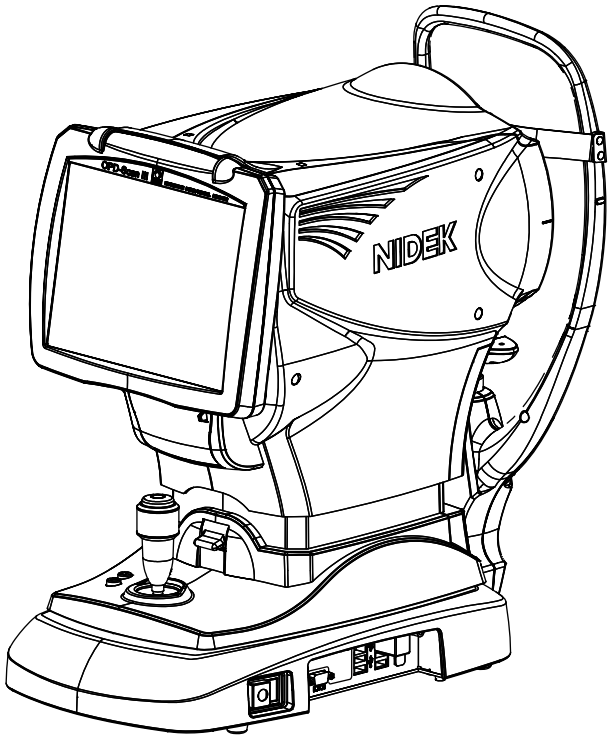
NIDEK

REFRACTIVE POWER / CORNEAL ANALYZER

OPD-Scan III

OPERATOR'S MANUAL



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

Original instructions

NIDEK CO., LTD.

NIDEK CO., LTD. **(Manufacturer)**	: 34-14 Maehama, Hiroishi-cho, Gamagori, Aichi 443-0038, JAPAN Telephone: +81-533-67-6611 URL: https://www.nidek.com/
NIDEK INC. **(United States Agent)**	: 2040 Corporate Court, San Jose, CA 95131, U.S.A. Telephone: +1-800-223-9044 (USA Only) URL: https://usa.nidek.com/
NIDEK S.A. **(EU Authorized Representative)**	: Ecoparc, rue Benjamin Franklin, 94370 Sucy En Brie, FRANCE

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IMPORTANT - READ CAREFULLY

THIS AGREEMENT APPLIES TO THE NIDEK SOFTWARE AND ACCOMPANYING DOCUMENTS. PLEASE READ THIS AGREEMENT CAREFULLY AND THOROUGHLY BEFORE USING SOFTWARE.

SOFTWARE LICENSE AGREEMENT

This SOFTWARE LICENSE AGREEMENT (this "Agreement") is an agreement between you, whether person or legal entity, and NIDEK CO., LTD., a Japanese corporation, ("NIDEK") for software (including but not limited to software linked dynamically or statically with other software) supplied by NIDEK or its designee pursuant to this Agreement, whether software alone or embedded software in a NIDEK hardware product, whether on disk or in read only memory, or on other media, or through an authorized website or network, and any accompanying documents or materials (including, but not limited to, operation manuals and electronic documents for such software, and other software for displaying or saving the data acquired from or through other NIDEK hardware product) (collectively, the "Software").

The Software and NIDEK hardware product (collectively, "NIDEK product") may include a third party's software which is linked, whether dynamically or statically, with the Software (the "Third-Party-Software"). The Third-Party-Software shall not be included in the definition of the "Software" in this Agreement. The rights and title of the Third-Party-Software belong to the third party, and the terms of use of the Third-Party-Software are set forth separately from this Agreement. The terms in this Agreement will not apply to the use of the Third-Party-Software except as expressly stipulated herein.

By using or installing the Software, you agree to be bound to the terms and conditions of this Agreement. If you do not agree with this Agreement, please do not use or install the Software and return the Software to the company from which you obtained the Software.

1. GRANT OF LICENSE

1.1. Subject to the terms and conditions set forth in this Agreement, NIDEK grants to you, and you accept, a limited, non-transferable and non-exclusive license to use the Software.

1.2. Unless otherwise agreed in writing by NIDEK or its designee, the license is limited to using the Software on a single computer or a single NIDEK hardware product and if you replace such computer or NIDEK hardware product, you may not use the Software without a new license of the Software.

1.3. Notwithstanding the provision of 1.2, if you connect a single server computer with the Software installed to a plurality of client computers, you may use the Software on such client computers; provided, however, that the upper limit of the number of said client computers will be determined by NIDEK in writing separately and individually from this Agreement.

1.4. Notwithstanding the provision of 1.2, if NIDEK permits you to install the Software on a plurality of computers using one license key of the Software, you may install and use the Software on such computers up to the upper limit of the number determined by NIDEK in writing separately and individually from this Agreement.

1.5. The Software is only to be used for its intended purpose provided in the specifications, operation manual or related documents in accordance with applicable laws and regulations. If the Software is embedded software in a NIDEK hardware product, you will use such Software only as embedded software for the use of such NIDEK hardware product.

1.6. For the license of the Software granted in this Agreement, unless the license is granted by NIDEK or its designee explicitly free of charge, you will pay to NIDEK or its designee the price for the Software, or if the Software is embedded software in a NIDEK hardware product, the price for the NIDEK hardware product in which the Software is embedded.

2. INTELLECTUAL PROPERTY RIGHTS

2.1. NIDEK, or an owner of the Third-Party-Software, retains any and all legal rights, title and interests in and to the Software or the Third-Party-Software. Any and all rights under copyright law, patent law, design law and other intellectual property laws not expressly granted herein are reserved by NIDEK or the owner of the Third-Party-Software. The license granted herein will not be intended as, or construed to be, any assignment of the rights of NIDEK or the owner of the Third-Party-Software. The Software and the Third-Party-Software are protected by copyright and other intellectual property laws and international treaties.

3. LIMITATIONS

3.1. You may not use the Software for any products without a license of the Software.

3.2. Unless otherwise permitted and other than the part specified by NIDEK in operation manuals or any accompanying documents for the Software, you may not analyze, reverse-engineer, decompile, disassemble or otherwise attempt to discover the source code of the Software.

3.3. You may not alter, reproduce, modify, translate, adapt, or divert the Software.

3.4. You may not remove, delete or change the copyright notice or other legends of the Software.

3.5. You may not sell, distribute, rent, license, sublicense, lease, assign or otherwise transfer the Software to third parties, or operate the Software for the benefit of third parties without prior written consent of NIDEK.

3.6. You may not create derivative works or cause or permit others to create derivative works based upon the Software without prior written consent of NIDEK.

3.7. You may not disclose operation manuals for the Software to any third party without prior written consent of NIDEK; provided, however, for the avoidance of doubt, the "third party" in this section will not include doctors, examiners, nurses, employees, patients and other persons who need to know the Software.

3.8. You may not use NIDEK’s trademarks or trade names without prior written consent of NIDEK.

4. CONDITIONS OF USE

4.1. You shall take necessary measures (including but not limited to antivirus software) to prevent failure of NIDEK product due to external factors; provided, however, that in the case where it is otherwise provided in the provisions of operation manuals for NIDEK product or other documents, you shall take such necessary measures to the extent not inconsistent with such provisions.

4.2. If you enter data into NIDEK product or obtain data by the use of NIDEK product, you shall obtain and save backup of such data.

5. EXPORT RESTRICTIONS

5.1. If you export or re-export, directly or indirectly, the Software, you must comply with applicable export laws and regulations of Japan and other countries, and obtain any licenses or approvals required by governmental authorities.

6. UPDATES

6.1. The Software and/or the Third-Party-Software may be, at NIDEK's own discretion, changed, updated or modified from time to time without any prior notice to you. If such changes, updates, and modifications are applied to the Software licensed to you under this Agreement, such changes, updates, and modifications will be deemed a constituent part of the Software, and the terms and conditions of this Agreement will apply to such changes, updates, and modifications.

6.2. NIDEK may, at its own discretion, make amendments to any provisions of this Agreement (the "Amendments"), if NIDEK deems that:

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.

8. NO WARRANTIES

8.1. NIDEK MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE SOFTWARE AND THE THIRD-PARTY-SOFTWARE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, INCLUDING, WITHOUT LIMITATION, THIRD PARTY INTELLECTUAL PROPERTY RIGHTS, ACCURACY, RELIABILITY OR AVAILABILITY, ABSENCE OF OR RECOVERY FROM ANY INTERRUPTION, ERROR-FREE OPERATION OR CORRECTION OF DEFECTS OR MALFUNCTIONS.

9. LIMITATION OF LIABILITY

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.

19. APPLICATION OF SOFTWARE LICENSE AGREEMENT

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.

MICROSOFT SOFTWARE LICENSE TERMS for Microsoft embedded software

Microsoft OS (Windows 10 IoT Enterprise LTSC 2019 64bit) is embedded in this device. Read the Microsoft software license terms before using the device at our website shown below.

http://www.nidek-intl.com/aboutus/entry-3001.html/

Use this device properly and safely.

⚠ **BEFORE USE, READ THIS MANUAL.**

This operator's manual includes operating procedures, safety precautions, and specifications for the NIDEK REFRACTIVE POWER / CORNEAL ANALYZER, OPD-Scan III.

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 10342 subclause 4: 2010 (Ophthalmic instruments - Eye Refractometers) and ISO 10343 subclause 4: 2014 (Ophthalmic instruments - Ophthalmometers). The dioptric powers are indicated with reference wavelength λd = 587.56 nm.

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

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

Safety precautions

In this manual, a signal word is used to designate the degree or level of safety alerting. The definition is 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.

Usage precautions

Before use

⚠ WARNING

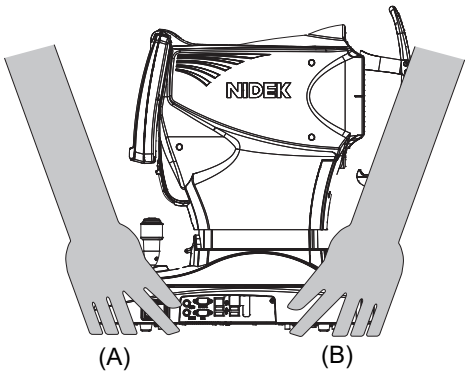
- **If any serious device-related incident occurs, report it to NIDEK and the competent authority in the country where the user or patient, or both reside.**
- **Be sure to use a grounded power outlet.**
  Electric shock or fire may result in the event of malfunction or power leakage.

⚠ CAUTION

- **Do not use the device for other than the intended purpose.**
  NIDEK will not assume responsibility for accidents or malfunction caused by misuse.
- **The safety precautions and operating procedures must be thoroughly understood prior to operation of the device.**
  Use of the device outside the scope of this manual may cause adverse events.
- **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 90% (Non-condensing)
  Atmospheric pressure: 800 to 1060 hPa
  A well ventilated place free from hazardous particles, smoke or fumes
  A place not exposed to water
  A place with little external light
  Level and stable surface free from vibration and bumping
  If the device is not installed and used under the above conditions, the reliability of image capture results is lowered, and malfunction may result. In addition, injury may result if the device is bumped or topples over.
- **Do not store the device in an area that is exposed to rain or water, or contains poisonous gas or liquid.**
  Corrosion or malfunction of the device may occur.
- **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 measurement results.
- **Avoid installing the device near sunny window or directly under a light.**
  Intense light entering the measuring window may interfere with proper measurement.
- **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.
- **Insert the power plug fully into the power outlet.**
  Imperfect connection may result in fire.

⚠ **CAUTION**

- **Never use power strips or extension cables for the power supply of the device.**
  Overloading the electric outlet may cause overheating and fire.
- **Do not use any power cord other than the one provided. Do not use the provided power cord for any other instrument.**
  Malfunction or fire may result.
- **When connecting interface devices to the device, check the symbols, then securely connect them without applying unnecessarily great force.**
  Terminals or cables may become damaged.
- **Install the device in area where the outlet that the mains plug is inserted into is easily accessible during use. In addition, ensure that the power cord can be disconnected without the use of a tool.**
  Otherwise, it may interfere with disconnecting of the power from the input power source in case of abnormality.
- **Never crush or pinch the power cord with heavy objects.**
  Damage may result in electric shock or fire.
- **Before connecting any cables to the device, be sure to turn off power to the device and unplug the power cord.**
  Malfunction may result.
- **When carrying the device to another location, its base should be held by two hands from both sides by two persons as indicated by (A) and (B) in the figure shown to the right. Never hold any parts other than the base such as the forehead rest, chinrest, joystick, or main unit.**
  If any parts other than the base are held, the device may fall and injury or failure may result.
  In particular, never hold the forehead rest or chinrest.



- **Keep the touch screen panel away from direct sunlight or excessive ultraviolet rays.**
  They will damage the touch-screen panel.

During use

⚠ **CAUTION**

- **Perform visual and operational checks before using the device. Do not use the device if any error is found.**
  Use of a malfunctioning {device} will not produce the expected results and may cause troubles or lead to inappropriate diagnoses that may induce health hazards.
- **After confirming that each cable is securely connected, use the device.**
- **Be sure not to touch the patient's face during alignment or when switching the right and left of the patient's eye.**
- **Before and after use, and before every patient, clean the forehead rest and chinrest with clean gauze or cloth dampened with rubbing alcohol. For severe stains, wipe with a clean cloth dampened with rubbing alcohol instead of wiping them repeatedly with a dry cloth.**
  If the chinrest paper is used, remove a sheet after each patient.
- **Do not perform servicing or maintenance on the device during use.**
- **Take care not to catch hands or fingers in moving parts (such as the measuring unit, main body, or chinrest). Pay particular attention to the measuring unit as it moves in each direction during auto alignment. Be sure to also give this caution to patients.**
  Hands or fingers may be pinched and result in injury.
- **Keep the measuring window free of fingerprints and dust.**
  The measurement accuracy may decrease substantially.
- **In the event of smoke or strange odors, immediately turn off the device and disconnect the power plug from the outlet. Once it is determined that the smoke will not become more serious, contact NIDEK or your authorized distributor.**
  Continued use may result in electric shock or fire. In case of fire, use a dry chemical (ABC) extinguisher.
- **Before measurement, explain the measurement purpose or method sufficiently to patients.**
- **When the chinrest is moved during measurement, let the patient know that the chinrest is moved.**
- **Instruct the patient to fix on the fixation light with their eyes wide open. Start the measurement after confirming that the instruction is properly followed by the patient.**
  Proper measurement may not be performed.
- **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.**
  Immediately remove the plug from the power outlet and contact NIDEK or your authorized distributor for replacement. Failure to do so may result in electric shock or fire.

⚠ **CAUTION**

- **Never touch the LCD monitor with any hard pointed object such as a ball-point pen. Never touch the LCD monitor with wet hands. Keep magnetic objects away from the LCD monitor.**

  The monitor may be damaged.

- **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.**

- **When turning off the instrument, be sure to follow the instructions in "2.2.3 Shut down" (page 48) instead of turning OFF the power switch.**

  Turning off the power switch before Windows is shut down may result in a loss of data or a malfunction.

- **While the pointer ( ) is changed into the hourglass ( ), do not perform any operation through the touch-screen panel.**

  A malfunction may result or the system may lock up.

- **Operators are responsible for managing their data.**

  NIDEK assumes no responsibility for a loss of data.

- **Be sure to back up measured data on removal storage drives such as a removal hard disk drive or USB flash drive.**

  In case of the corruption of the built-in SSD (Flash Solid State Drive), saved data will never be usable again.

- **Never press two or more points on the touch-screen panel at the same time.**

  A malfunction may result.

- **Do not install Windows application software other than the OPD-Scan III software.**

  Installing any other Windows application software may lead to abnormal operation of the OPD-Scan III and loss of stored data. In addition, the warranty may not cover the OPD-Scan III if Windows application software other than the OPD-Scan III software is installed.

- **Do not display data obtained with the OPD-Scan III with the ARK-10000 (OPD-Scan II) or OPD-Station.**

  Maps obtained with the OPD-Scan III cannot be displayed properly with the ARK-10000 (OPD-Scan II) or OPD-Station because the contents of data differ between those devices.

- **If the device is used after a long period of disuse, check for any abnormality before use.**

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

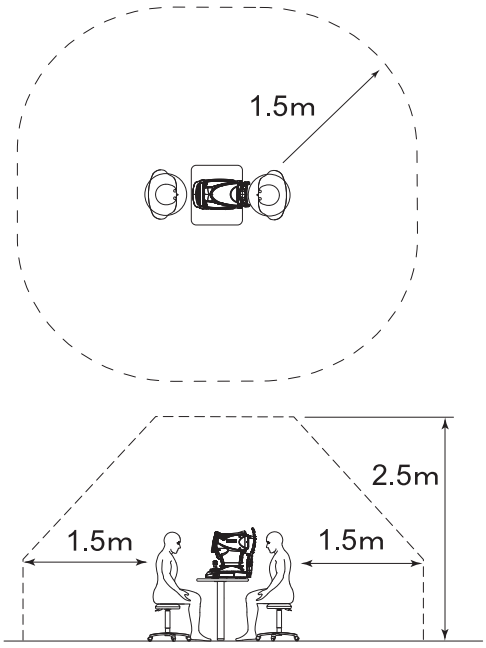
- **If the device is connected to a computer that does not comply with IEC 60601-1 (except one that uses an AC adapter that meets the Class II requirements of IEC 60950-1 or IEC 62368-1), supply power to the device and computer through an isolation transformer.**

  Contact NIDEK or your authorized distributor for installing isolation transformers.

⚠ **CAUTION**

- **Use devices that comply with IEC 60601-1 in the patient environment. If any device that does not comply with IEC 60601-1 is to be used, install the device outside the patient environment. For a generalized information system, use the device that complies with IEC 60950-1 or IEC 62368-1. For other devices, use any separation device that complies with IEC 60601-1 and keep sufficient distance between the device and patient environment.**

  The patient environment where any contact can occur between the patient and any part of the device (including connecting devices) or between the patient and any other person(s) touching the device (including connecting devices) is as shown to the right.

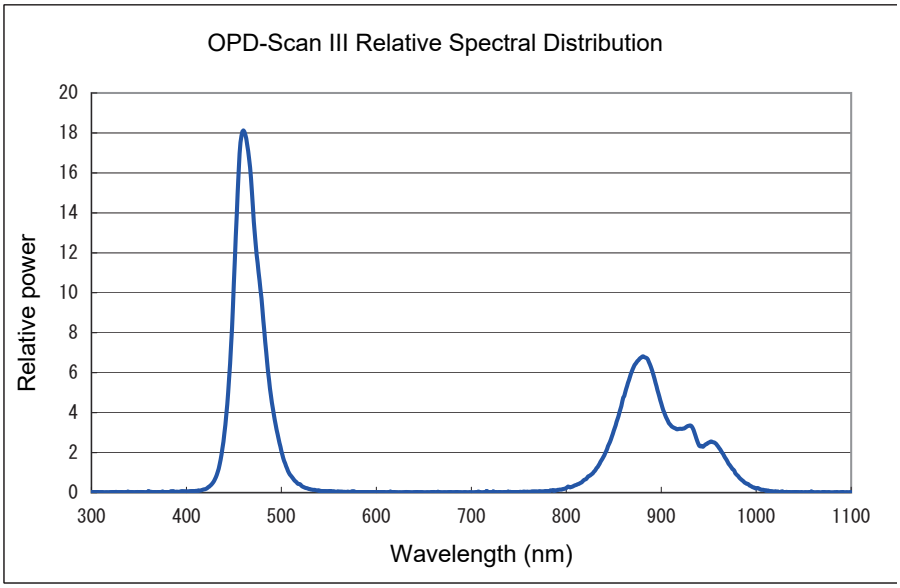


⚠ **CAUTION** • **Provision of information on the avoidance of light hazard from the optical device is required in ISO 15004-2 (2007) "Ophthalmic instruments - Fundamental requirements and test methods -".**

The light emitted from this device is potentially hazardous. The greater the number of times, the greater the risk of ocular damage. Exposure to light from this device when operated at maximum intensity will exceed the guideline in 18 seconds. However, because exposure to light lasts only about 0.45 second in a single CT measurement, 18 seconds of exposure is not reached until the measurement is executed about 40 times.

Spectrum output of all light source during measurement

(maximum light intensity)



* The values in the graph were obtained using separate measurement devices.

After use

⚠ **CAUTION**

- **This device uses a heat-sensitive printer paper. The paper degrades over time and the printed characters may become illegible.**
  If glue containing organic solvents or adhesives such as on adhesive tape comes in contact with the printer paper, the printed characters may become illegible.
  To keep the printed data for a long period of time, make copies of the printouts or write the measured results down.

- **When the device is not in use, turn off the power switch and put the dust cover over the device.**
  Dust may affect the accuracy of image capture.

- **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.

- **During transport or storage, maintain an environment that meets the following conditions:**
  Ambient temperature: –10 to 55ºC (14 to 131ºF)
  Humidity: 10 to 95% (non-condensing)
  Atmospheric pressure: 700 to 1060 hPa
  No large amount of dust content in the air
  A place not exposed to water
  A place not exposed to direct sunlight

- **When transporting, set the mode to Packing mode and pack the main body in the original packing material with the locking lever unlocked. Also do not apply excessive vibration or shock to the device during transport.**
  It may result in failure when excessive vibration and shock are applied.

Maintenance

⚠ **CAUTION**

- **To ensure the continued safe use of the device, it is recommended that the manager of this device make sure that maintenance and preventive inspection (and calibration if necessary) are performed at least once a year.**
  For details of maintenance and preventive inspection, ask NIDEK or your authorized distributor. If the manager of this device cannot perform the maintenance and preventive inspection, contact NIDEK or your authorized distributor.
- **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.
- **Never use organic solvents such as a thinner, or detergents with abrasives to clean the covers, touch-screen panel, and placido rings.**
  The covers or touch-screen panel may be corroded or scratched. Especially, cleaning of the placido rings with organic solvents or detergents with abrasives will disturb concentric ring shapes, which may lower measurement accuracy.
- **Before performing maintenance, clean the surface of the device properly with a clean cloth dampened with rubbing alcohol.**
- **Be sure to use only the printer paper (80620-00001) specified by NIDEK.**
  Any paper other than the specified one may damage the printer head.
- **Blow the dust off the placido rings with a blower.**
  Careless wiping may disturb concentric ring shapes, and may lower the measurement accuracy.
- **When sending the device back to NIDEK for repair or maintenance, clean the surfaces of the device (especially, the areas that come into contact with the patient) with a clean cloth dampened with rubbing alcohol.**
- **Contact NIDEK or your authorized distributor to check whether the device needs measurement accuracy calibration if the AR measurement results are substantially different from subjectively measured results.**
- **Do not use the device beyond its service life.**
  Even with proper maintenance and check, after time, the device reliability or safety may begin to fail to achieve the target values.

Disposal

⚠ **CAUTION**

- **To prevent the leakage of data such as personal information (patient information) to any unauthorized third party, it is the customer's responsibility to dispose of the device after making sure that data on the built-in memory (SSD) cannot be read or restored.**

  When the disposal is conducted by an industrial disposal service, data may be physically destroyed to make it unreadable. Select the disposal method that suits the purpose.

