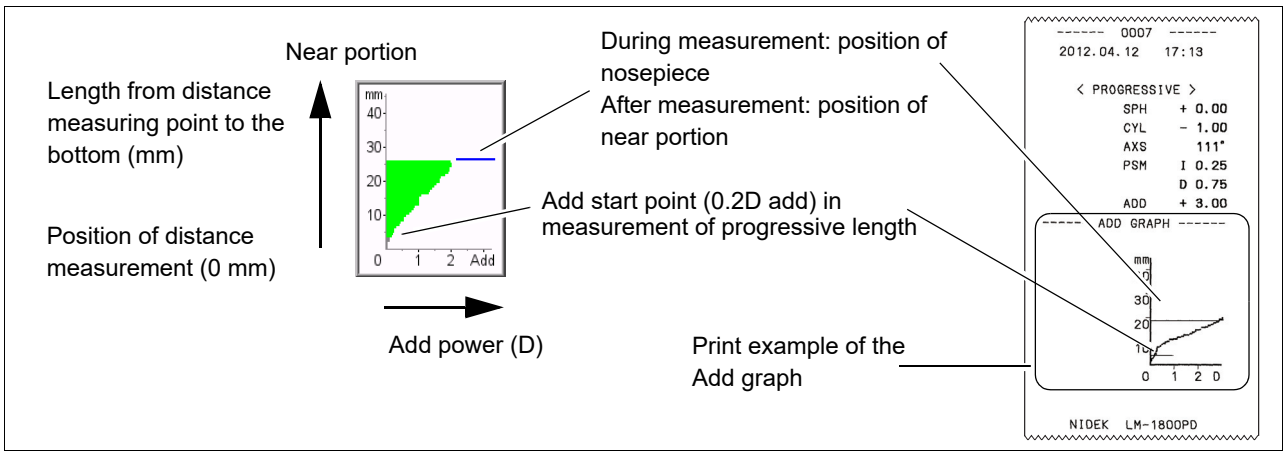
When the lens side is not specified (single state), a round lens is displayed in form on the screen.
The measurement procedure is the same as when the lens side is specified.



○ Add graph display and printing (LM-1800PD only)

The Add graph indicates the transition of the add power from distance to near portion in graph.
It indicates the length from the distance measuring point to its bottom (toward near portion) and the add power at the point. It allows the user not only to measure the distance power and add power but to check the change in the add power.
The graph is also useful to know the lens type such as that the add power stabilizes, decreases or increases around the near portion. It allows choosing the same type of lenses that are currently used for comfortable use of new glasses.
In addition, after near portion defect has been determined, the graph display turns orange.

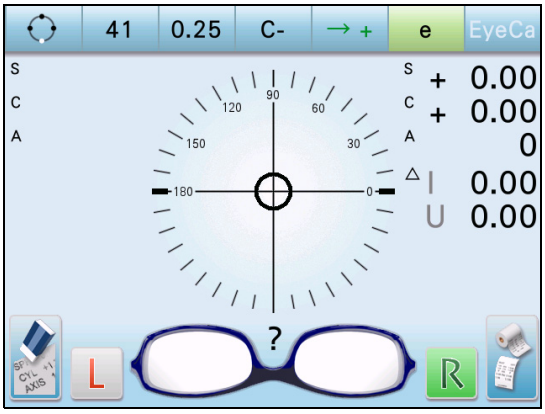
For the graph display, set the Add graph parameter to On.
For the graph printing, set the Add graph parameter to Print.
In the Add power graph on the printout, a horizontal line is drawn at the start point (0.2D add: the position where green line starts in the Add graph on the display) and the position of near portion (blue line in the ADD graph on the display).



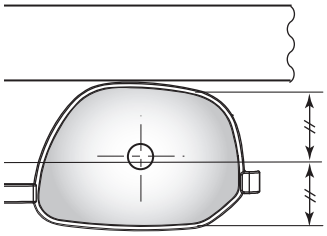
○ Screen change in auto measurement

When the lens on the nosepiece is detected as a progressive power lens on the auto measurement screen (normal measurement), the screen changes to the PPL measurement screen (auto measurement mode) automatically.

1) Set a progressive power lens onto the nosepiece on the auto measurement screen.



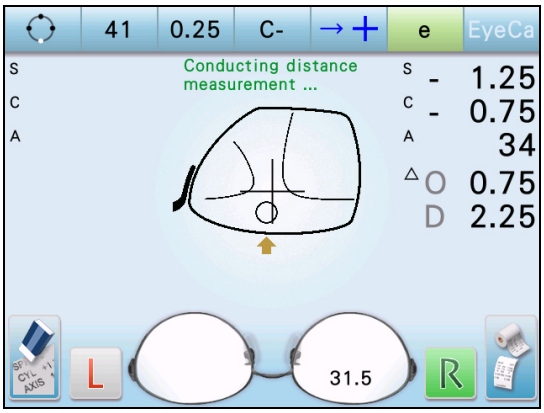
Place the intermediate portion (progressive zone) that is slightly lower than the center of the lens or near portion area onto the nosepiece.



Note

- If the distance portion is placed on the nosepiece, the lens may not be detected as a progressive power lens.
- The progressive power lens detection is continuously performed while the lens is set on the nosepiece in auto measurement mode.

2) The screen changes to the PPL measurement screen automatically.



After lens measurement, pressing  or  returns the screen to the auto measurement screen (normal measurement).

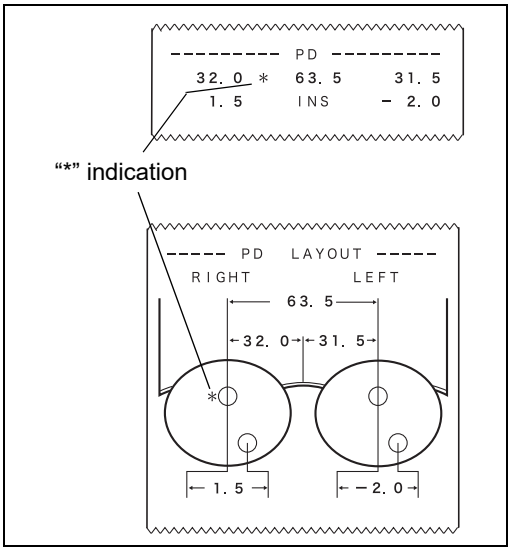
○ PD indication in PPL measurement (LM-1800PD only)

●PD measurement of the distance portion

PD displayed in orange indicates that PD measurement is not performed correctly due to a lens with simple astigmatism at the distance portion or equivalent.

When PD is displayed in orange, the position of the nose slider is displayed as the PD data. Use it as a reference value.

The PD data is printed with "*" for attention.

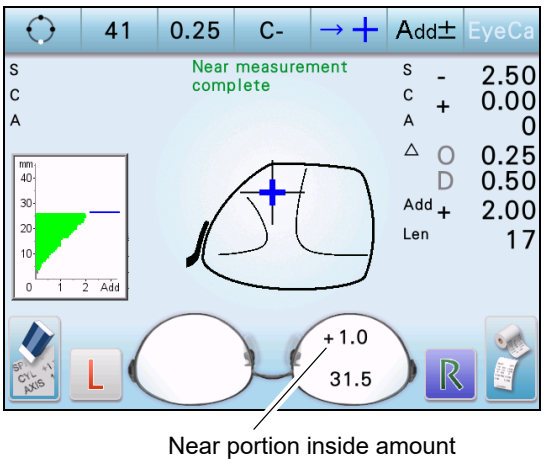


●PD measurement of the near portion

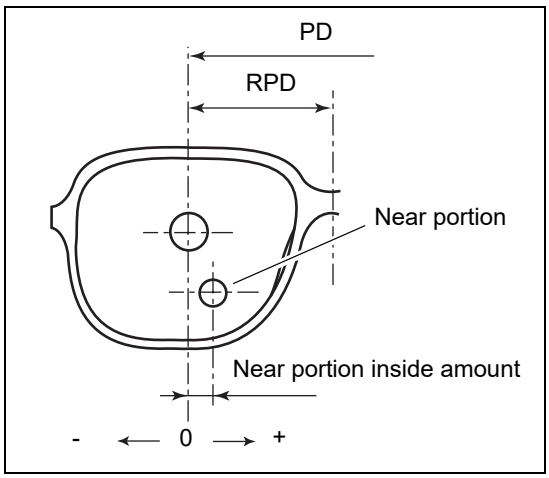
When the near PD of a progressive power lens is measured, the near portion inside amount can be displayed.

The near portion inside amount indicates the distance (mm) that the near portion is inside to the distance portion.

To display the near portion inside amount, set the Inside parameter to "On".



When the displayed value is positive, the near portion is inside to the distance portion. When negative, the near portion is outside to the distance portion. In such a case, check if the right lens or left lens is correct.



2.6.3 Measuring the progressive length (LM-1800PD only)

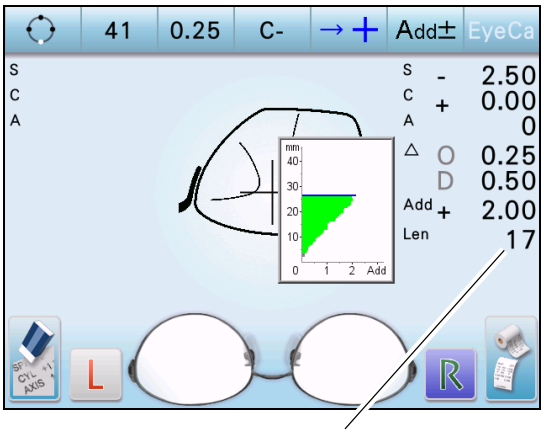
■ When a lens is measured on the progressive power lens measurement screen with the Length parameter at “On”, the length (mm) from the add start point (0.2 D add) of a progressive power lens to the near portion (near measuring point) can be measured.

Note

- Measuring the progressive length allows for checking whether the lens has the progressive length shortened for smaller frames or has smaller astigmatic aberration by lengthening the progressive zone.

With the same measurement as mounted lenses, the measured result (Len) of the progressive length is displayed.

When measurement of the near portion is complete, the measured data of the progressive length is locked in.

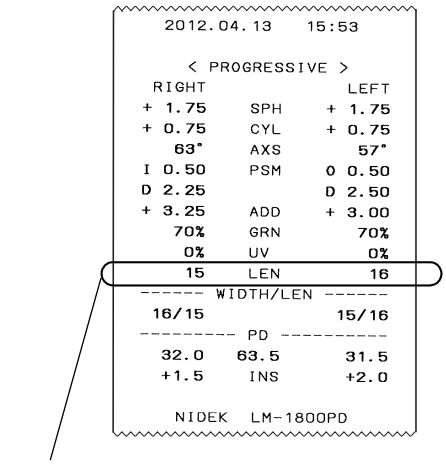


Measured result (Len) of the progressive length

Note

- The LM-1800PD measures the length from “0.2D add point to the near measuring point” as the progressive length. The definition of progressive length varies depending on lens manufacturer so the measured result may not match the nominal value of the lens manufacturer.

After the progressive length is measured, the result (LEN) is printed.



Progressive length

2.6.4 Measuring the channel width (LM-1800PD only)

- When the Channel width parameter is set to “On”, the width of the progressive zone can be measured. The measurement only applies to the mounted lens since the nose slider is used as a measuring tool.
- The measuring method and contents of the channel width depend on the setting of the Channel width auto read parameter. Check the setting in advance.

For the details of parameter setting, see “2.14 Setting Parameters” (page 111).

The setting can be checked on the setting indication at the top of the screen. The factory setting is “0.50”.

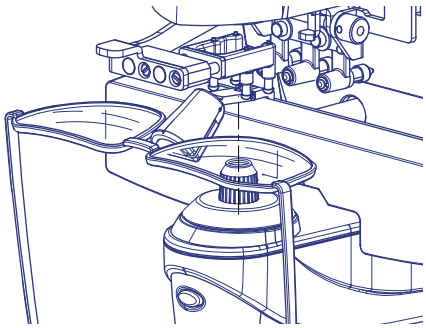
Off	In measurement of the channel width, auto read function is disabled.
0.25	In measurement of the channel width, auto read is performed at the point changed in 0.25 D from the distance cylinder value (measures the range of distance cylinder value ±0.25 D as channel width).
0.50	In measurement of the channel width, auto read is performed at the point changed in 0.50 D from the distance cylinder value (measures the range of distance cylinder value ±0.50 D as channel width).

Note

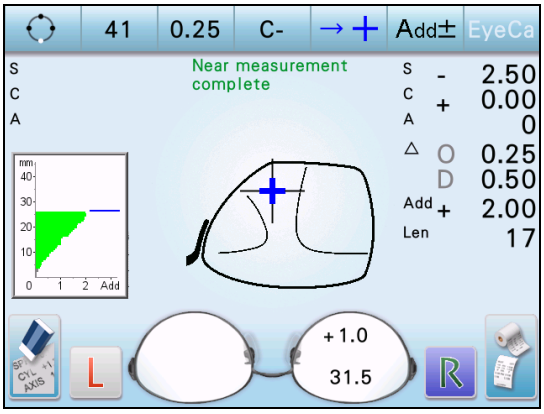
- The LM-1800PD measures the width of “the range that the difference with the distance cylinder value is less than 0.50 D (or 0.25 D)” as channel width. The definition of channel width is not disclosed by lens manufacturers.
- When the PD measurement parameter is set to “Off” or “R/L only”, the channel width can be measured.

1 Measure the progressive power lens.

Before measurement, set the lens using the nose slider.



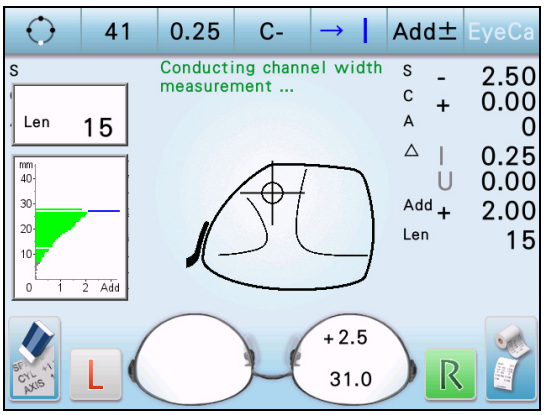
2 With the “Near measurement complete” message displayed, press and hold for about 1 second.



3 Channel width measurement mode turns on and the “Conducting channel width measurement...” message appears.

The target disappears.

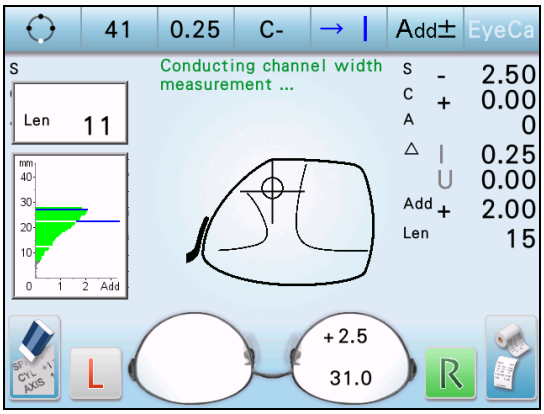
A box that displays “length from the distance portion (0.2 D add point) (Len)” is displayed on the screen.



4 Move the lens vertically to bring the channel width to the desired position.

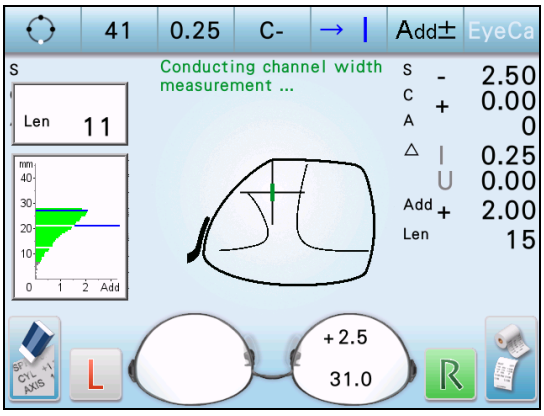
Determine the position to be measured, referring to the horizontal axis of the Add graph.

Make sure that the lens table touches the bottom of frames.



5 Slowly move the lens horizontally to align the channel width boundary with the cross-line.

Depending on the lens position, the target appears. The shape of the target indicates the variations in lens powers.

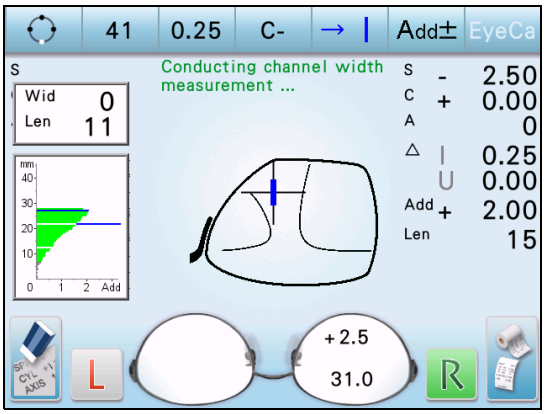


(Green):	Position changed in 0.25 D from the distance cylinder value
(Blue):	Position changed in 0.50 D from the distance cylinder value

6 Press  .

With the Channel width auto read parameter set to “0.25” or “0.50”, auto read is automatically performed when the lens is placed in the appropriate position in Step 5 and the measured data stabilizes.

Channel width (Wid) is also displayed in the box.



Note

- Depending on the lens, change in 0.50 D cannot be detected, so auto read of the channel width (0.50 D) may not function.
- Some frames may contact the body of the device due to its shape before auto read of the channel width starts.

7 Slowly move the lens to align the target with the other boundary.

Note

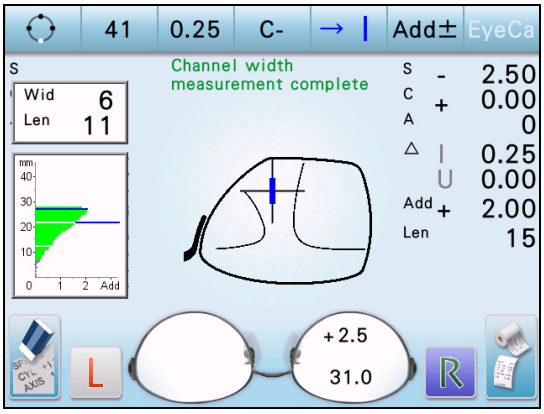
- Do not push or pull the lens while moving the lens.

  If the lens table is moved, channel width (Wid) is not displayed. In such a case, replace the lens table until it is displayed and restart the measurement.

8 Press .

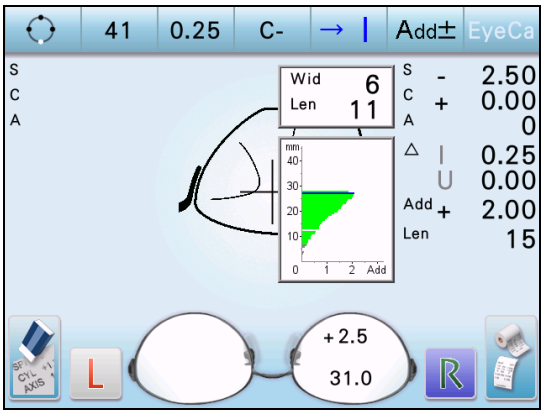
With the Channel width auto read parameter set to “0.25” or “0.50”, auto read is automatically performed when the lens is placed in the appropriate position in Step 7 and the measured data stabilizes.

The measured data of the channel width is locked in.

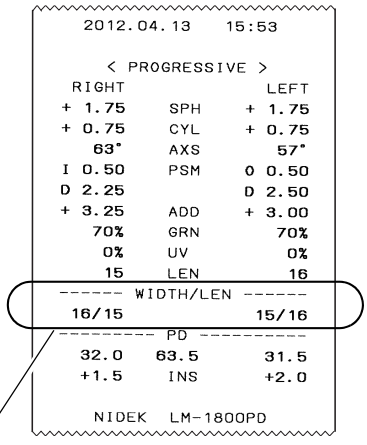


Removing the lens from the nosepiece displays the measured result of the channel width and Add graph in the center of the screen.

The Add graph indicates the result of near measurement.



After the channel width is measured, the result (WIDTH/LEN) is printed.


2012.04.13 15:53

< PROGRESSIVE >

RIGHT		LEFT
+ 1.75	SPH	+ 1.75
+ 0.75	CYL	+ 0.75
63°	AXS	57°
I 0.50	PSM	0 0.50
D 2.25		D 2.50
+ 3.25	ADD	+ 3.00
70%	GRN	70%
0%	UV	0%
15	LEN	16

------ WIDTH/LEN ------

16/15		15/16

--------- PD ----------

32.0	63.5	31.5
+1.5	INS	+2.0

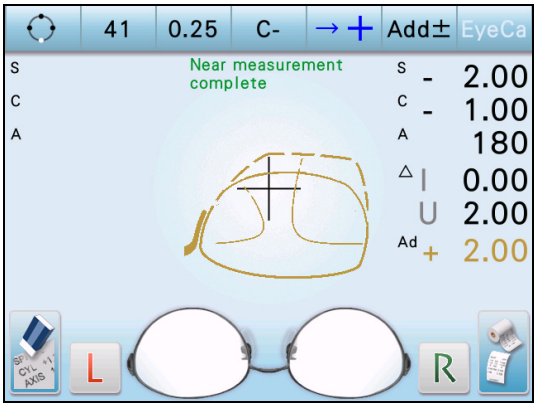
NIDEK LM-1800PD

Channel width/Progressive length

2.6.5 Progressive power lenses for small vertical frame

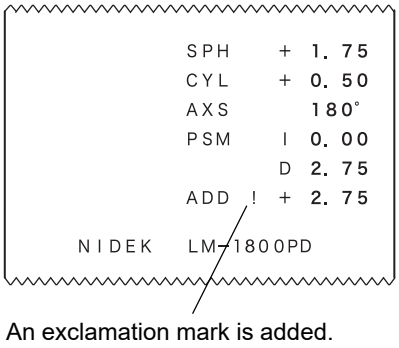
When the height of the processed lens is small and near portion is not intact, the display is changed to alert that the correct near power has not been measured.

When the edge of the lens is found before the near portion is detected, a small lens image is displayed on the screen. At this time, the lens image and measured value of add power are displayed in orange (the lens image is displayed in pink when lens table is used).

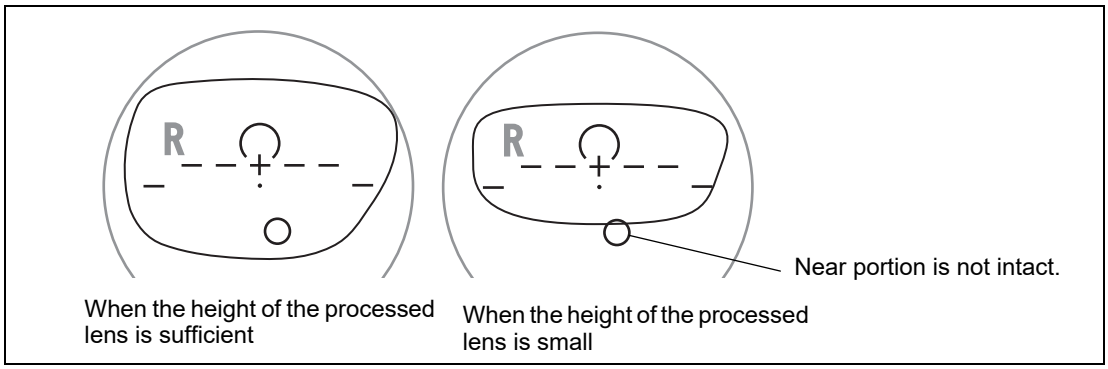


The near add power is locked in by auto read function, and measurement completes.

An exclamation mark is added to add power on the printout.



When the height of the processed lens is small and near portion is not intact, add power cannot be measured with usual auto read function.

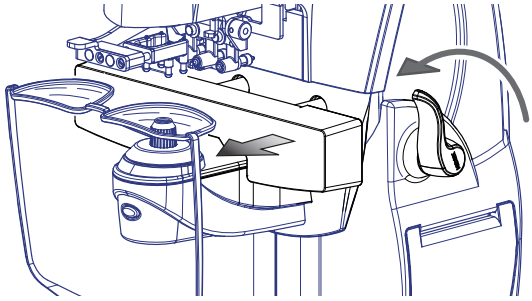


●Measurement with lens table

1) Set mounted lenses.

Place the frames on the nosepiece with the lens convex side up, and pull the lens table until it comes into contact with the bottom of the frames.

Secure the lens with the lens holder.

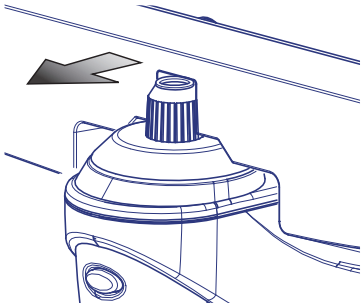


2) Measure the distance portion of the lens with auto read function. Align the target with crossline to change the target from ○ to ＋ (cross).

3) Measure the near portion of the lens with auto read function.

Pull the lens table lever to the far front while holding the frame until the nosepiece is partially hidden by nosepiece or lens table.

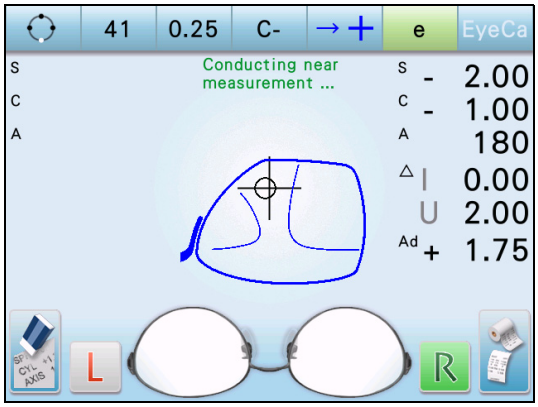
Pull the lens table to the far front



In this position (when the lens table is at far front and lens image is displayed in blue), measurement position ＋ aligns with the vertical position of the target (○).