- **Follow local governing ordinances and recycling plans regarding disposal or recycling of device components. Especially when disposing of the lithium ion battery, circuit board, plastic parts that contain brominated flame retardant, LCD, or power cord, be sure to follow the local governing ordinances.**

  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 ordinances and recycling regulations.**

  Inappropriate disposal may contaminate the environment.

Connection to Network

⚠ **CAUTION**

- **Incorrect network setting may result in malfunction of a part or the whole of the network. Under the supervision by network administrator, confirm that the network settings are correct.**
- **If the network is disconnected or fails, check the network connection. If necessary, consult with network administrator.**
- **When connecting a network with a device other than the OPD-Scan III, be sure to consult with a network administrator and confirm that the network to be connected functions normally. Connection with a network in abnormal state may result in computer virus infection or data falsification caused by external factors.**
- **To use network devices such as switching hubs or routers, use devices whose security has been ensured.**
- **When connecting to peripheral equipment such as a PC with LAN port via a medical facility network, insert or connect an isolation transformer between the medical electrical equipment and network devices (such as HUB), or the network devices and other electrical equipment.**

  Depending on the types or numbers of other electrical equipment connected to the network, electric shock or malfunction/failure of the electrical equipment may occur.
  For installation of the network isolation transformer, consult NIDEK or your authorized distributor.
- **To share the database with PCs installed with OPD Software for External PC, do not connect them to the network that can connect to the Internet.**

  Configure a local network only with the device, PCs installed with OPD Software for External PC, and other related instruments or software such as Final Fit. NIDEK will not assume responsibility or compensate for damages caused by any virus infection and development due to connection of the device to a network that can connect to the Internet.
  The device is a medical equipment. If the user changes the setting of the device by installing other software such as antivirus software, NIDEK will not guarantee proper operation of the device.
- **When connecting with other device via medical system network, make sure that none of patient, operator, and third party is exposed to hazards. When connecting/ disconnecting or upgrading the equipment in the network, also confirm that none of patient, operator, and third party is exposed to hazards.**
- **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 refractive power / corneal analyzer OPD-Scan III (hereafter referred to as “the device”) measures objective refractive error, corneal curvature, shape of the anterior corneal surface (topography), and pupil size of the patient’s eye, and analyzes wavefront aberration.
The measured refractive error can be used for reference when prescribing corrective lenses such as glasses or contact lenses.
The measured corneal curvature and shape of the anterior corneal surface can be used for reference when selecting the base curve of contact lenses or determining refractive power of intraocular lenses.
The measured pupil diameter and pupil center can be used for reference when selecting multifocal intraocular lenses.
The result of the wavefront aberration analysis can be used when obtaining informed consent from patients, for example, by quantifying components of irregular astigmatism or presenting simulated views of how visual acuity charts appear to the patient after vision correction.
The analysis result is also useful for planning of refractive or cataract surgery. In addition, the database function facilitates postoperative followup.
The device offers two measurement modes: OPD/CT mode and AR/KM mode.

OPD/CT mode	For functions such as measurement of the whole eye refractive error, map display based on measured corneal shape, analysis result display, and simulation Patient data and measurement data can be saved and managed in the database.
AR/KM mode	For obtaining AR values and KM values within the central area of the cornea Measurement data can be printed with the internal printer or can be output to an external storage device, but cannot be saved in the database.

In OPD/CT mode, three measurement modes are available: OPD mode for refractive error measurement, CT mode for corneal curvature measurement, and OPD/CT mode for both refractive error and corneal curvature measurements. Each measurement mode provides different measurement data as shown below.

OPD measurement mode	AR values, OPD map, anterior segment image in mesopic vision, retroillumination image
CT measurement mode	KM values, placido ring image, anterior segment image in photopic vision
OPD/CT measurement mode	AR values, KM values, OPD map, anterior segment image in mesopic vision, retroillumination image, placido ring image, anterior segment image in photopic vision

AR values: Refractive error of the central area of the eye as obtained with an auto-refractometer

KM values: Keratometry data as simulated based on analysis of the captured placido ring image

When an external PC installed with OPD Software for External PC is connected to the OPD-Scan III, operations such as viewing or export of measurement data can be performed with the PC.

1.2 Intended Use

The OPD-Scan III is a diagnostic instrument that is indicated for use: Mapping of refractive error distribution of the eye by measurement and analysis of spherical power, cylindrical power, and cylinder axis. The measurement and analysis of corneal curvature, cylindrical power, and cylinder axis of the cornea. Mapping and display of the corneal shape, and screening out possibility of having corneal diseases or conditions. The functions for calculating the power of the intraocular lens to be implanted, for comparing multiple brands of intraocular lenses, and for providing a simulation of a postoperative visual function via Point Spread Function and a complete summary of information for an intraocular lens exchange surgical procedure are available.

1.3 Intended Patient Population

- Age
  Adult/infant
- Health condition
  Able to undergo an examination in a sitting position
- Conditions - Visual function
  One or both eyes are normal or have disease.
  Eyes that have lost the visual function are not targeted.

1.4 Intended User Profile

Ophthalmologist or nurse, orthoptist / OD, or optician

1.5 Intended Use Environment

• Location

Medical facility / Optical store

The device is a stationary type that is supposed to be installed on a table in a stable manner.

• Power supply

Power should be supplied from a medical power supply or isolation transformer regardless of whether any external computer is connected.

For conditions such as power supply, frequency, power consumption, see “6.2 Specifications” (page 360).

• Hygienic conditions

Clean room in which eyes can be safely measured or examined

• Illumination

50 lx or less is recommended.

The light should not be too intense, but should be intense enough to allow clear recognition of human face or movement.

• Ambient conditions

For conditions such as temperature, humidity, and atmospheric pressure, see “6.2 Specifications” (page 360).

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

1.6 Principles

○ Refraction measurement

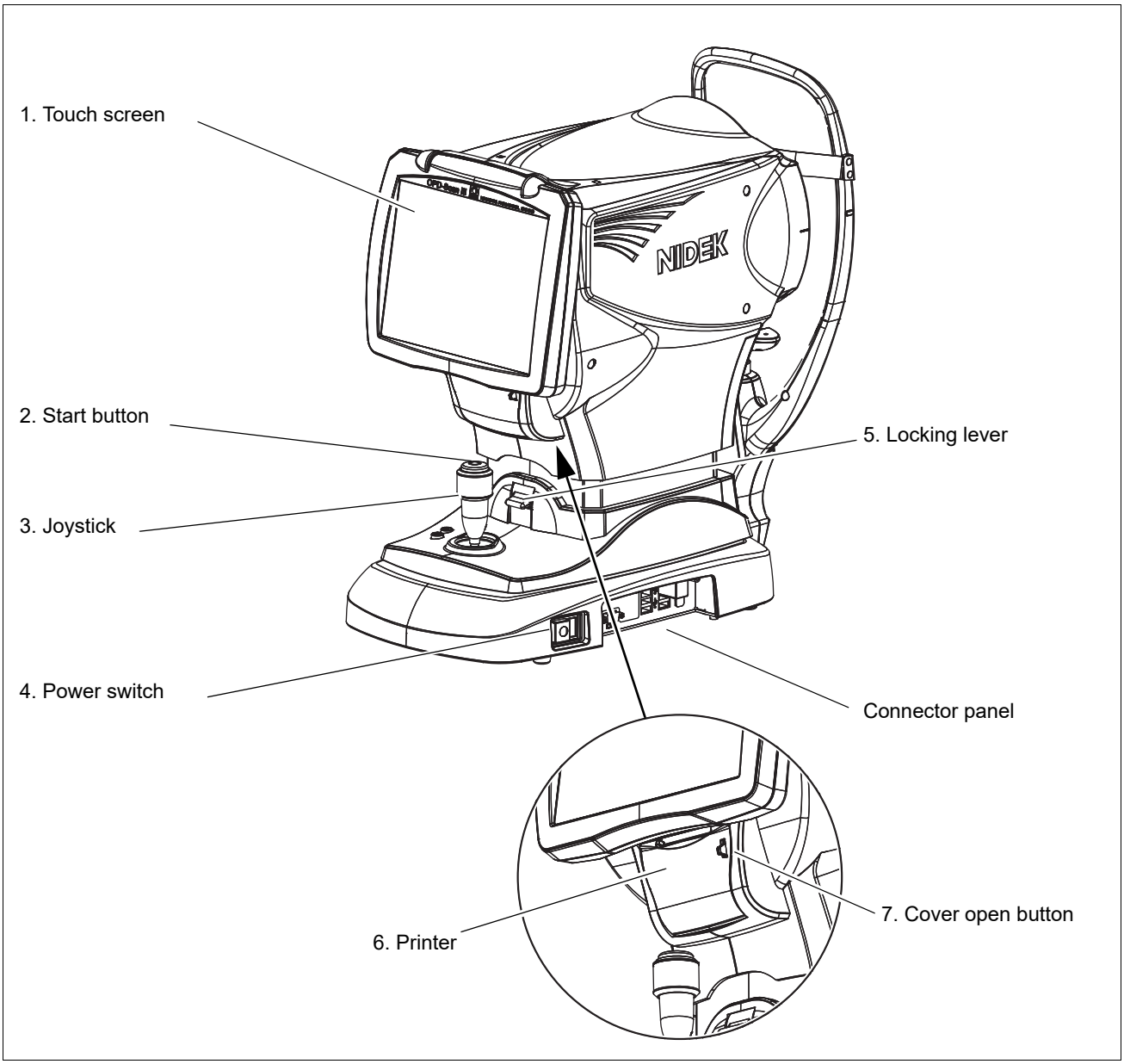
Measurement light emitted in a grid-like pattern is scanned on the retina, and the light reflected from the retina is received by multiple pairs of photodetectors. Refraction of the eye causes time (phase) difference in the signals issued by the pairs of photodetectors. The device calculates the refraction (spherical and cylindrical refractive errors, and cylinder axis angle) of the patient using these phase differences.

○ Corneal topography

Placido ring images are projected onto the cornea and the reflected light is captured with a CCD camera. The device measures the distances between the captured placido rings and calculates the shape (curvature radius and refraction) of the cornea.

1.7 Device Configuration

○ Front view



1. Touch screen

Displays various operation screens, examination data, and maps.

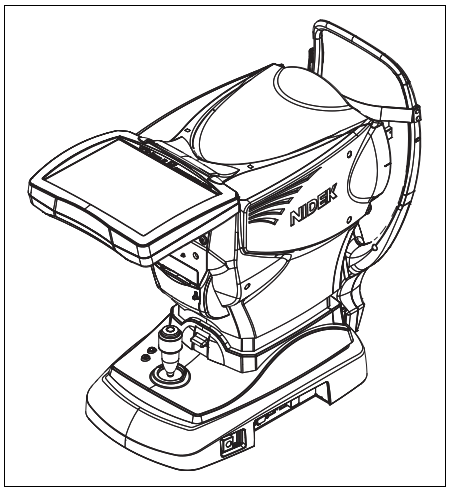
The device can be operated by touching the buttons on the screen.

The touch screen is a 10.4-inch color LCD. It can be tilted by pulling its bottom and fixed at various angles.

If the operator uses the device in a standing posture, tilt the screen at a suitable angle.

To return the screen to the original position, raise it to the horizontal position, then slowly lower it.

The screen is fastened to the original position by magnet.



2. Start button

Used to start measurement.

3. Joystick

Used for alignment and focusing.

For horizontal alignment, move the joystick to the right and left. For vertical alignment, rotate the joystick. For focus adjustment, move the joystick forward and back.

4. Power switch

Flip the power switch to the On side to turn on power to the device.

Do not use the power switch to turn off the device power. Be sure to use the Exit button on the touch screen to turn off the device power.

5. Locking lever

Used to lock the main body to the base.

To lock the main body, press down the locking lever.

6. Printer

This internal printer is used to print AR and KM values (equivalent to values measured with a keratometer).

7. Cover open button

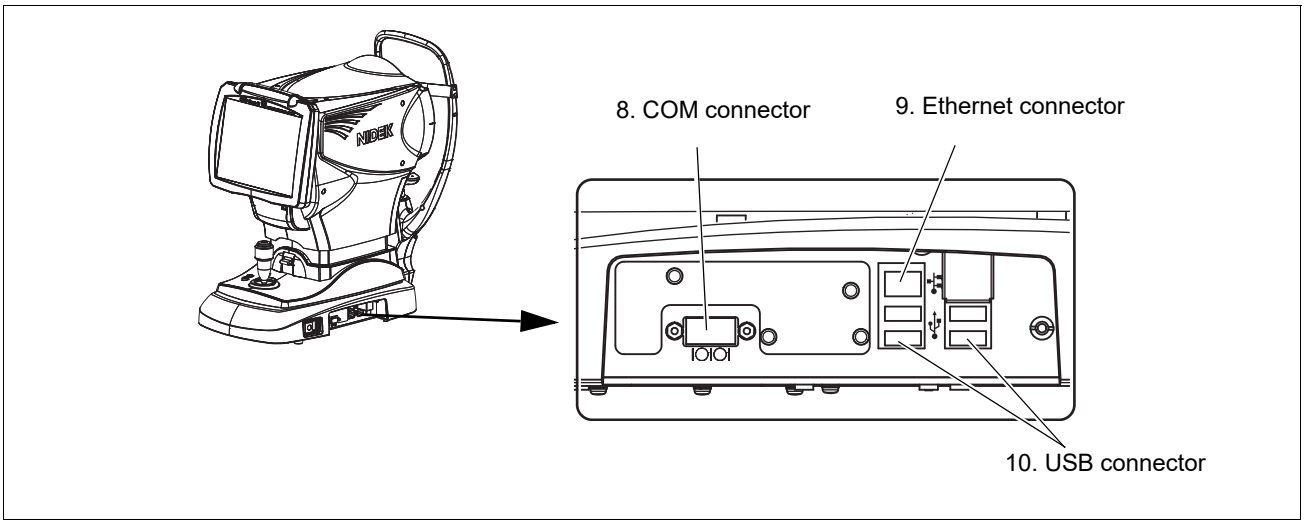
Used to open the printer cover for replacement of the printer paper.

○ Connector panel

Provides the connectors for the keyboard, mouse, and external devices.

⚠ **CAUTION**

- **Equipment connected to the analog or digital interfaces must be certified according to the representative appropriate national standards (such as EN 60601-1 and IEC 60601-1). Furthermore, all configurations must comply with the system standard IEC 60601-1. Anyone who connects additional equipment to the signal input part or signal output part configures a medical system is therefore responsible that the system complies with the requirements of the system standard IEC 60601-1. If in doubt, consult the technical service department of your local representative.**
- **During connector connection, never touch the terminal (plug or connector) and patient at the same time.**

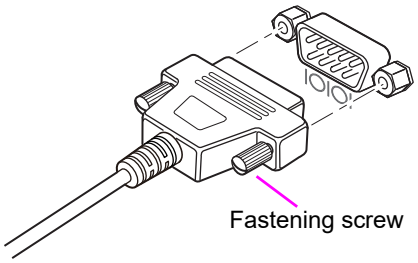


8. COM connector |○|○|

This COM conductor is a 9-pin, D-sub serial port to which the RS-232C cable is connected to transfer data to the NIDEK RT-2100, RT-5100, or Eye Care card system, or to an external PC.

Be sure to connect or remove the connector with the device power turned off.

Insert the COM connector straight according to the proper orientation. After insertion, tighten the fastening screws.



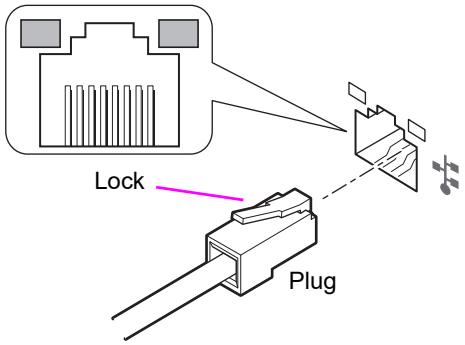
9. Ethernet connector

Used to connect the device to an Ethernet network.

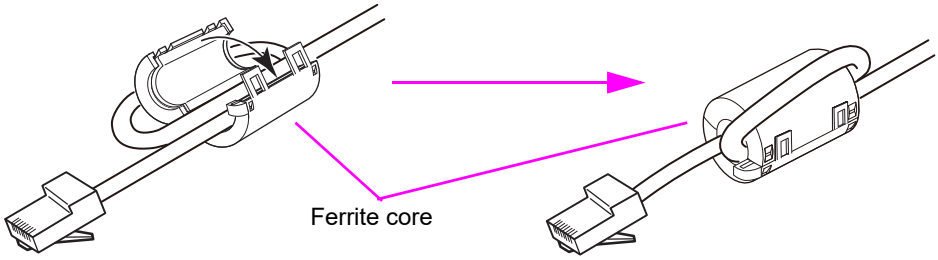
Setting up of a LAN is required for connection to an Ethernet network. Set up a LAN in the LAN Settings window that appears by pressing the LAN button in the Maintenance screen.

Insert the plug with its lock facing up until it is snapped into the LAN connector.

To disconnect, pull out the plug while holding its lock.



Attach the accessory ferrite core to the LAN cable (commercially available) near the plug inserted into the device. Wind the cord once around the ferrite core.



10. USB connector

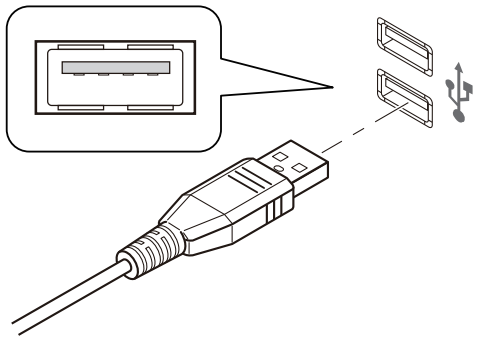
Used to connect USB devices. There are four ports of them.

(USB 2.0 ports)

They can be used to connect devices such as a mouse, keyboard, external color printer, barcode reader, magnetic card reader, and external hard disk drive.

The USB connector is designed for hot plug. The USB plugs can be connected or removed with the device power on.

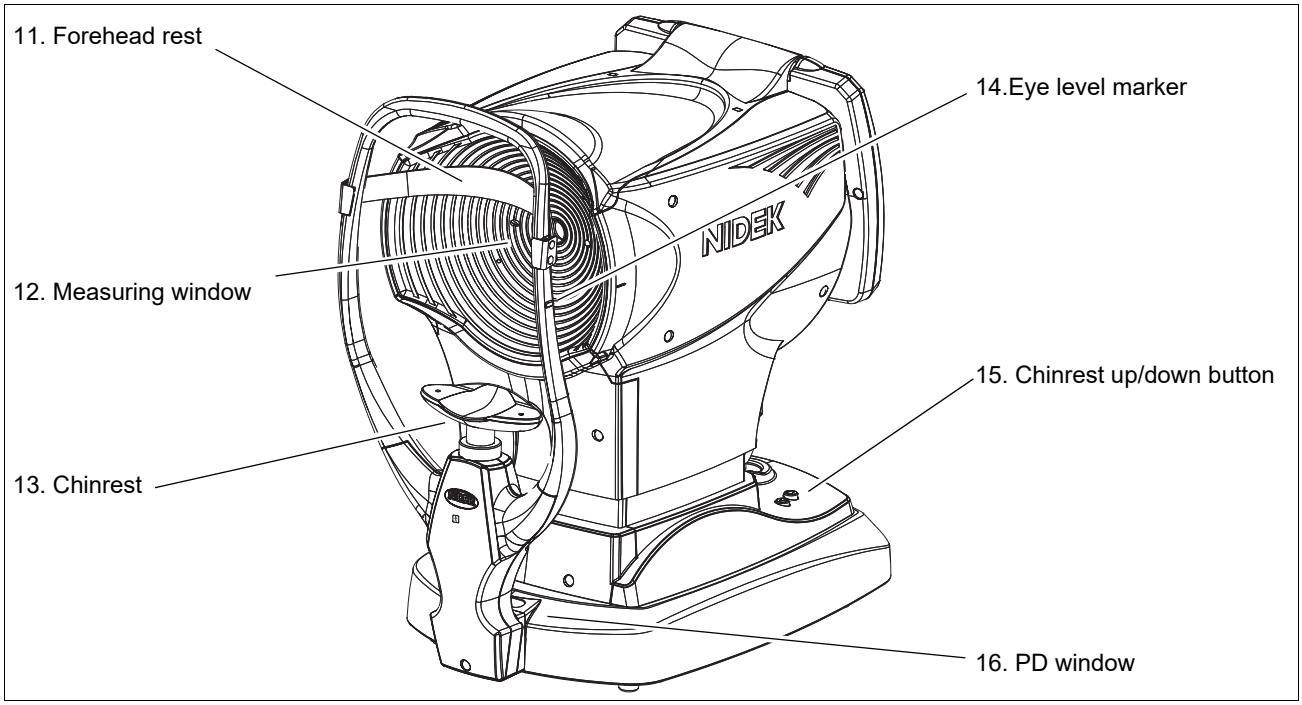
Insert the USB connector straight according to the proper orientation.



⚠ CAUTION • **Do not connect any unspecified USB devices.**

The USB devices may not be recognized or operate properly.

○ Rear view



11. Forehead rest

Used to rest the patient's forehead to restrict head movement during measurement.

Clean it for each patient.

12. Measuring window

Check the window cleanliness before measurement.

13. Chinrest

Clean the chinrest for each patient.

14. Eye level marker

Used as a guide to adjust the patient's eye level.

Adjust the height of the chinrest so that the patient's eyes are roughly aligned with this line.

15. Chinrest up/down buttons (▲ , ▼)

Used to move the chinrest up and down.

16. PD window

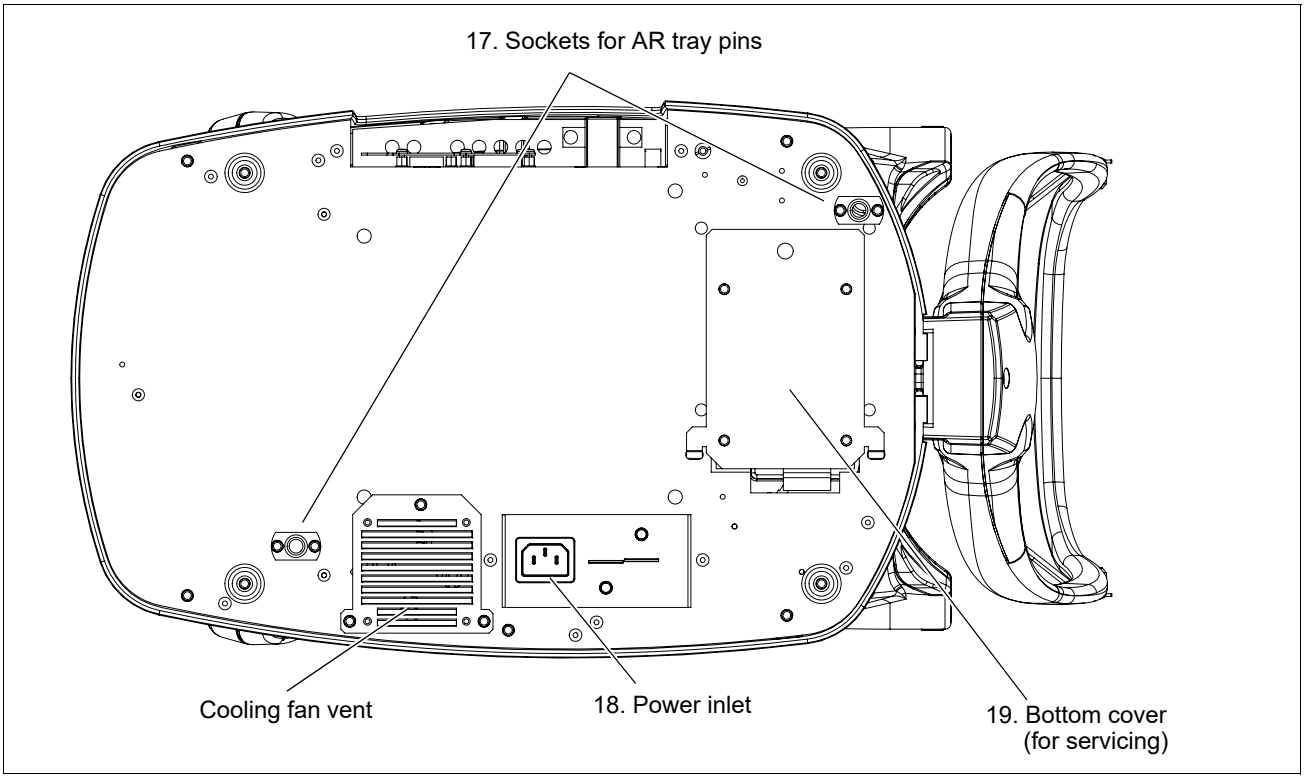
An LED is provided to detect the PD value.