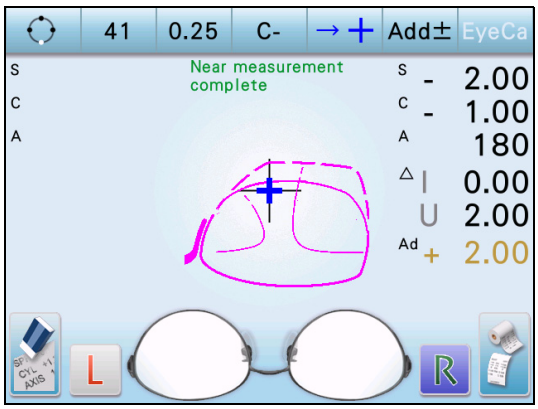
4) Align the lens horizontally.

Align the target with crossline horizontally to change the target from ○ to ＋ (cross) with auto read function.



After auto read is performed, whether the near portion is completely intact is checked.

When the near portion is not intact, the lens is displayed in pink as shown to the right.



Note

- When the lens table is pulled at the far front and not moved, near portion can be detected by mounting the frames on the nosepiece again even if the frame becomes out during measurement.

●Measurement without lens table

When the near portion cannot be detected with auto read function by using lens table, measure the point which is nearest to the near portion.

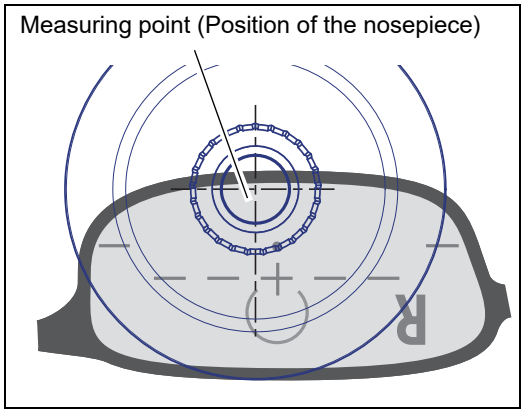
1) Set mounted lenses.

   Place the frames on the nosepiece with the lens convex side up, and pull the lens table until it comes into contact the bottom of the frames.

2) Measure the distance portion of the lens with auto read function. Align the target with crossline to change the target from ○ to ＋ .

3) After distance power measurement, leave the lens table as it is and move the frame toward the operator. At this time, make the indicators for near portion (▶) not to be displayed.

4) When the near point cannot be detected and the bottom of the frames begins to contact the nosepiece, moving the frame so the nosepiece is positioned about one third back (measurement point) allows near portion auto read to function.



   Maximum additional power is automatically detected from a part of near portion on the nosepiece.

Note

- This function is disabled with the lens table pulled forward (The target is displayed in blue).
- If the near portion is not intact when Near auto read parameter is set to “Off”, the near add power is automatically read.

The measurement portion is a part of near portion since the near portion is lacked from the lens, so the measured data without lens table is not an actual additional power.

The measuring method is same as normal lenses, but note the following points.

- Be sure to move the lenses in the vertical direction when the indicator for near portion (▶) is not displayed on the right and left sides.

  Otherwise, additional power may be underestimated.
- Align the nosepiece so that more than half of it is covered with a lens.

  When nosepiece is widely out of lens, measurement error occurs.
- The intact amount of the add power cannot be judged. Consider the add power acquired with this function as lower than actual.

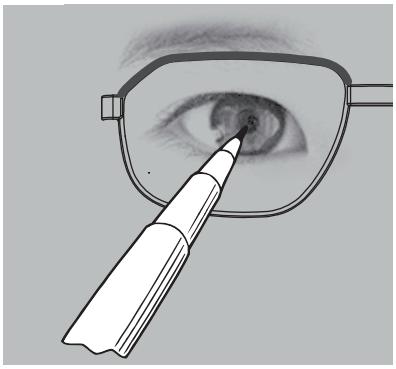
2.7 Measuring Prism Lenses

■ This is the method to measure prism power of mounted prism lenses. Set the Prism parameter in advance.

P-B	The measured prism value is displayed by polar coordinates.
BU/D BI/O	The measured prism value is displayed by rectangular coordinates.
Off	The measured prism value is not displayed.

1 Mark the pupil center (eye point).

Instruct the customer to wear glasses and look straight. Mark the pupil center on each lens.



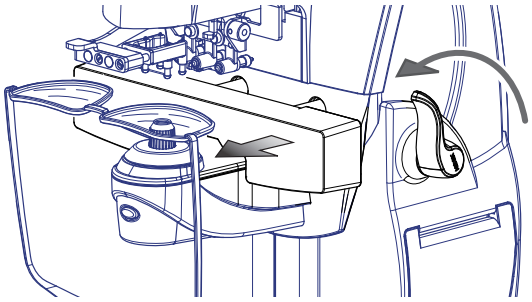
Note

- The mark should be 1 mm or smaller in diameter.
  If the mark is too big, it may interfere with the measurement.

2 Set mounted lenses.

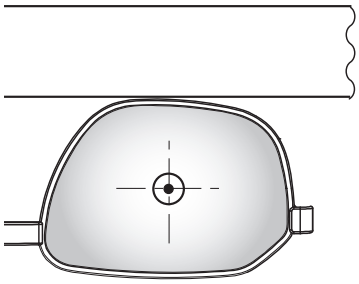
Place the frames on the nosepiece with the lens convex side up, and pull the lens table until it comes into contact with the bottom of the frames.

When the PD measurement parameter is set to “Off”, press L or R to specify the left-eye or right-eye lens.



3 Secure the lens with the lens holder.

4 Bring the eye point marked in Step 1 to the center of the nosepiece.



Note

- It is not necessary to align the target.

5 Press  .

The measured data is locked in.

Note

- If the “Measurement error” message appears, the mark may interrupt the measuring beam. Move the lens slightly to achieve the measured data.

6 Measure the other lens if necessary.

When the PD measurement parameter is set to “Off”, press  or  to specify the left-eye or right-eye lens.

Follow the same steps as the first lens.

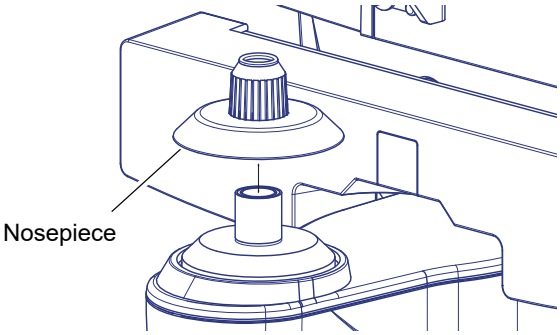
7 Press  to print the measured results.

For details of the printing, see “2.11 Printing” (page 103).

2.8 Measuring Contact Lenses

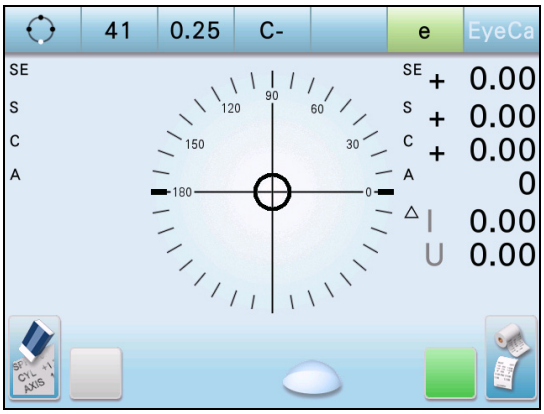
1 Replace the nosepiece with the one for contact lenses.

The top of the nosepiece for contact lenses is smaller than the standard one.



2 Change the screen to the CL measurement screen.

Press the measurement mode indication to change the screen to the CL measurement screen.



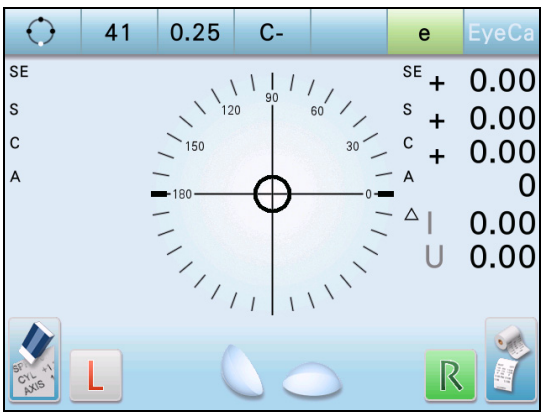
Contact Lens (CL) measurement screen

Note

- When the Contact measurement parameter is set to “only”, the mode change window is not displayed.
  The mode is restricted to the CL measurement.
- When the Contact measurement parameter is set to “Off”, the screen cannot be changed to the CL measurement screen.
  Select “On” or “only”.

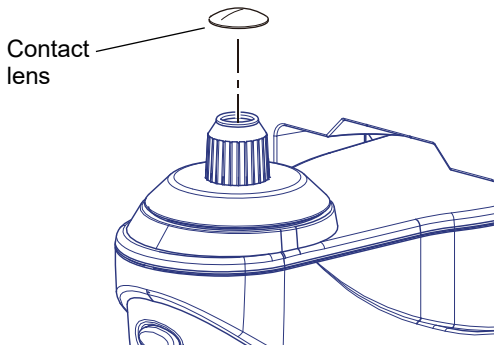
3 Specify the lens side if necessary.

Press L or R to specify the left-eye lens or right-eye lens.



4 Set a contact lens.

Put the lens on the nosepiece with the convex side up.

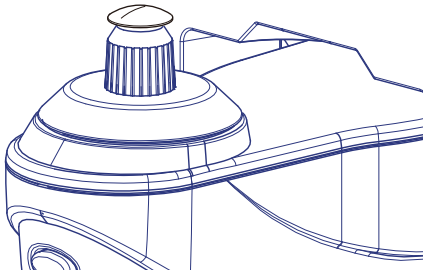


⚠ CAUTION

- **Hold a contact lens with tweezers or fingers. Be careful not to damage the lens.**
- **Only use tweezers with round tips.**
- **Do not press the contact lens down with the lens holder.**
  It damages the contact lens.

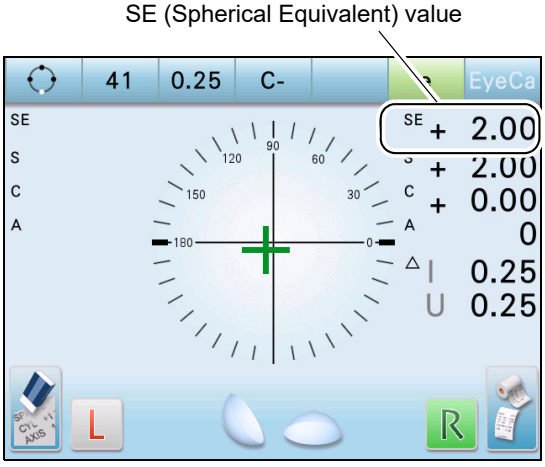
5 Align the contact lens.

Align the contact lens, pushing its end lightly with tweezers tips.



6 Press  .

In CL measurement, a SE value is displayed along with the S, C and A measured data.



Note

- SE (Spherical Equivalent) value
  This is the half of the cylinder value added to the sphere value. When a non-cylindrical contact lens is measured and still a cylinder value is detected, the SE value is more reliable than the SPH value to know the total sphere value.
  It reduces the error in the measured data made by the unintended cylinder value.

Note

- In CL measurement, auto read function is enabled when the Contact auto read parameter is set to “On”.
  When the Contact auto read parameter is set to “Off”, press  to perform measurement.

7 Remove the contact lens from the nosepiece.

8 Measure the other lens if necessary.

Press L or R to specify the left-eye lens or right-eye lens.

Follow the same steps as the first lens.

9 Press  to print the measured results.

For details of the printing, see “2.11 Printing” (page 103).

Note

- Measure a soft contact lens quickly so that the lens surface does not dry.
  Due to drying of the lens or its soft material, the lens surface may be distorted resulting in incorrect measured data.

2.9 Various Measurements

■ This section describes how to measure the transmittance, net prism (lens layout and eye point level), and refractive index (optional).

2.9.1 Measuring transmittance

The transmittance of visible light (GREEN. center wavelength of 535nm) and UV (ultraviolet rays, center wavelength of 365nm) can be measured by percentage unit. The transmittance can be measured on all measurement screens.
To measure the transmittance, set the Transmittance, Transmittance step, and Auto correct parameters.
In addition, select the measured result display “Compare” or “Simple” with the Transmittance display parameter.

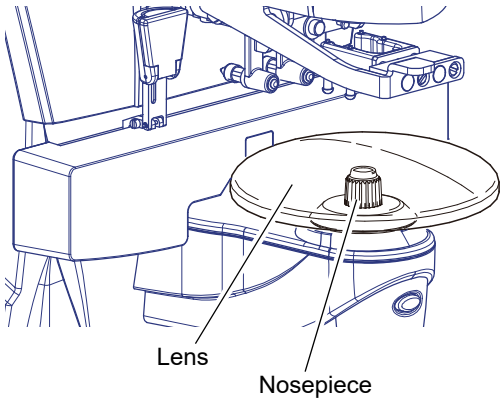
Note

- Use the visible light (GREEN) transmittance measured result as simple judgment.
  Since the luminosity curve and GREEN LED output characteristics are different, the LM measured value does not offer the measured value of GREEN wavelength for both luminous transmittance and spectral transmissometer.

1 Set the lens on the nosepiece.

Place the lens center on the nosepiece with the convex side up.

*The illustration to the right is for the LM-1800PD.



2 Align the distance portion of the lens.

Move the lens to bring the target (◯) close to the center of the alignment circle.

When the lens is in the range within about 0.5 D from the center, the target changes from ◯ to ＋ (cross).

3 Press and hold  for about 1 second.

Transmittance measurement is performed and the measured result is displayed.

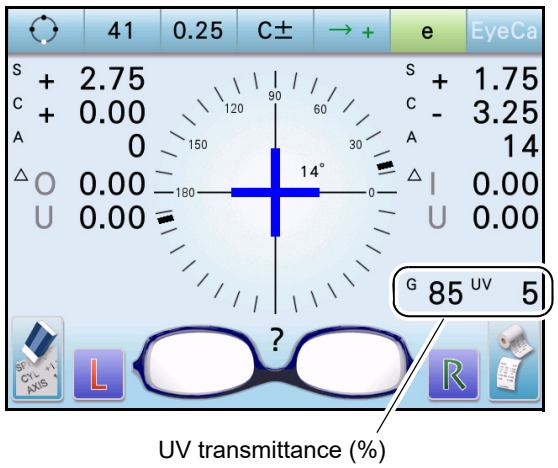
Note

- Perform the transmittance measurement just after measurement for the distance portion.
  Transmittance measurement is not performed after measurement for the near portion (intermediate portion) even if  is pressed.

The indication of the measurement result differs according to the setting of the UV display parameter.

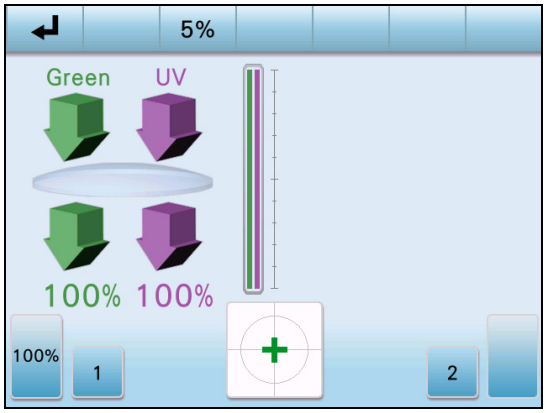
●When the Transmittance display parameter is set to “Simple”

The measured result (%) of GREEN transmittance (G) and UV transmittance (UV) is displayed on the lower part of the screen.



●When the Transmittance display parameter is set to “Compare”

The screen changes to the transmittance screen and the measured result is displayed.



Buttons on transmittance screen

100% 100% correction button	Without any lens on the nosepiece, perform extended pressing of the button for about 1 second. This button corrects the transmittance to 100% (GREEN/UV). When 100% correction is correctly performed, a beep sounds. This button is used when 100% is not displayed without any lens on the nosepiece.
1 Retry button	Used to measure the transmittance of the same lens again and the result is displayed on the left of the screen. When the target is in cross (within 4Δ), measurement can be performed more precisely. The last result of the transmittance measured with the "1" Retry button is saved as the lens measurement data.
2 Compare measurement button	Used to measure the transmittance of other lenses and the result is displayed on the right of the screen.
↵ Exit button	Returns to each (original) measurement screen.

Note

- When the transmittance is unstable, it is recommended to perform transmittance measurement after the transmittance 100% correction is performed.

Compare measurement of the transmittance

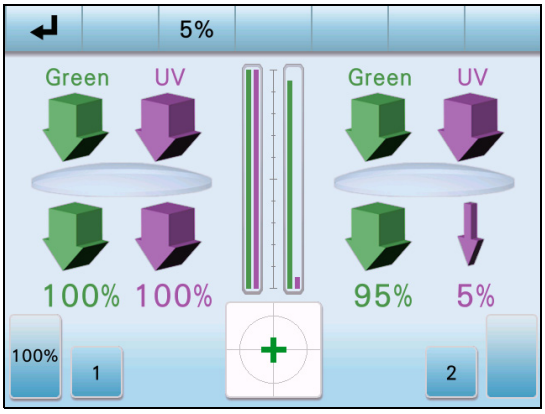
After another lens is measured, transmittance can be compared if necessary.

1) After replacing the lens and bring the optical center to the nosepiece, press [2].

   When the target becomes cross (within 4Δ), measurement can be performed more precisely.

2) The measured result of two lenses are displayed on the comparison screen simultaneously.

   The left side is original measured result and right side is that of additional one.



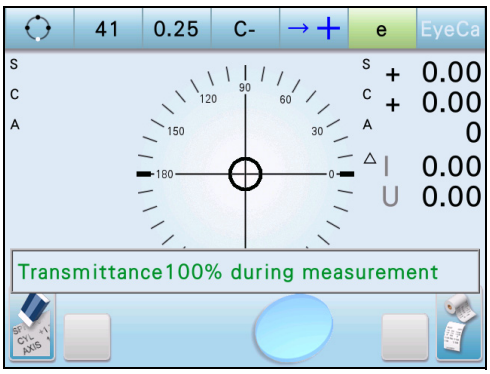
Note

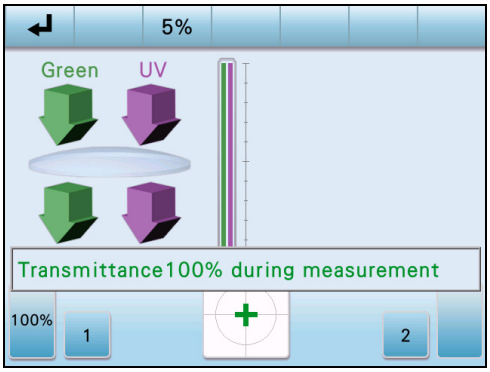
- Pressing of [1] (or [2]) renews each result.

3) Press the exit button [↵] to return to the measurement screen.

○ Screen display at the time of auto correction

When the Auto correct parameter is set to “On” or “Silent”, the UV transmittance is automatically corrected to 100%. During the auto correction, the “UV100% during measurement” message is displayed.





After the message disappears, correction is performed. Correction is not renewed when the lens is set.

When the Auto correction parameter is set to “On” and the correction is renewed, two short beeps sound. When the correction is not renewed, a long beep sounds.

Note

- The UV100% correction is performed automatically at 5 to 60 minute intervals according to change amount of camera sensitivity in UV transmittance measurement.

○ Harmful effect of ultraviolet rays on eye

Ultraviolet rays included in sunlight are roughly classified into three types.

UV-C 280 nm or less	Do not reach the Earth's surface.
UV-B 280-320 nm	Absorbed in cornea. Cornea damage such as inflammation. Causes sunburn. The skin becomes red. Causes skin irritation and skin damage such as stains, freckles, and wrinkles.
UV-A 320-380 nm	Accumulated in the crystalline lens, which may result in cataract. Causes sunburn. The skin becomes dark.

The LM-1800P/1800PD measures UV-A transmittance.

Since the UV-A is the strongest, most harmful level of ultraviolet rays, measurement of the transmittance of UV-A is effective to assess protection.

2.9.2 Measuring the net prism (lens layout) (LM-1800PD only)

■ Check the layout of mounted lenses by measuring the net vertical prism. Set the Net prism parameter to “On” in advance.

Net vertical prism (NV), (NVP)	Based on the optical center of the right-eye lens, the vertical difference of the optical center of the left-eye lens is indicated with prism. The lens layout of prism prescribed can be checked.

1 Set the right-eye lens of frames.

For details of the lens setting, see “2.3.2 Setting mounted lenses” (page 38).

Note

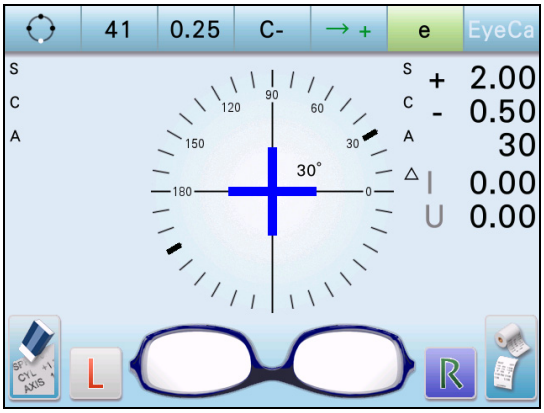
- Measurement is performed based on the right-eye lens so measure the right-eye lens first.

2 Align the lens.

Move the lens to bring the target (○) close to the center of the alignment circle.

3 After changing the target to ＋ (large cross), press  .

Even if the measured data is locked in by the auto read function, press  for remeasurement after changing the target to ＋ (large cross).



4 Set the left-eye lens of frames.

With the lens table stayed at the position where the right-eye lens is measured, touch the bottom of the frames to the lens table.

The table position indicator shows the position of the lens table. When the indicator is lit in the middle, the left-eye lens can be measured.

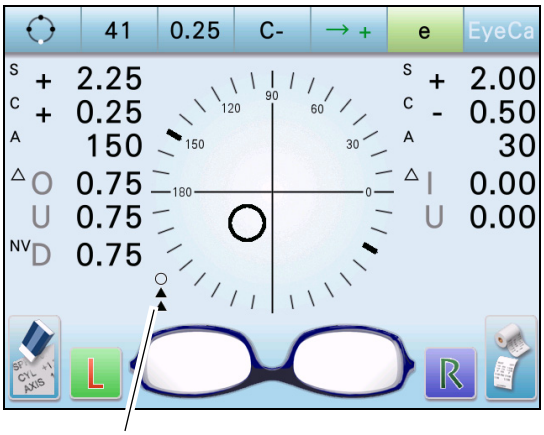


Table position indicator

Note

- Change of table position indicator

  The table position is changed as shown to the right.

  As the lens table approaches the proper position, the ▲ mark changes from a double display to a single display and then to ⊕ .

Pull the lens table forward

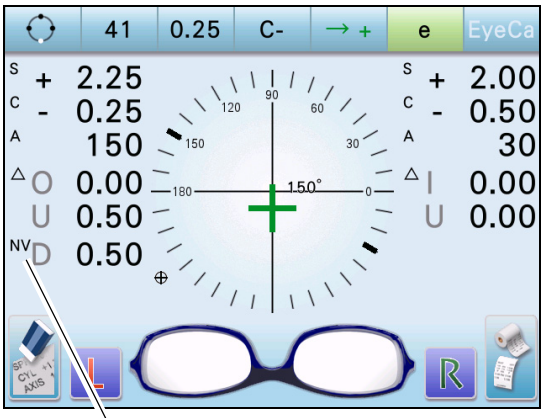
When the indicator is lit in the middle

Push the lens table backward.

2

5 Move the lens to align the center of the target (○) with the vertical line of alignment circle.

The difference from the horizontal axis is the net vertical prism (NV).



Net vertical prism

6 Press ⬭ .

The measured data of the bet vertical prism (NV) is locked in.

Note

- The left-eye lens is measured without alignment of a lens. Care should be taken to the measured data.

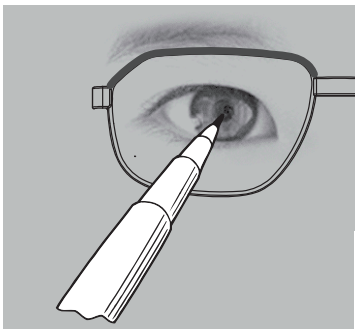
2.9.3 Measuring the net prism (eye point level) (LM-1800PD only)

■ Measure net prisms (net vertical prism, net horizontal prism) of the eye point using mounted lenses. Set the Net prism parameter to “On” in advance.

Net vertical prism (NV),(NVP)	Based on the optical center of the right-eye lens, the vertical difference from the eye point of the left-eye lens is indicated with prism.
Net horizontal prism (NHP)	Horizontal prism difference of the right or left lens at the eye point

1 Mark the pupil center (eye point).

Instruct the customer to wear glasses and look straight. Mark the pupil center on each lens.



Note

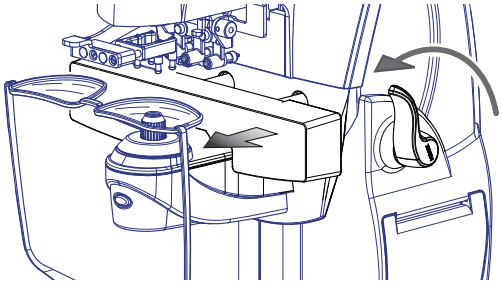
- The mark should be 1 mm or smaller in diameter.
  If the mark is too big, it may interfere with the measurement.

2 Specify the lens side.

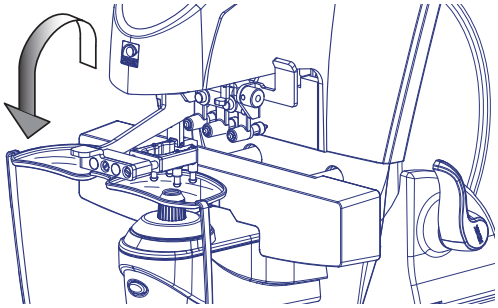
Press L or R to specify the left-eye lens or right-eye lens.

3 Set mounted lenses.

Place the frames on the nosepiece with the lens convex side up, and pull the lens table until it comes into contact with the bottom of the frames.

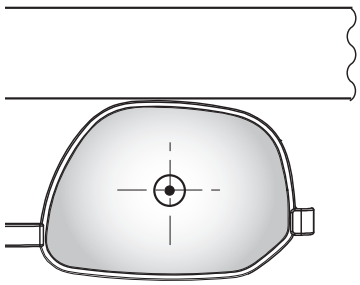


4 Secure the lens with the lens holder.



5 Bring the eye point marked in Step 1 to the center of the nosepiece.

Make sure that the lens table touches the bottom of frames.



Note

- It is not necessary to align the target.

6 Press  .

The measured data is locked in.

Note

- If the “Measurement error” message appears, the mark may interrupt the measuring beam. Move the lens slightly to achieve the measured data.

7 Measure the other lens.

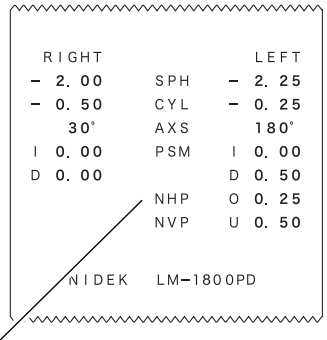
Press L or R to specify the left-eye lens or right-eye lens.

Follow the same steps as the first lens.

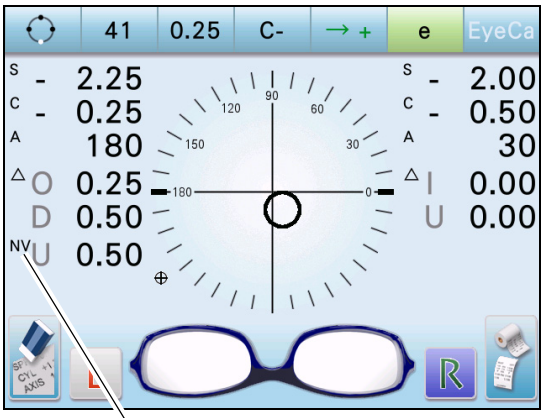
8 The result is displayed on the screen.

The net vertical prism is displayed on the screen.

The net horizontal prism is printed.



Net horizontal prism



Net vertical prism

2.9.4 Measurement using scale mode function

The values of the LPD/RPD (1/2 PD), PD, and height can be measured easily by aligning the marked lenses to the scale displayed on the screen.
When reading the scale, be sure to be positioned directly facing the screen.
The values taken from the reading should only be used as a guide because they may be affected by the lens they are read through.
The accuracy of the scale in the scale mode screen is within 0.5 mm.

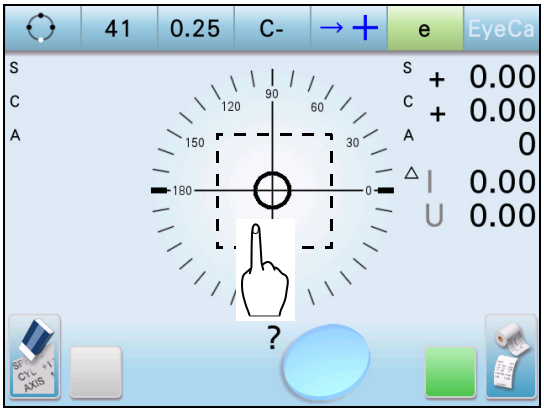
⚠ CAUTION	• **When aligning the markings on glasses to the scale, do not slide the glasses with the frames in contact with the screen.** To do so could damage the screen.

○ LPD/RPD (1/2PD) measurement

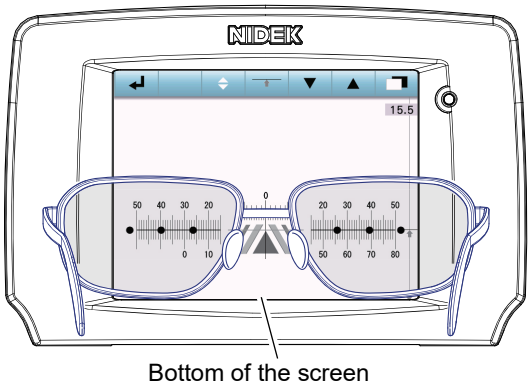
1 Display the scale mode screen.

On a screen other than contact measurement screen in which the target is displayed, press and hold the area around the target center for 1 second or more.

The scale mode screen is displayed.



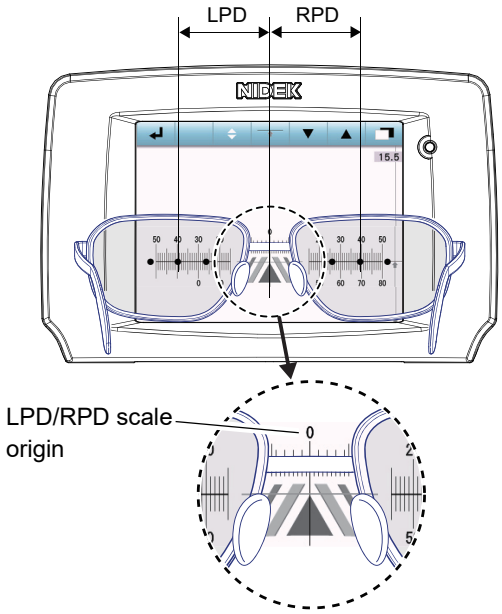
2 Align the bottom of the frames with the bottom of the screen.



Bottom of the screen

3 Measure the LPD and RPD (1/2PD) by aligning the frame center position to the LPD/ RPD scale origin.

1) Align the scale to the markings with ▲▼, ▼, or ▲.
2) Align the frame center position to the LPD/ RPD (1/2PD) scale origin.
3) Read the distance from the origin to the center marking on each left (LPD) and right (RPD) lens.



4 Press ↵ to finish the measurement.

○ PD measurement

1 Display the scale mode screen.

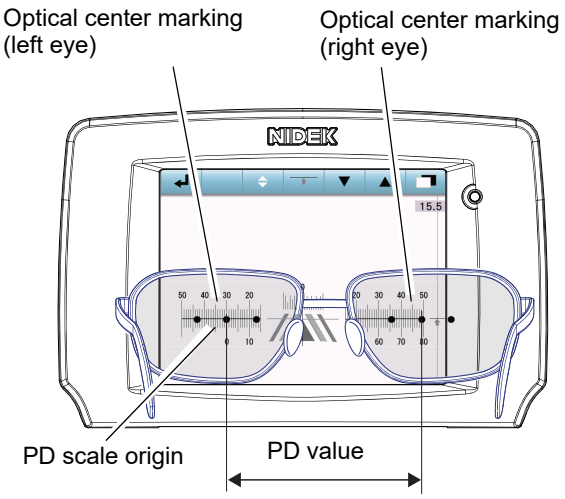
See Step 1 of “○ LPD/RPD (1/2PD) measurement” (page 82).

2 Align the bottom of the frames with the bottom of the screen.

See Step 2 of “○ LPD/RPD (1/2PD) measurement” (page 82).

3 Measure the PD by aligning the optical center marking on the left lens to the PD scale origin.

1) Align the scale to the markings with ▲▼, ▼, or ▲.
2) Align the optical center marking on the left lens to the PD scale origin.
3) Read the distance between the optical center marking on the left lens and that on the right lens (PD value).



4 Press ↵ to finish the measurement.

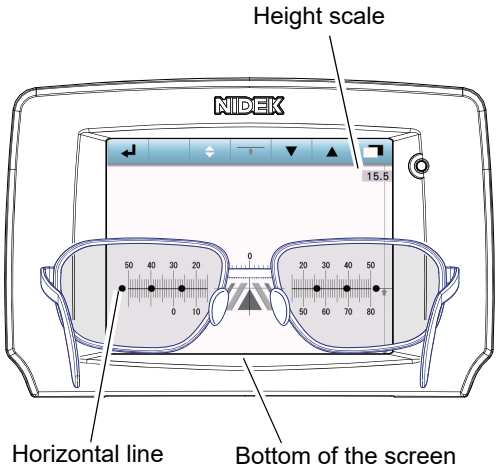
○ Height measurement

1 Display the scale mode screen.

See Step 1 of "○ LPD/RPD (1/2PD) measurement" (page 82).

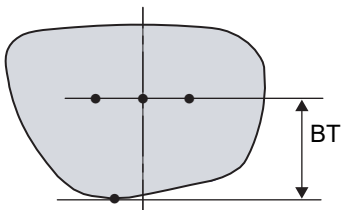
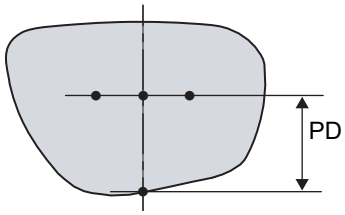
2 Measure the desired height. [↑] [↓]

1) Align the bottom of the frames with the bottom of the screen.
2) Switch the scale origin to [↓].
   Align the height scale origin line to the origin point of the height desired to be measured with [▼] or [▲].
3) Switch the scale origin to [↑].
   Align the horizontal line to the markings with [◆], [▼], or [▲].
4) Check the value of the height scale.



3 Press [↵] per completare la misurazione.

- Per misurare il valore BT: Allineare la linea di origine della scala relativa all'altezza con il punto inferiore della lente.
- Per misurare il valore PD altezza: Allineare la linea di origine della scala relativa all'altezza con il bordo inferiore della lente, direttamente sotto il segno (centro ottico).

Valore BT	Distanza tra il centro ottico e il punto più basso della lente.	
PD altezza	Distanza tra il centro ottico e il punto direttamente inferiore della lente.	

2.9.5 Measuring refractive index (optional)

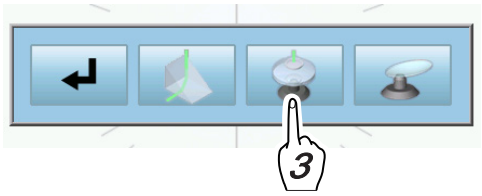
■ The refractive index is measured using a simple refractive index measurement system for eyeglass lenses (GO-MEISAN).

Note

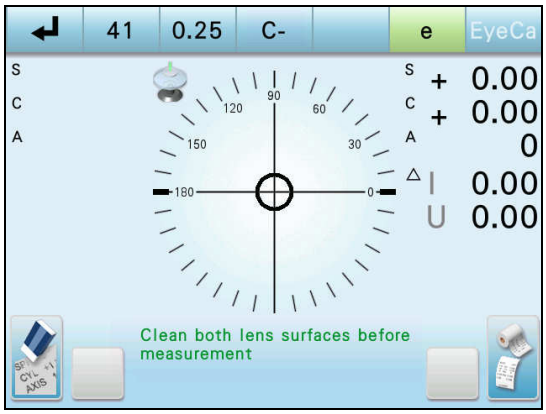
- This system aims to measure the refractive index easily. It is recommended to use the measured results as a guide.
- Low-power lenses within ±2.00 D are not suitable for this system due to its measurement method. In addition, lenses of -14.25 D or more may not be measured.

1 Display the desired measurement screen (auto, normal, or progressing power lens measurement) according to the lens to be measured.

2 Press and hold the measurement mode indication about 1 second to display the mode change window.

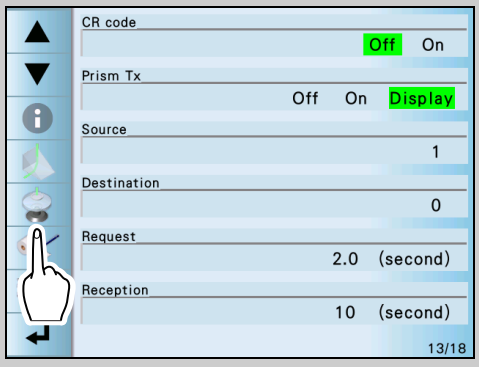


3 Press the refractive index button  to display the refractive index measurement screen.



Note

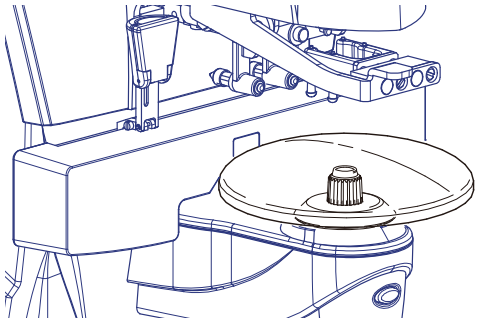
- The prism entry screen can be switched from the parameter screen.
  a. The screen changes to the parameter screen.
  b. Press  to switch the screen to the refractive index measurement screen.



4 Clean both surfaces of the lens to be measured.

5 Set the lens on the nosepiece.

*The illustration to the right is for the LM-1800PD.

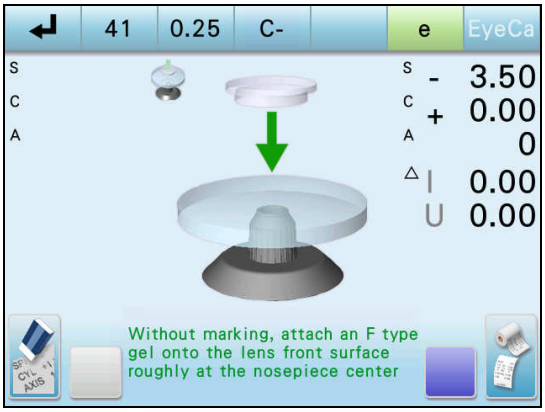


6 Perform alignment of the lens and press .

The auto read function is disabled on the refractive index measurement screen. Therefore, it is necessary to press in order to confirm the measurement.

For progressive lenses, the distance portion is aligned.

Pressing changes the image in the screen center.



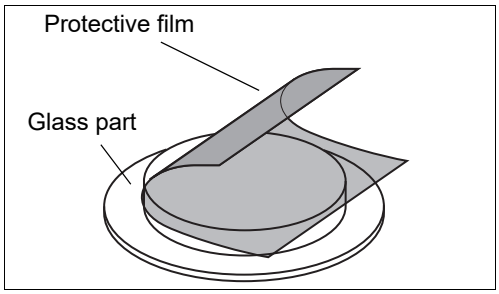
7 Attach a F type gel onto the lens front surface.

1) Select an appropriate F type gel (F-1 to F-3) according to the lens power.

F-1	Negative lens, C + S = -5.0 D or more
F-2	Low-power negative and positive lenses, C + S = ±5 D
F-3	Positive lens, C + S = +5.0 D or more

2) Take out the F type gel from the case and remove the protective film.

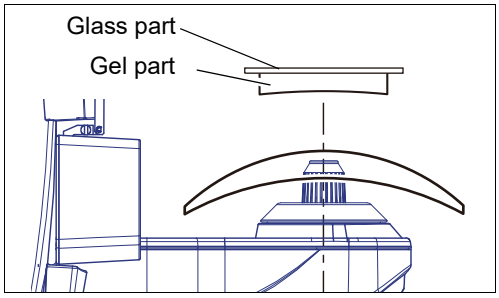
Hold the glass part taking care not to touch the gel part with fingers.



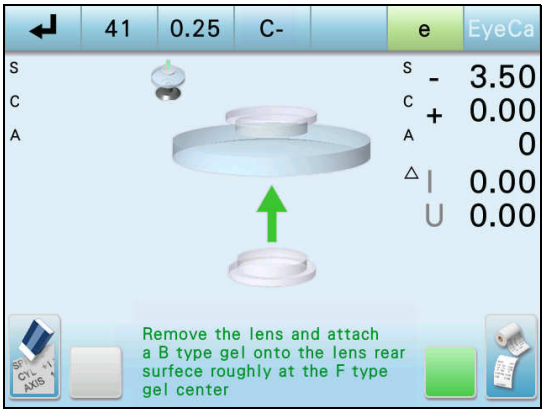
3) Keep the lens from moving and attach the F type gel onto the lens front surface roughly at the nosepiece center.

Be careful not to trap air between the lens and F type gel.

If any air is trapped, lift up the F type gel to release the air and reattach.

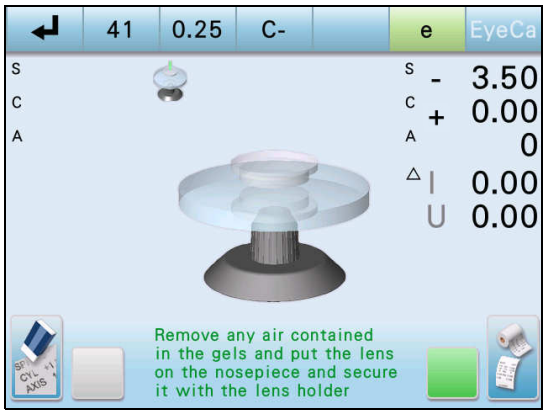


4) When the F type gel is attached, the screen changes as shown to the right.



8 Remove the lens from the nosepiece and attach the B type gel onto the lens back surface.

When the lens is removed, the screen changes as shown to the right.



1) Prepare an appropriate B type gel (B-1 to B-3) corresponding to the F type one.

The number of the B type gel must be the same as that of the F type one.

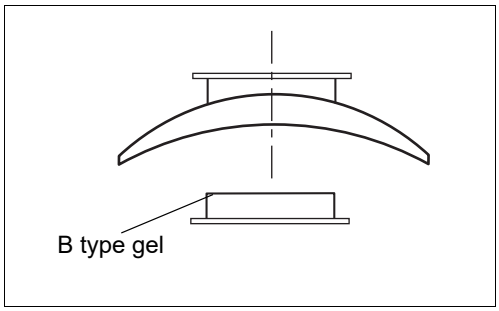
B-1	Negative lens, C + S = -5.0 D or more
B-2	Low-power negative and positive lenses, C + S = ±5 D
B-3	Positive lens, C + S = +5.0 D or more

2) Take out the B type gel from the case and remove the protective film.

Hold the glass part taking care not to touch the gel part with fingers.

3) Attach the B type gel onto the lens back surface roughly at the F type gel center.

Be careful not to trap air between the lens and B type gel.



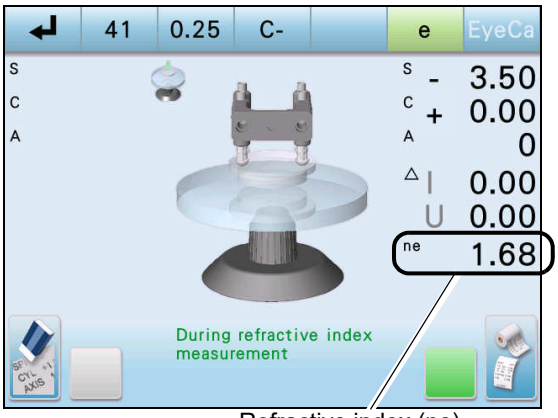
If any air is trapped, lift up the B type gel to release the air and reattach.

9 Set the lens on the nosepiece and secure it by the lens holder.

The refractive index (ne)[*1] is displayed on the screen.

Set the lens so that the Gel center is aligned to the nosepiece center.

The Gel may become detached from the lens because the Gel is not an adhesive but is only naturally tacky. Keep the lens in position with fingers until it is secured by the lens holder.



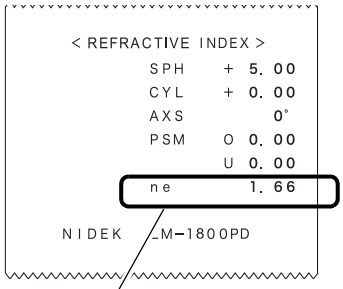
Refractive index (ne)

10 Press  to confirm the refractive index.

11 Press  to print out the measured results.

12 Press  to return to the measurement screen.

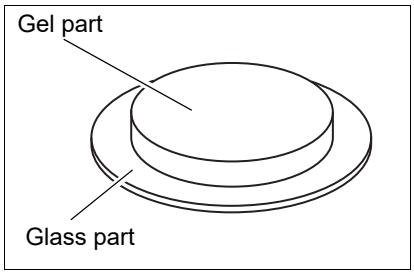
After refractive index measurement, detach the Gel from the lens and store it with the protective film attached.



Refractive index

○ Notes on Gel handling

- Do not touch the gel part because its surface is very soft. If the gel part comes into contact with fingers, its surface is smeared requiring gel replacement.
- When the Gel surface is smeared, replace it with a new one.
- Each Gel consists of two parts; the gel part and bottom glass part. Use the Gel with the two parts attached. Always hold the Gel by the glass part edge so that the gel part does not come into contact with fingers.
- When the gel and glass parts are separated, stick them back together with the provided tweezers taking care that no air is trapped.
- The gel part has a correct orientation. Should the gel and glass parts be separated, confirm its front and back surfaces. The flat surface is for the glass side and curved surface is for the lens side.
- The diopter chart for gel type determination is only a guide because the lens curve can differ depending on lens manufactures. Therefore, any Gel can be used so long as no air is trapped between the Gel and the lens. However, it is recommended to use the Gel corresponding the lens curve as listed in the chart as much as possible.



***1. When the reference wavelength is e-line (wavelength of λe = 546.07 nm).**

•Therefore, any Gel can be used so long as no air is trapped between the Gels and the lens. However, it is recommended to use the Gel corresponding the lens curve as listed in the chart as much as possible.

Gel set for replacement

Part name	Part number
GO-MEISAN set	31021-M001

2.9.6 Checking distortions

■ This function measures the lens of glasses being used by the customer by obtaining the vertex power difference from the nosepiece aperture at the center to those of eight portions of the lens around it and compares the results with the tolerances of ISO standards.

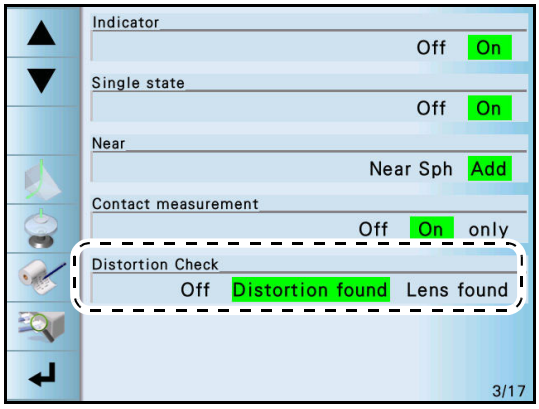
Note

- The results can only be used as a guide because the distribution of entire lens distortion cannot be measured. In addition, lens design characteristics such as an aspheric surface may be detected as a distortion.
- In response to a customer's request or how the glasses will be used, it is suggested to refer to these results when recommending whether or not a customer should replace their glasses.

○ Distortion Check parameter setting

The Distortion Check parameter has three options of "Off", "Distortion found", and "Lens found". It can be selected on the parameter screen. The setting remains saved even if the power is turned off.

See "2.14 Setting Parameters" (page 111).
See "2.14.1 Parameter tables" (page 113).



○ Targeted lens and measurement mode

Targeted lens: Single vision lenses
Available measurement mode
: Normal measurement or auto measurement except for add power

In auto measurement mode, when a progressive power lens is detected, the screen changes to the PPL measurement screen automatically even in distortion check measurement mode.

A distorted lens may be mistaken for a progressive power lens. In such a case, measure the lens in normal measurement mode.

○ Using the distortion check function

1 Set the Distortion Check parameter to “Distortion found” or “Lens found”.

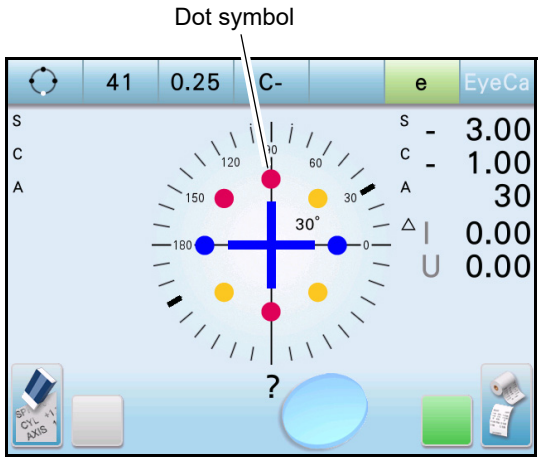
2 Place a lens to be measured on the nosepiece.

3 Eight dots are displayed in a circle within the distortion check target area.

The ● symbols are displayed in three colors depending on the discrepancy from the vertex power of the lens center.

When the lens has no distortion, the vertex power in all eight positions is the same. The eight ● symbols are then displayed in blue.

When lens distortion is found, the vertex power at some or all of the eight positions differs from the center one. In this case, the dot symbols are displayed in yellow (●) or red (●).



There are three distortion levels:

● (blue) is less than half of ISO standards.

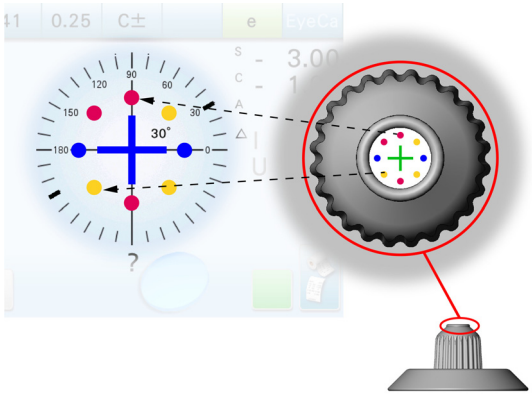
● (yellow) is more than half of ISO standards and less than the ISO standards.

● (red) is over ISO standards.

The following ISO standards that indicate the tolerance of vertex power of uncut and mounted lenses are applied to this function.

- ISO8980-1: 2004 Ophthalmic optics - Uncut finished spectacle lenses Part1
- ISO21987: 2009 Ophthalmic optics - Mounted spectacle lenses

The figure as shown to the right indicates the relationship between eight dots and the nosepiece detection positions. In this manner, distortion positions are roughly identified.



○ Measurement record

These results cannot be output to the printer or network. However, pressing the read button freezes the screen display to show the lens distortion levels to the customer.

When the Distortion Check parameter is set to “Lens found”, a non-distorted lens (one with eight blue dots) can be measured as the other lens. This allows for comparison of the distorted and non-distorted lenses.

2.10 Marking

■ This section describes marking at the optical center, marking for prism prescription (prism layout), and marking for prism prescription (measurement screen) are described.