Note

- Parts that come into contact with the patient or the operator during measurement are composed of the following materials:

  Forehead rest - Fluorocarbon resin
  Forehead rest frame, locking lever - Aluminum
  Chinrest, start button, chinrest up/down button - ABS resin
  Joystick - ABS resin, synthetic rubber, polycarbonate
  Touch screen - Polyester
  Power switch - Nylon
  Power switch cover - Steel

○ Bottom view



17. Sockets for AR tray pins

When placing the device on the AR tray of the NIDEK system table, place it so that the pins on the AR tray are inserted into these sockets.

18. Power inlet

A detachable power cord is connected here.

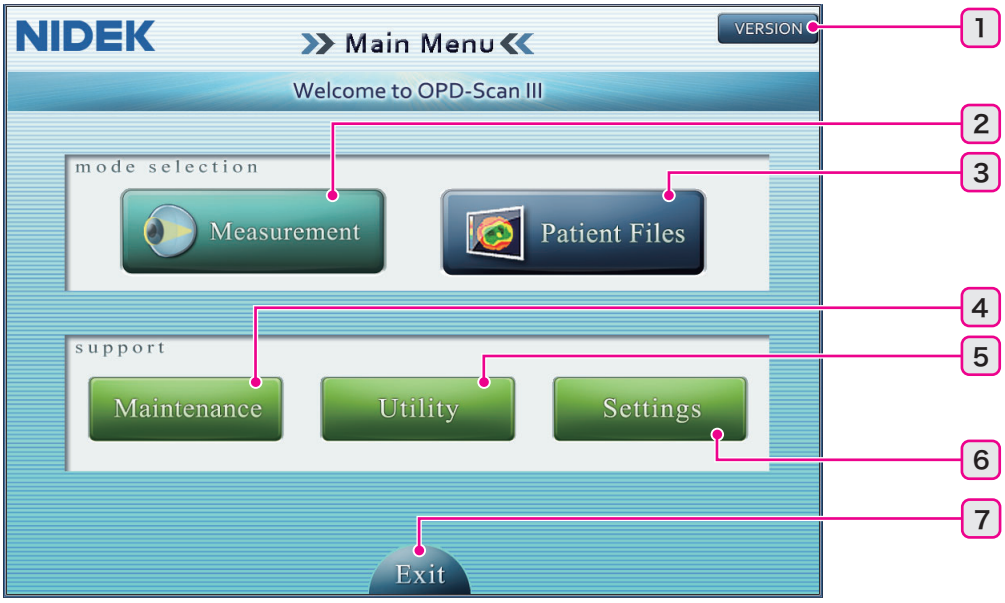
19. Bottom cover (for servicing)

This cover is opened when a service person accesses the interior of the device. Only service persons are allowed to open this cover.

1.8 Screen Configuration

1.8.1 Main Menu screen

The Main Menu screen is displayed when the OPD-Scan III is activated and allows selection of which screen to proceed to.



1	VERSION button	2	Measurement button	3	Patient Files button
4	Maintenance button	5	Utility button	6	Settings button
7	Exit button				

1. VERSION button

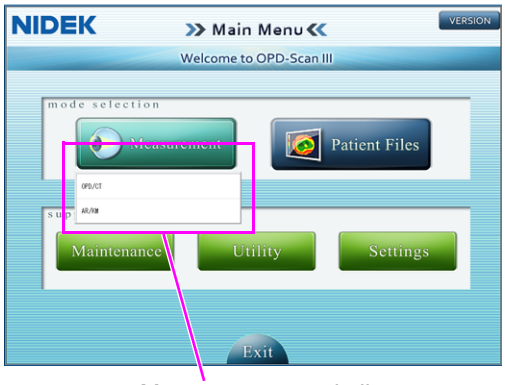
Used to display the software version of the device.

2. Measurement button

Used to move to the screen for measurement.

When OPD/CT mode is selected, the Patient List screen (before measurement) is displayed. When AR/KM mode is selected, the measurement screen is displayed.

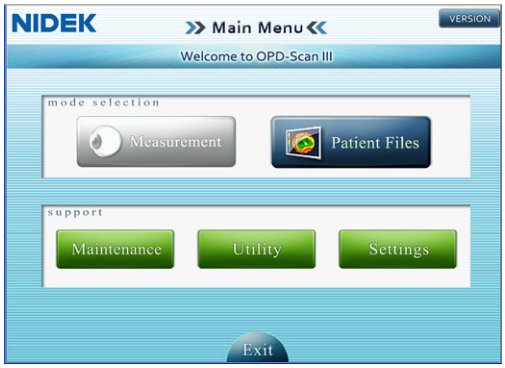
With the “Measurement mode” parameter, it can be selected whether pressing the Measurement button immediately displays the preset measurement mode screen or shows the measurement mode list for the operator to select the desired mode.



Measurement mode list

If this software is used on an external computer, this button is disabled.

This software can be installed on an external computer and used as standalone viewer software. (A USB license key is required.)



3. Patient Files button

Used to move to the Patient List screen (before displaying summary).

4. Maintenance button

Used to move to the Maintenance screen.

The Maintenance screen allows maintenance of the database, backup and restoration of the device parameters, LAN setting, date and time setting, reading of the license file, touch screen calibration, and setting of the device to Packing mode.

5. Utility button

Used to move to the Utility screen.

The Utility screen allows import and export of the measurement data, setting of barcode or magnetic card readers, copying of temporary data, and setting of the on-screen keyboard.

6. Settings button

Used to move to the Settings screen.

The Settings screen allows setting of the measurement conditions, summary parameters, and color scale parameters.

7. Exit button

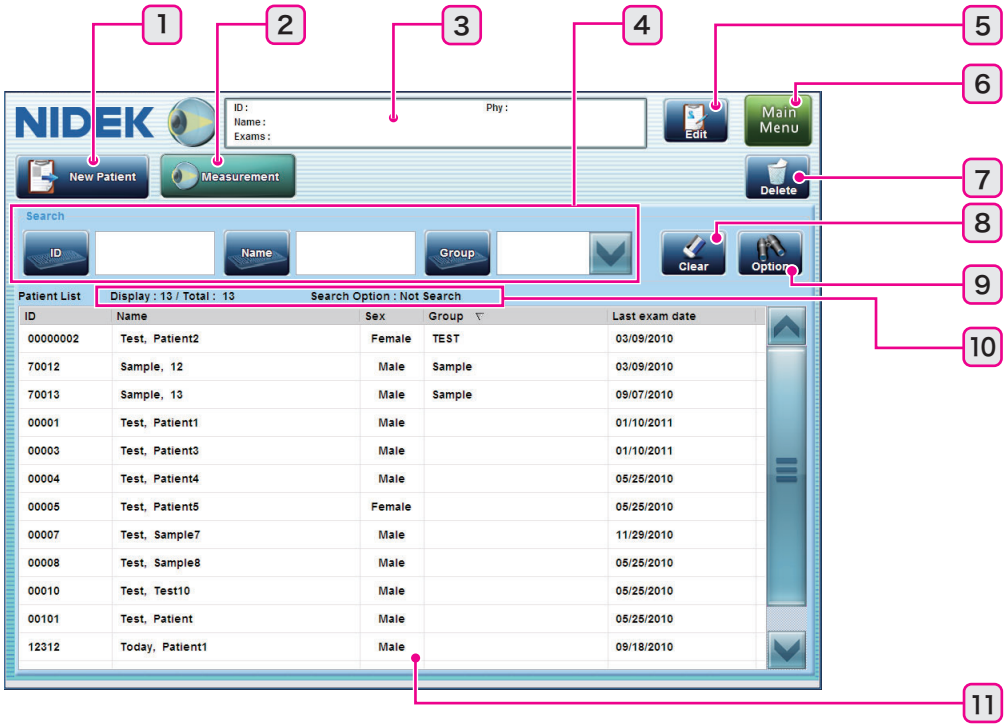
Used to close the OPD-Scan III software and turn off power to the device.

Be sure to use this button, not the power switch, to turn off power to the device. Turning off power to the device using the power switch may cause failure of the device.

When using OPD Software for External PC, pressing this button closes the OPD-Scan III software.

1.8.2 Patient List screen (before measurement)

The Patient List screen (before measurement) allows selection of the patient on whom the measurement is going to be performed in OPD/CT mode.



1	New Patient button	2	Measurement button	3	Patient data brief information box
4	Easy search boxes	5	Edit button	6	Main Menu button
7	Delete button	8	Clear button	9	Option button
10	Number of listed data sets	11	Patient List		

1. New Patient button 

Used to create new patient data.

The New Patient window is displayed. Input new patient data.

2. Measurement button 

Used to display the Measurement screen and start measurement for the patient selected in the patient list.

The measurement is performed for the patient being selected in the patient list.

3. Patient data brief information box

Displays the ID, name, date of birth (only when set to be displayed), number of examination data sets, and physician name for the patient selected in the patient list.

4. Easy search boxes

Used to search the desired patient data by entering search conditions in the ID, Name, and Group boxes.

When a hardware keyboard is used, characters can be directly input in the box.

The search results are cleared when the Patient List screen is closed.

ID button	Used to display the on-screen keyboard for inputting the ID.
ID box	Used to enter the ID of the patient to search for the patients whose ID begins with the entered ID.
Name button	Used to display the on-screen keyboard for inputting the name.
Name box	Used to enter the patient name to search for the patients whose names begin with the entered name.
Group button	Used to display the on-screen keyboard for inputting the group.
Group box	Used to enter the group of the desired patient. Clicking the V button displays the existing groups that can be selected. The patients belonging to the group whose name begins with the entered characters are displayed.

If multiple search conditions are entered, the AND search is executed.

Note

- The button for displaying the on-screen keyboard is effective only when the software is run on the OPD-Scan III device.

  For OPD Software for External PC, only the names of the boxes are displayed instead of the buttons for displaying the on-screen keyboard.

5. Edit button 

Displays details of the selected patient data in the Edit Patient Information window that allows editing of the information as well.

In the Edit Patient Information window, patient information such as diagnosis, phone number, and address 1 to 3, e-mail, and referrer can be input in addition to the existing patient information.

6. Main Menu button 

Used to return to the Main Menu screen.

7. Delete button 

Used to delete the selected patient and their examination data.

When a patient is deleted, all examination data sets for the patient are deleted. To delete only examination data, move to the Exam List screen.

8. Clear button 

Used to clear the current search condition.

The search condition is not cleared when a search has been executed using “Sex” or “Last Exam Date” in the Search Option screen. To clear the search condition set with “Sex” or “Last Exam Date”, press the Clear button in the Search Option window.

9. Option button 

Used to display the Search Option window.

The desired patient can be searched by sex or the last examination date. The search conditions specified in this window are maintained even when the Patient List screen is closed or the device power is turned off.

10. Number of displayed data sets

Shows the total number of data sets (A) and the number of data sets being displayed in the list (B). Search conditions specified in the Search Option window are shown as well.

Number of data sets being displayed in the list (B) / Total number of data sets (A)
If a search has not been executed, (B) equals (A).

11. Patient List

Shows the existing patients. Select the row of the patient for whom the measurement is going to be performed.

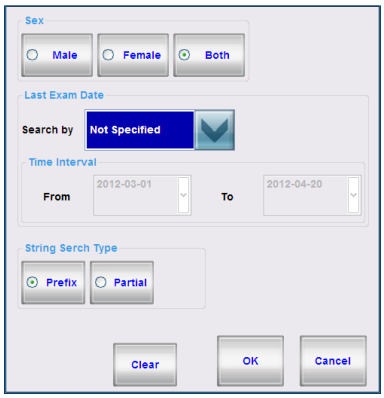
Pressing an item name (ID, name, date of birth [only when set to be displayed], sex, group, or last exam date) on top of the patient list sorts the data in ascending order. Pressing the item name once again sorts the data in descending order. The sort order is indicated by △ (ascending order) or ▽ (descending order) to the side of the item name.

When extracted data is shown, the background of the patient list changes from white to yellow.

If the extracted data sets cannot be displayed in a single screen, the list can be scrolled using the scroll bar.

○ Search Option window

Used to search patients using optional search conditions to facilitate patient selection. The AND search is executed together with the search conditions specified in the easy search boxes.



1) Press the Option button to display the Search Option window.
2) Specify the desired search conditions and press the OK button.

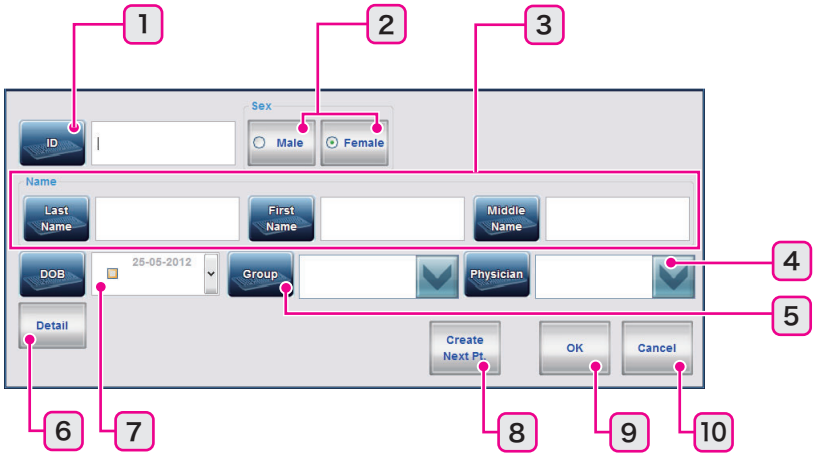
Sex	Select “Male”, “Female”, or “Both”.
Last Exam Date	Select “Not Specified”, “Today”, “Last Week”, “Last Month”, “Last 3 Month”, or “Time interval”. For any selection other than “Not Specified” in the “Search by” box, only patient data of the last examination date falling within the specified range is extracted. When “Time interval” is selected, data can be searched within a specific period of time by entering “From” and “To”. Press the From and To buttons, then input the desired values, or press “V” and select the desired dates.
String Search Type	Select the method of easy search from “Prefix” (right truncation) and “Partial” (simultaneous left and right truncation).

All the specified conditions are joined by AND, and patient data meeting all the conditions is displayed.

Clear button	Used to restore the initial conditions. “Both” is selected for “Sex”. “Not Specified” is selected for “Search by”. The first day of the previous month is selected for “From”. The current day is selected for “To”.
OK button	Used to enable the specified search conditions and close the Search Option window.
Cancel button	Used to cancel the specified search conditions and return to the Patient List screen.

1.8.3 Create Patient window

The Create Patient window is used to create new patient data. It is displayed by pressing the New Patient button in the Patient List screen.



1	ID button/box	2	Sex select button	3	Name button/box
4	Physician button/box	5	Group button/box	6	Detail button
7	DOB button/box	8	Create Next Pt. button	9	OK button
10	Cancel button				

1. ID button/box

Press this button to display the on-screen keyboard, then input the desired ID. If a hardware keyboard is used, the ID can be directly input.

2. Sex select button

Press this button to select the sex of the patient.

3. Name button/box

Press this button to display the on-screen keyboard, then input the name of the patient. If a hardware keyboard is used, the name can also be directly input.

A maximum of 20 characters can be input.

Selecting “Last, First MI.” or “Last First MI.” for “Name” in the Settings screen (Other tab) displays the patient name in the order of last name, first name, and middle name with or without a comma. If “First Last MI.” is selected, the patient name is displayed in the order of first name, last name, and middle name.

4. Physician button/box

Press this button to display the on-screen keyboard, then input the name of the physician. The name can also be input using a hardware keyboard or selected from a list that appears by pressing the V button.

A maximum of 20 characters can be input.

5. Group button/box

Press this button to display the on-screen keyboard, then input the name of the group. The name can also be input using a hardware keyboard or selected from a list that appears by pressing the V button.

A maximum of 20 characters can be input.

6. Detail button

Used to display the Edit Patient Information window that allows input of diagnosis, phone number, post code, address, e-mail address, and referrer.

7. DOB button/box

Press the DOB button to display the input window and input the date of birth. The date of birth can also be selected from the calendar displayed by pressing the V button.

8. Create Next Pt. button

Used to save the input patient data and initialize the screen for the next patient data.

9. OK button

Used to register the input patient data and return to the Patient List screen (before displaying summary).

If the Create patient window was opened from the Patient List screen (before measurement), the screen moves to the Measurement screen.

10. Cancel button

Used to cancel the input patient data and return to the Patient List screen.

Note

- The button for displaying the on-screen keyboard is effective only when the software is run on the OPD-Scan III device.

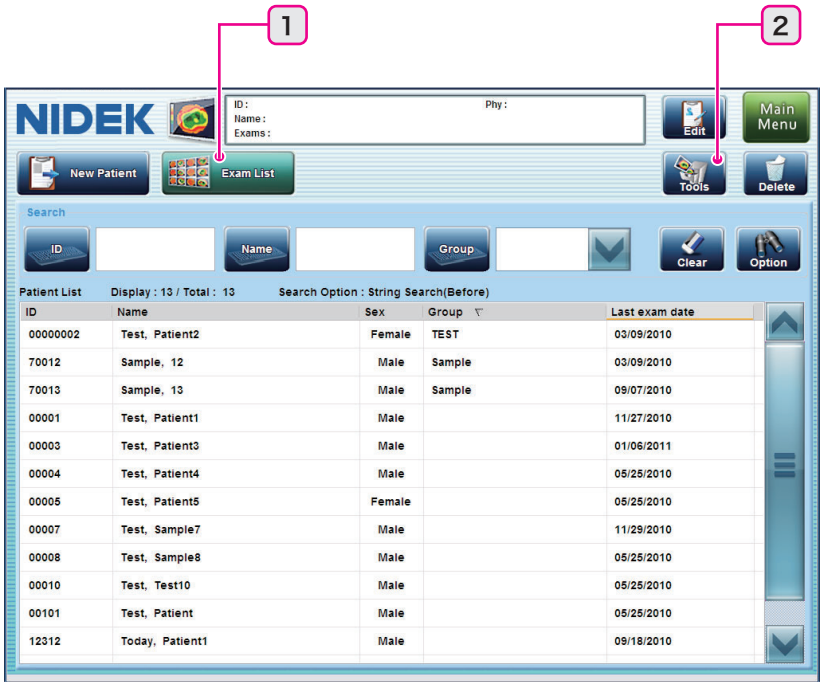
  For the OPD software for external PC, only the names of the boxes are displayed without the buttons.

1.8.4 Patient List screen (before displaying summary)

The Patient List screen (before displaying summary) allows selection of the patient for whom a summary (map) is to be displayed from the measurement data stored in the database. The patient data can be edited as well.

To select a patient, select the row of the desired patient.

For explanation of the items, see “1.8.2 Patient List screen (before measurement)” (page 12).



1	Exam List button	2	Tool button

1. Exam List button

Used to move to the Exam List screen of the patient being selected.

2. Tool button

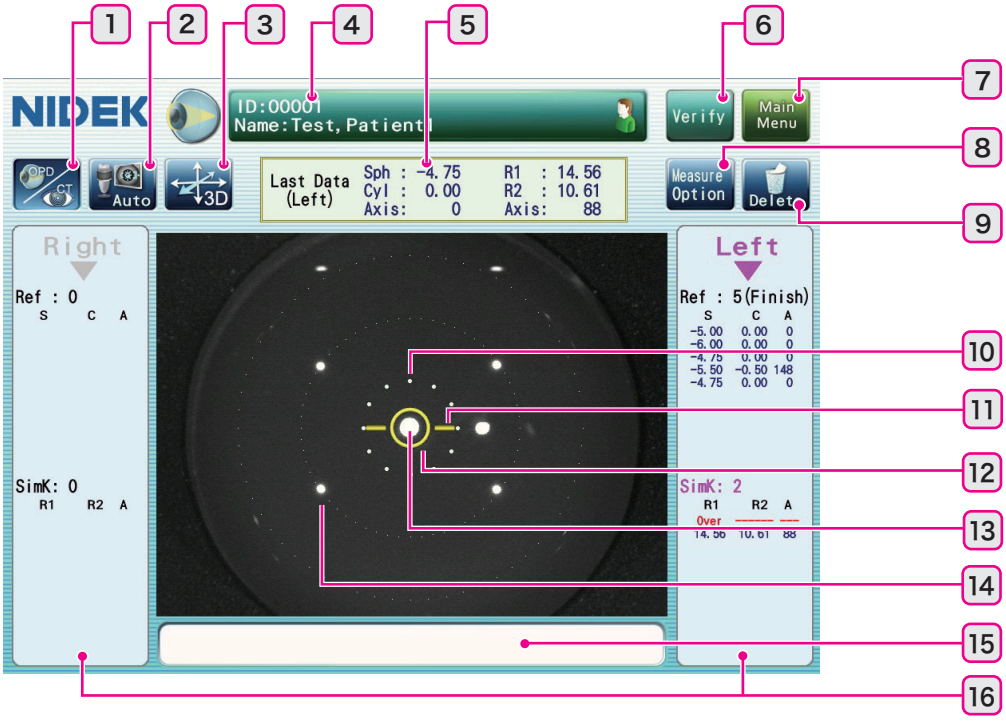
Used to recreate the thumbnail with the current settings.

Pressing this button displays the Recreate Thumbnail menu. Pressing “Recreate Thumbnail” displays the message “Are you sure you want to recreate this patient’s thumbnails? Yes/No”. Pressing “Yes” executes recreation of the thumbnail.

Pressing “Recreate Thumbnail” updates the thumbnail map display in accordance with the current map setting.

1.8.5 Measurement screen (OPD/CT mode)

The Measurement screen in OPD/CT mode allows measurement of the corneal curvature and whole eye refractive error.