2.10.1 Marking at the optical center

■ Marking is performed to indicate the optical center position and axis direction.

Note

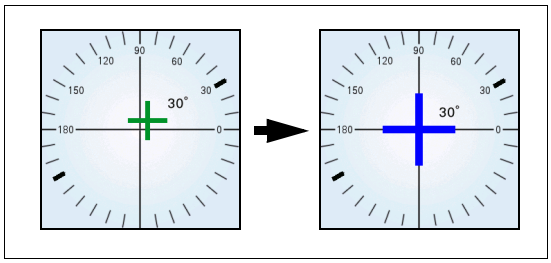
- For simple astigmatism lenses such as S 0.00 D and C -1.00 D or equivalent lenses, the target cannot be moved in the bus direction.
  Mark a lens at the geometric center in the correct direction.

1 Set the lens on the nosepiece.

2 Align the lens.

Move the lens to align the target with the center of the alignment circle until the target changes from ○ to ＋ (cross) and then from ＋ (cross) to ✚ (large cross).

✚ (large cross) shows that the lens is within 0.8 mm in diameter from the optical center where marking is allowed.

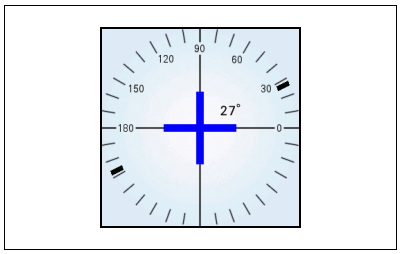


3 When the lens contains cylindrical power, set the cylinder axis according to the prescription.

While watching the axis value, rotate the lens until the prescribed axis value is displayed.

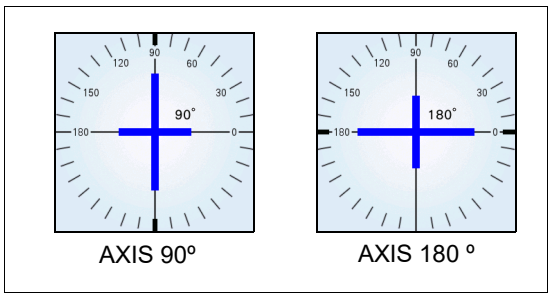
When the Auto read S parameter is set to " ＋ " or " ✚ ", the measured data is automatically locked in after the target is aligned.

Watch the axis value displayed in the upper-right of the target.



When ✚ (large cross) changes back to ＋ (cross), align the target (✚) again.

For the axis of 90º or 180º, the shape of the target changes as shown on the right.

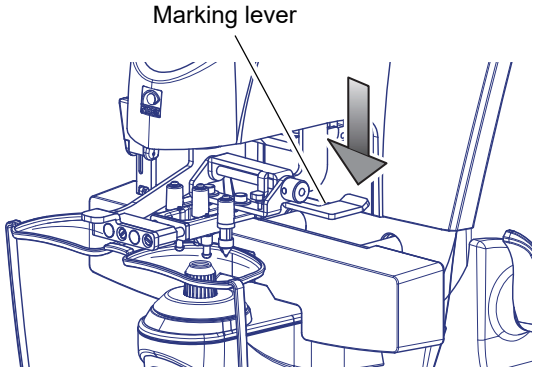


Note

- When marking a cylinder lens in the bus direction, adjust the axis to 180º.

4 Mark the lens.

Press down the marking lever to mark the lens. Three points in a line parallel to the lens table are marked.

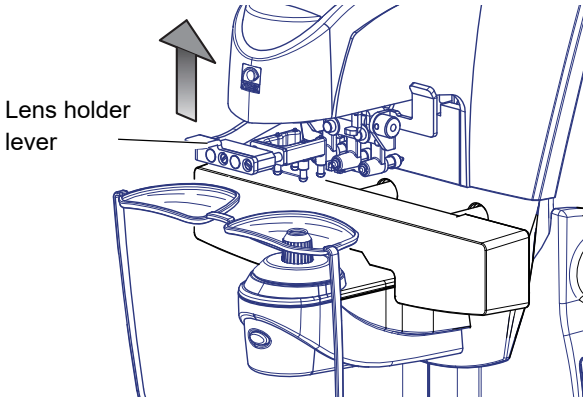


Note

- Press down the marking lever slowly and lightly.
  Pressing down firmly may damage the tip of the ink cartridge.

5 Remove the lens from the nosepiece.

To remove the lens, lift the lens holder lever until it clicks.



Note

- Do not touch the marked points.
  Faded ink makes the cylinder axis hard to see.
- It is recommended to make its mark on the uncut lens with a marking pen to identify the right side or left side of the lens or nasal side after marking.
- After marking the repellent or super repellent lenses, pull up the marking lever slowly so that the tip of the ink cartridge gradually becomes off from the lens.
  To do so causes fewer ink spread and the ink markings become easy to see.

2.10.2 Marking for prism prescription (Prism Layout)

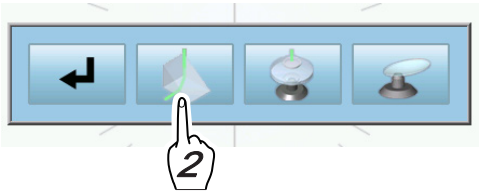
- This is the procedure to mark lenses for heterophoria prescription.
- The prism alignment function allows the operator to easily determine the marking point on the lens.

Prism layout function

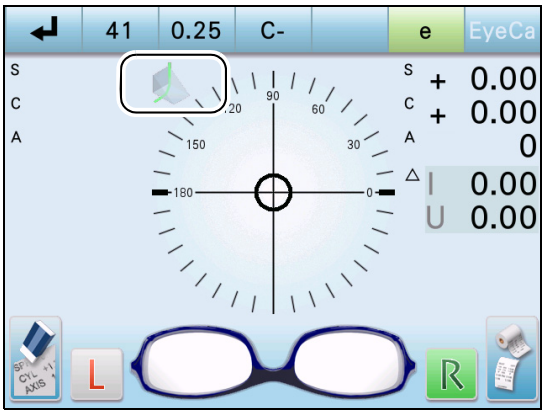
- Prior entry of prism prescription causes the on-screen target to move opposite to the direction by the amount of the prism data.
- Align the lens so that the target is aligned to the center of the alignment circle and then mark the lens.

○ When marking lenses only

1 Press and hold the measurement mode indication for about 1 second to display the mode change window.



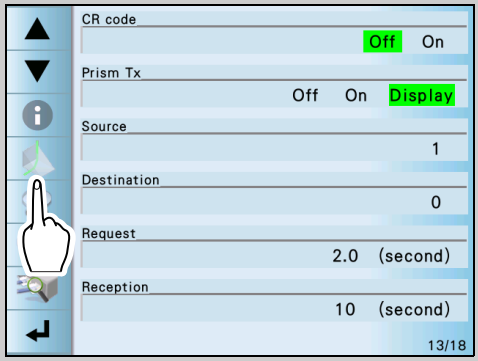
2 Press  to display the prism layout measurement screen.



Prism layout measurement screen

Note

- Prism layout measurement screen can be displayed from the parameter screen.
  a. Display the parameter screen.
  b. Press  to switch the screen to the prism layout measurement screen.



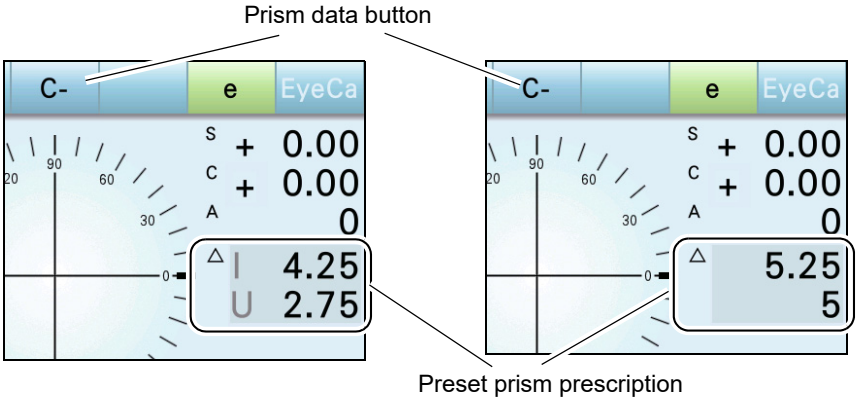
3 Specify the lens side if necessary.

Press L or R to specify the left-eye lens or right-eye lens.

Note

- It is possible to enter prism prescriptions for both left-eye and right-eye lenses in a row before marking them.

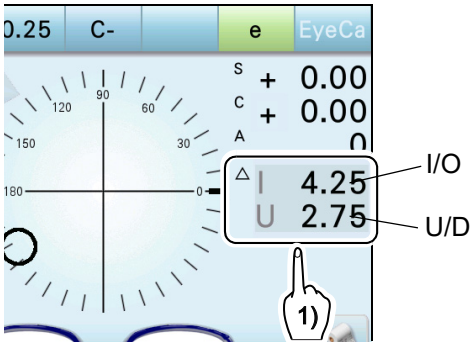
4 Press and hold C- for about 1 second to set the representation method of the prism value according to the prescription. Every press of the prism data button switches between the rectangular coordinate and polar coordinate displays.



●To enter prism prescriptions in rectangular coordinates

1) Select preset prescription of rectangular coordinates to display the numeric keypad.

   Select the U/D (base up/down) or I/O (base in/out) value to display the numerical keypad.



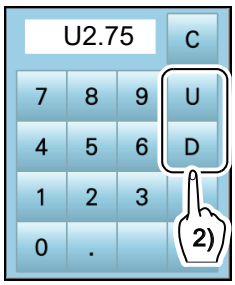
Rectangular coordinates	U/D	Enter prism prescriptions in the base up/down direction.
	I/O	Enter prism prescriptions in the base in/out direction.

2) Enter prism prescriptions with the numeric keypad for rectangular coordinates.

Select U or D (base up/down) or I or O (base in/out) first and enter the values.

Examples: Base up (U#.##)

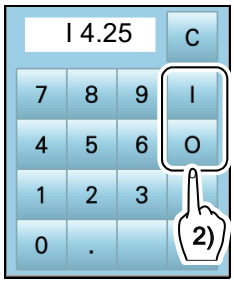
Base down (D#. ##)



(Base up/down)

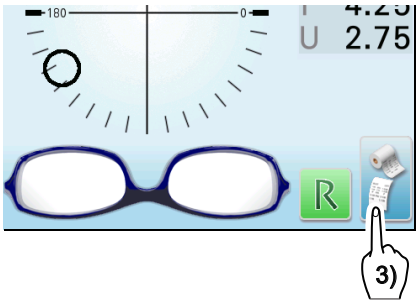
Examples: Base in (I#.##)

Base out (O#. ##)



(Base in/out)

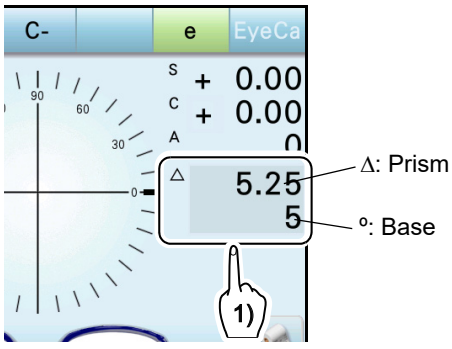
3) After entering the prism prescriptions, press the print button to print the prescriptions as necessary.



●To enter prism prescriptions in polar coordinates

1) Select preset prism data of polar coordinates to display the numeric keypad.

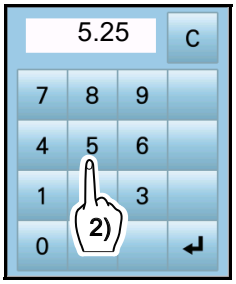
Select the Δ:prism (absolute prism) or º: base (base direction) value to display the numerical keypad.



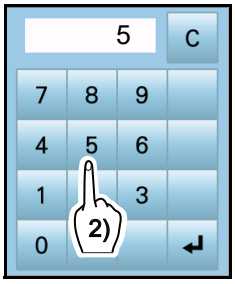
Polar coordinates	Δ: Prism	Enter prism prescriptions by absolute prism value.
	º: Base	Enter prism prescriptions by prism base direction.

2) Enter prism prescriptions with the numeric keypad for polar coordinates.

Select the Δ: prism to enter the absolute prism value (Δ). Select the º:base to enter the angle (º).

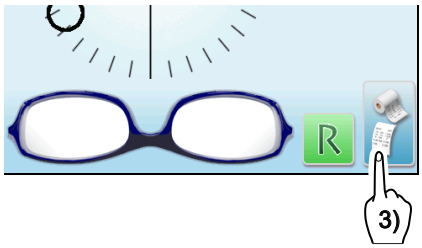


Δ: prism (absolute prism value)



°: base (prism base direction)

3) After entering the prism prescriptions, press the print button to print the prescriptions as necessary.



Note

- Up to 20Δ of prism prescriptions expressed in polar coordinates can be entered. The entry of value less than 20Δ may be rejected when the prism prescription is displayed in rectangular coordinate, or the other side of the value may be modified* to confine the absolute prism value expressed in polar coordinates to 20Δ.

  * For example, when the prism value is modified in the base in/out direction, the prism value in the base up/down direction may be modified.

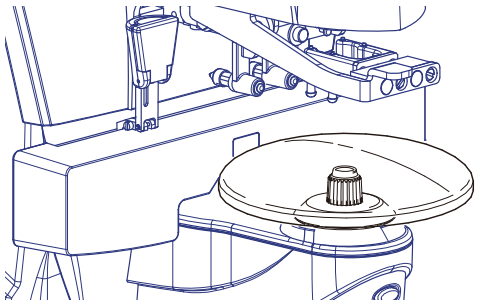
5 As necessary, enter prism prescriptions of the other lens.

Press L or R to specify the left-eye lens or right-eye lens. Enter prism prescriptions in the same manner.

6 Press L or R to specify the left-eye lens or right-eye lens.

7 Set the lens on the nosepiece with the top of the lens forward.

* The illustration to the right is for the LM-1800PD.



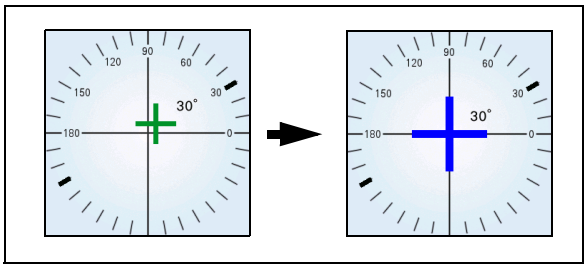
⚠ **CAUTION** • **When marking lenses for prism prescription, be sure to set the lens with the top of the lens forward.**

If the lens is set with the wrong side toward you, the marked lens does not follow prescription.

For the LM-1800PD, the zero degree direction of the prism base is on the operator's left as viewed from the front. This is opposite to the orientation of the lens with a manual lensmeter or blocker.

8 Align the lens.

Move the lens to align the target to the center of the alignment circle until the target changes from ○ to ＋ (cross) and then changes from ＋ (cross) to ＋ (large cross).

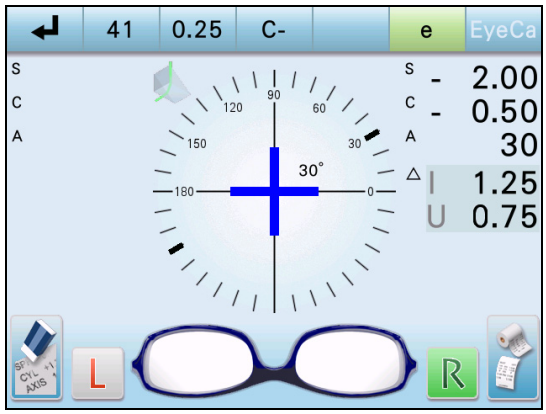


＋ (large cross) shows that the lens is within 0.8 mm in diameter from the optical center where marking is allowed.

9 When the lens contains cylindrical power, set the cylinder axis according to the prescription.

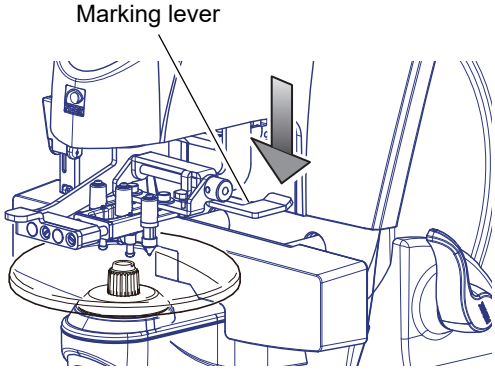
While watching the axis value, rotate the lens until the prescribed axis value is displayed.

The current axis is also displayed at the upper right of the target.



10 Mark the lens.

Press down the marking lever to mark the lens.



Note

• When ⬭ is pressed at that time, the measured data is locked in.
The saved measured data can be printed from the measurement mode screen.

11 As necessary, mark the other lens.

Press L or R to specify the left-eye lens or right-eye lens.

Mark the other lens in the same manner.

Note

- To mark both lenses in a row, enter prism prescriptions for both lenses before making.

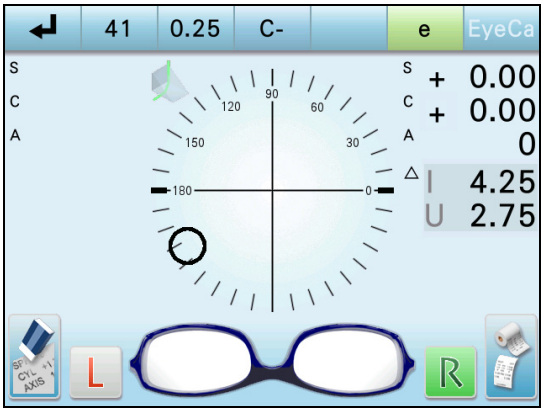
12 Press ↵ to return to the measurement screen.

○ When measuring and marking lenses in a row

1 Perform Steps 1 to 4 of "○When marking lenses only" (page 93) to enter prism prescriptions.

2 Specify the lens side if necessary.

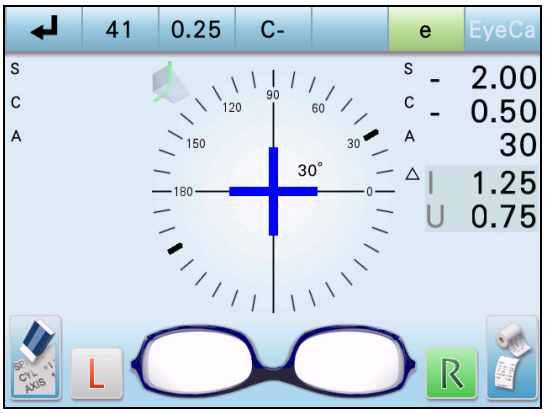
Press L or R to specify the left-eye lens or right-eye lens.



Measurement mode

3 Set and align the lens.

Set and align the lens in the same manner as Steps 7 to 9 of "○ When marking lenses only" (page 93).



4 Press .

The measured data is locked in.

Note

- Skip this step only when marking lenses on the measurement mode screen.

5 Mark the lens.

Press down the marking lever to mark the lens.

6 As necessary, measure and mark the other lens.

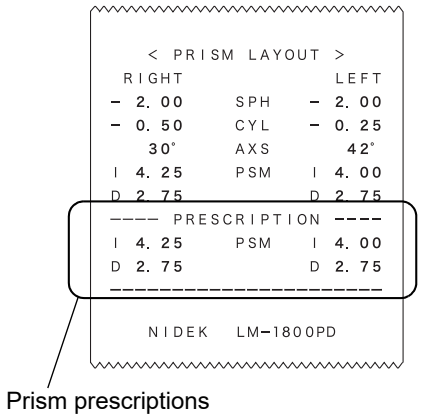
Press L or R to specify the left-eye lens or right-eye lens.

Measure and mark the lens in the same manner.

7 Press  to print the measured results.

Prism prescription is printed together with the other measured data.

Printing the data clears the measured data but maintains preset prism prescriptions.



Prism prescriptions

8 Press  to return to the measurement screen.

Note

- To mark lenses in a row, enter prism prescriptions for the other lens.

  If the measured data has been saved, press  to clear the data in advance.

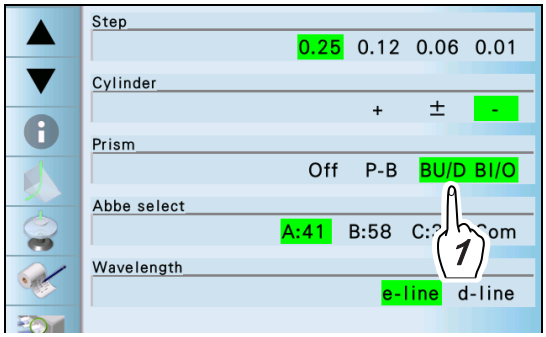
2.10.3 Marking for prism prescription (Measurement screen)

■ This is the method to mark lenses for heterophoria prescription using the measurement screen.

○ For rectangular coordinates

1 Set the Prism parameter on the parameter screen to “BU/D BI/O”.

For the details of parameter setting, see “2.14 Setting Parameters” (page 111).



2 Press L or R to specify the left-eye lens or right-eye lens.

Note

• Specify the left-eye lens or right-eye lens for rectangular coordinates.

3 Set the lens on the nosepiece with the top of the lens forward.

⚠ CAUTION • **When marking lenses for prism prescription, be sure to set the lens with the top of the lens forward.**

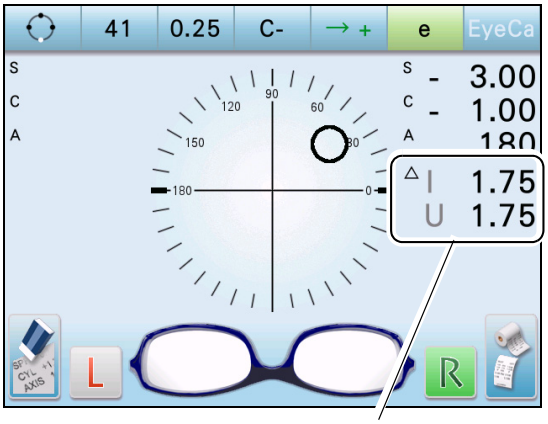
If the lens is set with the wrong side toward you, the marked lens does not follow prescription.

For the LM-1800P/LM-1800PD, the zero degree direction of the prism base is on the operator's left as viewed from the front.This is opposite to the orientation of the lens with a manual lensmeter or blocker.

4 While watching the prism values on the screen, move the lens until the values show the prescription.

Prism indication

I	Base in
O	Base out
U	Base up
D	Base down



5 If the lens contains cylindrical power, while watching the axis value on the screen, rotate the lens until the value shows the prescription.

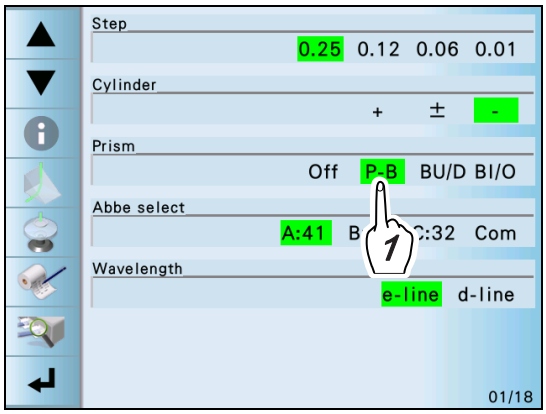
6 Mark the lens.

Press down the marking lever to mark the lens.

○ For polar coordinates

1 Set the Prism parameter on the parameter screen to “P-B”.

For the details of parameter setting, see “2.14 Setting Parameters” (page 111).



2 Press L or R to specify the left-eye lens or right-eye lens.

3 Set the lens on the nosepiece with the top of the lens forward.

⚠ **CAUTION**

- **When marking lenses for prism prescription, be sure to set the lens with the top of the lens forward.**

  If the lens is set with the wrong side toward you, the marked lens does not follow prescription.

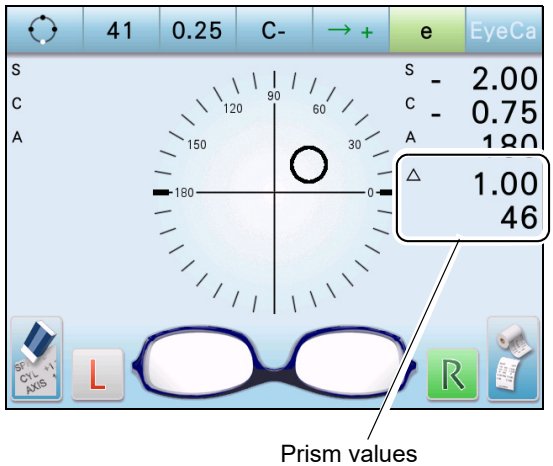
  For the LM-1800P/LM-1800PD, the zero degree direction of the prism base is on the operator's left as viewed from the front. Be aware that the lens should be set with the upper side of the lens forward, which is opposite to the orientation of the lens with a manual lensmeter or a blocker.

---

4 While watching the prism values on the screen, move the lens until the values show the prescription.

Prism power is displayed with the absolute value (Δ: prism) and base direction (º: base).

5 If the lens contains cylindrical power, while watching the axis value on the screen, rotate the lens until the value shows the prescription.



6 Mark a lens.

Press down the marking lever to mark the lens.

2.11 Printing

Press  to print the measured data.

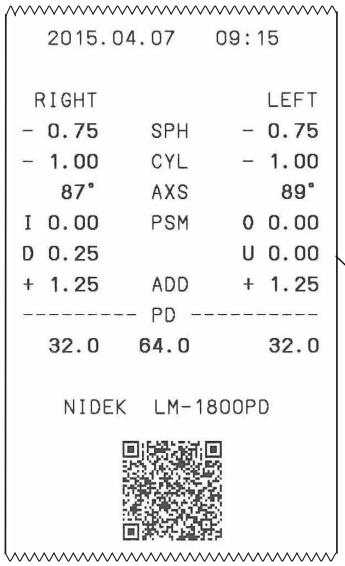
Note

- Print the data out after making sure that the measured data is locked in.

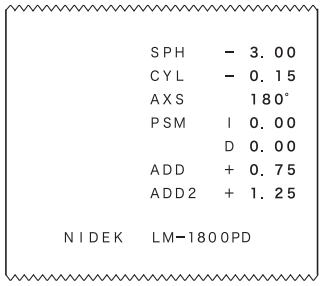
  When  is pressed before the measured data is locked in, the measured data is locked in and printed.
- When an external device is connected, printing and data transmission are performed.

  When the Printer parameter is set to “Off”, only data transmission is performed by pressing  .

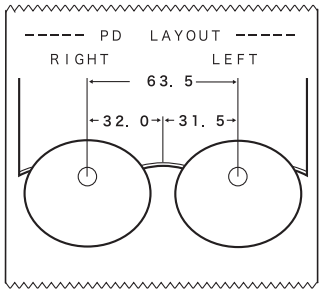
[Sample printout in normal or contact lens measurement]



Sample printout in the R/L state (QR code is set to “On”)

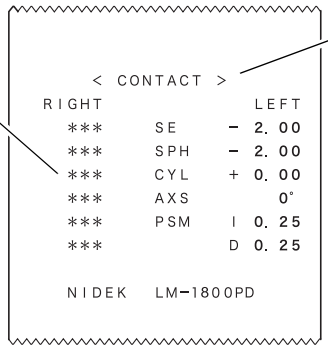


Sample printout in the single state



Depending on the setting of the PD layout parameter, the PD layout can be printed as an illustration.
(only when the PD measurement parameter is set to “On”.)

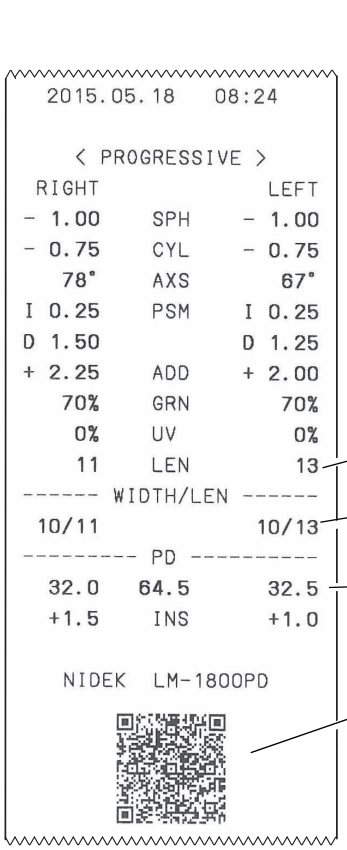
When printing is performed after only one side of lens is measured in R/L state, "***" is printed on the numeric field.



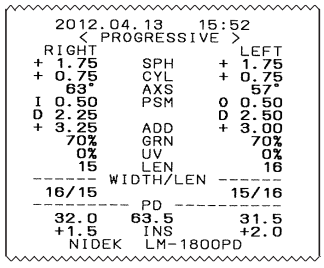
Measurement mode
Not printed in normal measurement mode.

Sample printout in CL measurement

[Sample printout in measurement of progressive power lens]



[Sample printout in measurement of progressive power lens]
(measurement of progressive length, channel width, and PD)



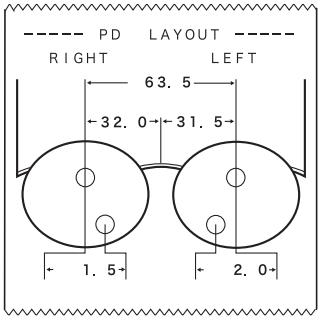
Depending on the setting of the Economy print parameter, printing is performed with line space reduced.

Progressive length

Measurement position from channel width/distance portion

Right PD, Binocular PD, Left PD
Near portion inside amount

QR code



Depending on the setting of the PD layout parameter, the PD layout can be printed as an illustration.
(only when the PD measurement parameter is set to “On”.)

⚠ **CAUTION** • **The QR code may not be read if the paper is not flat. Read the QR code after flattening the paper.**

2.11.1 Connecting to the AR, ARK or RKT and setting parameters

It is possible to print measured data using the printer of the connected AR, ARK or RKT.

Connectable devices:

AR-600/AR-330A series, AR-1 series, ARK-700/ARK-530A series, ARK-1 series

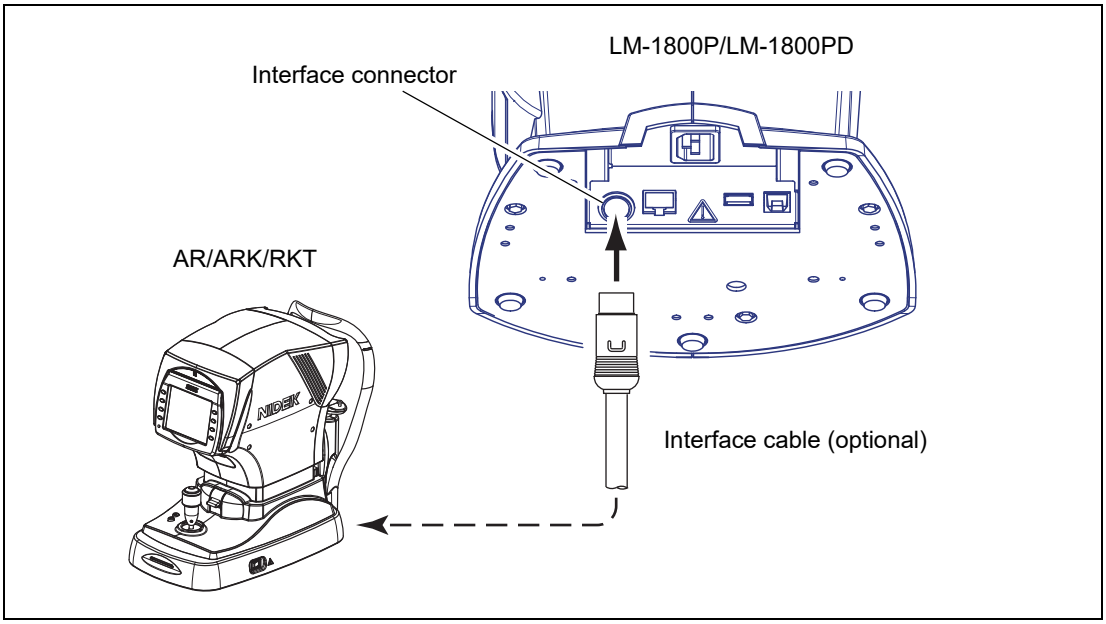
RKT-7700, TONOREFII

○ Connecting procedure

⚠ **CAUTION** • **Be sure to turn off each device before connecting the interface cable, etc.**
Connecting the cable with power on may cause malfunction.

1 Connect the AR, ARK or RKT to the interface connector of the LM-1800P/LM-1800PD with the interface cable (option: OPIF-6).

Connect the cable with the device laid down.



○ Setting procedure

Set the following parameters on the LM-1800P/LM-1800PD and AR, ARK or RKT.

1 Set the following parameters related to communications on the LM-1800P/LM-1800PD.

No.	Parameter	Settings
17	Printer	AR print
52	Com mode	NIDEK
53	Baud rate	9600 (bps)
54	Parity	Odd
55	Data bits	8bit
56	Stop bits	1bit

For the details of parameter setting, see “2.14 Setting Parameters” (page 111).

Set parameter No. 52 to 56 to the factory settings. When the Printer parameter is set to “AR print”, those parameters are automatically set to their factory settings.

2 Set the following parameters on the AR, ARK or RKT.

Parameter settings on the AR or ARK series

Parameter	Settings
I/F MODE	NIDEK
BAUD-RATE	9600
BIT LENGTH	8
LM DATA PRINT	YES

Parameter settings on the RKT-7700

Parameter	Settings
BAUD-RATE	9600
BIT LENGTH	8
LM DATA PRINT	YES

For details of the parameter setting procedure, refer to the corresponding Operator's Manual to the connected AR, ARK or RKT.

Note

- The printout produced by the printer of the AR, ARK or RKT is different in font etc. from the printout produced by the printer of the LM-1800P/LM-1800PD.
- “Economy print” and “PD layout” are not supported for communication print.
  Printing is performed with PD value and normal line space.

2.12 Data Save to the Eye Care Card

- The measured data is saved to the Eye Care card to transfer the LM data to the device such as the RT-5100.
- The sphere, cylinder, axis, add, and prism data are each saved.

  The 2nd add power is saved for the data with it.

  Prism value is saved in the form set with the Prism parameter.

Note

- When the lens side is not specified (single state), the data is not written to the Eye Care card.

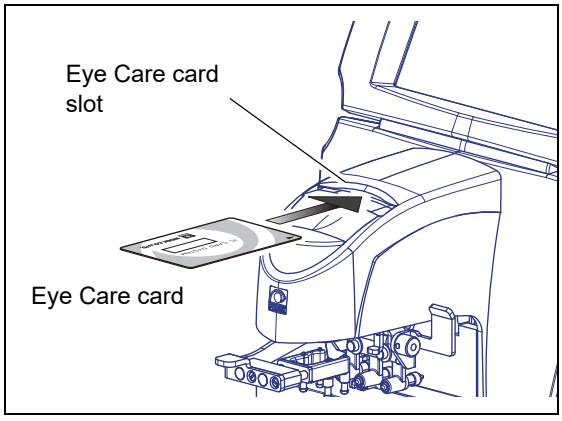
  Even if data is attempted to be written, the data cannot be written.

2.12.1 Writing of data to the Eye Care card

○ When the Eye Care card is inserted before measurement.

1 Insert the Eye Care card when the LM-1800P/LM-1800PD has no measured data in the internal memory.

The Eye Care card icon EyeCa is changed from white to black.



2 Start measurement.

3 Press .

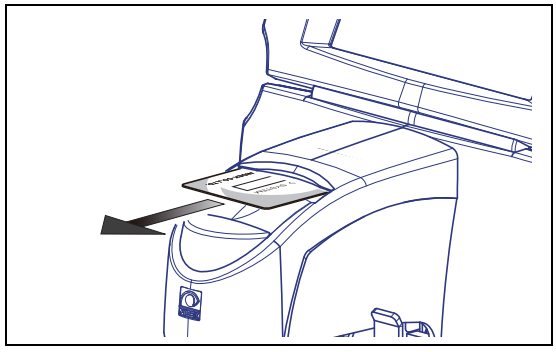
Regardless of the print button icon, the data is written to the Eye Care card.

EyeCa becomes green, and the data is written to the Eye Care card.

After the data is written successfully, the icon changes to black.

4 When the Eye Care card button EyeCa is changed to black, remove the Eye Care card.

Remove the card straight.



Note

- Never remove an Eye Care card while it is being accessed.
  While the card is being accessed, the icon is displayed in green.
  If the card is removed while it is being accessed, data is not written successfully and the Eye Care card may be irreparably damaged.
- The data is written to the Eye Care card when the Auto print R/L parameter is set to “On”.

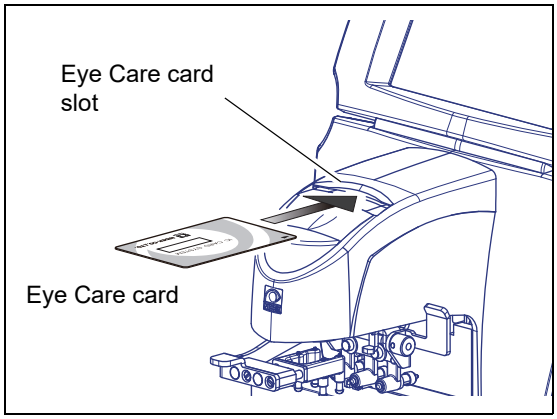
○When the Eye Care card is inserted after measurement.

When the measured data is saved in memory and the Eye Care card is inserted, the data is automatically written.

1 After measurement, insert the Eye Care card to the Eye Care card slot.

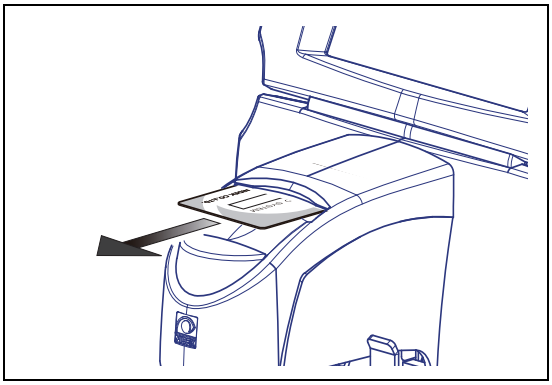
EyeCa becomes green, and the data is written to the Eye Care card.

After the data is written successfully, the icon changes to black.



2 When the Eye Care card button EyeCa is changed to black, remove the Eye Care card.

Remove the card straight.



Note

- Never remove an Eye Care card while it is being accessed.
  While the card is being accessed, the icon is displayed in green.
  The red icon indicates an error occurrence. In such a case, the operator is only allowed to remove the card.
  If the card is removed while it is being accessed, data is not written successfully and the Eye Care card may be irreparably damaged.

Indications of the Eye Care card icon

EyeCa (White):	The Eye Care card is not inserted.
EyeCa (Black):	The Eye Care card is inserted.
EyeCa (Green):	The Eye Care card is being accessed. Never touch the card.
EyeCa (Red):	The error occurs while the Eye Care card is being accessed. The card can be removed.

2.12.2 Erasing Data on the Eye Care card

This is the method to erase all the data on the Eye Care card.

1 Insert the Eye Care card to the Eye Care card slot.

The Eye Care card icon EyeCa is changed from white to black.

2 Press and hold EyeCa .

After the button is pressed and held for about 1 second or more, a beep sounds and the pilot lamp blinks. Releasing the button erases all the data in the Eye Care card.

While the data is being erased, EyeCa is displayed in green.

3 When EyeCa is changed to black, remove the Eye Care card.

Remove the card straight.

Note

- Only one LM data (1 frame) can be saved to the Eye Care card.

2.13 After Use

1 Turn the device off.

When the measurement screen is displayed, turn the power off (○).

Note

- Turning the power off when the parameter screen is displayed may not save the set parameter settings.

  Parameter settings are saved when ↵ is pressed on the parameter screen.

2 Put the dust cover over the device.

⚠ **CAUTION**

- **If the device will not be used for a long period of time, disconnect the power cord from the grounded power outlet.**

  If dust on the device attracts moisture, it may cause short circuit or fire.

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

  Dust may affect the measurement accuracy.

2.14 Setting Parameters

- The LM-1800P/LM-1800PD contains the function to change each parameter setting of the device according to user's needs and preference.
- There are parameters related to the indication, measurement, printing, and communication. The grayed parameter cannot be changed.
- The prism layout, refractive index, and comments screen can be switched from the parameter screen.

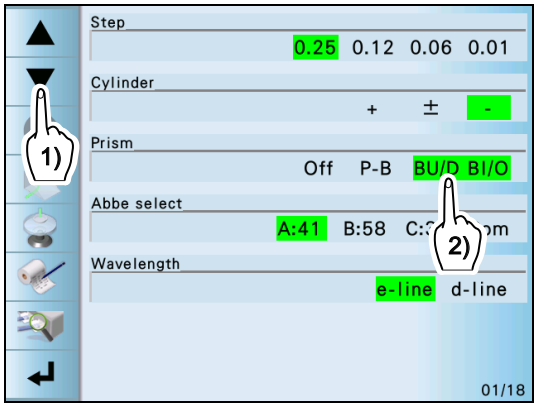
1 Press [ ] in the measurement screen.

The screen changes to the parameter screen.

2 Display the page on which the parameter setting needs to be changed.

1) Select the page on which the parameter setting needs to be changed with [▼] or [▲].

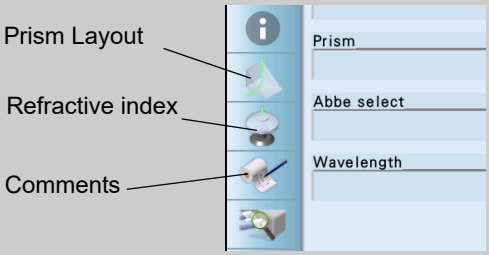
2) Select the parameter to be changed. The selected parameter becomes green.



Note

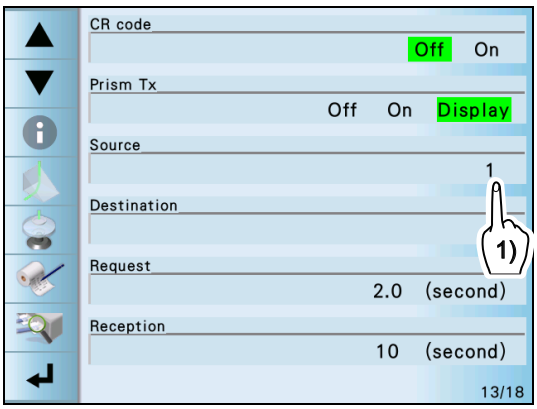
- The prism layout, refractive index, and comments screen can be switched from the parameter screen.

  Press any button on the parameter screen as shown to the right.

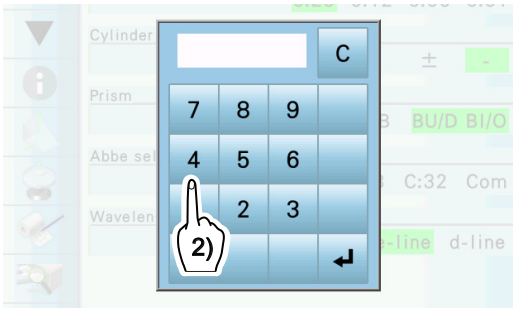


●When the values of parameter setting is changed

1) Select the parameter setting to be changed.

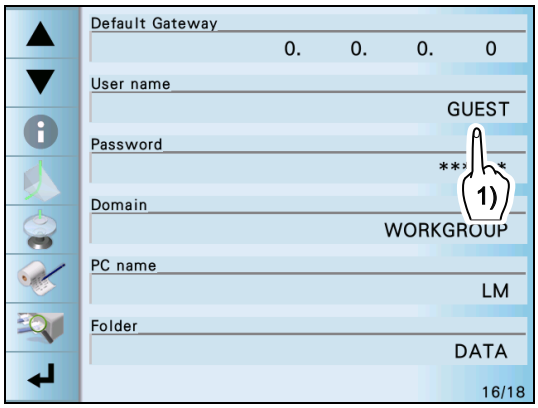


2) Select parameter setting to display the numeric keypad. Enter the desired value and press ↵ .



●When the characters of parameter setting is changed

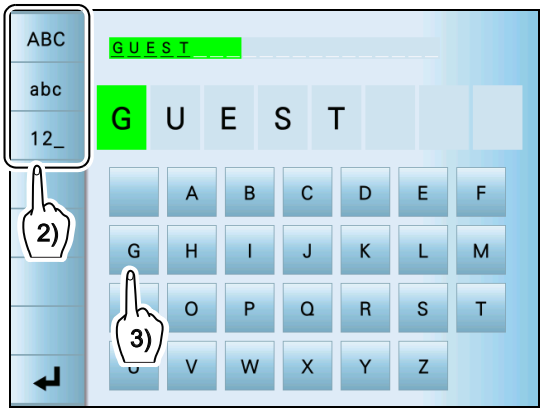
1) Select the parameter setting to be changed. The alphanumeric entry screen appears.



2) Select the desired alphanumeric button.

The entered alphanumeric character is displayed on the top of the screen and the cursor moves to the right box automatically.
Pressing the [12_] button displays the [INS] (insert) and [CLR] (clear) buttons.

3) Repeat Step 2) to enter any alphanumeric characters.



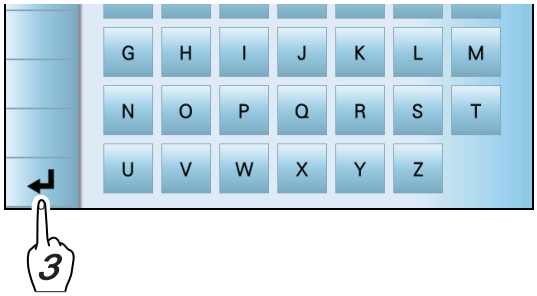
Frames with a black underline in the overall display field above have been filled in. Pressing the [CLR] button deletes the highlighted character.

A blank frame with black underline indicates that a space is entered.

3 Press ↵ .

The window for selecting among data save, data clear, and back screen is displayed.

When data save or data clear is selected, the screen returns to the menu screen.



2.14.1 Parameter tables

<Page 1>

* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
1	Step	0.25, 0.12, 0.06, 0.01	Representation method
2	Cylinder	+, +/-, -
3	Prism	Off, P-B, BU/D BI/O
4	Abbe select	A:41, B:58, C:32, Com	Standard of measurement
5	Wavelength	e-line, d-line

1 : Step

This is for selecting the indication step of measured data.

The indication step of axis and prism is 1º at all times.

2 : Cylinder

This is for selecting the cylinder mode from +, +/- (MIX), or -.

+	Displays the cylindrical power by positive reading.
+/- (MIX)	Displays the cylindrical power by positive reading when the refractive power is positive for any axis angle. Indicates the cylindrical power by negative reading in other cases.
-	Displays the cylindrical power by negative reading.

3 : Prism

This is for selecting the representation method of the measured prism value.

Off	The measured prism value is not displayed.
P-B	The measured prism value is displayed by polar coordinates.
BU/D BI/O	The measured prism value is displayed by rectangular coordinates.

4 : Abbe select

This is for compensating an error in measured data produced due to measurement of high-power lenses using the abbe number.

Select the abbe number for compensation from A, B, C, or Com.

A: □□ (factory setting:41)

B: □□ (factory setting:58)

C: □□ (factory setting:32)

Abbe numbers can be entered in each of A, B, and C in the range of 20 to 60 according to the lens material.

“Com” can be selected only when the abbe number is transmitted from a connected PC. When “Com” is selected, the abbe number through communication is set and displayed on the setting indication of the measurement screen.

Extended pressing of A, B, or C for about 1 second displays the numeric keypad, so enter numeric and press ↵.

A is automatically selected at power-on.Set the abbe number that is usually used at A.

5 : Wavelength

This is for selecting the measured data from the one to be obtained with the e-line wavelength (546.07 nm) or that with the d-line wavelength (587.56 nm).

<Page 2>

* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
6	Auto R/L	Off, On	Auto function
7	Auto read S	Off, ＋ , ＋	
8	Auto read R/L	Off, ＋ , ＋	
9	Distance auto read	Off, On	
10	Near auto read	Off, On	
11	Contact auto read	Off, On	

6 : Auto R/L

This is for changing the R/L indication automatically or manually when the measuring lens side is changed.

Off	The lens side is specified by pressing the button.
On	After the measured data is locked in, the R/L indication changes automatically by removing the lens without pressing the button. However, when both R and L data is locked in, the sign does not change by removing the lens.

7 : Auto read S

This is for enabling or disabling the auto read function in the single state.

Off	The measured data is locked in by pressing .
＋	When the lens is aligned until the target changes to ＋ (cross) (or), the measured data is automatically locked in without pressing . After auto read, if alignment is performed again until the target changes to ＋ (cross) (or), auto read is performed again.
＋	When the lens is aligned until the target changes to ＋ (large cross) (or), the measured data is automatically locked in without pressing .

* The target inside the parentheses is the setting when the Target parameter is set to "＋".

8 : Auto read R/L

This is for enabling or disabling the auto read function in the R/L state.

Off	The measured data is locked in by pressing .
＋	When the lens is aligned until the target changes to ＋ (cross) (or), the measured data is automatically locked in without pressing . After auto read, if alignment is performed again until the target changes to ＋ (or), auto read is performed again.
＋	When the lens is aligned until the target changes to ＋ (large cross) (or), the measured data is automatically locked in without pressing .

* The target inside the parentheses is the setting when the Target parameter is set to "＋".

9 : Distance auto read

This is for enabling or disabling the auto read function for the distance portion in measurement of progressive lenses.

When this parameter is set to “On” and the lens is aligned until the target changes to ＋ (cross), the measured data is locked in without pressing  .

10 : Near auto read

This is for enabling or disabling the auto read function for the near portion in measurement of progressive power lenses.

When this parameter is set to “On” and the lens is aligned until the target changes to ＋ (cross), the measured data is locked in without pressing  .

11 : Contact auto read

This is for enabling or disabling the auto read function in CL measurement mode.

Off	The lens side is specified by pressing the button.Auto read is disabled.
On	Auto read is enabled with the Auto read S or Auto read R/L parameter.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
12	Indicator	Off, <u>On</u>	On-screen indication
13	Single state	Off, <u>On</u>	
14	Near	Near Sph, <u>Add</u>	
15	Contact measurement	Off, <u>On</u>, Only	
16	Distortion Check	Off, <u>Distortion found</u>, Lens found	

12 : Indicator

This is for selecting whether to display the indicator for near portion (6) for alignment of the near portion in PPL measurement.

When this parameter is set to “On”, the indicator for near portion (6) appears above, below, on the right of, or on the left of the target, which shows the direction and movement distance to move the lens.

13 : Single state

This is for selecting whether to display the single state.

When “On” is selected, the single state is set by pressing  . When “Off” is selected, R is set.

14 : Near

This is for selecting the representation method of the measured data for the near portion.

Near Sph	The near portion power is displayed by sphere value (SPH).
Add	Indicates the near portion power by the add power (Add).

15 : Contact measurement

This is for enabling or disabling the CL measurement mode.

Off	When CL measurement is not performed: The screen changes by pressing the measurement selection button in the order of Auto measurement screen → Normal measurement screen → PPL measurement screen → Auto measurement screen...

On	When CL measurement is performed: The screen changes by pressing the measurement selection button in the order of Auto measurement screen Normal measurement screen → PPL measurement screen → CL measurement screen → Auto measurement screen...
Only	Only when CL measurement is performed. The measurement selection button is disabled. Only the CL measurement screen is available.

16 : Distortion Check

This is for enabling or disabling the distortion check mode.