1	Measurement mode button	2	Auto shot button	3	Tracking button
4	Patient data button	5	Latest data display	6	Verify button
7	Main Menu button	8	Measure Option button	9	Delete button
10	Minimum pupil mark	11	Focus indicator	12	Alignment target
13	Alignment light	14	Anterior segment illumination spots	15	Message box
16	Eyes/Measurement data display				

1. Measurement mode button

Each pressing of this button cycles the measurement mode in the order of OPD/CT measurement (), OPD measurement (), and CT measurement ().

2. Auto shot button

Used to toggle use the auto shot function (automatically starting OPD measurement when proper vertical and horizontal alignment and focus is achieved).

 Manual	The auto shot function is disabled.
 Auto	The auto shot function is enabled.

3. Tracking button

Used to toggle use the auto tracking function (automatic alignment).

3D	The auto tracking function in the forward/backward, right/left, and up/down directions is enabled.
2D	The auto tracking function in the right/left, and up/down directions is enabled. The focus is manually adjusted.
OFF	The auto tracking function is disabled. The alignment and focus are manually adjusted.

4. Patient data button

Used to display the information of the patient currently under measurement. Pressing this button stops the measurement and displays the Patient List screen.

5. Latest data display

Displays the latest measurement data.

6. Verify button 

Used to move to the Verify Examination Quality screen or the Verify Multi Measurement screen.

7. Main Menu button 

Used to move to the Main Menu screen.

Data of unfinished measurement is not saved.

8. Measure Option button 

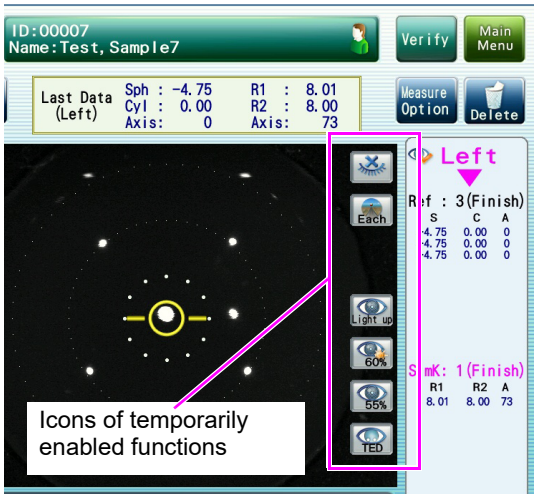
Used to temporarily enable the desired functions.

Pressing this button displays available functions and settings. Press to enable the desired function and setting. These temporarily enabled functions are disabled when the Measurement screen is closed.

The available functions are: printing with the internal printer, eyelid detection, fogging, placido ring mode selection, placido ring intensity, CT measurement internal LED intensity, and photopic vision mode.

Icons on the screen indicate the functions that differ from the setting in the Settings screen.

If the internal printer is selected, the values bracketed with < > are the typical values, not the SCA values of the best measurement data selected in the Verify Examination Quality screen.



9. Delete button 

Used to delete the measurement data being displayed.

Pressing this button displays the message “Are you sure you want to delete the measurement data? Yes/No”. Pressing “Yes” deletes the measurement data being displayed.

10. Minimum pupil mark

Indicates the minimum pupil size measurable.

If the pupil is smaller than this circle or eyelashes cover this circle, measurement may not be possible.

11. Focus indicator

Indicates the distance between the main body and the patient's eye.

Operate the joystick until the (-○-) mark indicates that focus is proper.

12. Alignment target

Used as a guide to center the patient's eye on the screen.

13. Alignment light

This bright light reflected from the cornea indicates the center (apex) of the cornea.

14. Anterior segment illumination spots

If these four light spots around the alignment light reflected from the anterior segment are obscured by eyelashes or such, a measurement error may occur.

15. Message box

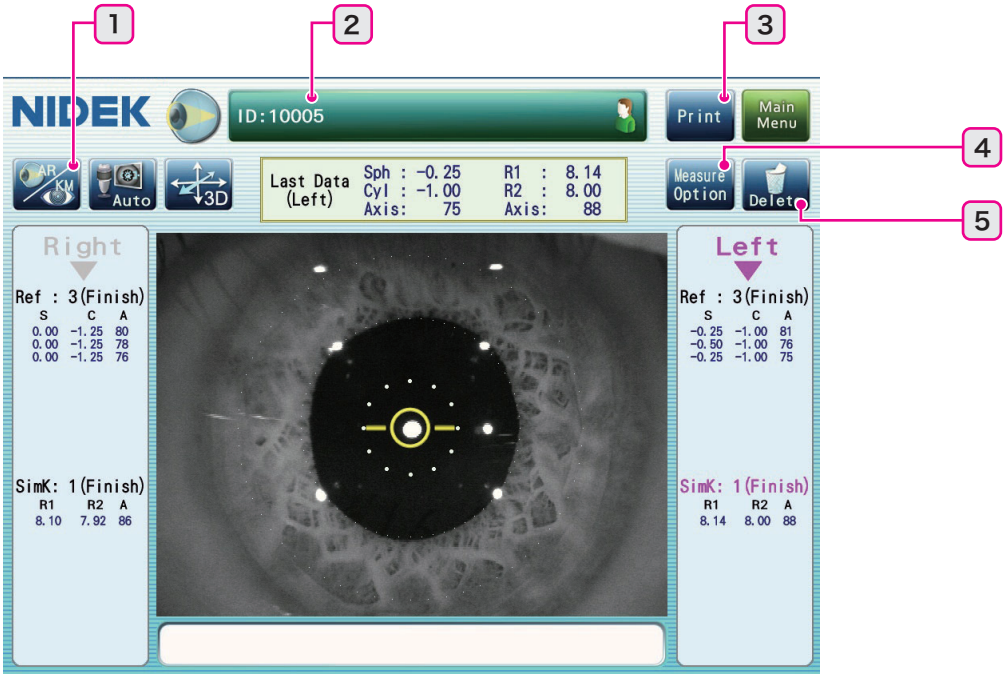
Displays error messages and other indications.

16. Eyes/Measurement data display

Shows which eye (left or right) is being displayed, and displays the number and results of OPD and CT measurements and whether or not the conditions for completing the measurement are satisfied.

1.8.6 Measurement screen (AR/KM mode)

The Measurement screen in AR/KM mode allows measurement of refractive error (AR value) and corneal curvature radius (KM value) within the central area of the cornea. All operations from measurement to printing are executed in the Measurement screen.



1	Measurement mode button	2	Patient ID button	3	Print button
4	Measure Option button	5	Delete button		

1. Measurement mode button

Each pressing of this button cycles the measurement mode in the order of AR/KM measurement ( ), AR measurement ( ), and KM measurement ( ).

2. Patient ID button

Displays the input patient ID. Pressing this button displays the screen for inputting the patient ID.

To input the patient ID using the optional barcode reader or magnetic card reader, read the patient ID while displaying the Measurement screen.

If the patient ID is displayed, it is printed along with measurement data and exported along with other data.

3. Print button Print

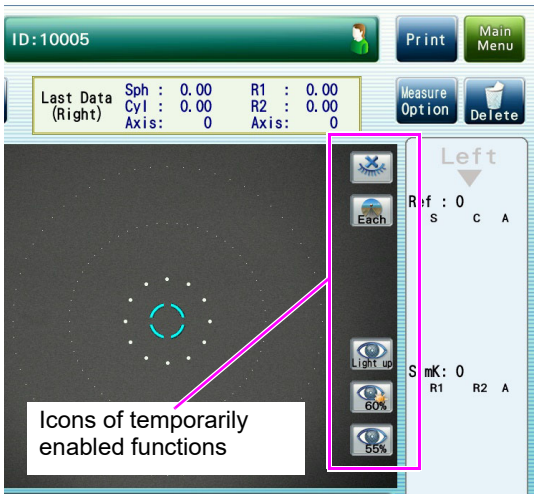
Used to print measurement data using the internal printer.

Depending on the parameter setting, measurement data can be output through the RS-232 port or AR/KM data can be output as an XML file through the LAN port.

4. Measure Option button 

Used to temporarily enable the desired functions.

Pressing this button displays available functions and settings. Press to enable the desired function and setting. These temporarily enabled functions are disabled when the Measurement screen is closed.
The available functions are: eyelid detection, fogging, placido ring mode selection, placido ring intensity, and CT measurement internal LED intensity.
Icons on the screen indicate the functions that differ from the setting in the Settings screen.



5. Delete button 

Used to delete the measurement data being displayed.

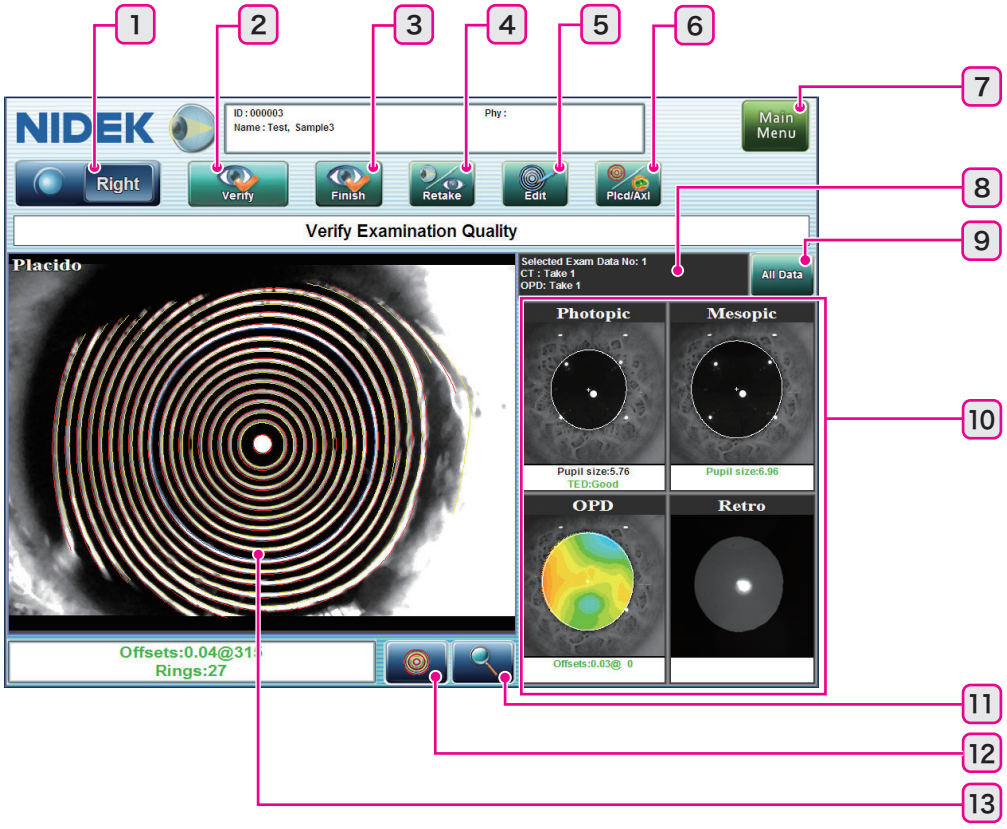
Pressing this button displays the message “Are you sure you want to delete the measurement data? Yes/No”. Pressing “Yes” deletes the measurement data being displayed.

1.8.7 Verify Examination Quality screen

The Verify Examination Quality screen in OPD/CT mode allows verification of the measurement data in Single measurement mode.

This screen is automatically displayed when measurement is complete. This screen can also be set to be displayed when the Verify button is pressed in the Measurement screen.

The displayed measurement data is the best data selected from multiple results.



1	Right/Left button	2	Data verify button	3	Finish button
4	Retake button	5	Edit button	6	Plcd/Axl button
7	Main Menu button	8	Measurement data display	9	All Data button
10	Thumbnail button	11	Enlarge button	12	Edge display button
13	Map verification area				

1. Right/Left button

Indicates the eye (left/right) for which measurement data is being displayed. Pressing this button displays the measurement data of the other eye.

The measurement data of the other eye displayed by pressing this button has already been verified, so the data verify button is not displayed and the Retake button is disabled.

If the other eye has not been measured, the message “No data is found.” appears.

2. Data verify button  / 

Used to verify the measurement data being displayed as being proper and save it to the database. This button can be set to execute printing or outputting data to electronic medical record (EMR) with the “Accept Button Handling” setting in the Settings screen (Measurement tab).

Verify	Displayed when measurement of an eye is complete. Verifies the measurement data to be proper for saving to the database, then returns to the Measurement screen for measurement of the other eye.
Verified & Save	Displayed when measurement of both eyes is complete. Verifies the measurement data to be proper, saves it to the database, and displays the Verify Result window that shows the progress of printing and data output.

3. Finish button 

Used to verify the measurement data being displayed as being proper, save it to the database, and choose not to perform measurement for the other eye.

This button is displayed when measurement for one eye only is complete. Pressing this button displays the Verify Result window that shows the progress of printing and data output.

4. Retake button 

Used to return to the Measurement screen to perform the measurement again. The “Finish” indication for the selected measurement mode is deleted.

In OPD/CT measurement mode, either OPD or CT measurement mode needs to be selected before returning to the Measurement screen.

Pressing this button displays the options: “Retake OPD/CT”, “Retake OPD”, and “Retake CT”. Select the desired measurement mode.

Retake OPD/CT	Returns to the Measurement screen in OPD/CT measurement mode.
Retake OPD	Returns to the Measurement screen in OPD measurement mode.
Retake CT	Returns to the Measurement screen in CT measurement mode.

The Measurement screen is displayed with the “Finish” indication for the selected measurement mode deleted, allowing additional measurements.

In OPD or CT measurement mode, pressing this button returns directly to the Measurement screen.

The Measurement screen is displayed with the “Finish” indication for the measurement mode, and allows additional measurements.

5. Edit button 

Used to move to the screen that allows editing of placido ring edge or such.

6. Plcd/Axl button 

Used to toggle the image displayed in the map verification area between the Placido image and the Axial map.

The Plcd/Axl button is displayed only when a Placido image is displayed in OPD/CT or CT measurement mode.

7. Main Menu button 

Used to move to the Main Menu screen.

Pressing the Main Menu button displays the message “Are you sure the current measurement data is lost? Yes/No”. Press “Yes” to move to the Main Menu screen.

8. Measurement data display

Shows the order in which the data being displayed was obtained.

9. All Data button 

Used to move to the Verify Multi Measurement screen.

The Verify Multi Measurement allows verification of all the measurement data and changing of the measurement to be selected.

If the Verify Multi Measurement screen is moved to from the Verify Examination Quality screen, saving of data cannot be executed unlike in Multi measurement mode.

10. Thumbnail button

Used to display the measurement results with thumbnails.

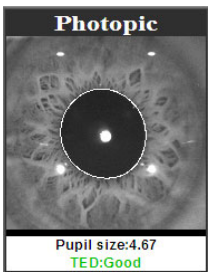
Map images (OPD, Placido, Photopic, Mesopic, or Retro) other than the one being shown in the map verification area can be selected for display.

Pressing the desired thumbnail opens it for display in the map verification area, and reduces the previously displayed map to a thumbnail.

Below each thumbnail, the pupil diameter and the number of placido rings are displayed.

For “Photopic”, the TED result is displayed (when the TED parameter is enabled.)

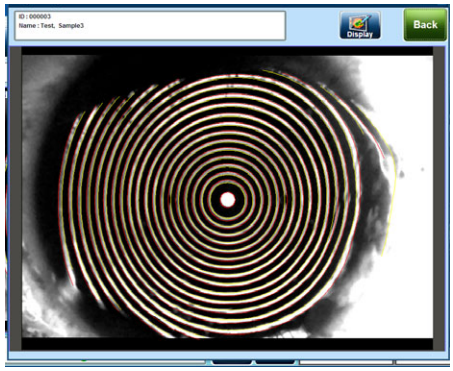
TED – Enabled	TED: Good TED: NG (****) (**** indicates an error number) NG (-101): Pupil edge detection error NG (-104): Low pupil image quality TED: — (Not measured)
TED – Disabled	TED: OFF



11. Enlarge button 

Enlarges the map being displayed.

The enlarged image can be overlaid with data such as analytic values.



12. Edge display button

Used to toggle display of the placido ring edges detected on the placido image.

This button is displayed when a placido ring image is displayed in the map verification area.

13. Map verification area

Shows the map to be verified in a large frame.

OPD/CT measurement CT measurement	The placido ring image is displayed by default.
OPD measurement	The OPD map is displayed by default.

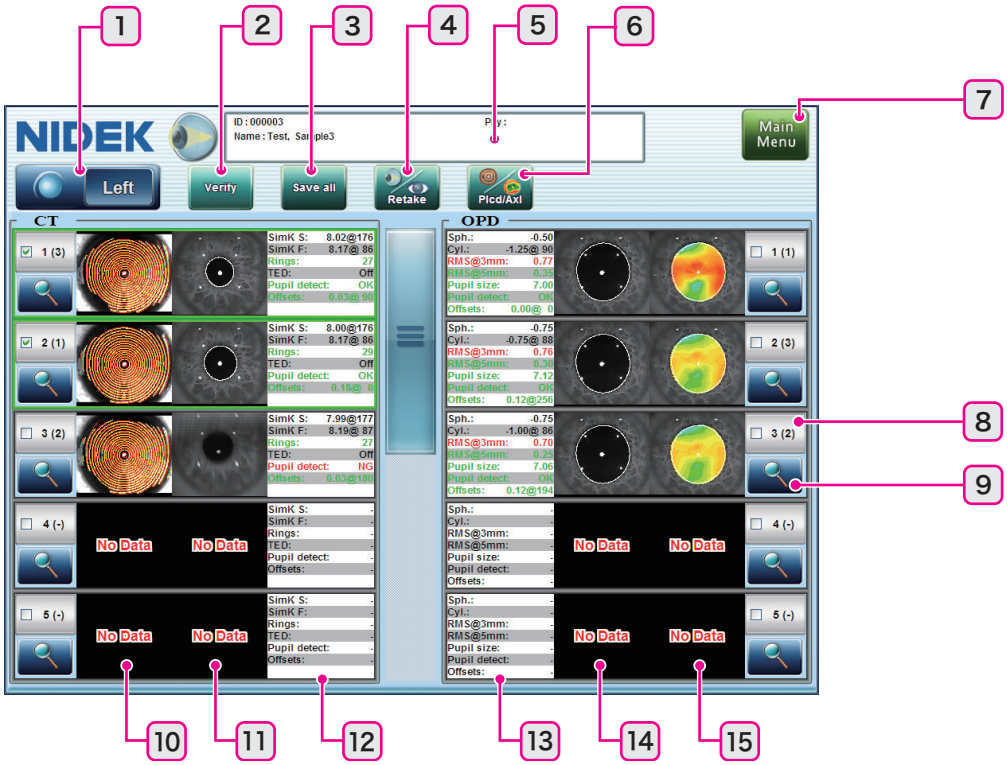
1.8.8 Verify Multi Measurement screen

The Verify Multi Measurement screen in OPD/CT mode allows selection of data to be saved to the database in Multi measurement mode.

When measurement is finished for both eyes in Multi measurement mode, the Verify Multi Measurement screen is automatically displayed when “Auto Display” is selected in the Settings screen (Measurement tab).

This screen can be displayed also in Single measurement mode to view all measurement data by pressing the All Data button in the Verify Examination Quality screen.

Check the check box of the measurement data to be saved by pressing the check box or any part of the measurement data. Pressing the selected data or its check box again cancels the selection.



1	Right/Left button	2	Verify button	3	Save all button
4	Retake button	5	Patient data brief information box	6	Plcd/Axl button
7	Main Menu button	8	Check mark	9	Verify examination quality button
10	Placido ring image	11	Pupil image (photopic vision)	12	CT measurement data
13	OPD measurement data	14	Pupil image (mesopic vision)	15	OPD map image

1. Right/Left button

Used to toggle display of right or left eye in the Verify Multi Measurement screen.

If the other eye has not been measured, the message “No data is found.” appears.

2. Verify button

Used to save the selected data to the database, and move to the Summary screen or the Patient List screen.

This button can be set to move to the Summary screen or the Patient List screen with the “Accept Button Handling” setting in the Settings screen (Measurement tab).

3. Save all button

Used to save all measurement data to the database, and move to the Summary screen or the Patient List screen.

This button can be set to move to the Summary screen or the Patient List screen with the “Accept Button Handling” setting in the Settings screen (Measurement tab).

4. Retake button

Used to return to the Measurement screen to perform the measurement again on the currently displayed eye (right/left). The “Finish” indication for the selected measurement mode is deleted.

In OPD/CT measurement mode, either OPD or CT measurement mode needs to be selected before returning to the Measurement screen.

Pressing the Retake button displays the options: “Retake OPD/CT”, “Retake OPD”, and “Retake CT”. Select the desired measurement mode.

Retake OPD/CT	Returns to the Measurement screen in OPD/CT measurement mode.
Retake OPD	Returns to the Measurement screen in OPD measurement mode.
Retake CT	Returns to the Measurement screen in CT measurement mode.

The Measurement screen is displayed with the “Finish” indication for the selected measurement mode deleted, allowing additional measurements.

In OPD or CT measurement mode, pressing the Retake button returns to the Measurement screen.

The Measurement screen is displayed with the “Finish” indication for the measurement mode deleted, allowing additional measurements.

5. Patient data brief information box

Used to display the ID, name, date of birth (only when set to be displayed), and physician of the patient.

6. Plcd/Axl button 

Used to toggle the image displayed in the placido ring image area between the Placido image and the Axial map.

The Plcd/Axl button is available only when a Placido image is displayed in OPD/CT or CT measurement mode.

7. Main Menu button 

Used to move to the Main Menu screen.

The message “Are you sure the current measurement data is lost? Yes/No”. Press “Yes” to move to the Main Menu screen.

8. Check mark

Displayed when data is selected to be saved.

The number in parentheses to the side of the image number indicates the order in which the measurement was executed.

9. Verify examination quality button 

Used to the Verify Examination Quality screen for this data.

10. Placido ring image

Shows the eye image overlaid with the placido rings.

11. Pupil image (photopic vision)

Shows the pupil image in photopic vision.

White line	Pupil contour in photopic vision.
White cross	Pupil center in photopic vision.

12. CT measurement data

SimK S	“Refractive power@Angle” in steepest meridian direction
SimK F	“Refractive power@Angle” in flattest meridian direction
Rings	Shows the number of consecutive solid rings without any gaps counted from the inner side.
Pupil detect	Pupil contour detection result
Offset	Shows the amount of alignment error in the CT measurement. The amount of alignment error is indicated in green when less than 0.3 mm, and in orange or red as the amount increases.

13. OPD measurement data

Sph.	Spherical refractive error in AR measurement values (S)
Cyl	Cylindrical refractive error in AR measurement values (S) @ Angle (A)
RMS@3mm	RMS (root-mean square deviation) on the circumference of a 3 mm-diameter circle
RMS@5mm	RMS (root-mean square deviation) on the circumference of 5 mm-diameter circle
Pupil size	Pupil diameter
Pupil detect	Pupil contour detection result
Offset	Shows the amount of alignment error in the OPD measurement. The amount of alignment error is indicated in green when it is less than 0.3 mm, and in orange or red as the amount increases.

14. Pupil image (mesopic vision)

Shows the pupil image in mesopic vision.

White line	Pupil contour in mesopic vision.
White cross	Pupil center in mesopic vision.

15. OPD map image

Shows the OPD map.