Off	When distortion check is not performed.
Distortion found	When lens distortion is found, dot symbols indicating the distortion level are displayed. If the measurement status becomes stable and the lens is judged to have no distortion, the dot symbols disappear.
Lens found	The dot symbols are displayed unless the lens is placed. This option is selected to indicate that the lens is not distorted.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
17	Printer	Off, <u>On</u>, AR print	Printer
18	Print format	<u>Right & Left</u>, Left & Right	
19	Print density	60, 80, <u>100</u>, 120, 140 (%)	
20	Print number	<u>Off</u>, On: 0001	
21	Paper cut	<u>Partial</u>, Full	
22	Auto cutter	Off, <u>On</u>	

17 : Printer

This is for setting the condition when the print button is pressed.

Off	The print button is displayed by the  icon. Printing is not performed by pressing the print button. Only data transmission is performed.
On	Printing is performed by pressing the print button. The print button is displayed by the  icon. Data transmission is also performed.
AR print	The print button is displayed by the  icon. Printing by the printer of the connected AR, ARK or RKT is performed by pressing the print button. Data transmission is also performed.

Note

- When this parameter is set to “AR print”, the “Print density”, “Paper cut”, “Auto cutter”, and “Economy print” parameters are disabled.

18 : Print format

This is for setting the right or left lens to be marked.

19 : Print density

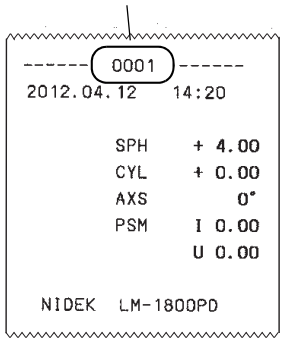
This is for setting the density of printing.

20 : Print number

This is for setting the density of printing.

Off	The data number is not printed when printing the measured results.
On: 0001	The data number is printed when printing the measured results. Extended pressing of “On” for 1 second or more displays a numeric keypad and the numbers from 1 to 9999 can be input. Every time the Clear button is pressed in the measurement screen, the serial number advances by one. After 9999, the number returns to 0001. The number is retained even after the power is turned off. When there is a RT data No., the RT data No. is prioritized for printing.

Data number



21 : Paper cut

This is for selecting the cut method of the printer paper.

Partial	Printer paper is cut with a center part left.
Full	Printer paper is cut off.

22 : Auto cutter

This is for selecting whether to cut the paper automatically after printing.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
23	Economy print	Off, On	
24	Auto print S	Off, On	Printer
25	Auto print R/L	Off, On	
26	Print&Clear	Off, On	
27	Print date format	Off, Y.M.D, M/D/Y, D/M/Y	
28	QR code	Off, On	

23 : Economy print

This is for setting the line space of printing.

When the parameter is set to “On”, the printer paper can be saved by reducing the line space.

For details of the printing, see “2.11 Printing” (page 103).

Off	Printed with normal line space.
On	Printed with line space reduced to 1/4 of the normal space.

24 : Auto print S

This is for selecting whether to print the measured data by removing the lens after the data is locked in when the lens side is not specified (single state).

25 : Auto print R/L

This is for selecting whether to print the measured data by removing the lens after the data is locked in when the lens side is specified (R/L state).

26 : Print&Clear

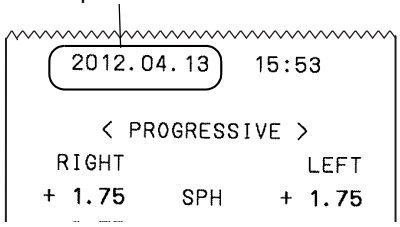
This is for selecting whether to clear the measured data from memory after printing, data communication, or data writing to the Eye Care card.

Off	Measured data is not cleared after printing, data communication, or data writing to the Eye Care card. Previous measured data is overwritten when next measurement is performed. In addition, when the device is connected to the optometry system or a clear command is sent from an external device, the data is cleared.
On	Measured data is cleared after printing, data communication, or data writing to the Eye Care card.

27 : Print date format

This is for setting the order of the printing date on the printout.

Sample when “Y.M.D” is set.



28 : QR code

This is for setting whether to print the QR code.

Off: The QR code is not printed.

On: Prints the QR code. Part of the measurement result is output.

Note

- For details regarding the printed QR code, ask for the QR code manual in which the QR code specifications are written.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
29	Initial screen	Auto, Normal, Progressive, Contact	On-screen indication
30	Target	○, +	
31	Guide	Off, On	
32	Beep	Off, Low, Middle, High	Other functions
33	Auto off	Off, 1. 3, 5, 10, 15, 30, 60 (min)	

29 : Initial screen

This is for selecting the measurement screen displayed at power-on.

Auto	Normal measurement screen in auto mode
Normal	Normal measurement screen
Progressive	PPL measurement screen
Contact	CL measurement screen

30 : Target

This is for selecting the indication format of the target displayed on the measurement screen.

○	Normal target The target indicates the distance and direction from the nosepiece center. The direction and movement distance are constant regardless of the refractive power of lenses.
─┼─	Prism target The target moves based on prisms as with the eyepiece- type or projection-type lensmeter.The target indicates the axis while rotating.

For details of the display, see “O Details of target” (page 36).

31 : Guide

This is for setting whether to display the guide mark ( ) in the center of the alignment circle for precise alignment of the target.

For details of guide mark, see “O Guide mark (page 43)”.

32 : Beep

This is for selecting the musical quality of beeps, which sound for each press of the button and when the data is automatically read.

33 : Auto off

This is for enabling or disabling the display auto off function or setting the display auto off time.

During lens measurement, the device will not be placed into display auto off mode.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
34	Contrast	Low, Middle, High	On-screen indication
35	Color	Standard, Change:	On-screen indication

34 : Contrast

This is for screen contrast setting.

35 : Color

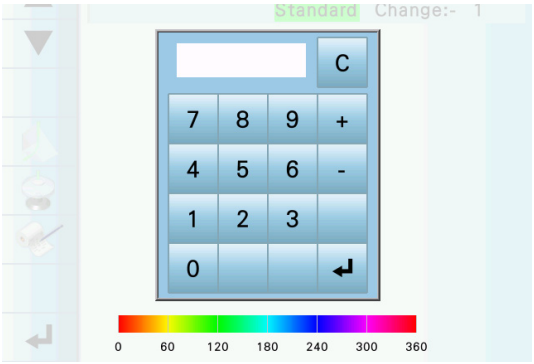
This is for screen color setting.

When “Change:” is pressed and held for about 1 second, the numeric keypad is displayed for specifying the desired screen color by numeric value input.

The standard value is 199.

The monochrome value is -360 to -1. The inversed display changes depending on the values.

The color can be specified in the range of 0 to 359 (Red = 0, Green = 120, Blue = 240).



<Page 8> (LM-1800PD only) * Underlined options indicate factory settings.

No.	Parameter	Settings	Category
36	PD measurement	Off, <u>On</u>, R/L only	Other functions
37	PD layout	<u>Off</u>, On	Printer
38	Add graph	Off, <u>On</u>, Print	PPL lens measurement function
39	Length	<u>Off</u>, On	
40	Channel width	<u>Off</u>, On	
41	Channel width auto read	Off, 0.25, <u>0.50</u>	

36 : PD measurement (LM-1800PD only)

This is for setting whether to display the PD.

Off	The PD is not displayed. R/L change with the nose slider is not performed.
On	The PD is displayed. R/L change with the nose slider is performed.
R/L only	The PD is not displayed. R/L change with the nose slider is performed.

When R/L change with the nose slider is performed (set to “On” or “R/L Only”), L and R buttons in the measurement screen are disabled.

The nose slider automatically turns off when the lens table is positioned beyond 50 mm from the center of the nosepiece. In such a case, lens side can be specified with L or R .

37 : PD layout (LM-1800PD only)

This is for setting the printout format of the PD measurement data.

For details of the printing, see “2.11 Printing” (page 103).

Off	Only values are printed.
On	This setting is active only when the PD measurement parameter is set to “On”. When the PD value is entered manually, the parameter is set to other than “On” and the PD measurement result cannot be printed in the PD layout format. The PD layout is printed as an illustration. When the “Economy print” is set to “On”, only values are printed.

38 : Add graph (LM-1800PD only)

This is for setting whether to display the Add graph (distance from the distance measuring point and add power at the point) in measurement of progressive power lens.

Off	The Add graph is not displayed on the screen.
On	The Add graph is displayed on the screen.
Print	The Add graph is displayed on the screen and it is printed when the measured results are printed. However, when the Economy print parameter is set to “On”, the Add graph is not printed.

39 : Length (LM-1800PD only)

This is for setting whether to measure the progressive length (distance from the add start point to near portion).

40 : Channel width (LM-1800PD only)

This is for setting whether to measure the channel width.

41 : Channel width auto read (LM-1800PD only)

This is for enabling or disabling the auto read function in measurement of the channel width.

Off	In measurement of the channel width, auto read is disabled.
0.25	In measurement of the channel width, auto read is performed at the point changed in 0.25 D from the distance cylinder value
0.50	In measurement of the channel width, auto read is performed at the point changed in 0.50 D from the distance cylinder value

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
42	Inside	Off, On	Other functions
43	Net prism	Off, On	
44	Diameter	Off, On	

42 : Inside (LM-1800PD only)

This is for setting whether to display the near portion inside amount in PD measurement of the near portion.

For details of Near portion inside amount, see "○ PD indication in PPL measurement (LM-1800PD only)" (page 60).

43 : Net prism (LM-1800PD only)

This is for setting whether to perform net vertical prism measurement or net horizontal prism measurement in measurement of the mounted lens.

44 : Diameter (LM-1800PD only)

This is for setting whether to display the lens diameter.

When this parameter is set to "On", it is necessary to use the lens table in measurement of uncut lenses.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
45	Transmittance	Off, On, With	UV measurement function
46	Transmittance step	1, 5 (%)	
47	Transmittance display	Compare, Simple	
48	Auto correct	Off, On, Silent	

45 : Transmittance

This is for selecting whether to perform transmittance measurement.

Off	Transmittance measurement is not performed by pressing  .
On	Transmittance measurement is performed by extended pressing of  .
With	Reading of the lens power and transmittance measurement are performed by extended pressing of  . When add power is measured, only the reading of the lens power is performed.

46 : Transmittance step

This is for setting the indication step of the transmittance (1%/5%).

Note

- Even though the indication step is set to 1%, the measurement accuracy is within ±5%.

47 : Transmittance display

This is for screen setting in the transmittance measurement.

Compare	Displays the measured results by switching the screen to the transmittance measurement screen. The transmittance can be compared with that of other lenses by compare measurement in the transmittance compare screen.
Simple	Displays the measured results on the measurement screen.

48 : Auto correct

This is for setting the auto correction of the transmittance to 100%.

Off	The transmittance is not automatically corrected to 100%.
On	The transmittance is automatically corrected to 100%. When transmission is renewed after correction, two short beeps sound. When error occurs (transmission is not renewed) after correction, a beep sounds.
Silent	The transmittance is automatically corrected to 100%.

Note

- The transmittance 100% correction is performed automatically at 5 to 60 minute intervals (according to change amount of the camera sensitivity) to correct the change of camera sensitivity in transmittance measurement.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
49	USB	Host, <u>Device</u>	Communication function
50	Read beginning of reader	Patient: 1 Operator: 1	
51	Read length of reader	Patient: 16 Operator: 16	

49 : USB

This is for communication setting of the barcode scanner or a PC with the USB.

Set this parameter to “Host ” when connecting with the barcode scanner. Set this parameter to “Device” when connecting with the PC.

50 : Read beginning of reader (1 to 255)

This is for selecting the position to start reading of data transferred from a reader.

Two settings for the operator and patient are available. The parameter is limited up to 256 including the read length by the reader.

51 : Read length of reader (1 to 16)

This is for setting the length of data to be read.

Two settings for the operator and patient are available. The parameter is limited up to 256 including the reading start position.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
52	Com mode	Off, NIDEK, NIDEK2, PC, NCP10, NCP20	Communication function
53	Baud rate	1200, 2400, 4800, 9600,19200 (bps)	
54	Parity	Off, Odd, Even	
55	Data bits	7bit, 8bit	
56	Stop bits	1bit, 2bit	
57	CR code	Off, On	Communication function (NCP20)

Note

• In order to connect the LM-1800P/LM-1800PD with external computers, ask your authorized distributor for the interface manual which explains the details of the communication protocols.

52 : Com mode

This is for selecting the device for communication.

OFF	Data communication is not performed
NIDEK	Communication with a NIDEK-brand device
NIDEK2	Communication with a NIDEK-brand device (timeout period is extended)
PC	Computer
NCP10	NCP10-compliant NIDEK-brand device
NCP20	NCP20NCP20-compliant NIDEK-brand device

When the Printer parameter is set to “AR print”, “NIDEK” or “NIDEK2” can only be set.

53 : Baud rate

This is for selecting the baud-rate (bit transmission speed) for communication.

When the Com mode parameter is set to “NIDEK”, “9600” is automatically selected.

54 : Parity

This is for selecting whether to perform odd parity or even parity.

When the Com mode parameter is set to “NIDEK” or “NIDEK2”, “Odd” is automatically selected.

55 : Data bits

This is for selecting the bit number for a single character used for communication.

When the Com mode parameter is set to “NIDEK” or “NIDEK2”, “8bit” is automatically selected.

56 : Stop bits

This is for selecting the bit number of stop bit for communication.

When the Com mode parameter is set to “NIDEK” or “NIDEK2”, “1bit” is automatically selected.

57 : CR code

This is for selecting whether to attach CR code at the end of data to be transmitted.

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* Underlined options indicate factory settings.

No.	Parameter	Settings	Category
58	Prism Tx	Off, On, Display	Communication function (NCP20)
59	Source	0 to 255, factory setting: 1	
60	Destination	0 to 255, factory setting: 0	
61	Request	0.1 to 10.0 (seconds), factory setting:2.0	
62	Reception	1 to 100 (seconds), factory setting: 10	
63	Response	0.1 to 10.0(seconds), factory setting:2.0	

Parameters No. 59 to 65 are the items when the Com mode parameter is set to “NCP20”.

58 : Prism Tx

This is for selecting whether to transmit the measured prism value.

Off	The measured prism value is not transmitted at any time.
On	The measured prism value is transmitted at all times.
Display	When the measured prism value is displayed on the screen, it is transmitted. When the value is not displayed, it is not transmitted.

59 : Source

This is for setting the port number of the source (LM-1800/LM-1800PD) from 0 to 255.

60 : Destination

This is for setting the port number of the destination (receiving device) from 0 to 255.

61 : Request

This is for setting the response waiting time (time-out) for command requests from 0.1 to 10.0 seconds.

62 : Reception

This is for setting the waiting time (time-out) for receiving commands from 1 to 100 seconds.

63 : Response

This is for setting the waiting time (time-out) for responding commands from 0.1 to 10.0 seconds.

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No.	Parameter	Settings	Category
64	Re-request	0.1 to 10.0(seconds), factory setting:2.0	Communication function (NCP20)
65	Retry	0 to 5 (times), factory setting: 3	

64 : Re-request

This is for setting the response waiting time (time-out) for command requests from 0.1 to 10.0 seconds.

65 : Retry

This is for setting the number of retry times from 0 to 5 when communication is not established.

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No.	Parameter	Settings	Category
66	MAC address	FF-FF-FF-FF-FF-FF	Communication function
67	Network	Off, On, Sending only	
68	File format	NIDEK_V1.00, NIDEK_V1.01	
69	DHCP	Off, On	
70	IP address	192. 168. 0. 90.	
71	Subnet mask	255. 255. 255. 0.	

66 : MAC address

This setting cannot be changed.

The MAC address of the LM is displayed.

67 : Network

This is for setting whether to use the network.

When “Off” is selected, the device does not use the network.

When “On” is selected, the device uses the network. It always opens ports and stands by to send and receive data.

When “Sending only” is selected, the device uses the network. It opens the ports only at the time of sending.

68 : File format

NIDEK_V1.00: Settings for NIDEK specifications V1.00

NIDEK_V1.01: Settings for NIDEK specifications V1.01

69 : DHCP

This is the setting whether to obtain the IP address and subnet mask from the DHCP server.

When “On” is selected, the device obtains them.

* The IP address and subnet mask become unchangeable. The values obtained from the DHCP are displayed.

When “Off” is selected, the device does not obtain them.

70 : IP address

This is the setting for the IP address of the LM.

71 : Subnet mask

This is the setting for the network subnet mask of the LM.

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No.	Parameter	Settings	Category
72	Default gateway	0.0.0.0	Communication function
73	User name	GUEST	
74	Password	******	
75	Domain	WORKGROUP	
76	PC name	LM	
77	Folder	DATA	

72 : Default gateway

This is the setting for the default gateway of the LM.

73 : User name

This is the setting for the user name of the connected computer.

74 : Password

This is the setting for the login password associated with the user name of the connected computer.

75 : Domain

This is the setting for the domain name of the connected computer.

76 : PC name

This is the setting for the PC name of the connected computer.

77 : Folder

This is the setting for the shared folder of the connected computer on which data is saved.

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No.	Parameter	Settings	Category
78	Network timeout	Off, On: 5 (seconds)	Communication function

78 : Network timeout

This is the setting whether files saved in the shared folder of the destination computer are deleted.

When “Off” is selected, the files in the share folder are not deleted in the receiver side.

When “On” is selected, the time to delete files in the receiver side can be set (1 to 60 seconds).

Pressing “On” for about 1 second displays the numeric keypad.

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No.	Parameter	Settings	Category
79	Date	**** / ** / **	Other functions
80	Time	** : **	

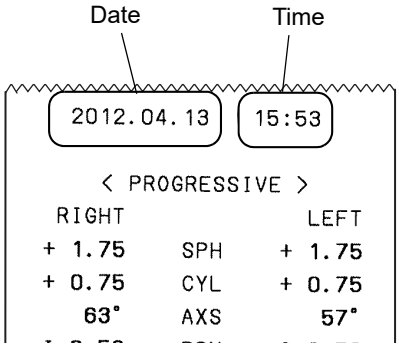
For The Date and Time settings, the other settings of date or time cannot be changed until the set item is renewed.

79 : Date

This is for setting the printing date on the printout.

80 : Time

This is for setting the printing time on the printout.



2.14.2 Entering comments

■ The comments in communication print can be changed. (Factory setting: NIDEK LM-1800P/LM-1800PD)

1 Press  in the measurement screen.

The screen changes to the parameter screen.

2 Press  .

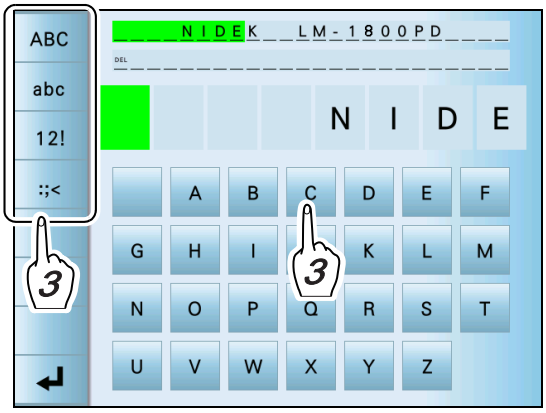
The screen changes to the comments screen.

3 Enter the comments.

Select the desired alphabetic character (upper or lower case letter), number, or symbol as necessary.

The entered alphanumeric is displayed on the top of the screen and the cursor moves to the right box automatically.

See “1.6.7 Comments screen” (page 26).

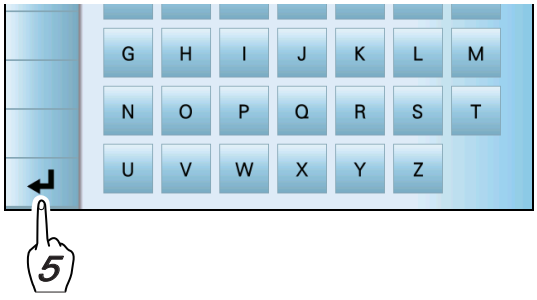


4 Repeat Step 3 to enter the characters.

5 Press  .

The window for selecting among data save, data clear, and back screen is displayed.

When data save or data clear is selected, the screen returns to the parameter screen.



3 OPERATION WHEN PERIPHERAL DEVICES ARE CONNECTED

■ The LM-1800P/LM-1800PD transmits data to an external device such as the NIDEK motorized refractor, computer, and Eye Care card system.

The optional foot switch can be used instead of  to read measured data.

⚠ **CAUTION** • **Be sure to turn off each device before connecting the interface cable.**
Connecting the cable with power on may cause malfunction.

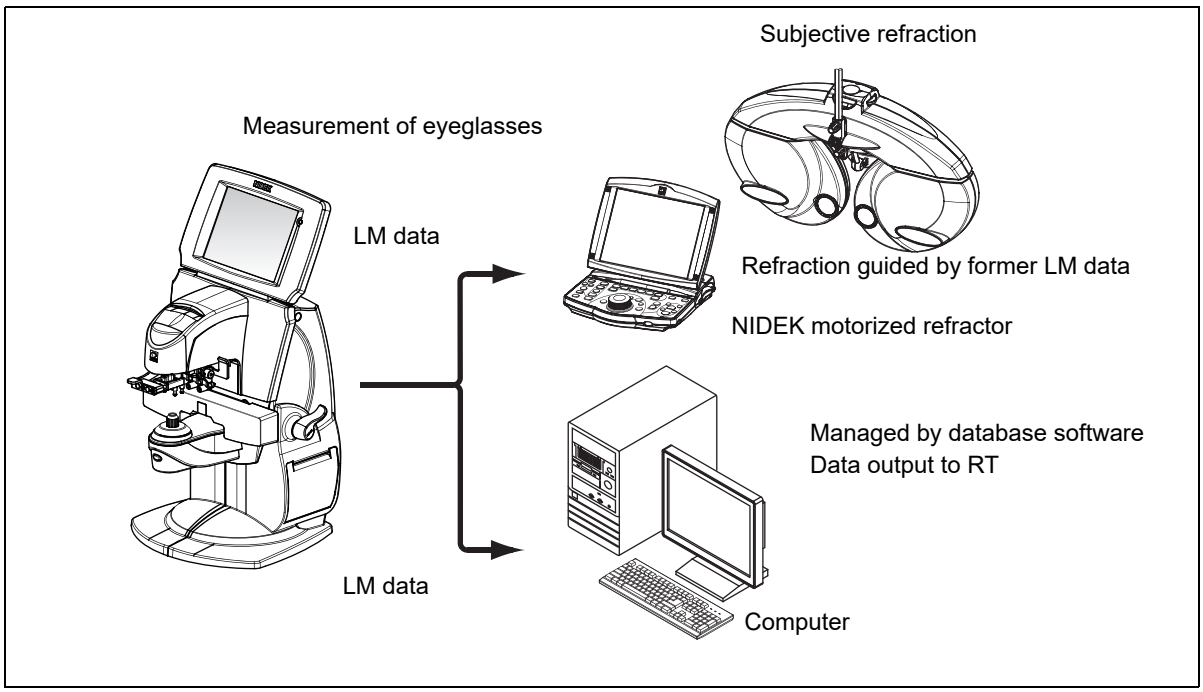
3.1 Connecting to the NIDEK Motorized Refractor (RT) or Computer

3.1.1 Outline

Any data (except for transmittance data) on printout can be transmitted to the NIDEK motorized refractor (hereafter referred to as the RT) or a computer.
The measured data transmitted to the RT is used as former LM data in subjective refraction.

Connectable device: RT-2100 series, RT-5100 series

LM data transmitted to a computer can be managed by various database software.

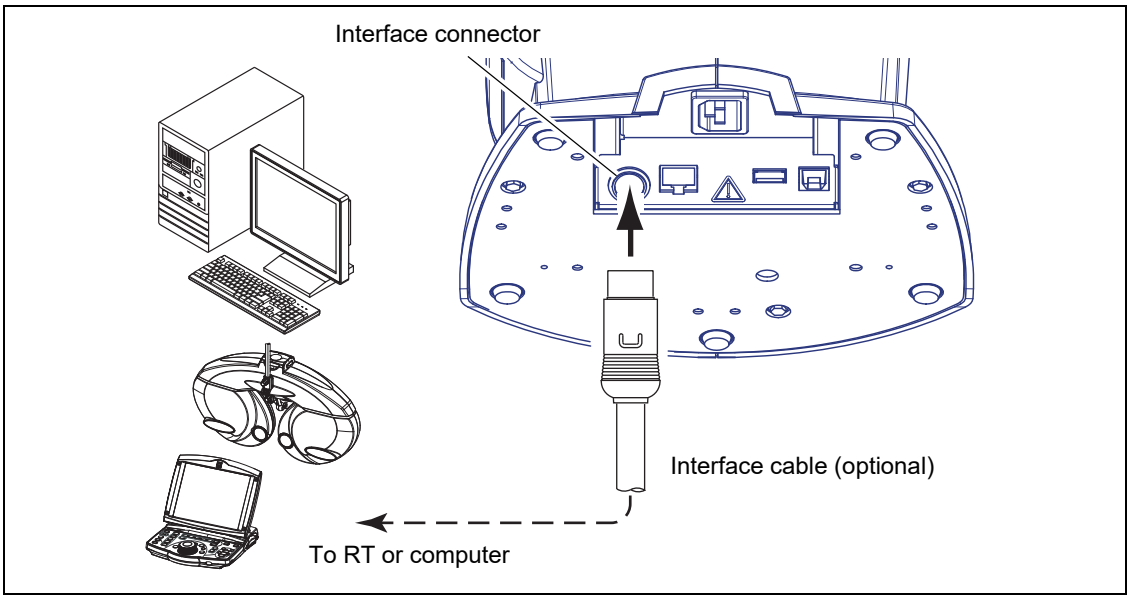


Note
- LM data can be transmitted through RS-232C compliant interface.
- Data can be transmitted to a computer through USB.

3.1.2 Connecting procedure

Connect the RT (or a computer) to the interface connector of the LM-1800P/LM-1800PD with the interface cable (optional).

Connect the cable with the device laid down.



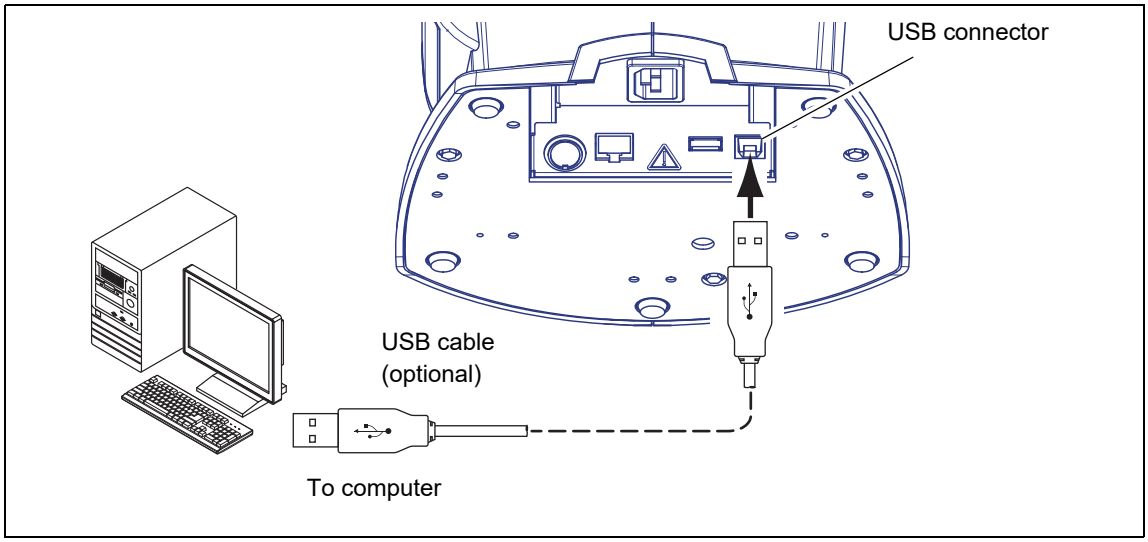
○ Connecting to computer through USB

Connect the optional USB cable between the USB port of the LM-1800P/LM-1800PD and that of a computer (⇔).

The USB driver included with the optional USB cable is necessary to be installed in the computer.

Note

- The USB interface is in compliant with USB 2.0.
- Do not use the commercially available USB cable since the EMC performance may deteriorate (electromagnetic interference may occur).



3.1.3 Operating procedure

1 After measurement, press  .

Perform operation in the same manner as the normal printing.

For details of measuring procedure, see “2 OPERATING PROCEDURE” (page 33).

For details of printing, see “2.11 Printing” (page 103).

2 The LM-1800P/LM-1800PD automatically transmits data to the RT (or a computer).

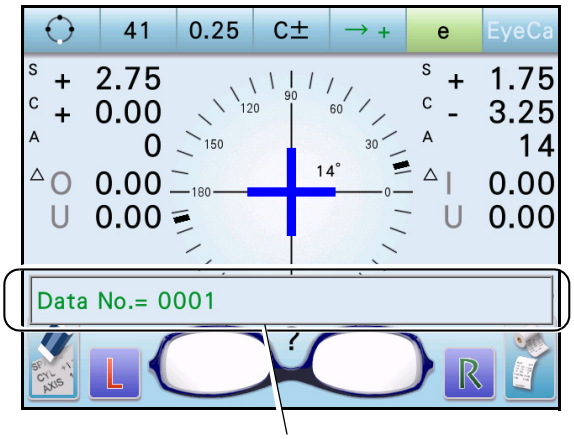
When the LM-1800P/LM-1800PD is connected to the RT, it receives a data No. (ID No.)

When the LM-1800P/LM-1800PD is connected to a computer, it does not receive a data No. (ID No.)

3 The measured data is printed.

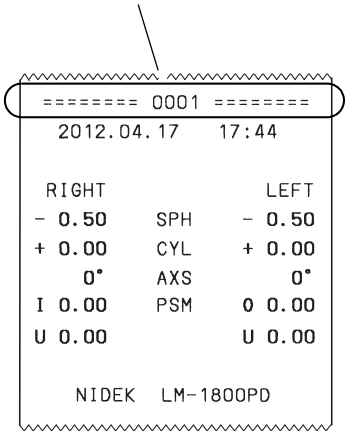
When the LM-1800P/LM-1800PD is connected to the RT, the data No. (ID No.) is also printed.

The following is the example of the screen which the RT data No. (ID No.) is displayed and the printout.



Display example of data No.

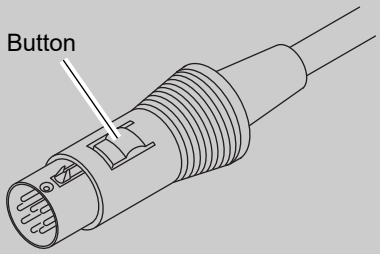
Print example of the data No.



Note

- Disconnect the interface cable while pressing the button on the connector.

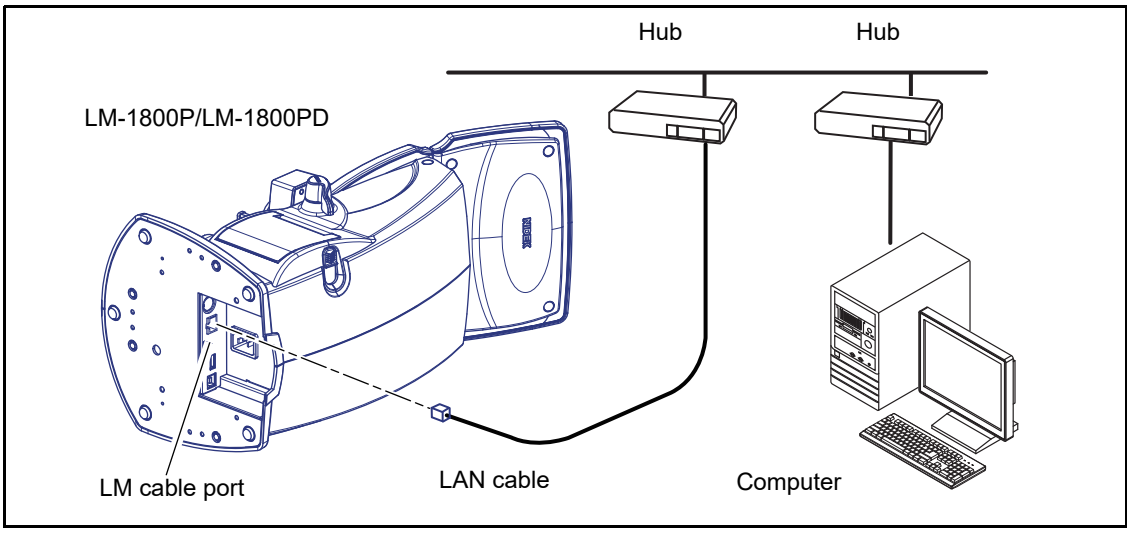
  When the cable is connected, the button is located on the underside of the connector.



3.2 Connection to LAN Communication

○ Connecting procedure

Connect the computer with a LAN cable to the device through the LAN cable port at its base.
Connect the cable with the device laid down.



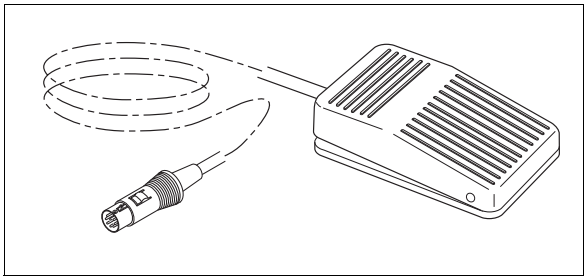
Be sure to obtain permission from the network administrator before making any parameter settings in the device or the PC.

Only service personnel trained by NIDEK sets the LAN and parameters.

3.3 Connecting the Foot Switch

The optional foot switch can be used instead of  to read measured data.

In such cases when a number of lenses are measured in the Lab system, the foot switch allows for measurement while holding lenses with both hands.



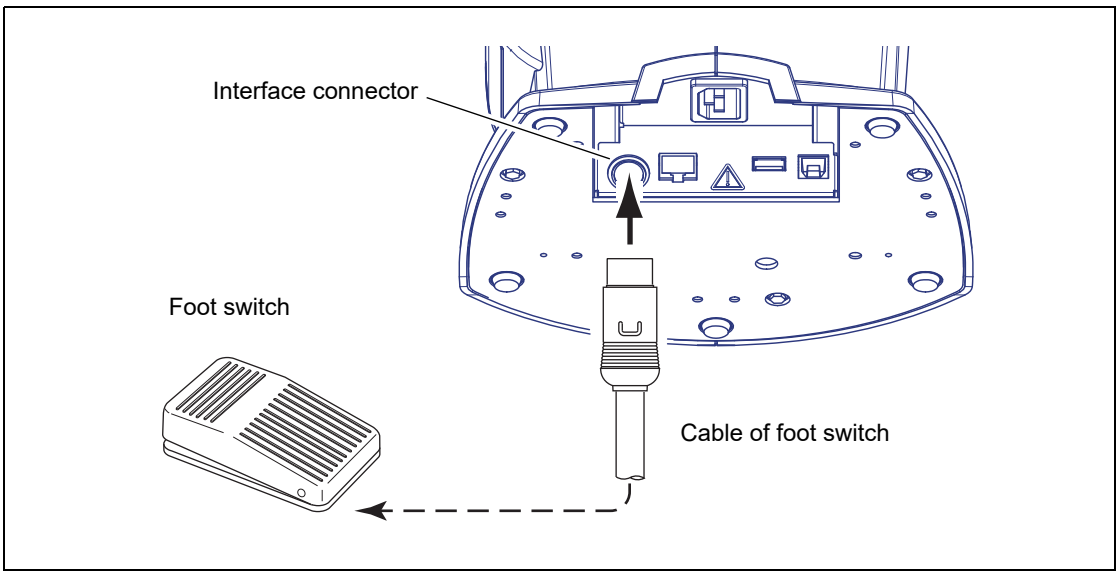
Note

-  works with the foot switch connected.
- Transmittance measurement and PPL measurement can be performed by depressing the foot switch for about 1 second.

○ Connecting procedure

1 Connect the cable of the foot switch to the interface connector.

2 Draw the cable from the space at the rear of the device so as not to be caught.



3.4 Reading Patient ID

■ Read ID using a barcode scanner or magnetic card reader.

The read ID can be printed with measurement results and output via communication.

Note

- Although patient ID can be read before or after measurement, it is advisable to read it before printing the measured data.
- If an incorrect patient ID is read, extended pressing of the barcode button  reads the correct ID again.

  Pressing  clears data, and the current two IDs are saved.

3.4.1 Connecting procedure of barcode scanner/magnetic card reader

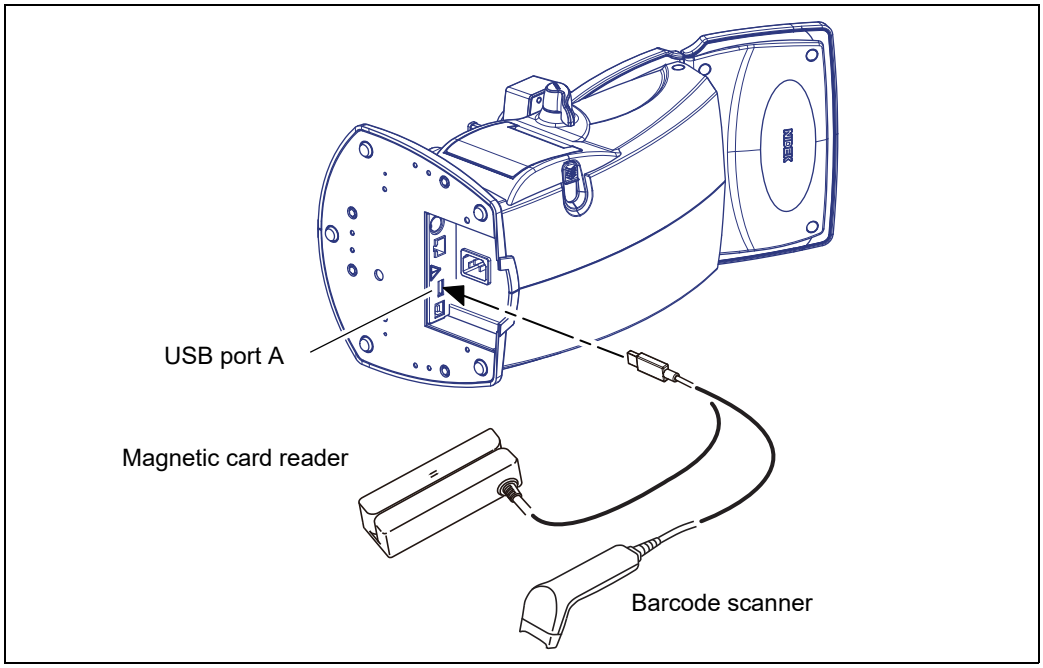
Note

- No device other than the dedicated barcode scanner or magnetic card reader can be connected.

1 Set the USB parameter to “Host” and check the settings of the “Read beginning of reader” and “Read length of reader” parameters.

See “2.14 Setting Parameters” (page 111).

2 Connect the barcode scanner or magnetic card reader to the USB port A at the bottom of the device.



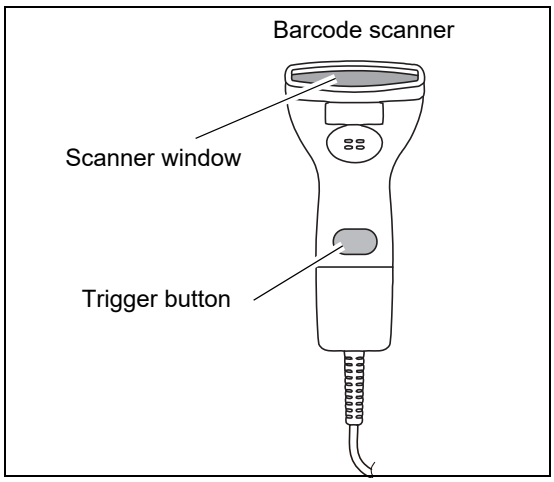
Note

- A beep sounds when the device is turned on with the barcode scanner or magnetic card reader connected.

  The beep is not an error. It indicates that connection is correct.

3.4.2 Operation with barcode scanner

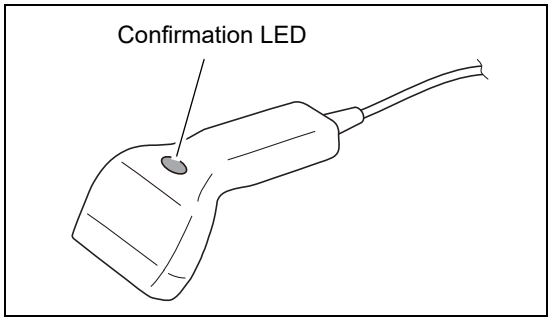
1 Place the scanner window over a barcode.



Press the trigger button.

The scanner window lights up in red and reads the barcode.

When the barcode has been read successfully, the confirmation LED lights up and the scanner emits a short beep.

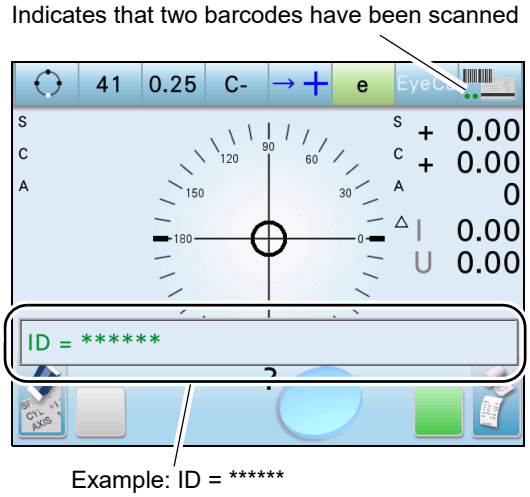


● Entering any IDs

The barcode button is displayed on the measurement screen. When the barcode is read, “ID = ******” is displayed.

Two barcodes can be scanned.

Extended pressing of the button clears the entered ID.



● Entering operator and patient barcodes

Specify barcodes for the operator and patient as necessary.

[Operator barcode]

1) Press the barcode button.

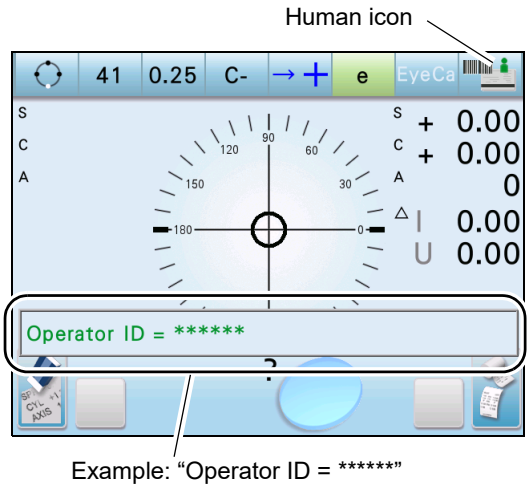
   The icon color becomes orange.

2) Read the operator barcode.

   The barcode is specified for the operator.

   The icon color returns to its original color when the barcode is successfully read.

   To change the operator barcode, press the barcode button again and read the new barcode while the icon is displayed in orange.



Example: “Operator ID = ******”

When there is no data prior to the “Read beginning of reader“ parameter, a human icon is dispalyed in gray and “Operator ID=******” is not displayed.

Extended pressing of the button clears the operator barcode.

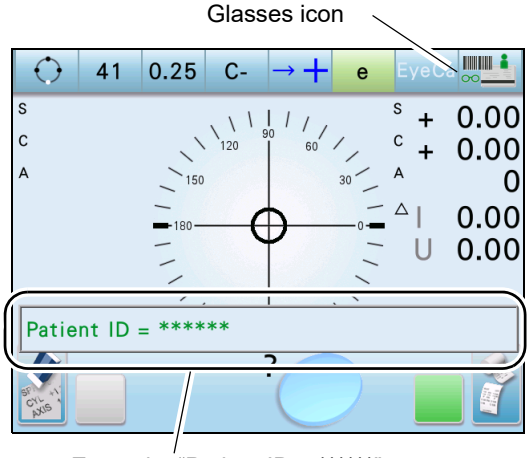
[Patient barcode]

1) With the barcode icon in its original color, read the patient barcode.

   After the patient barcode is read, the glasses icon is displayed on the button.

   To input another patient barcode, with the glasses icon displayed in the original color, read the new barcode.

   When there is no data prior to the “Read beginning of reader“ parameter, a glasses icon is not dispalyed and “Patient ID=******” is not displayed.



Example: “Patient ID = ******”

Note

- For the barcode, use “CODE39”.
- For ID, numbers, any alphanumeric characters, and symbols (other than \, {, |, }) can be used.

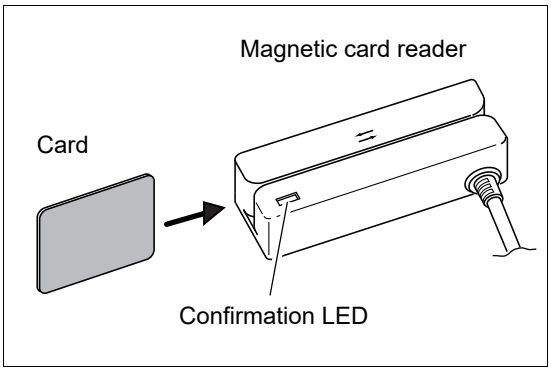
  Other control codes are not recognized by the LM-1800P/LM-1800PD. All the unrecognized symbols are converted to “~”.
- Pressing  clears the IDs except for the operator ID when entered separately as described above.

3.4.3 Operation with magnetic card reader

1 Swipe the card with the magnetic card reader.

A beep sounds and the confirmation LED goes out.

When the card has been read successfully, the LED lights up in green.

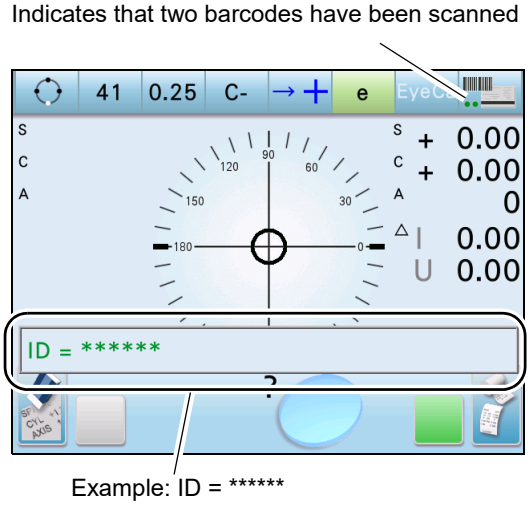


● Entering ID

The barcode buttons is displayed in the measurement screen. When the barcode is read, “ID = ******” is displayed.

Two barcodes can be scanned.

Extended pressing of this button clears the input ID.



● Entering operator / patient ID

Switches the operator and patient ID input. (The procedure is the same as “3.4.2 Operation with barcode scanner”.)

Note

- Use a magnetic card utilizing a magnetic stripe format compliant with ISO 7811, AAMVA, CA DMW.
- For the ID, numbers, alphanumeric characters, and symbols (other than \, {, |, }) can be used.

  Other control codes are not recognized by the LM-1800P/LM-1800PD. All the unrecognized symbols are converted to “~”.
- Pressing  clears the IDs except for the operator ID when entered separately as described in Section 3.4.2.

4 MAINTENANCE

4.1 Troubleshooting

■ In the event that the device does not work correctly, correct the problem according to the following table before contacting your authorized distributor.

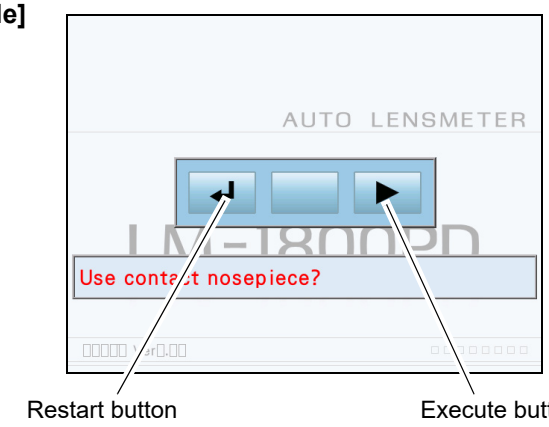
Symptom	Actions
The LCD does not turn on.	• The power cord may not be correctly connected. Reconnect it securely. • The power switch may not be turned on. Check the power switch.
The LCD does not turn on (or is unclear) even though the power is on.	• It seems that the display auto off function has been executed. Press any button on the screen to exit from the auto off mode.
The screen disappears suddenly.	• It seems that the display auto off function has been executed. Press any button on the screen to exit from the auto off mode.
The device freezes.	• The device may be affected by external electromagnetic noise or static electricity noise. Turn the power off and on to reboot the device. • If the symptom occurs even after the power is restored, check the installation environment according to the EMC guidelines.
L and R are disabled.	• Move the nose slider to the far left. (LM-1800PD only)
Data is not printed.	• Check the printer paper. When the paper has run short, set new printer paper. • The Printer parameter may be set to “Off”. Reset the parameter.
The printer runs, but the paper is blank.	• The printer paper may be set with the wrong side up. Set it with the correct side up.
Data cannot be read even though the Eye Care card is inserted.	• The contacts in the Eye Care card slot may be soiled. Clean them (see page 151). • When an error occurs while data is read in the other device such as a refractor, clean its card reader.

If the symptom cannot be corrected with the above actions, contact NIDEK or your authorized distributor.

4.2 Error Messages and Countermeasures

■ If a message appears on the lower part of the screen, take measures according to the table below. Should a service visit be necessary, please prepare the details of the message and symptom along with the serial number of the device.

[Message display sample]

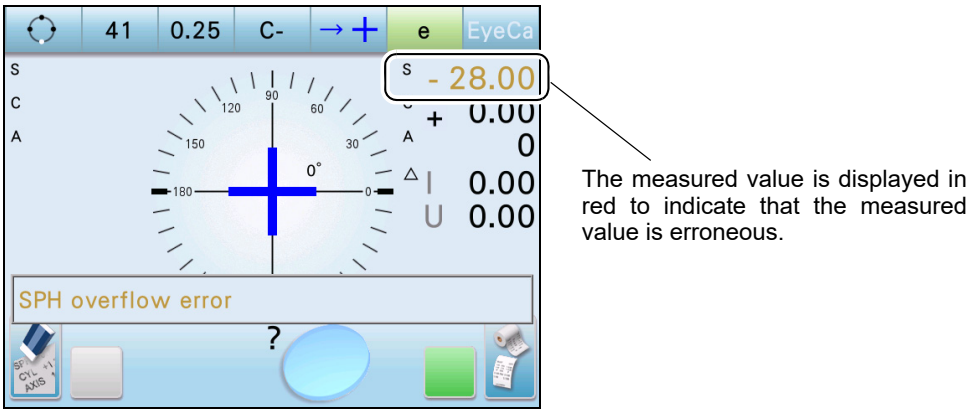


Error message	Cause and countermeasure
0D Initialization error	• The measuring beam is interrupted during initialization. • Check the nosepiece. • Press the restart button to reboot the device.
Please remove lens from nosepiece.	• A lens is on the nosepiece when power is turned on. • After removing the lens, press the restart button to reboot the device.
Dust detected. Please clean lens.	• There is something which interrupts the measuring beam on the nosepiece when power is turned on. • Check the nosepiece. Remove the dust and dirt from the protective glass. • Press the restart button to reboot the device.
Use contact nosepiece?	• The nosepiece for contact lenses is placed when power is turned on. • Replace with the standard nosepiece, press the restart button to reboot the device. • To measure a contact lens, press the execute button.
Transmittance initialization error	• The measuring beam is interrupted during initialization. • Check the nosepiece. • Press the restart button to reboot the device.
SPH overflow error	• The sphere value exceeds ±27 D. • Check the power of the lens.
CYL overflow error	• The cylinder value exceeds ±10 D. • Check the power of the lens.
ADD overflow error	• The add value exceeds ±11 D. • Check the power of the lens.
Center overflow error	• The lens with the prism value exceeding 20 Δ is on the nosepiece. Align or remove the lens.