1.8.9 Exam List screen

The Exam List screen displays the examination data of the patient selected in the patient list as a list of thumbnail maps.

Select the thumbnail of the desired examination data, then press the desired button according to the intended operation.

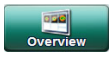
1	Right/Left button	2	Summary button	3	Patient data brief information box
4	Advance button	5	Display button	6	Edit button
7	Enlarged map	8	Measurement value display	9	Back button
10	Image button	11	Sorting button	12	Delete button
13	Comparison button	14	Difference button	15	Thumbnail list

1. Right/Left button

Used to toggle display of the right and left eye maps.

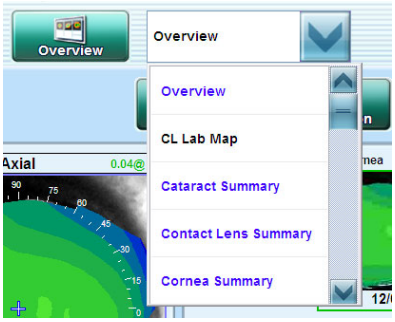
This button is enabled only when there are any measurement data sets for both eyes with the same examination number. The right eye and left eye display cannot be toggled when measurement data sets for both eyes are being displayed.

To change from display of both eyes to display of a single eye, press the Sorting button.

2. Summary button 

Used to move to the Summary screen of the selected exam.

The default summary name is displayed on the button. The desired summary can be selected from the drop-down list shown to the right of the button. (The factory setting is “Overview” and can be changed with a parameter setting.)



3. Patient data brief information box

Used to display the ID, name, date of birth (only when set to be displayed), and physician of the patient of the selected examination data.

4. Advance button (optional)

Used to move to the Advance screen for the currently selected examination data.

This button is enabled only when the license of the optional software “Advance” is installed. (Only for the OPD Software for External PC)

5. Display button 

Used to modify the overlay settings common to all maps.

Pressing this button displays the Display Option window. Press to check the desired overlay items.

Overlay items (All Maps)

Angle scale	Angle scale shaped as a protractor
Cross Cursor	Shows the refractive power (Pwr), cornea curvature radius (Rad), distance from the center (Dist), and Axis of the position the cursor is dragged to.
Polar Grid	Polar grid (circles about 1 mm apart), cornea apex, and measurement optical axis
Eye Image	Shows a captured image of patient’s eye
Pupil Contour	Shows the pupil contour in a white line. The color of the line is in accordance with the Text setting for “Map Color” in the Settings screen (Other tab).
Border Line	Toggles display of black lines on the borders of colors. Useful to differentiate adjacent colors that are similar in the absolute color scale.
Numeric values	Displays refractive powers at selected positions on a map.
Hide Text	Toggles display of analysis results.

Button operation

Save Settings button	Used to save the overlay setting. When the overlay setting is changed, the Save Settings button becomes enabled. To use the modified setting regularly, save the setting with the Save Settings button. If the modified setting is not saved, it is effective only for the currently displayed data.
OK button	Used to make the modified setting effective and close the Display Option window.
Cancel button	Used to cancel the modified setting and close the Display Option window.

6. Edit button 

Used to display or edit the detailed information of the examination data.

Pressing this button displays the Edit Exam Information window that contains detailed measurement data and allows input of “Diagnosis”, “Comment”, “Technician”, “VAsc”, and “VAcc”.

7. Enlarged map

Shows the enlarged view of the image selected in the thumbnail list.

The overlay items selected with the Display button are displayed over the image.

8. Measurement value display

Displays the measurement values for the enlarged image.

9. Back button 

Used to return to the Patient List screen.

10. Image button 

Used to change the type of thumbnail list.

Select from the menu that appears by pressing the button. Select “Cornea”, “Total”, “Internal”, “Total Cornea”, “Cornea Internal”, “Total Internal”, or “All”.

11. Sorting button 

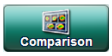
Used to change the contents of thumbnail list.

Select from the menu that appears by pressing the button.

by date (sort order)	Used to toggle the thumbnail list display between the ascending and descending dates.
Both eyes (OU)	Used to display data for both eyes in the thumbnail list. Displayed when only data for a single eye is displayed.
Right eye (OD only)	Used to display data for the right eye in the thumbnail list. Displayed when data for both eyes is displayed.
Left eye (OS only)	Used to display data for the left eye in the thumbnail list. Displayed when data for both eyes is displayed.

12. Delete button 

Used to move to the Delete Exam screen to delete the desired examination data.

13. Comparison button 

Used to move to the “Comparison: Select Exam” screen that allows selection of examination data to display in the Comparison screen.

14. Difference button 

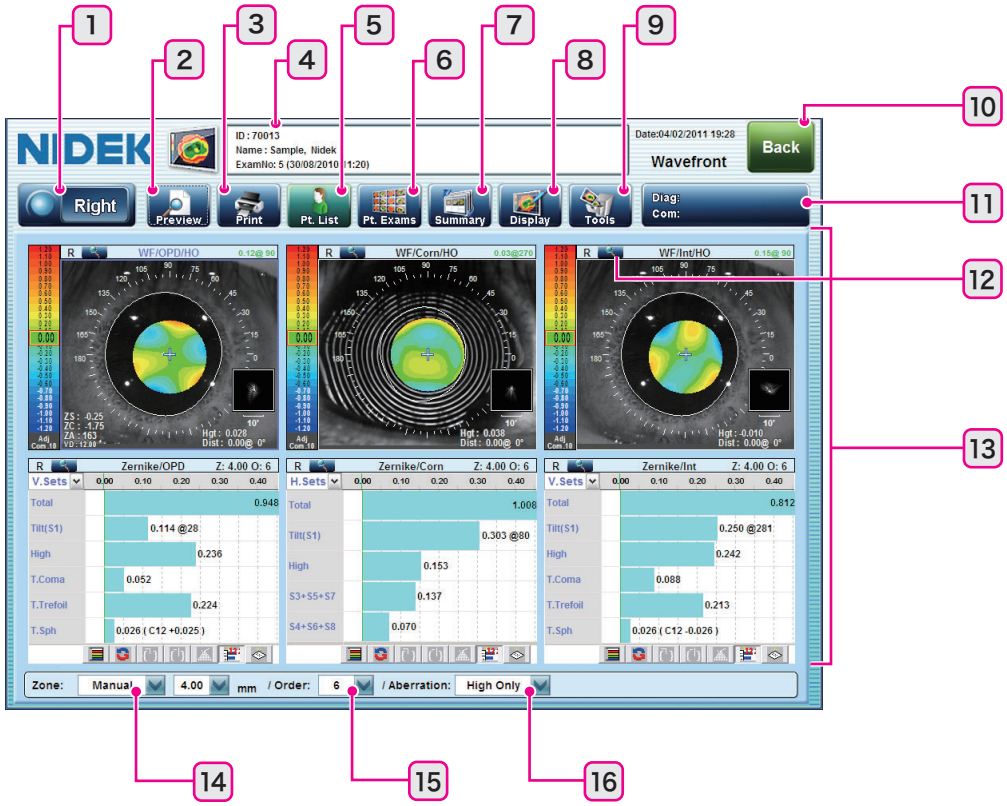
Used to move to the “Difference: Select Exam” screen that allows selection of examination data to display in the Difference screen.

15. Thumbnail list

Examination data of the currently displayed patient is shown as thumbnails in accordance with the selection of the Image button and the Sorting button.

1.8.10 Summary screen

The Summary screen allows viewing of a maximum of six maps in a single screen.
In addition, maps can be enlarged by pressing the Enlarge button ( ) at the top left of each map.
A summary offers desired information such as various maps, text data, and eye image. In addition to the default summary, user-customized summaries can be registered.



1	Right/Left button	2	Preview button	3	Print button
4	Patient data brief information box	5	Pt. List button	6	Pt. Exams button
7	Summary button	8	Display button	9	Tools button
10	Back button	11	Diag/Com	12	Enlarge button
13	Map display area	14	Zone	15	Order
16	Aberration				

1. Right/Left button

Used to toggle display of the right and left eye summaries.

2. Preview button

Used to display the Map Image Preview screen to confirm the image to be printed.

Note

- The Preview button can be used only when an external printer has been set.
  With the default setting of the OPD-Scan III, no external printer is set. To set an external printer (to add printer driver), contact NIDEK or your authorized distributor.

3. Print button 

Used to print maps using an external printer.

Data can be output at the same time as printing.

4. Patient data brief information box

Used to display “ID”, “Name”, “DOB” (date of birth [only when set to be displayed]), and “ExamNo (Exam date)” of the patient of the selected examination data.

The current date and the name of the currently displayed summary are displayed at the far left of the box.

5. Pt. List button 

Used to move to the Patient List screen.

Selection of the currently selected patient is cancelled.

6. Pt. Exams button 

Used to display different examination data.

Pressing this button displays the examination data number and the examination date in a list. The currently selected examination data is displayed in the same summary.

7. Summary button 

Shows the summary list for selection of the desired summary.

For registration and editing of summaries, see “4.3 Setting of Summaries (Map Layout)” (page 239).

8. Display button 

Used to modify the overlay settings for each map.

Pressing this button displays the “for all maps” and “for selected map” options. When the desired option is selected, the corresponding Display Option window appears. Check the desired overlay items.

9. Tools button 

Pressing this button displays the options: “Data Output”, “Edit exam data”, and “Go to Main Menu”. Select the desired action.

Data Output	Outputs data.
Edit exam data	Allows edit functions such as editing of placido ring edge.
Go to Main Menu	Returns to the Main Menu screen.

10. Back button 

Used to return to the Exam List screen.

If the Summary screen is displayed directly from the Measurement screen, the Main Menu button is displayed instead of the Back button.

11. Diag/Com

Used to display the Diagnosis window that allows input and editing of diagnosis and comments.

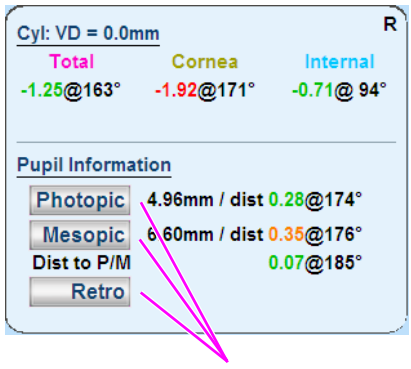
12. Enlarge button 

Enlarges the selected map.

13. Map display area

The map and analytical values for the selected summary are displayed.

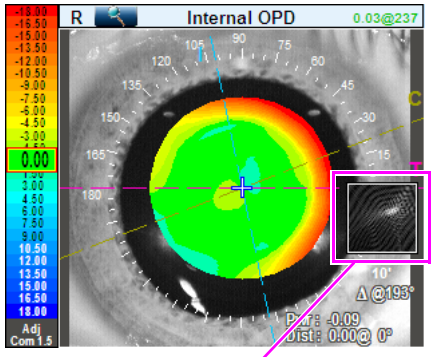
Pressing the map name, image name, or graph name buttons in the analytical value box (text map) enlarges the corresponding map, image, or graph.



Buttons in the analytical value

When the mini map is displayed, pressing the mini map enlarges it. There are two types of mini maps.

PSF mini map	Used to display the PSF map.
Retro mini map	Used to display an enlarged retroillumination image.



Mini map

14. Zone

Used to change the analysis area.

Photopic	Uses the pupil area in photopic vision as the analysis area.
Mesopic	Uses the pupil area in mesopic vision as the analysis area.
Manual	Used to specify the analysis area as desired. Selecting “Manual” enables the analysis area diameter box. Select from the menu that appears by pressing the V button. (3.00 - 9.50 mm)

15. Order

Used to display or change the analysis order.

16. Aberration

Used to display or change the type of aberration.

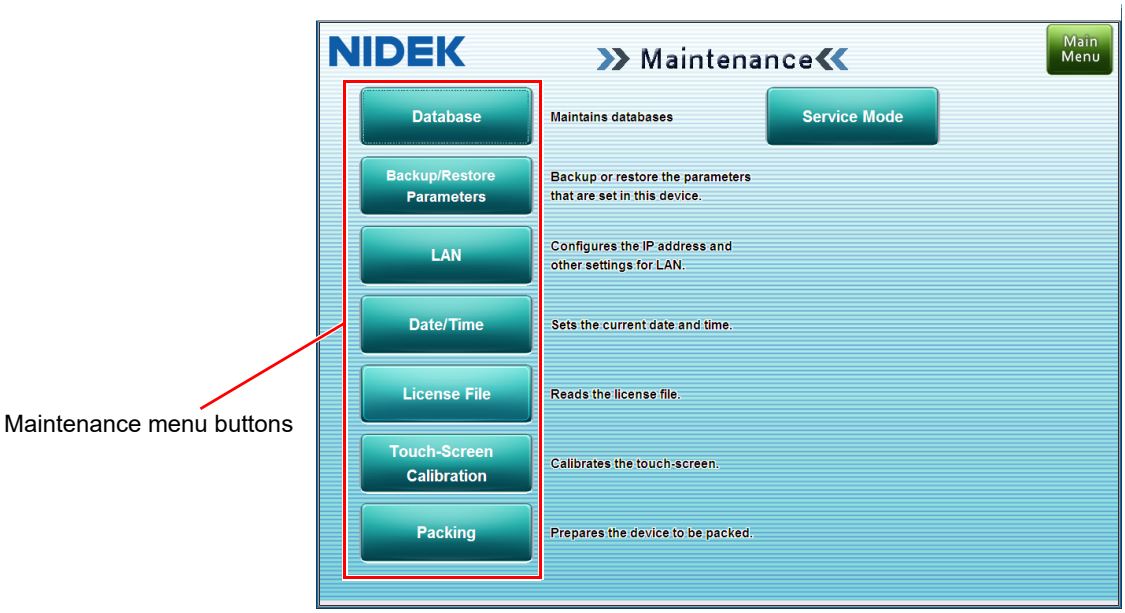
Select from “Total”, “High Only”, and “Group”. When “Group” is selected, buttons indicated with group names appear. Pressing the desired button displays the Zernike Coefficient Selection screen.

Note

- “Display of “13. Zone”, “14. Order“, and “15. Aberration” differs depending on the selection in the summary.

1.8.11 Maintenance screen

The Maintenance screen allows selection and execution of the desired maintenance operations.

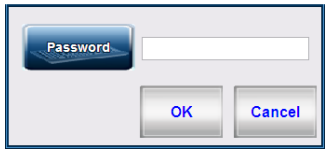


Maintenance menu buttons

Display the corresponding maintenance screen.

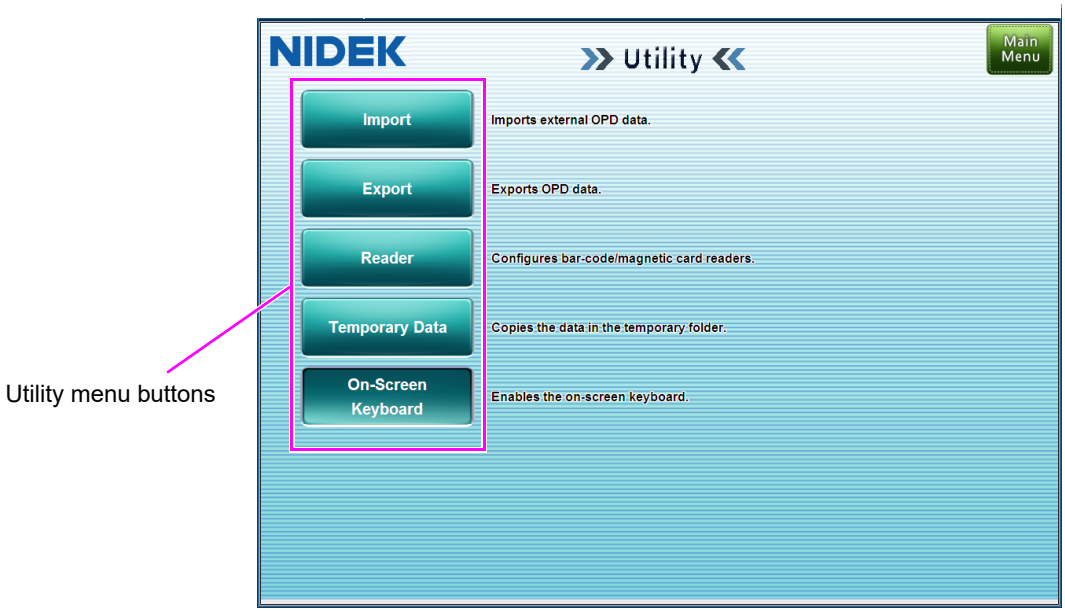
Database	Used to maintain the database.
Backup/Restore Parameters	Used to back up or restore the setting information for this device. The setting file is stored to an external memory to be used for restoration of the setting after replacement of the device (or the OPD Software for External PC). Reading of the setting file is also executed with this button.
LAN	Used to configure the IP address and other settings for LAN.
Date/Time	Used to set the current date and time.
License File	Used to read the license file.
Touch-Screen Calibration	Used to calibrate the touch screen. * This button is not displayed with OPD Software for External PC.
Packing	Used to prepare the device to be packed. Pressing the Packing button displays the message “Do you prepare packing? Yes/No”. Pressing the Yes button displays the messages “Packing Finish” and “Please Wait”, then turns off power to the device. * This button is not displayed with OPD Software for External PC.

The Service Mode button is not for customer use.

Service Mode	Used to enter Service mode that only properly trained service personnel are allowed to operate. Pressing the Service Mode button displays the password window. Press the Cancel button to close the password window. 

1.8.12 Utility screen

The Utility screen allows operation of auxiliary functions of the OPD-Scan III.



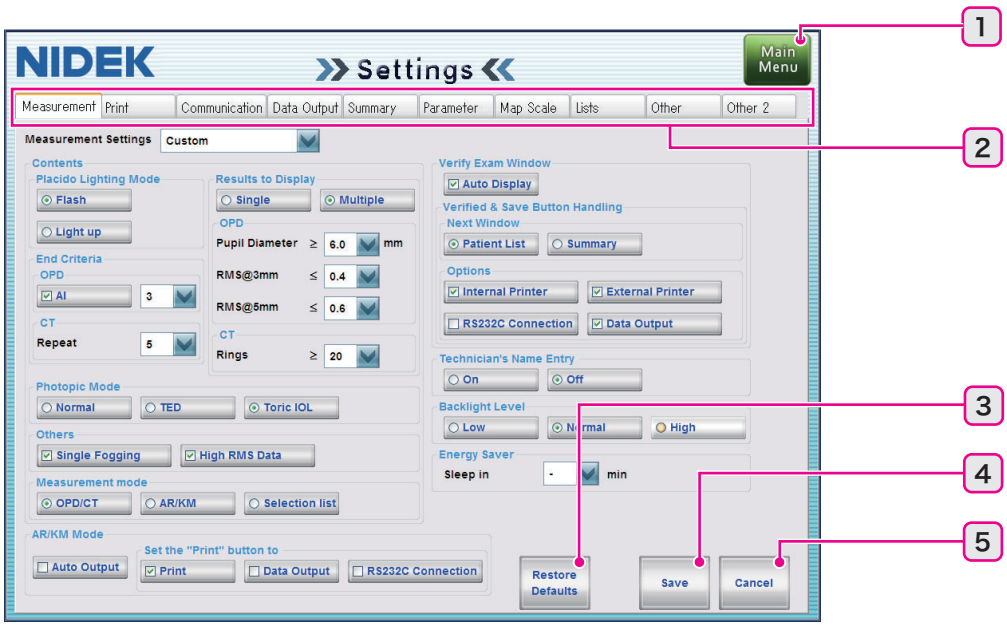
Utility menu buttons

Display the corresponding utility screen.

Import	Used to import external OPD measurement data.
Export	Used to export OPD measurement data.
Reader	Used to set parameters for the barcode or magnetic card reader.
Temporary Data	Used to copy the data in the temporary folder. If a USB flash drive is not available, data can be temporarily output to a temporary folder. Pressing the Temporary Data button copies the data in the temporary folder to the desired devices. * This button is not displayed with the OPD Software for External PC.
On-Screen Keyboard	Used to toggle the on-screen keyboard. Each pressing of this button toggles use of the on-screen keyboard. If the on-screen keyboard is set not to be used, the on-screen key board button is displayed as a label not a button. * This button is not displayed with the OPD Software for External PC.

1.8.13 Settings screen

The Settings screen allows setting of various parameters: “Measurement”, “Print”, “Communication”, “Data Output”, “Summary”, “Parameter”, “Map Scale”, “List”, “Other”, and “Other 2”.



1	Main Menu button	2	Setting parameter tabs	3	Restore Defaults button
4	Save button	5	Cancel button		

1. Main Menu button Main Menu

Used to return to the Main Menu screen.

When parameters are changed, a message appears to ask whether or not to save the changed parameters.

2. Setting parameter tab

Toggles display of the setting parameters.

There are ten tabs: “Measurement”, “Print”, “Communication”, “Data Output”, “Summary”, “Parameter”, “Map Scale”, “Lists”, “Other”, and “Other 2”. The Map Scale tab is further divided into the CT-A, CT-R, OPD, OPD HO, Wavefront, Elevation, Zernike Graph, and Internal OPD tabs.

* The Measurement tab is not displayed with OPD Software for External PC.

3. Restore Defaults button

The current parameters set in the various tabs are restored to their default.

4. Save button

Used to save the current parameters in the tabs.

After changing any parameter, if another tab is pressed or the Main Menu button is pressed without pressing the Save button, a message appears to ask whether or not to save the changed parameters.

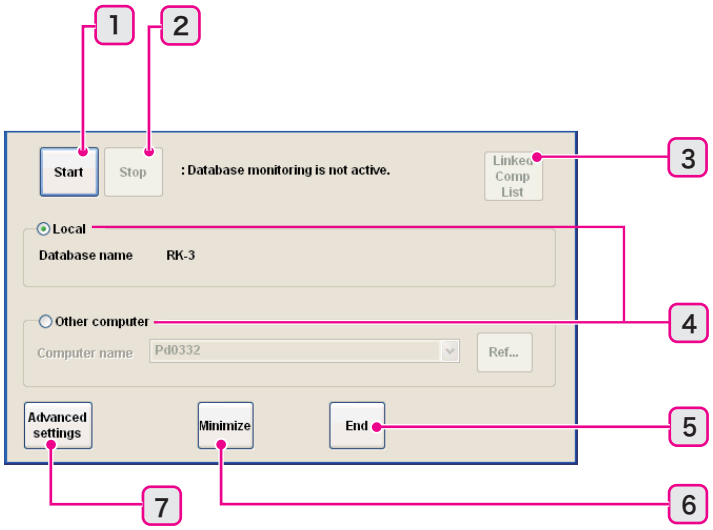
5. Cancel button

The parameters in the currently displayed tab are restored to their defaults.