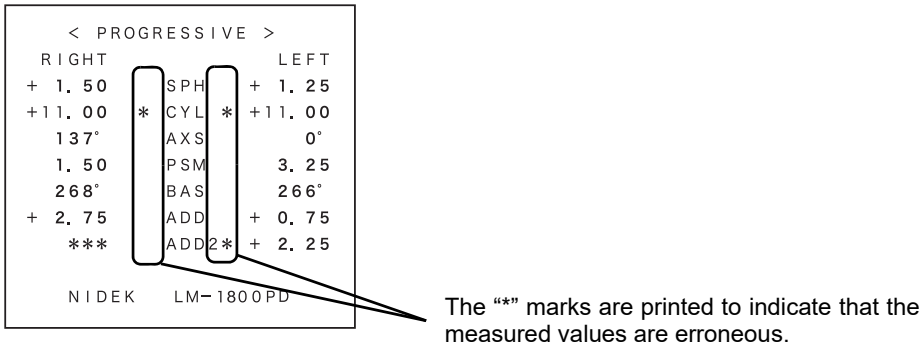
Error message	Cause and countermeasure
Printer error	• The print button is pressed with no printer paper set. Set new printer paper.
Printer paper error	• The printer ran out of paper while printing. Set new printer paper.
Communication error	• Correct communication is not performed with other devices. Check the interface cable. Check that the connected device is turned on. Check that the parameters related to communication are correctly set.
AR print error	• A request for data transmission is not sent from the AR, ARK or RKT before printing. Check the interface cable. Check the parameter settings on the AR, ARK or RKT.
Eye Care card error	• Correct communication is not performed with the Eye Care card. Replace the Eye Care card and check whether the communication is possible.
CCD error	• CCD signals are not correct. Failure in the interior of the device. Contact NIDEK or your authorized distributor.
Refractive index measurement error	• In refractive index measurement, the measured data is not correct. Check whether the measurement procedures such as attachment of gel are correct.
Measurement error	• The measuring beam is interrupted during initialization. • Check the nosepiece. • Press the restart button to reboot the device. • LED is not lit. Failure in the interior of the device. Contact NIDEK or your authorized distributor.
Transmittance measurement error	• Significant change such as interference light occurred during measurement. Make the lens stable and perform measurement again.
Network error	• Network communication failed. For details, perform network communication check.
Network timeout error	• Files were not deleted from the shared folder within a specified time.

○ Screen display at the time of overflow error

The measured value at the time of overflow error is displayed in red and the red indication remains even after data reading. Also, auto read is disabled at the time of error.



If printing is performed in this condition, erroneous measured values are displayed with "*".



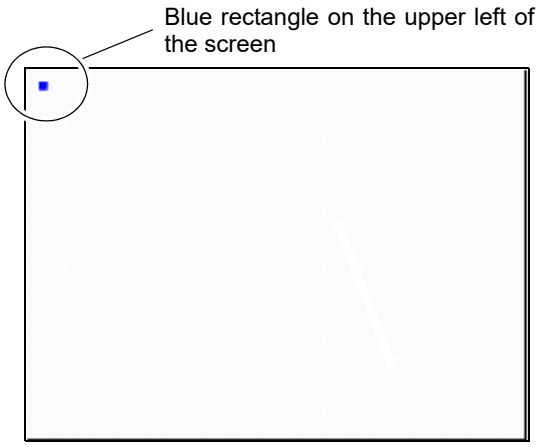
4.3 Adjusting the Touch Panel

■ If the accuracy of touch panel widely decreases, adjust the touch panel function.

1 Display the touch panel adjustment screen.

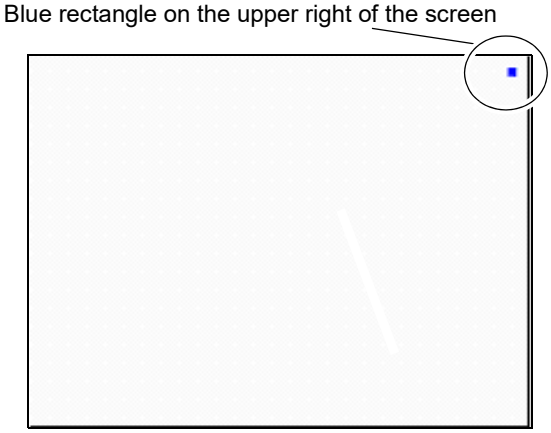
Turn the power on while holding  .

The blue rectangle is displayed on the upper left of the touch panel adjustment screen.



2 Press the center of the blue rectangle.

3 Then, blue rectangle is displayed on the upper right of the screen. Press the center of the rectangle.



4 Blue rectangles are displayed on the remaining corners in the same manner. Press the center of the rectangles respectively.

5 Turn the power off to complete the adjustment.

4.4 Replacing Printer Paper

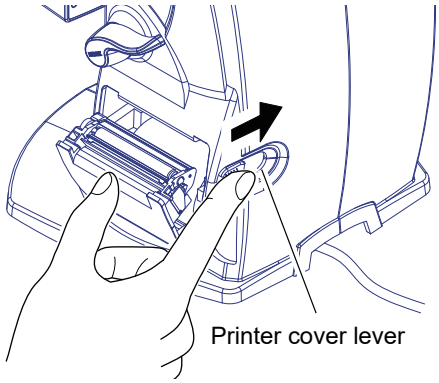
■ When a red line appears on the side of the printer paper, it means that paper is running short. In such a case, stop using the printer and replace the roll with a new one.

Note

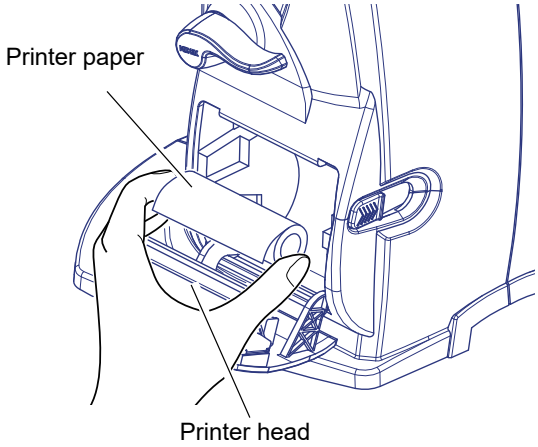
- Do not run the printer when printer paper is not set.
  It may ruin the printer head.
- Do not pull on the printer paper in the printer forcefully.
  This may cause malfunction of the printer.

1 Pull the printer cover forward.

Slide the printer cover lever at the rear of the device to open the cover.



2 Remove any remaining printer paper.



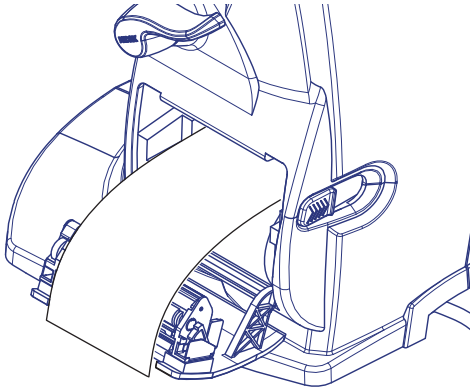
⚠ **CAUTION**

- **When replacing printer paper, be sure not to touch the printer head on the upper part inside the printer paper holder.**
  The printer head is extremely hot immediately after printing. Injury may occur.

3 Set new printer paper.

Set paper as shown in the figure to the right.

Leave the end of paper out from the cover.

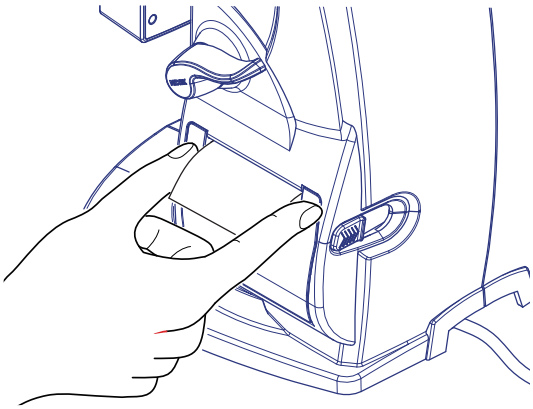


Note

- When the roll is set upside down, the data is not printed correctly.
- Make sure that printer paper roll is not tilted or the shaft misaligned.
  The paper will not be properly fed.

4 Close the printer cover.

Press the right and left sides of the printer cover to close the printer.



Note

- Make sure that the cover is securely closed.
  The auto cutter may not work normally.

4.5 Ink Refilling

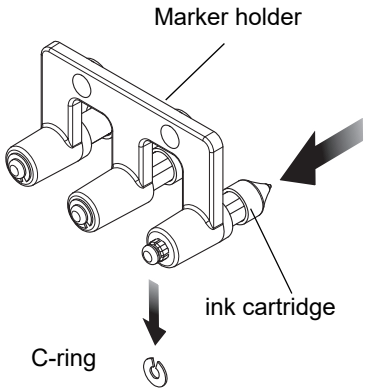
4.5.1 Ink cartridge type

When markings become faint, replace the ink cartridge.
Replace the optional blue ink cartridge in the same manner.

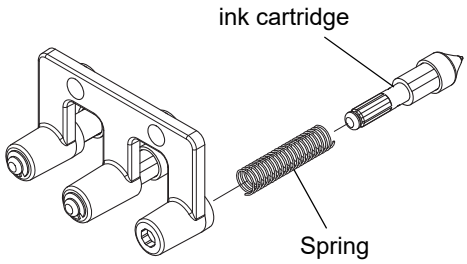
1 Press the tip of the ink cartridge and remove the C-ring with tweezers.

During work, take enough care not to lose the C-ring.

It is recommended to remove the C-ring with tweezers so as not lose.



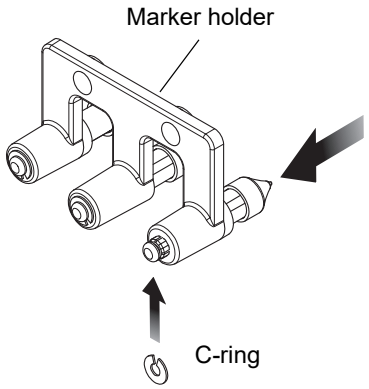
When the C-ring is removed, the spring and cartridge falls off. Take care not to lose them.



2 Insert the spring and the new cartridge into the marker holder, and set the C-ring in the groove on the end of the ink cartridge.

Match the shape of the cartridge to the hole of the marker holder by rotating until the cartridge can be inserted smoothly.

Use the C-ring which is removed in the procedure 1 or the one attached to the cartridge as a replacement part.



4.5.2 Ink pad type

When markings become faint, add some ink.

1 Remove the ink pad.

Push the pad to the right and pull it out of the holder.

2 Add ink.

Add some ink to the pad.

Note

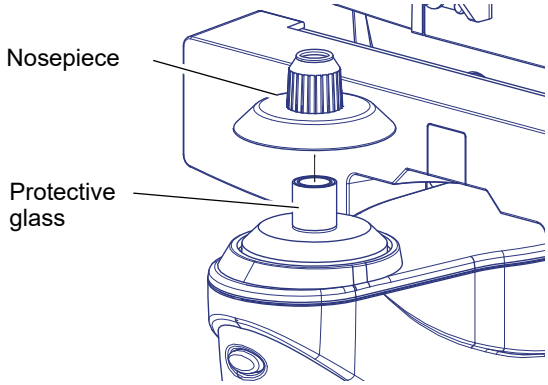
- If the refilled ink is too much, the periphery of the lens marker may be soiled. Be careful of the amount of the ink.

4.6 Cleaning the Protective Glass

■ When the “Dust detected. Please clean lens.” message appears at power-on, clean the protective glass. If dust settles on the protective glass, it may affect the measurement accuracy.

⚠ **CAUTION** • **Clean the protective glass under the nosepiece with a blower brush.**
The dust may include sharp particles. Wiping them without the blower brush damages to the lens coating. Be sure to remove any dust on the protective glass with the blower brush.

1 Remove the nosepiece.



2 Clean the protective glass.

Remove any dust on the glass with a blower brush.

3 If any dust remains, wipe gently with a lens cleaning cloth.

Note

• Take special care not to scratch the protective glass.
Flaws on the glass substantially lower the reliability of measurement.

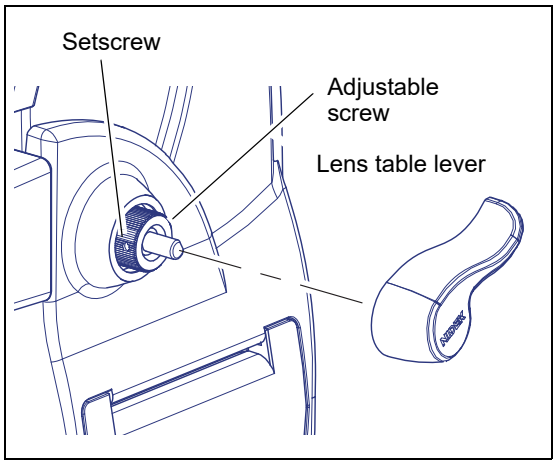
4.7 Adjusting the Lens Table

■ Adjust the feel of the lens table lever movement to be heavy or light. When the feel of lever is too heavy or light during use, perform the following adjustment.

1 Remove the lens table lever.

Pull it out straight.

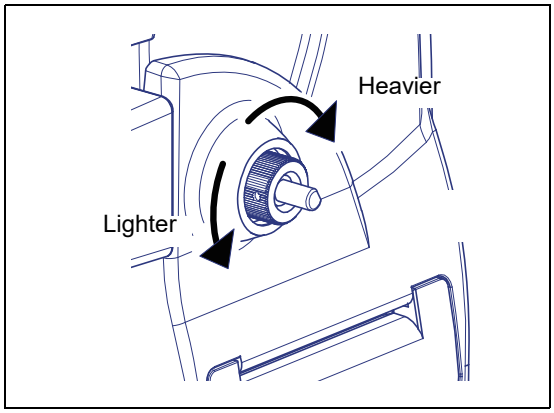
2 Loosen the setscrew on the adjustable screw with a flatblade screwdriver.



3 Rotate the adjustable screw to adjust the feel of the lens table lever movement.

Rotate the screw without rotating the center axis.

Rotate the screw clockwise.	Makes the feel of the lens table lever heavier.
Rotate the screw counterclockwise.	Makes the feel of the lens table lever lighter.



Note

- The effective rotation range of the adjustable screw is one rotation, either clockwise or counterclockwise.

  Even if the lever is rotated counterclockwise by more than one rotation, the lever does not become lighter.

  Moreover, continuing to rotate the screw counterclockwise (about five rotations or more) removes it. It may cause device malfunction.

4 Tighten the setscrew on the adjustable screw.

5 Attach the lens table lever and check the lever movement.

Align the lens table lever attachment hole with the center axis and push it as far as it goes.

Repeat the adjustment until the lever movement becomes proper.

4.8 Cleaning

4.8.1 Cleaning the device exterior

When the cover or panel of the device becomes soiled, wipe with a soft cloth. For severe stains, wipe them away with the cloth soaked in a neutral detergent and wrung well. Finally wipe them with a dry and soft cloth.

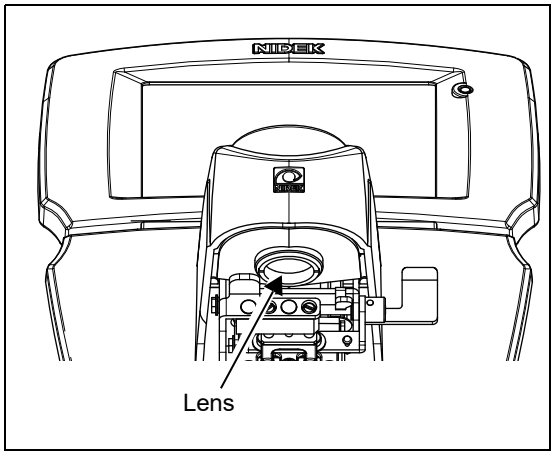
⚠ CAUTION

- **Never use an organic solvent such as paint thinner.**
  It may ruin the surface of the device.
- **Lightly wipe the exterior of the display.**
  Scratches or malfunction of the display may result.
- **Never use a sponge or cloth soaked in water.**
  The water may leak into the inside of the device and cause device malfunction.

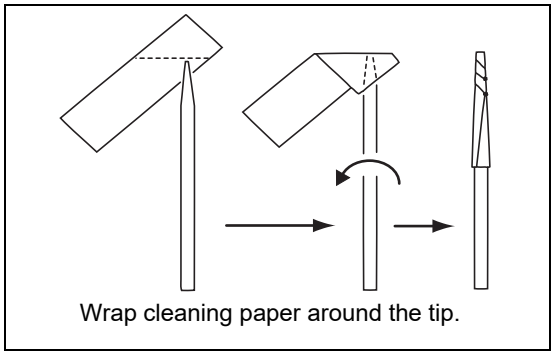
4.8.2 Cleaning the lens

If the ink pad type marker is repeatedly used, the ink may be attached to the lens above the nosepiece.
In such a case, clean the lens since it may cause measurement error.

1) Blow off any dust on the lens with a blower.



2) Wrap lens cleaning paper around a thin stick (or cotton swab) and wipe the lens with a material moistened with alcohol.



Note

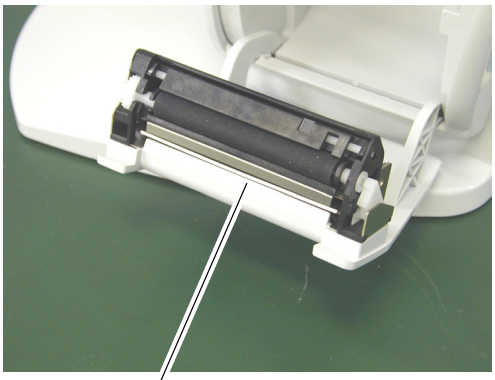
- Use a thin stick which does not damage the glass.
- Lightly wipe the lens from the center to the outside while drawing circles.

4.8.3 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 “4.4 Replacing Printer Paper” (page 144).



2 Apply the nozzle of a vacuum cleaner to the auto cutter to remove paper residue.

Never blow off paper residue with a blower. If residue settles on the internal working structure, malfunction may result.

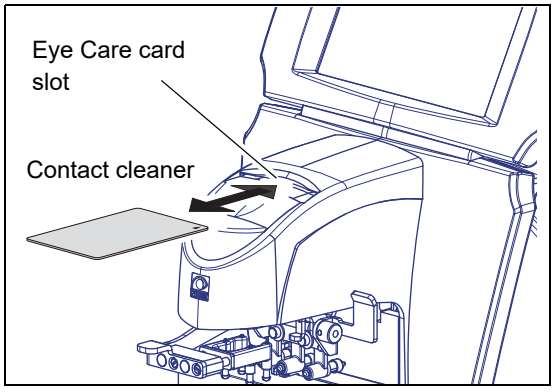
3 Set the printer paper as it was.

4.8.4 Cleaning the Eye Care card slot

With an extended period of use, the contacts in the Eye Care card slot may become soiled. If left uncleaned, the data may not be read or written properly.

In such a case, clean the contacts with a contact cleaner for contact-type IC card reader/writer.

Use a commercial contact cleaner or an optional one (part number 80605-00023).



When the contacts of the Eye Care card become soiled, wipe it with a soft cloth. For severe grime, wipe them away with the cloth soaked in a neutral detergent and wrung well. Finally wipe them with a dry and soft cloth.

Note

- Be sure to turn off the device power before contact cleaner cleaning.
- For use of the contact cleaner, see a manual provided with a 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.

4.9 List of Replacement Parts

Part name	Part number	Note
Printer paper	31001-E031	Width 58 mm, Length 25 m
Ink cartridge (Red)	31001-3371	Red ink, 3-pack, with C-ring
Ink cartridge (Blue)	31001-3372	Blue ink, 3-pack, with C-ring
Ink cartridge (Red)	31001-M231	Ink pad type, 20 mL
Ink cartridge (Blue)	31001-M232	Ink pad type, 20 mL
Contact cleaner	80605-00023	For cleaning the Eye Care card slot

Restock the spare consumables after replacing.

Note

- When storing the ink cartridge, keep the marker pen upright with the marking point downward.

  Otherwise, filled ink may be separated and hardly come out during marking.

5 SPECIFICATIONS AND ACCESSORIES

5.1 Specifications

○ Measuring items

- Spherical power (lens for glasses)

  -25.00 to +25.00 D
  0.01/ 0.06/ 0.12/ 0.25 D increments
  [Accuracy]

Measurable range (D)		Accuracy (D)
< 0 ≥ -5	> 0 ≤ +5	±0.06
< -5 ≥ -10	> +5 ≤ +10	±0.09
< -10 ≥ -15	> +10 ≤ +15	±0.12
< -15 ≥ -20	> +15 ≤ +20	±0.18
< -20	> +20	±0.25

  The accuracy specifications are based on the results of test lens measured in accordance with ISO 8598 (lensmeter).

- Spherical power (contact lenses)

  -25.00 to +25.00 D (BC = 6.00 to 9.00)
  0.01/ 0.06/ 0.12/ 0.25 D increments

- Cylindrical power 0.00 to ±10.00 D (-, +/-, +)
  0.01/ 0.06/ 0.12/ 0.25 D increments

- Cylinder axis 0° to 180°
  1° increment

- Addition power 0.00 to +10.00 D (first add, second add)
  0.01/ 0.06/ 0.12/ 0.25 D increments

- Prism power 0.00 Δ to 20.00 Δ
  0.01/ 0.06/ 0.12/ 0.25 D increments
  [Accuracy]

Measurable range (Δ)	Accuracy (Δ)
> 0 ≤ 5	0.1
> 5 ≤ 10	0.2
> 10 ≤ 15	0.3
> 15 ≤ 20	0.4

  The accuracy specifications are based on the results of test lens measured in accordance with ISO 8598 (lensmeter).

- Prism measurement
  Polar coordinates (Δ, θ)
  Rectangular coordinates (Base in/out, Base up/down)
- PD measurement (LM-1800PD only)
  20.0 mm to 49.5 mm (monocular PD)
  PD for single vision lenses, PF for distance portion of progressive power lenses
- UV transmittance 0 to 100%
  1/5% step

○ Measurement time

- Display update 0.06 ±10% second (Minimum time)

○ Measurement mode

- Measurement Continuous measurement of sphere, cylinder, axis, add, prism and PD (LM-1800PD only)
  Measured data is saved in the memory and locked on the screen with the read button.
  The data is automatically unlocked by placing a new lens on the nosepiece.
- Wavelength, grid 528 ±15 nm (green), 365 ±5 nm (UV)

○ Applicable lenses

- Lens diameter Lenses for glasses: 20 to 120 mm in diameter
  Contact lenses: Larger than the inner diameter of the nosepiece (5 mm in diameter)
- Transmittance 10% or more
  20% or more (±15.00 to ±25.00 D)
- Compensation function of high index lenses
  The abbe number is changeable in the range of 20 to 60.

○ Other functions

- Lens marker Ink cartridge type
  (Ink pad type is optional.)
- Display 5.7 inch color full graphic TFT LCD
  640 × 480 dots (VGA)
  Equipped with a LED backlight
- Printer Line printer with auto cutter
  Paper: 58 mm in width × 25 m
- Interface ports RS-232C: 1 port
  USB2.0 HOST: 1 port
  USB2.0 FUNC: 1 port
  10/100BASE-T Ethernet: 1 port

○ External configuration

- Dimensions 220 (W) mm × 252 (D) mm × 430 (H) mm
- Mass 5.0 kg

- Power source AC 100 (±10%) to 240 (±10%) V, 50/60 Hz
  Automatic world voltage capable (voltage selector is unnecessary), built-in fuses (replacement is unnecessary)
- Power consumption 60 VA

○ Environmental conditions (during use)

- Temperature 10 to 35°C (50 to 95°F)
- Humidity 30 to 85%
- Pressure 800 to 1060 hPa
- Altitude Up to 1000 m at sea level
- Installation location Indoors

○ Environmental conditions (during storage, packed condition)

- Temperature -10 to 55°C (14 to 131°F)
- Humidity 10 to 85%
- Pressure 700 to 1060 hPa

○ Environmental conditions (during transport, packed condition)

- Temperature -20 to 60°C (-4 to 140°F)
- Humidity 10 to 85%
- Pressure 500 to 1060 hPa

○ Others

- Installation category
  II (OVERVOLTAGE CATEGORIES)
- Pollution degree 2 (IEC60664)
- Expected service life (defined by manufacturer)
  8 years from the date of initial operation
  * Proper maintenance is necessary.
- Unit per package 1 unit

5.2 Accessories

5.2.1 Standard accessories

• Printer paper	3 rolls
• Power cord	1 unit
• Dust cover	1 unit
• Nosepiece for contact lenses	1 unit
• Operator's manual	1 volume
• Measuring Progressive Power Lenses explanation guide	1 page

5.2.2 Optional accessories

• Eye Care card system	
• Interface cable (OPIF-6)	* For RT connection (Din-8 to Din-8)
• Interface cable (OPIF-11)	* For PC connection (Din-8 to Dsub-9)
• USB cable	* With dedicated USB driver
• Foot switch (OPFS-3)	
• Ink cartridge (Blue)	
• Ink pad type marking unit	
• Simple refractive measurement system	
• Barcode scanner	
• Magnetic card reader	

6 EMC (ELECTROMAGNETIC COMPATIBILITY)

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

⚠ **WARNING**

- Do not use the device near, on, or under other electronic equipment or electromagnetic disturbance sources. Otherwise, it could result in improper operation. If such use is necessary, the device and the other equipment should be observed to verify that they are operating normally.
- Use of accessories, cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and cause improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) or electromagnetic disturbance sources as shown below should be used no closer than 30 cm (12 inches) to any part of the device, including the specified or provided cables. Otherwise, degradation of the performance of this equipment could result.

  The following are examples of electromagnetic disturbance sources:
  - Induction cooking appliance and ovens
  - RFID readers
  - Electronic article surveillance (EAS) systems
  - Sponge detection systems
  - Equipment used for position detection (e.g. in catheter labs)
  - Wireless power transfer charging systems for electrical vehicles

○ Specified cable

Part name	Cable Shielded	Ferrite Core	Length (m)
Power cord	No	No	2.5

○ Essential performance

- Lens power measurement function

◆ Compliance for Emission Standard

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

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

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

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

◆ Compliance for Immunity Standard

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

7 INDEX

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