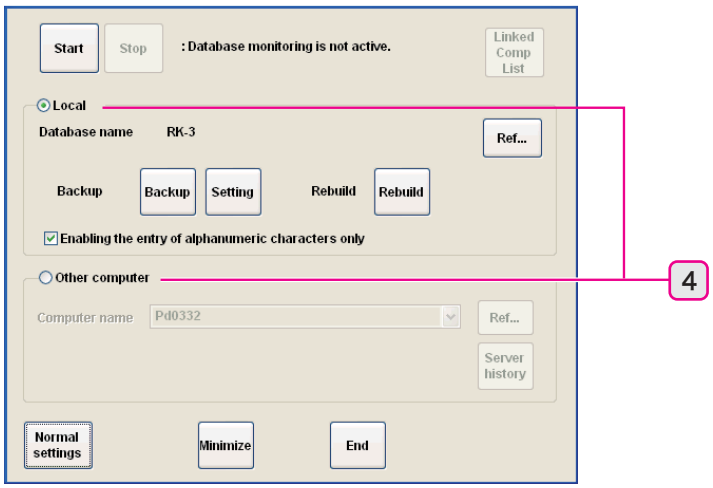
1.8.14 OPD Database Manager screen

The OPD Database Manager screen allows selection and backup of the database. This screen is displayed by pressing the Database button in the Maintenance screen.

<Normal settings>



<Advanced settings>



1	Start button	2	Stop button	3	Linked Comp List button
4	Local and Other computer radio buttons	5	End button	6	Minimize button
7	Advanced Settings/Normal Settings button				

1. Start button

Used to initiate connection of the device with the database.

After changing the settings in this screen, press this button to initiate connection with the database.

2. Stop button

Used to terminate connection of the device with the database.

Before selecting or backing up the database, using this button to end connection between the device and the database using this button.

3. Linked Comp List button

Used to display a list of computers connected to the database.

This button is enabled only when “Local” is selected with the “Local” and “Other computer” radio buttons.

4. Local and Other computer radio buttons

Used to toggle use of the local database or database on an external computer.

Local: Select to use database on the OPD-Scan III.

The buttons in the list below are displayed only in the advanced settings screen.

Ref… button (in Local box of Advanced Setting screen)	Used to display the Select Database screen that allows setting or selection of database.
Backup button	Used to display the Database Backup screen that allows backup of database.
Settings button	Used to display the Backup Settings screen that allows setting of the criteria for deleting data in the database.
Rebuild button	Used to display the Rebuild Database screen that allows rebuilding of database.
Enabling the entry of alphanumeric characters only	When the check is removed, patient names, diagnosis, comments, and such can be input in Japanese. Be sure to check this box when using the Final Fit software. Characters other than alphanumeric characters may become unreadable.

Note

- The Backup, Settings, and Rebuild buttons are enabled when the database setting is other than “RK-3”.

  For details of creation or selection of databases, see “4.4 OPD Database Manager” (page 255)

- When used with the ARK-9000, ARK-10000, or Final Fit is used, do not remove the check because they do not support Japanese.

  If any language other than English is used, characters may become unreadable.

Other computer: Select to use database on another computer installed with OPD Database Manager.

Ref… button	Used to display the computer reference screen that allows selection of the computer on which the database is stored.

The button below is displayed only in the advanced settings screen.

Server history button	Used to display the list of computers that the device has been connected to Computers in the list can be connected to or deleted from the list.

5. End button

Used to close OPD Database Manager.

This button cannot be used with the OPD-Scan III.

6. Minimize button

Used to reduce the OPD Database Manager screen to the task bar.

When using the OPD-Scan III regularly, keep OPD Database Manager resident and minimized to the task bar.

7. Advanced Settings/Normal Settings button

Used to toggle between the advanced settings and normal settings screens.

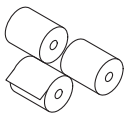
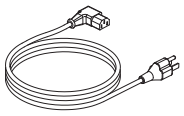
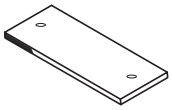
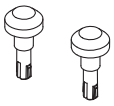
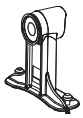
1.9 Labels

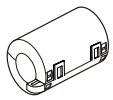
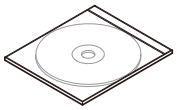
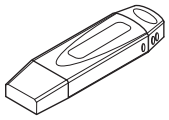
Cautionary labels are provided on the device.
If labels are curling up or characters fading and becoming barely legible, contact NIDEK or your authorized distributor.

	Indicates that the operator is advised to refer to the related instructions in the operator's manual.
	Indicates that the degree of protection against electric shock is of a Type B Applied Part. * The applied parts are the chinrest and the forehead rest (see 14 and 16 in "1.7 Device Configuration" (page 4)).
	Indicates the state of the power switch. If this symbol side of the switch is pressed down, power is not supplied to the instrument.
	Indicates the state of the power switch. If this symbol side of the switch is pressed down, power is supplied to the instrument.
	Indicates that the instrument must be supplied only with alternating current.
	Indicates the network connector.
	Indicates the connector for data communication.
	Indicates the connector for a USB device.
	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.
	Medical device
	EU Authorized Representative
	Serial number
	Unique Device Identifier
	Catalog number

1.10 Packed Contents

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

	Part name	Quantity	Appearance
☐	Main body	1	
☐	Printer paper	3	
☐	Power cord	1	
☐	Dust cover	1	
☐	Chinrest paper	1	
☐	Fixing pin for chinrest paper	2	
☐	Spherical model eye	1	

	Part name	Quantity	Appearance
☐	Ferrite core (for LAN cable)	1	
☐	Touch pen	1	
☐	Touch pen stand	1	
☐	Operator’s manual (this book)	1	
☐	Installation CD for OPD Software for External PC	1	
☐	USB license key for OPD Software for External PC	1	
☐	Operator’s manual for OPD Software for External PC	1	

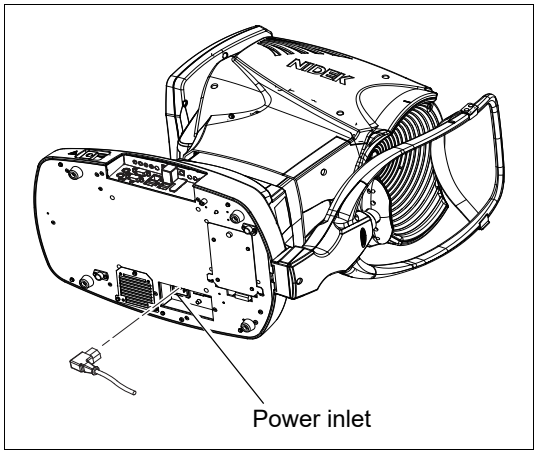
1.11 Before First Use

Place the device on a stable table and connect the power cord to it.

1 Place the main body on a stable table.

2 Pull the main unit fully to a side, then gently lay down the device on the same side.

3 Connect the power cord to the power inlet.



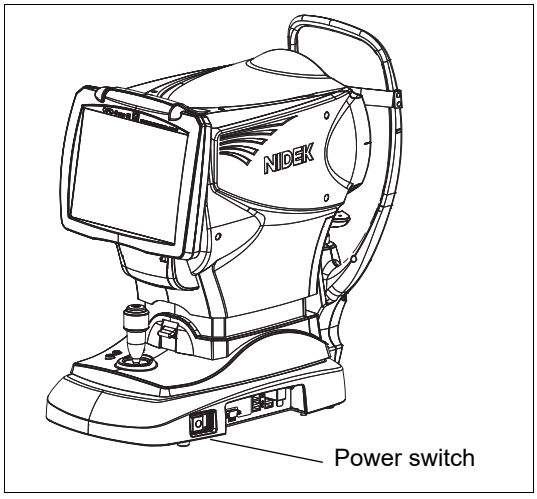
4 Stand the device upright.

5 Connect peripheral devices as necessary.

Be sure to connect the RS-232C cable before turning on power to the device. USB devices can be connected regardless of whether the device power is on or off.

See “○ Connector panel” (page 5) of “1.7 Device Configuration” (page 4) for the method of connecting peripheral devices.

6 Confirm that the power switch is turned off (○), then plug the power cord into the power outlet.



⚠ **WARNING** • **Be sure to use a grounded power outlet.**
Electric shock or fire may result in the event of malfunction or power leakage.

7 Turn on (|) the power switch.

The title screen is displayed on the touch screen and the device begins initialization.

Title screen

8 Confirm that the Main Menu screen is displayed.

Main Menu screen

9 Set the printer paper.

See “5.3 Replacing Printer Paper” (page 300) for details on the printer paper setting procedure.

The setup procedure is complete.

Note

- Set the parameters in the Settings screen as desired.

  See “5.8 Changing Device Parameters” (page 323) for the parameters and their setting methods.

2. OPERATING PROCEDURE (OPD/CT MODE)

2.1 Operation Flow

[Measurement and printing → Saving of measurement result in database]

Turning on the device

2.2.1 Start up (page 46)
Turn on power to the device, and change the parameter setting of the device.

Inputting patient name

2.3 Patient List Screen Operation (page 49)

Measurement

2.4 Measurement (page 59)
2.5 Measurement in OPD/CT measurement mode (page 66)
2.6 OPD Measurement (page 81)
2.7 CT Measurement (page 88)

Printout

2.12 Printing (page 133)
After measurement, measurement data can be automatically printed at the same time as data is saved.

Turning off the device

2.2.3 Shut down (page 48)

[Reading data from the database to display maps in a summary]

Turning on the device

2.2.1 Start up (page 46)
Turn on power to the device, and change the parameter setting of the device.

Displaying summary using saved data

2.8 Viewing Maps (page 95)

Turning off the device

2.2.3 Shut down (page 48)

Note

- The screens on the device are used for explanation of the operating procedure. OPD Software for External PC has some differences from the device software such as shown below.
  - Inability to use the measurement functions
  - Absence of button to display the on-screen keyboard.

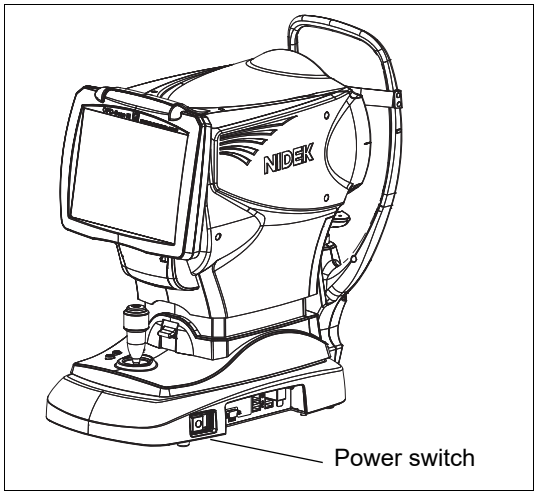
2.2 Start Up and Shut Down

2.2.1 Start up

1 To use an external printer, turn on power to the printer.

2 Turn on (|) the power switch of the device.

The device starts up.

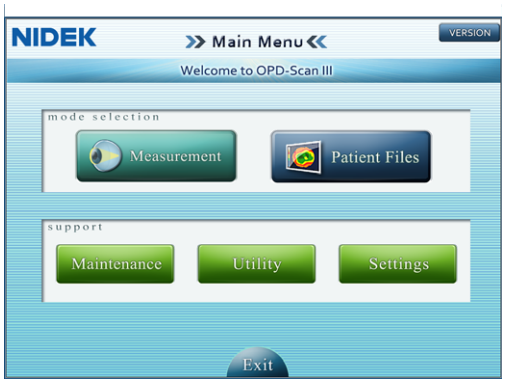


The title screen appears and the device is initialized.

When power to the OPD-Scan III is turned on, the main body makes slight movement in horizontal directions to determine the initial position for auto tracking. It is not a failure of the device.

Title screen

3 The Main Menu screen is displayed.



Main Menu screen

Note

- If the internal solid state disk (SSD) space is insufficient, a message appears during the startup of the device to recommend freeing up the SSD space by the following methods:
  1. Delete unnecessary patient data by pressing the Delete button in the Patient List screen.
  2. Output data to a USB flash drive or a shared folder in the Export window that appears by pressing the Export button in the Utility screen. After that, delete the data by pressing the Delete button in the Patient List screen.

4 Perform checks before use.

Perform the following checks before use.

- ☐ No error message appears.
- ☐ The main body moves smoothly using the joystick.
- ☐ The measuring window is clean.
- ☐ The chinrest moves up and down by pressing the chinrest up/down button.
- ☐ Printer paper is sufficient.
- ☐ Measurement accuracy (See “5.5 Checking Measurement Accuracy” (page 303).)

If any abnormality is found, stop using the device, and refer to “5.1 Troubleshooting” (page 295).

2.2.2 Recovery from power saving mode

The device automatically enters power saving mode when it is left idle for a preset period of time. In power saving mode, the indication “Power saving mode...” appears.

Note

- This idle time can be selected from 5 minutes, 10 minutes, 15 minutes, or “-” (No power saving mode) with the Energy Saver setting in the Settings screen (Measurement tab). (Factory setting “-”)

  See “5.8 Changing Device Parameters” (page 323) for the setting procedure.

To recover from power saving mode, perform any of the following operations:

- Touch the touch screen.
- Press any key of the keyboard.
- Press the start button.
- Manipulate the joystick to move the measuring unit so that the eye detected by the device is switched (from right to left, or left to right).

Note

- Depending on the screen condition, the device may not enter power saving mode.

2.2.3 Shut down

⚠ CAUTION • **Be sure to shut down the device according to the procedure described below. Do not turn off the power switch.**

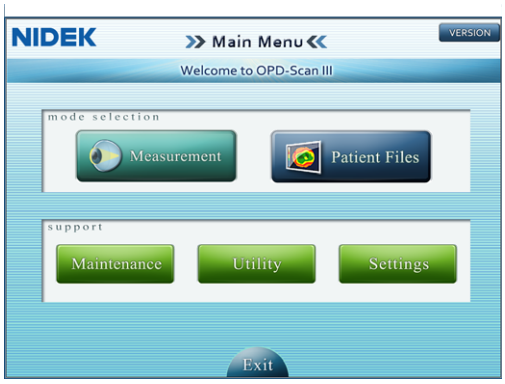
If neither touch screen nor keyboard can be operated, and the device cannot be shut down, turn off the power switch. After that, make sure to turn on the device again to check that the device can be operated properly.

Note

• When packing the device, turn off power to the device in Packing mode.

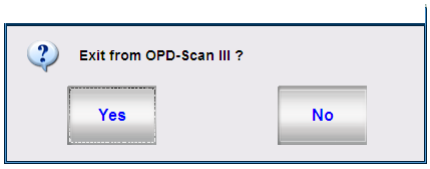
For details of Packing mode, see "5.7.7 Packing mode" (page 322).

1 Return to the Main Menu screen.



2 Press the Exit button.

A confirmation message, "Exit from OPD-Scan III? Yes/No" appears.



3 Press "Yes".

The OPD-Scan III is shut down, and the power switch is automatically turned off.

In case of the OPD software for external PC, the software becomes closed.

Pressing the No button returns to the Main Menu screen.

4 If an external printer is connected, turn off power to the printer.

5 Check the cleanliness of the measuring window. Clean it if necessary.

See "5.9.1 Cleaning the measuring window" (page 355).

6 Clean the forehead rest and chinrest. Then place the dust cover over the device.

Always keep them clean for the next use.

Note

• Be sure to always place the dust cover over the device when it is not in use.

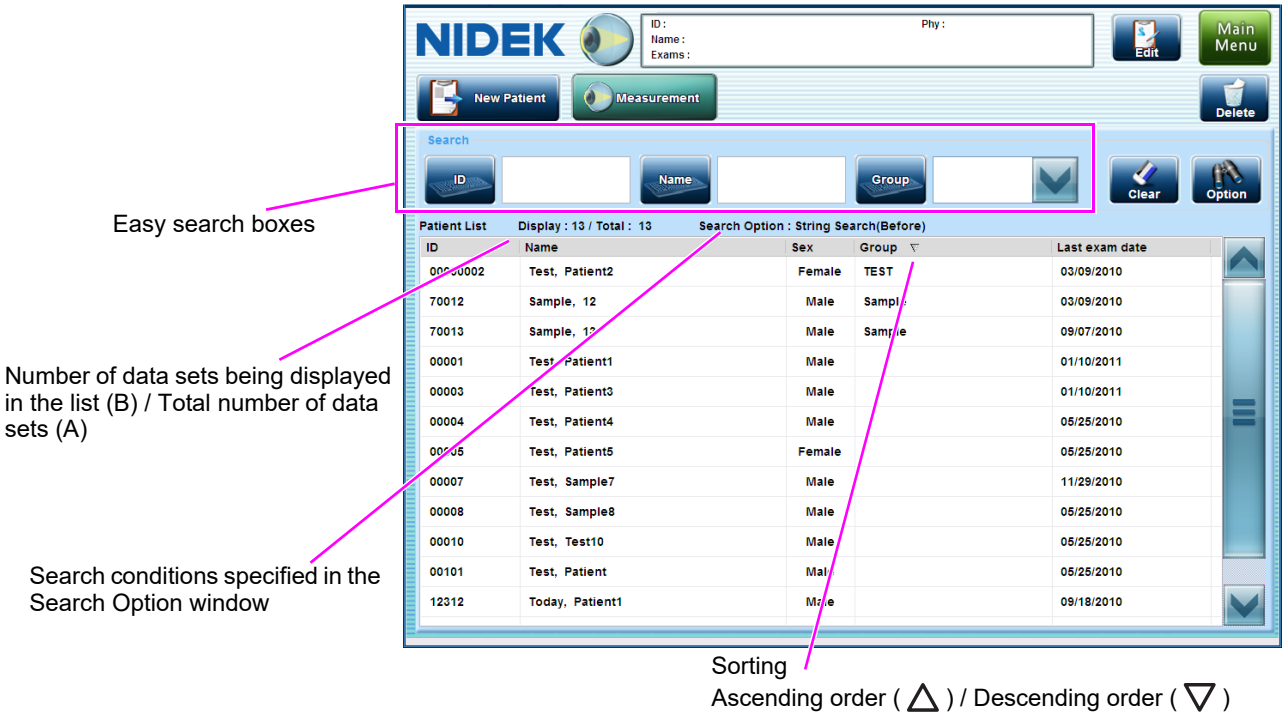
2.3 Patient List Screen Operation

2.3.1 Patient List screen operation

The Patient List screen allows selection of the patient for whom measurement is going to be performed, or whose previous measurement data is going to be viewed. Patient data can be created, edited, or deleted as well.

Depending on the desired operation, there are Patient List screen (before measurement) and Patient List screen (before displaying summary). Either of them can be selected in the Main Menu screen.

Patient List Screen (before measurement)	Displayed by pressing the Measurement button in the Main Menu screen. The Measurement button is displayed in the upper area of the Patient List screen.
Patient List Screen (before displaying summary)	Displayed by pressing the Patient Files button in the Measurement screen. The Exam List button is displayed in the upper area of the Patient List screen.



New Patient button	Used to display the Create Patient window to input new patient data. See “2.3.2 Registering a new patient” (page 50) for details.
Measurement button/ Exam List button	Used to start measurement for the patient selected in the patient list or to display examination data.
Easy search boxes	Used to display data sets that meet the conditions entered in the ID, Name, and Group boxes.
Edit button	Displays details of the patient data selected in the patient list in the Edit Patient Information window. In this window, patient information can be changed as well.

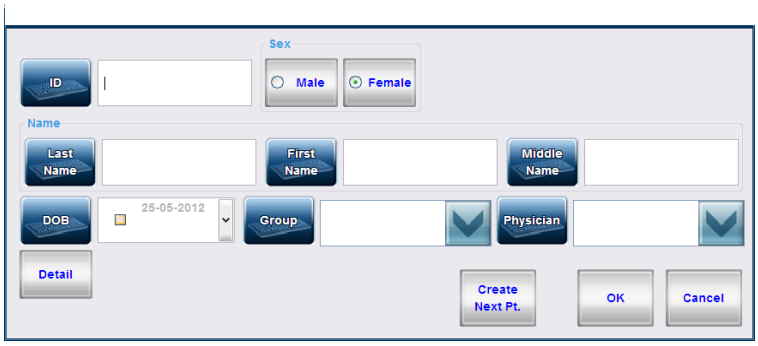
Main Menu button	Used to return to the Main Menu screen.
Delete button	Used to delete the patient information and examination data selected in the patient list. When a patient is deleted, all examination data sets for the patient are deleted. To delete only examination data, move to the Exam List screen.
Clear button	Used to clear the search conditions specified in the easy search boxes.
Option button	Used to display the Search Option window.
Tools button	Used to display the Recreate Thumbnail menu. Pressing “Recreate Thumbnail” updates the thumbnail map display according to the current map setting. This button is displayed in the Patient List screen (before displaying summary).

2.3.2 Registering a new patient

New patient data can be registered in the Create Patient window.

1 Press the New Patient button in the Patient List screen.

The Create Patient window opens.



2 Input the patient information.

Input the ID, sex, first name, last name, middle name, date of birth, group, and physician.

Use the on-screen keyboard that appears by pressing the buttons next to each box. If a hardware keyboard is used, the information can be directly input in the boxes.

1) Input the patient ID. (Compulsory)

By default, a serial number starting from “000001” is input as the ID. To set not to automatically input the default serial number, select “Off” for the Auto ID Allocation parameter in the Settings screen (Other tab).

2) Select the sex by pressing the Male or Female button.

3) Input the date of birth in the DOB box. (There are three methods for inputting this data.)

See “Inputting date (page 54)”, regarding input methods.

Note

- It is recommended to use unique IDs such as medical record numbers.

  If the input ID already exists, a message “The patient ID already exists.” appears, and the input ID is rejected.

  Pressing the OK button displays the message “Assign unique ID automatically? Yes/No.” Pressing the “Yes” button closes the message and automatically creates an ID.

Note

- When data is transferred with “RT-5100 Support” selected for “Connected Device”, the patient ID needs to consist of four or more digits.
  If the patient ID consists of less than four digits, the message “The data cannot be sent because the ID has less than 4 digits.” appears, and data is not transferred.
- If the measurement data is to be used for Final Fit, failure to input any of the patient ID, last name, first name, sex, and the date of birth disables creation of shot data. Therefore it is recommended to input these items beforehand.
- A future date cannot be input for the date of birth.

3 Press the OK button to register the patient information.

The screen returns to the Patient List screen.

The registered patient is added to the patient list and selected. If the patient is registered from the Patient List screen (before measurement), the Measurement screen is automatically displayed.

Other buttons

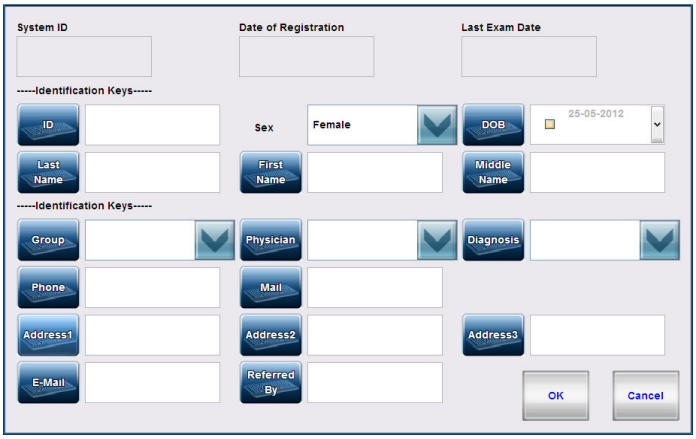
Create Next Pt. button	Used to register the current patient information and clear all the items in the Create Patient window to prepare for input of the next patient information. This button is used to register new patients consecutively.
Cancel button	Used to close the Create Patient window without registering new patient information.
Detail button	Used to display the Edit Patient Information window. The Edit Patient Information window allows input of additional patient information.

To input more detailed patient information

Additional information, such as, diagnosis, phone number, address 1 to 3, e-mail address, and referrer can be input. The patient information input in the Create Patient window is also displayed and can be edited.

1) Press the Detail button in the Create Patient window to display the Edit Patient Information window.

   The contents of “System ID”, “Date of Registration”, and “Last Exam Date” displayed along the top of the screen cannot be edited.



2) Press the button next to the desired item to display the on-screen keyboard, then input the information.

If a hardware keyboard is used, the information can be directly input in the boxes.

For “Diagnosis”, the information to be input can also be selected from the drop-down list.

3) Press the OK button.

The screen returns to the Create Patient window.

Pressing the Cancel button closes the Edit Patient Information window without registering additional information.

○ Inputting characters

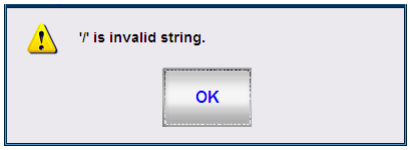
To input characters and symbols in the text box, hardware keyboard, on-screen keyboard, or drop-down list can be used.

Input using a hardware keyboard

Texts can be edited in the same manner as with a keyboard for a PC.

Press the text box or click it with a mouse to directly input the texts with a keyboard.

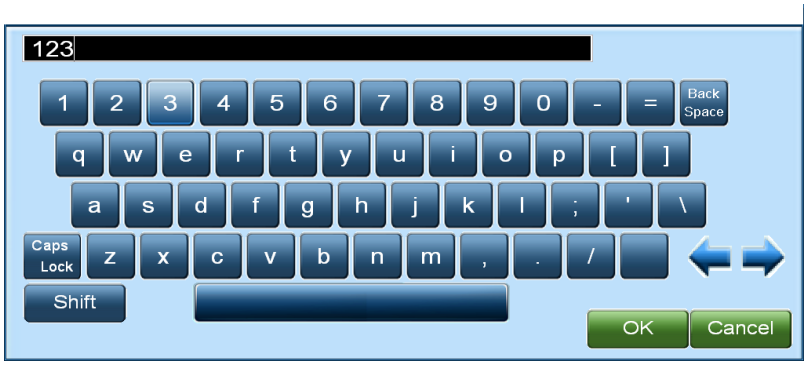
If invalid characters or symbols are input, a message ‘”*” is invalid string’ appears, and the input is rejected.



Input using on-screen keyboard

The on-screen keyboard appears by pressing the buttons next to each box.

The on-screen keyboard appears by pressing the button () next to each box.



,	Used to move the cursor to right or left by one position.

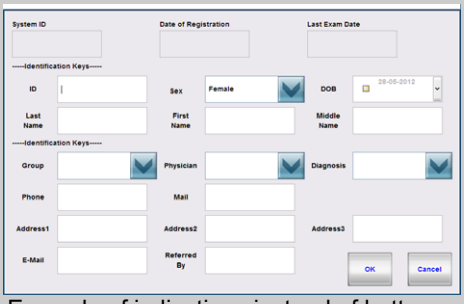
Other keys are used as with a standard keyboard.

If invalid characters or symbols are input, pressing the OK button displays a message “ ‘*’ is invalid string”, and the input is rejected.

Note

- If the on-screen keyboard is set to not be used, the buttons to display the on-screen keyboard are not displayed as buttons, but only as indications.

  For the setting to enable the on-screen keyboard, see “5.6.4 Using on-screen keyboard (OPD-Scan III)” (page 313).



Example of indications instead of buttons

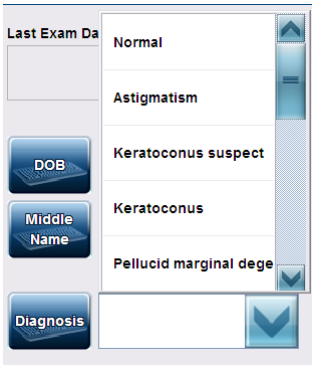
- When the on-screen keyboard is displayed, any hardware keyboard is disabled. However, the mouse can be used.
- If the on-screen keyboard is displayed to edit existing information, all the information becomes automatically highlighted. Therefore inputting a character deletes all of the existing information. To change only a part of the existing information, press a part of the box or the arrow button to display a cursor before inputting characters.

Selecting from drop-down list

If there is the V button to the side of the text box, the information to be input can be selected from a list.

Select the desired item from the list that appears by pressing the V button.

Information can be directly input in the text box as well. If new information is input, it is added to the list.



The items in the drop-down list shown below can be edited in the Settings screen (Lists tab).

Patient Data	Group, Physician
Examination data	Comment, Technician
Common Data	Diagnosis

○ Inputting date

There are three methods to input dates such as the date of birth, and the “From” and “To” dates of the “Time Interval” search.

Input using a numeric keypad

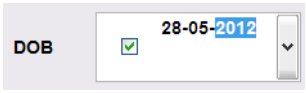
Use the numeric keypad that appears by pressing the button next to a date box.

Input the date in the Day, Month, and Year boxes.

	Used to delete a character to the left of the cursor. If characters are selected, the selected characters are deleted.
	Used to move the cursor to right or left by one position.
OK button	Used to save the current input and close the numeric keypad.
Cancel button	Used to cancel the current input and close the numeric keypad.

Input using a keyboard

If a keyboard is used, the information can be directly input in the boxes.



Press the day, month, and year to select them, then overwrite them using the keyboard.

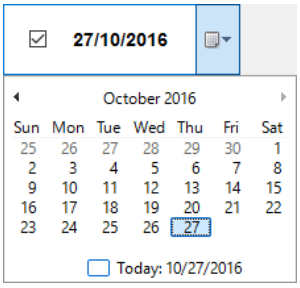
If an inappropriate number is input, a corrected number is automatically input.

Input using calendar

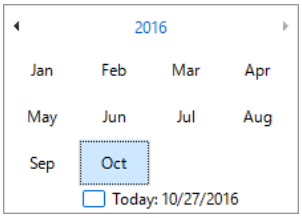
A calendar appears by pressing the down arrow (V) button.

Select the day by pressing the desired one in the calendar.

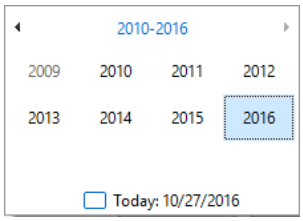
The highlighted day is the selected day.



Select the desired month from the list that appears by pressing the month and year indication. Pressing the (◄) or (►) buttons displays the previous or following year.



Select the desired year from the list that appears by pressing the year indication while the months are displayed. Pressing the (◄) or (►) buttons displays the previous or following 12 years.



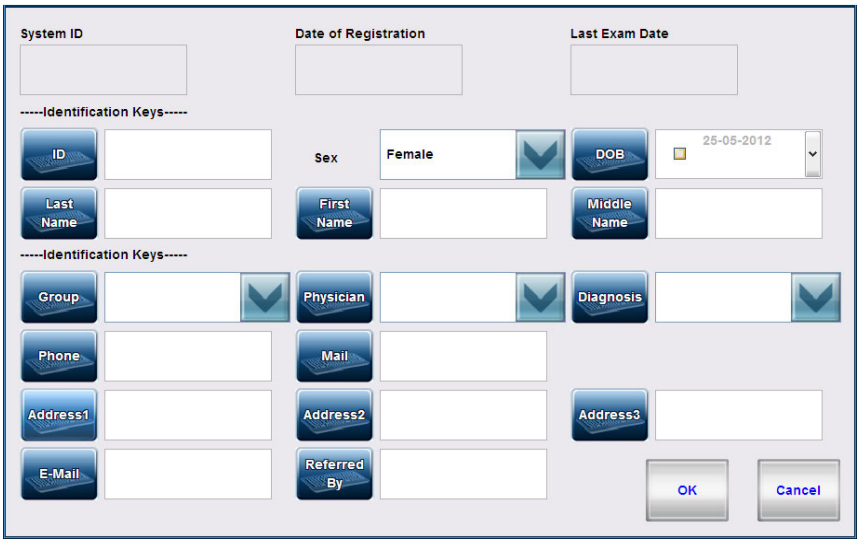
2.3.3 Editing patient data

The existing patient information can be edited.

1 In the Patient List screen, select the patient whose information is to be edited.

2 Press the Edit button.

The Edit Patient Information window opens.



3 Edit the existing information in text boxes.

Edit the existing information in the same manner as input of new information.

Information in white text boxes can be edited. Information in gray text boxes (System ID, Date of Registration, and Last Exam Date) cannot be edited as well.

4 Press the OK button to register the edited patient information.

The Edit Patient Information window is closed and the Patient List screen is displayed.

2.3.4 Deleting patient data

The existing patient information can be deleted.

When a patient is deleted, all examination data sets for the patient are deleted.

1 Select the patient to delete in the Patient List screen.

Multiple patients can be selected in the list by using the Shift + Ctrl key on the keyboard (when using the optional keyboard).

Selecting multiple consecutive rows	Press the first or last of the rows to be selected, then, while pressing the Shift key, press the row on the other end of the range.
Selecting multiple non-consecutive rows	While pressing the Ctrl key, select the desired rows.The selected rows are added to the multiple selection.

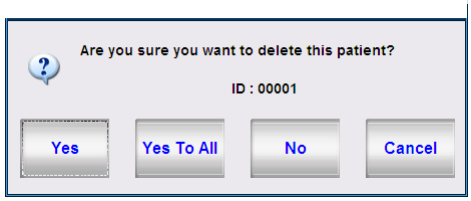
2 Press the Delete button 

.

The message, “Are you sure you want to delete this patient? ID:**** Yes/No” appears for confirmation.

When multiple patients are selected

The message, “Are you sure you want to delete this patient? ID:**** Yes/Yes To All/No/Cancel” appears for confirmation.



3 Press “Yes” to delete the patient data being selected.

The message closes and the Patient List screen is displayed.

Pressing “No” cancels the deletion and closes the message.

When multiple patients are selected

Yes	Deletes the patient data of the ID displayed in the message, then displays the confirmation message for the next patient.
Yes To All	Deletes all the selected patients, and closes the message.
No	Cancels deletion of the patient data of the ID displayed in the message, then displays the confirmation message for the next patient.
Cancel	Cancels deletion of all the selected patients, and closes the message. Patients deleted before pressing the Cancel button cannot be restored.

Note

- To delete only specific examination data, move to the Exam List (Delete Exam screen) screen.

See “2.9.2 Operation in Exam List screen” (page 120) for details.

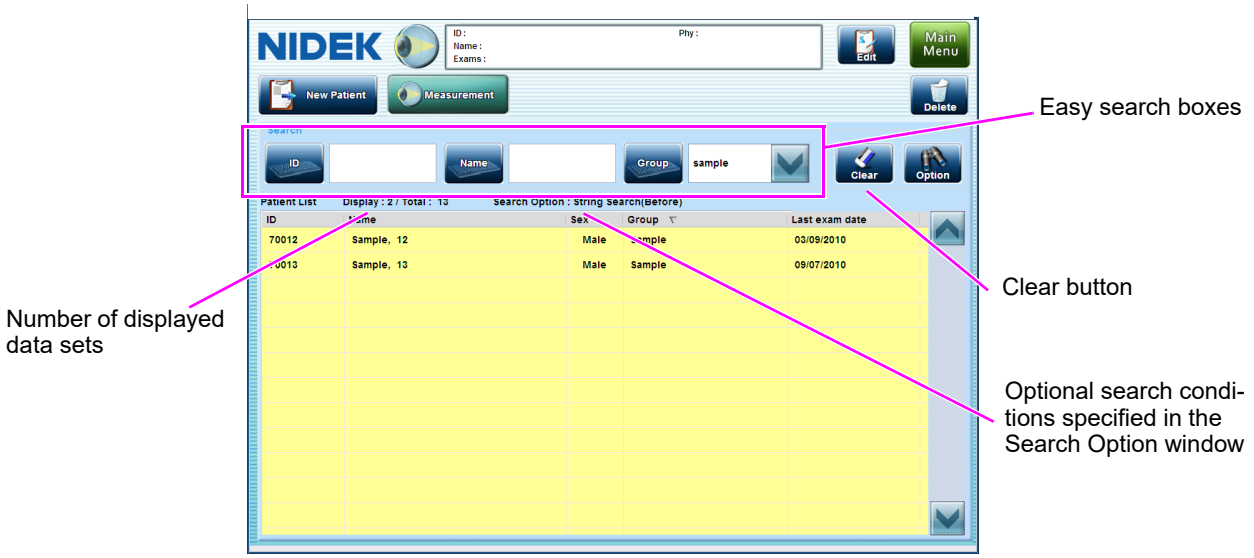
2.3.5 Patient search

The desired patient data can be searched by easy search in the Patient List screen or optional search in the Search Option screen.

○ Easy search

Inputting search conditions in the easy search boxes (ID, Name, and Group) in the Patient List screen displays only the patient data that meets the search conditions with right truncation in the patient list. When multiple search conditions are input, the AND search is executed. When search results are displayed, the background of the list is yellow. If no data meets the input search conditions, no data is displayed with the background of the list shown in yellow.

Above the patient list, the number of the extracted data sets is shown as “Display: ** / Total: **”.



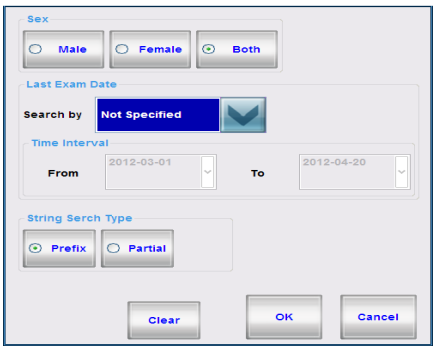
Pressing the Clear button (Clear) clears the search conditions in the easy search boxes (ID, Name, and Group).

The optional search conditions specified in the Search Option window cannot be cleared with the Clear button in the Patient List screen. They can only be cleared in the Search Option window.

○ Optional search

Patient data can be searched using optional search conditions in the Search Option window. In addition to the conditions specified in the easy search boxes, sex and the last examination date can be specified.

1) Press the Option button to display the Search Option window.



2) Specify the desired search conditions in the boxes.

When search conditions are added, the patient list is refreshed to reflect the new search conditions.

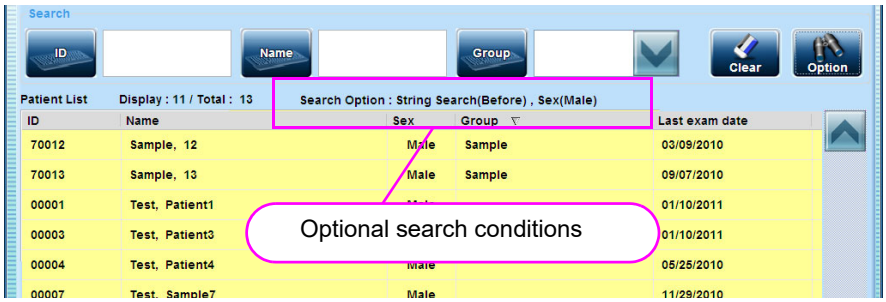
Sex	Select Male, Female, or Both.
Last Exam Date	Select “Not Specified”, “Today”, “Last Week”, “Last Month”, “Last 3 Month”, or “Time interval”. When other than “Not Specified” is selected for the “Search by” box, only patients whose last examination date fall within the specified range are extracted. When “Time interval” is selected, data can be searched within a specific period of time by entering “From” and “To”. Press the From and To buttons, then input the desired values, or press “V” and select the desired dates.
String Search Type	Select the method of easy search from “Prefix” (right truncation) and “Partial” (simultaneous left and right truncation).

For the method, see “Inputting date (page 54)”.

3) Press the OK button to execute the search.

The extracted patient data is displayed in the Patient List screen.

When the optional search is used, the optional search conditions are shown above the patient list.



The optional search conditions specified in the Search Option window cannot be cleared with the Clear button (Clear) in the Patient List screen.

To cancel the search result and restore the patient list to the original condition, press the Clear button in the Search Option window to initialize the search conditions (Sex: Both, Last Exam Date: Not Specified), then press the OK button.

2.4 Measurement

Corneal curvature radius and distribution of refractive power are measured.

Measurement mode

Two types of measurement are available: OPD and CT measurements. The measurement mode button allows selection of the OPD measurement mode, CT measurement mode, or OPD/CT measurement mode.

Measurement mode button	Measurement type	See
 OPD/CT	OPD measurement and CT measurement	“2.5 Measurement in OPD/CT measurement mode” (page 66)
 OPD	OPD measurement	“2.6 OPD Measurement” (page 81)
 CT	CT measurement	“2.7 CT Measurement” (page 88)

Explanation of measurement

OPD measurement	Calculates the AR values (refractive error as obtained with an auto-refractometer) by scanning the retina with slit-like beam and taking measurements within a 2 to 9.5 mm-diameter area every 1 degree. In addition, refractive error (D) is calculated at multiple points within the central 9.5 mm-diameter area and shown as the OPD map. The OPD map can also be displayed in a different format Wavefront map.
CT measurement	Calculates keratometry and produces maps that show the distribution of corneal curvature radius and refractive power on the cornea by analyzing the placido rings captured after projection on the cornea.

Single and Multi measurement modes

The number of data sets to be saved can be selected with the “Results to Display” parameter in the Settings screen (Measurement tab).

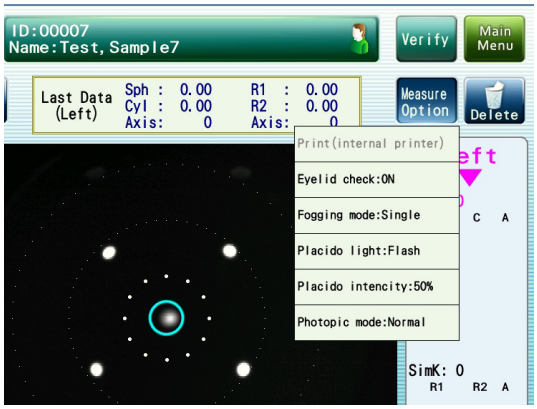
Single measurement	For both OPD and CT measurement modes, the best measurement data selected by the device is displayed in the Verify Examination Quality screen to be verified and saved.
Multi measurement	Multiple measurement data sets (maximum of 10 sets of data) are displayed in the Verify Multi Measurement screen for the operator selection of the data to be saved.

Temporarily enabled function

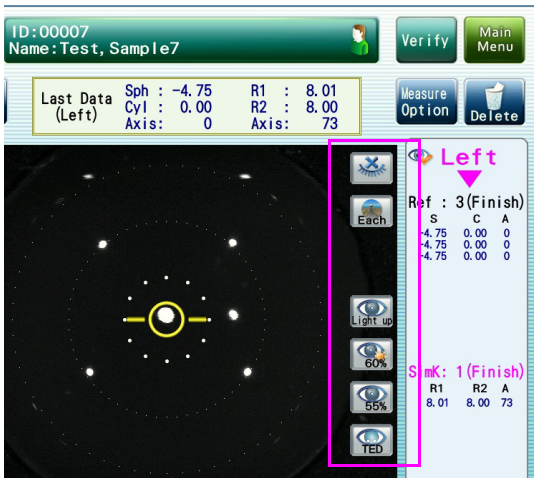
For convenience, some functions can be temporarily enabled without changing parameters in the Settings screen (Measurement tab). The same button operation offers an option to print the measurement data with the internal printer.

Select the desired functions to be temporarily enabled from the pop-up menu that appears by pressing the Measure Option button.

These temporarily enabled functions are disabled when the Measurement screen is closed.



Icons appear on the screen indicate the functions that differ from those in the Settings screen.



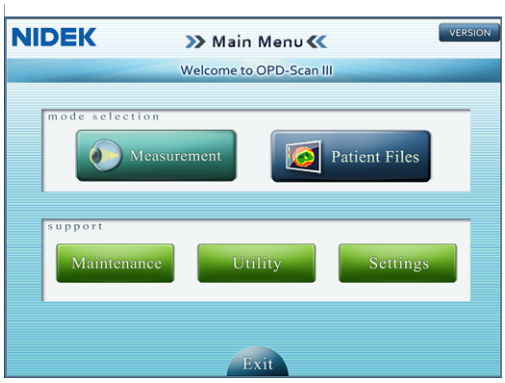
Print (Internal printer)	Prints the current measurement data with the internal printer and clears the measurement data. Selecting this icon immediately starts printing. If there is no measurement data, this option is grayed and cannot be selected.
Eyelid check	Used to toggle display of the error due to eyelid detection between “ON” and “OFF”. This setting is not in the Settings screen. The default setting is “ON”.
Fogging mode Each	Used to toggle use of fogging for every OPD measurement between “Single” and “Each”.
Placido light Light up	Used to toggle lighting of the placido light between “Flash” (lit only during measurement) and “Light up” (always lit).
Placido intensity 25%	Used to set the intensity of the placido rings. Selecting this option displays the on-screen numeric keypad. Input the intensity by percentage. Change the intensity if detection of the placido ring fails.

CT measurement internal LED intensity 	Used to set the CT measurement internal LED intensity. Selecting this option displays the on-screen numeric keypad. Input the intensity by percentage in the range from 0 to 100%. Detection of the entire placido ring edges may fail if the internal LED (central light) spots cannot be detected properly due to reflection of light by IOL or cataract. In such a case, perform the measurement with the intensity of the LED (central light) lowered, for example, from 50% (initial value) to 30%. That may reduce reflection of light during the measurement.
Photopic mode 	Used to select “Normal”, “For TED”, or “Toric IOL”.

2.4.1 Measurement procedure

1 Turn on power to the device.

The device starts up, and the Main Menu screen appears.



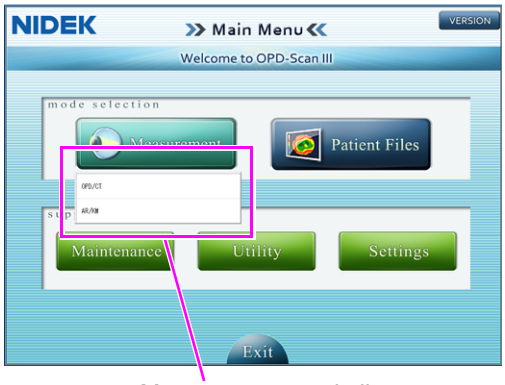
Main Menu screen

2 Press the Measurement button to move to the Patient List screen (before measurement).

With the “Measurement mode” parameter, the method of displaying the Measurement screen differs.

When “Selection list” is selected

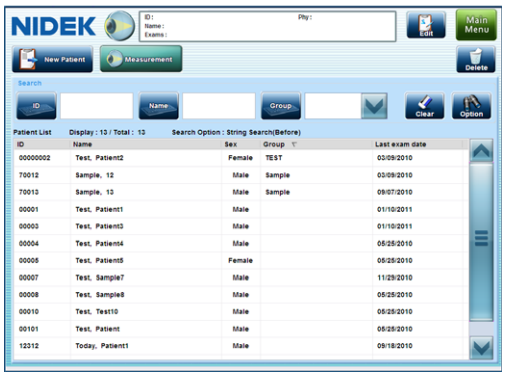
Pressing the Measurement button shows the measurement mode list for the operator to select the desired mode. Selecting “OPD/CT” displays the Patient list screen (before measurement).



Measurement mode list

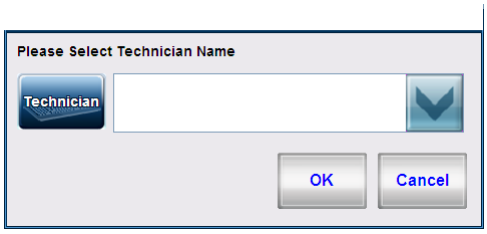
When “OPD/CT” is displayed

Pressing the Measurement button displays the Patient List screen (before measurement) in OPD/CT mode.



If the “Technician’s Name Entry” parameter is “On”, the screen for selecting the technician appears. Select the operator and press the Measurement button to move to the Patient List screen (before measurement).

Pressing the Cancel button moves to the Patient List screen without specifying the operator.



Note

- The “Technician’s Name Entry” parameter can be set in the Settings screen (Measurement tab).
  See “5.8.2 Measurement tab” (page 325) for details.
- To change the operator, return to the Main Menu screen, then press the Measurement button again to display the screen for selecting the operator.

3 Select the desired patient from the patient list.

Existing patient	Press the row of the patient.
New patient	Register the new patient. See “2.3.2 Registering a new patient” (page 50).

Pressing an item name (ID, Name, Sex, Group, or Last Exam Date) on top of the patient list sorts the data in ascending order. Pressing the item name once again sorts the data in descending order. The sort order is indicated by △ (ascending order) or ▽ (descending order) next to the item name.

To search the patient data, specify the easy search conditions (ID, Name, Group). Optional search conditions can be specified in the Search Option window.

For details of patient search, see “2.3.5 Patient search” (page 57).

[Inputting patient data when the device is connected to OPD Software for External PC via LAN]

Measurement data can be saved after selecting an existing patient from the patient list.

Measurement data of a new patient can be saved after registering the patient by inputting the patient ID, first and last names, sex, and the date of birth in the Create Patient screen in the same manner as saving a new patient in the OPD-Scan III.

4 Press the Measurement button to move to the Measurement screen.

Pressing the row of the desired patient twice (double-click) in the Patient List screen also displays the Measurement screen.

5 Prepare the patient.

1) Clean the forehead rest and chinrest that come into contact with the patient with clean gauze or absorbent cotton dampened with rubbing alcohol.

   If a stack of chinrest paper is on the chinrest, remove one sheet.

2) Instruct the patient to remove glasses or contact lenses, and sit on the chair.

Note

- To obtain accurate measurement from patients who wear contact lenses on a daily basis, it is recommended to have them wear glasses instead of contact lenses for a week before the measurement.

  The shape of the cornea altered by the contact lenses needs to be restored to the original condition.

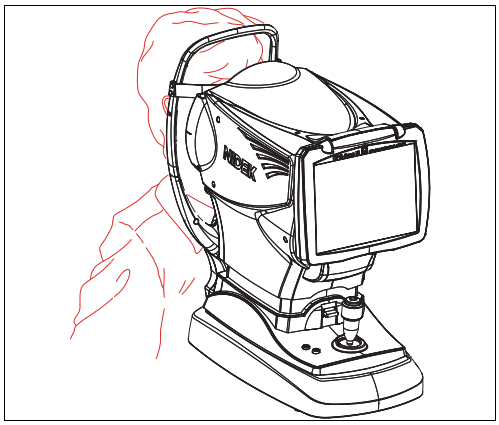
[Over-refraction]

Should case of over-refraction occur (measurement with glasses worn), the focus indicator may not appear (see page 68).

Execute the OPD measurement at the position where the alignment light becomes the smallest. However, reflection of the measurement light by the glasses may interfere with proper OPD measurement.

CT measurement cannot be executed properly due to causes such as alteration of image magnification by the glasses.

3) Have the patient place their chin on the chinrest as deeply as possible, and their forehead gently on the forehead rest.

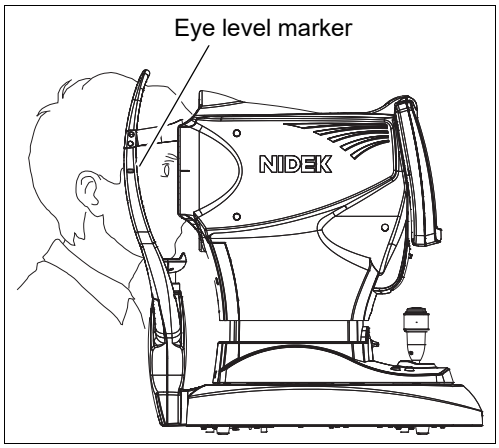


4) Adjust the height of the chinrest with the chinrest up/down button (▲ , ▼) so that the patient's eyes are roughly aligned with the eye level marker.

Before adjusting the height of the chinrest, let the patient know that the chinrest moves up and down.

When moving the chinrest up or down, check the patient condition directly.

If a large deviation with the eye level marker is found, release the chin from the chinrest and then move the chinrest up or down.



When the chinrest is at the upper (or lower) mechanical limit, the upper limit indicator  (or lower limit indicator ) is displayed on the screen.

Note

- To relax the patient, explain the following before measurement:
  This measurement is for determining the best lens for the patient and for measuring the corneal shape. The weak infrared light and blue light used for measurement do not harm the eyes.

6 Set the measurement conditions as necessary.

Measurement mode

Each pressing of the measurement mode button changes the selected mode as OPD/CT  → OPD  → CT  → OPD/CT→...

The measurement items corresponding to the selected measurement mode are displayed on the screen.

Auto shot function

Press the button to select the auto shot function.

 Manual	The auto shot function is disabled. Press the start button to start measurement.
 Auto	The auto shot function is enabled. Measurement starts automatically when the eye is best aligned and focused. In the CT measurement, the auto shot function is disabled.

Note

- When the auto shot function is used, any operation may not be effective during the time from the auto alignment to the start of the measurement.

Auto tracking function

Press the button to select the auto tracking function.

 3D	The auto tracking function in the forward and back, right and left, and up and down directions is enabled.
 2D	The auto tracking function in the right and left, and up and down directions is enabled.
 OFF	The auto tracking function is disabled. Manually align the device and bring the eye into focus.

Note

- Once the measurement settings above are set, they are maintained in the subsequent measurements.

7 Start measurement.

For details of each measurement, see:

"2.5 Measurement in OPD/CT measurement mode" (page 66)

"2.6 OPD Measurement" (page 81)

"2.7 CT Measurement" (page 88)

Note

- Instruct the patient not to blink during measurement. For successful measurement, it is recommended to have the patient blink once then open their eyes wide just before measurement.
- Instruct the patient to open both eyes wide during measurement.

  Closing one eye may cause unstable fixation and insufficient opening of the other eye.
- For patients who have difficulty fixating their eyes, the operator should guide the patient's gaze direction by voice.
- If necessary, temporarily enable the desired functions by pressing the Measure Option button.

  See "2.4 Measurement" (page 59) for details.

After verifying the measurement result, save the data in the database by operating the specific button in the screen.

⚠ **CAUTION**

- **Do not save excessively many measurement data sets for a single patient ID. It is recommended to determine the limit of the number of data sets to 100 for the right and 100 for the left eye.**

  If a large amount of data is saved for a single patient ID and the data processing becomes heavy, the processing may become slow and an error may occur.

8 Release the patient from the chinrest.

Instruct them to remain seated when removing their head from the chinrest. If they stand up at this time, their head may hit the headrest.

9 To measure the next patient, repeat from Step 3.

See "2.2.3 Shut down" (page 48) for details on finishing measurements.

To view the measurement result, see "2.8 Viewing Maps" (page 95).

To print the measurement result, see "2.12 Printing" (page 133).

2.5 Measurement in OPD/CT measurement mode

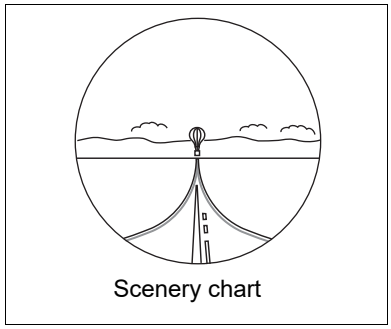
In OPD/CT measurement mode, OPD measurement and CT measurement are successively executed.
The OPD/CT measurement mode screen displays “Ref: S, C, A” (OPD measurement), and “SimK: R1, R2, A (or AVG, CYL, A)” (CT measurement) on both sides.

2.5.1 OPD/CT single measurement

Both in OPD and CT measurement modes, the best measurement data selected by the device is saved to the database.

To perform measurement in Single measurement mode, “Single” needs to be selected for “Results to Display” in the Settings screen (Measurement tab).

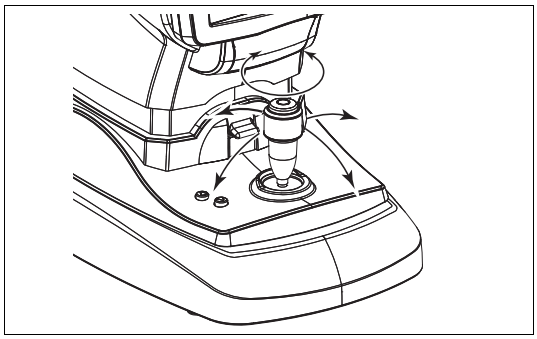
1 Instruct the patient to look into the measuring window, relax, and stare at the picture of balloon with eyes wide open.


Scenery chart

2 Manipulate the joystick so that the patient’s eye is displayed in the screen.

Moving the joystick right, left, forward, and back moves the main body of the device in the same direction. Rotating the knob of the joystick moves the main body up and down.

Move the main body up, down, right and left to align it with the patient’s eye. Then adjust the focus to the patient’s eye by moving the main body forward and back.



3 Perform alignment and focus adjustment.

The method of alignment and focus adjustment varies depending on the setting of the auto tracking function.

* See “2.4.1 Measurement procedure” (page 61) for details.

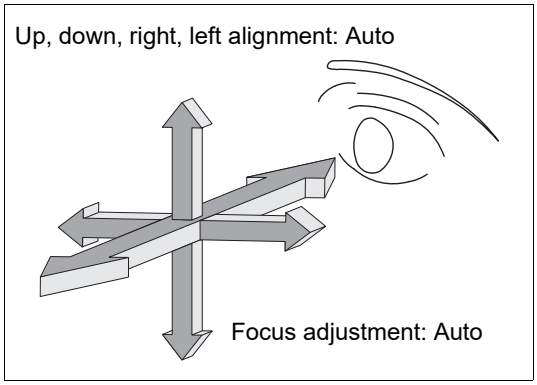
Perform alignment by bringing the alignment light (center of the eye) in the alignment target.

Adjust the focus while referring to the focus indicator displayed in the center of the screen.

Check that the patient’s pupil is larger than the minimum pupil mark.

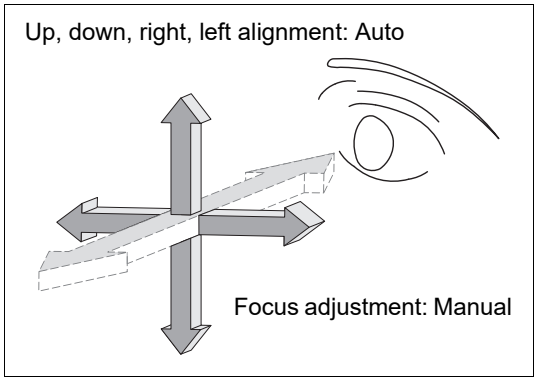
3D auto tracking 

1) Perform rough alignment and focus adjustment to the working range of the auto tracking function.
2) When the main body is brought into the working range of the auto tracking function, fine alignment and focus adjustment automatically starts.



2D auto tracking 

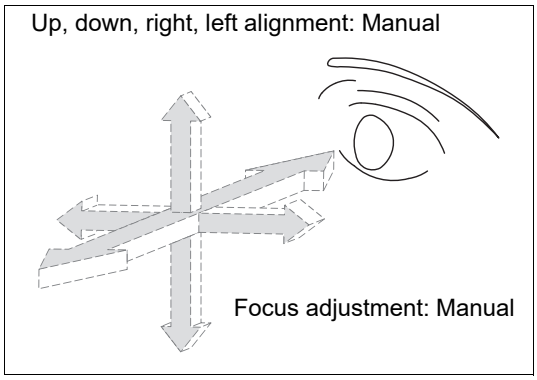
1) Perform rough alignment and focus adjustment to the working range of the auto tracking function.
2) When the main body is brought into the working range of the auto tracking function, fine alignment automatically starts.
3) As the focus indicator is displayed, manipulate the joystick until the optimum focus indicator is displayed.



Auto tracking OFF 

1) Perform alignment and focus adjustment.
2) Manipulate the joystick to bring the alignment light reflected on the patient's eye patient's eye to into the alignment target.
3) When the focus indicator is displayed, adjust the focus so that the focus indicator indicates the best focus condition.

   During the focusing, maintain the alignment between the device and the patient's eye.



Note

- If eyelashes cover the minimum pupil circle, proper measurement may not be achieved.

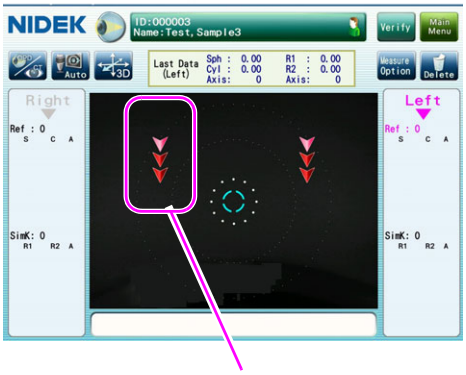
  In such a case, instruct the patient to open their eyes wider.

  If the patient cannot open their eyes wider, lift the patient's eyelid while paying attention not to press against the eyeball.

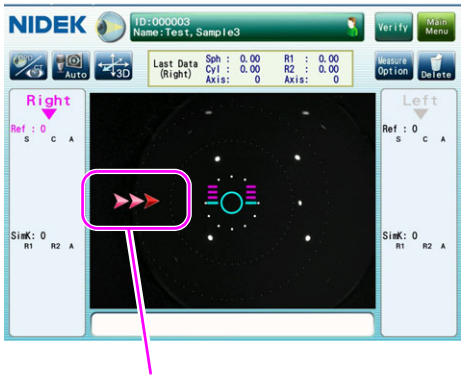
If the alignment is outside the working range of the auto tracking function

The limit indicator appears. Manipulate the joystick or the chinrest up/down button while referring to the limit indicator.

<Example of limit indicator>



The measuring unit is too high from the patient's eye.
Move the measuring unit down.

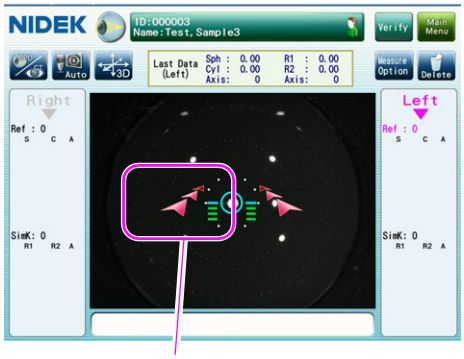


The measuring unit is too far to the left from the patient's eye.
Tilt the joystick to the right to move the measuring unit to the right.

	Move the measuring unit up.
	Move the measuring unit down.
	Tilt the joystick slightly to the right.
	Tilt the joystick slightly to the left.

○ Focus indicator displays:

If the focus is outside the working range of the auto tracking function, the limit indicator appears.

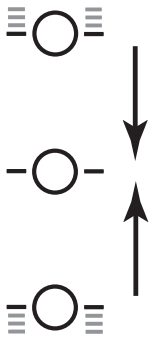


Focus limit indicator

When the focus indicator appears, manipulate the joystick while referring to it.

	Push the joystick forward to move the measuring unit closer to the patient.
	Pull the joystick back to move the measuring unit away from the patient.

Refer to the focus indicator for the amount to move the joystick forward and back.



Too close to the patient's eye

Pull the joystick back to move the measuring unit away from the patient's eye.

Best focus condition

Push the joystick forward to move the measuring unit closer to the patient's eye.

Too far from the patient's eye

4 Measurement starts.

To measure both right and left eyes in OPD/CT measurement mode, either Procedure (A) or (B) can be selected.

(A) First the OPD and CT measurements are performed for one eye, then the same measurements are performed for the other eye.

Example: OPD measurement (right eye) → CT measurement (right eye) → OPD measurement (left eye) → CT measurements (left eye)

(B) The OPD measurement is performed for both eyes, then the CT measurement is performed for both eyes.

Example: OPD measurement (right eye) → OPD measurement (left eye) → CT measurement (right eye) → CT measurements (left eye)

In this manual, the measurement procedure is explained with Procedure (A).

When Procedure (A) is used, the accuracy of the PD measurement executed at the same time as the OPD measurement may be lowered. This is because the time difference between the OPD measurements for right and left eyes is greater in Procedure (A) than (B), and the probability of shift in the pupil position is higher.

Note

- When the OPD and CT measurements for an eye is complete in Single measurement mode, the Verify Examination Quality screen is displayed.

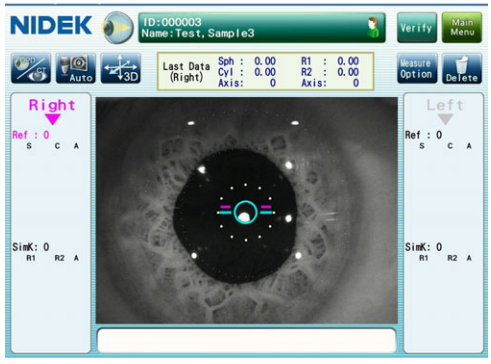
The eye to be measured is automatically switched between the right and left eyes when the measuring unit is moved and the eye to be measured is displayed in the screen.

The currently displayed eye (right/left) and measurement mode (OPD/CT) are shown in pink in the Measurement screen.

① When the best alignment and focus are achieved, the OPD measurement automatically starts (when the auto shot function is enabled).

When the auto shot function is disabled, press the start button to start measurement.

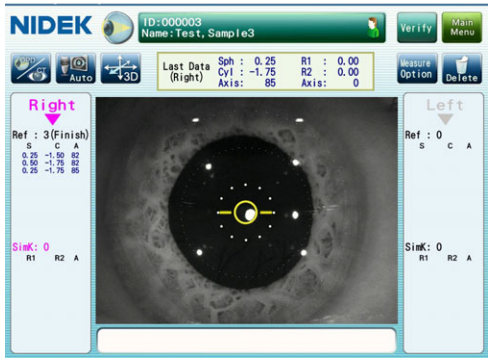
When the OPD measurement is executed the specified number of times, "Finish" appears on the side of the "Ref" indication, and the OPD measurement is complete.



For the setting of the number of measurements, see “ [OPD measurement count]” (page 71).

▼

② When the OPD measurement is complete, the “SimK” indication for the selected eye in the Eyes/Measurement display is shown in pink.



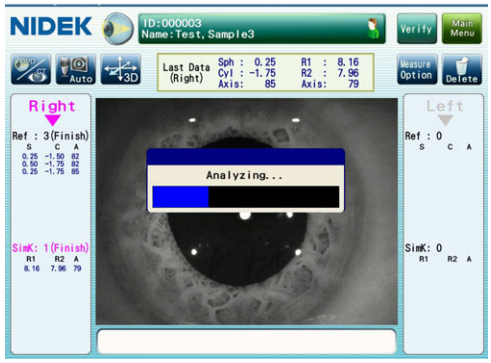
▼

③ To prepare for the next measurement, have the patient slowly blink once or twice.

▼

④ When the best alignment and focus are achieved, press the start button to start the CT measurement.

The start button needs to be pressed to start the CT measurement regardless of the auto shot function setting.



The latest OPD measurement and the latest keratometry simulated based on the CT measurement result are displayed in the latest data display in the upper part of the screen.

When the CT measurement is executed for the specified number of times, “Finish” appears on the side of the “SimK” indication, and the CT measurement is complete.

Inform the patient that the measurement is complete and have them rest comfortably.

Note

- Even when the auto shot function is enabled, the operator can start measurement by pressing the start button.

  If the measurement does not start automatically due to frequent blinks or other causes, the measurement can be started by pressing the start button.
- Instruct the patient not to blink or move their head or eyes during the measurement.
- If the measurement resulted in an error, the possible causes are as shown below. If the error occurs successively, find the cause.
  a. Patient’s blink during measurement
  b. Eyelid or eyelashes covering the minimum pupil mark during OPD measurement
  c. Eyelid or eyelashes covering the anterior segment illumination spots during CT measurement
  d. Patient’s pupil smaller than the minimum pupil mark

     Have the patient sit in a dark room for a while and wait until the pupil diameter becomes large enough for measurement.
  e. Extremely low retinal reflection due to eye disease such as cataract
  f. Extraneous reflection of light on the cornea during measurement
  g. Extremely distorted cornea

Note

- The measurement stops if the alignment or focus is off. However, when the alignment and focus are adjusted again and the measurement is performed, the measurement data is added to the memory together with the previous measurement data.
- A maximum of ten times of measurement data can be saved in the memory for the right and left eyes each. When a measurement data set is added to the memory with ten measurement data sets, the oldest data is deleted.

[OPD measurement count]

When the auto-shot function is turned ON		
	When “OPD” of “End Criteria” is “AI”	When the best alignment and focus are achieved, the OPD measurement is continued until the typical value is automatically obtained.
	When “OPD” of “End Criteria” is not “AI”	When the best alignment and focus are achieved, the OPD measurement is continued until the specified number of measurements is executed.
When the auto-shot function is turned OFF		
	When “OPD” of “End Criteria” is “AI”	Pressing the start button executes the OPD measurement once. Pressing and holding the start button continues the OPD measurement until the typical value is obtained.
	When “OPD” of “End Criteria” is not “AI”	Pressing the start button executes the OPD measurement once. Pressing the start button continues the OPD measurement until the specified number of measurements is executed.

Note

- The criteria for completing the OPD measurement is set with the “End Criteria – OPD” parameter in the Settings screen (Measurement tab).
- The OPD measurement can be repeated with fogging by checking “Single Fogging” in the Settings screen (Measurement tab).

[OPD measurement value display]

If the reliability of the measurement result is low or the measurement was executed with different measurement conditions than the usual, any of the symbols shown below appears to the right of the AR value in the screen.

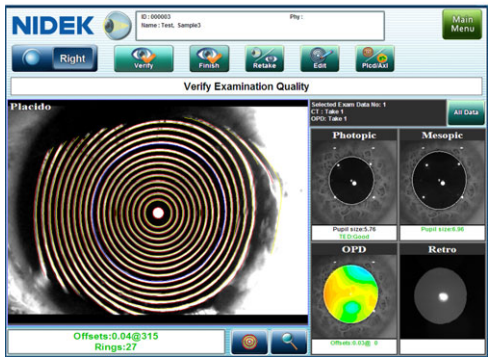
E	Indicates high RMS data (only when “High RMS Data” is selected under the Measurement tab in the Settings screen). The measurement value is displayed in orange.
*	Indicates that the measurement was executed in Cataract mode. If measurement cannot be executed due to cataract or any other eye abnormality, the measurement conditions are automatically changed to allow the measurement.
#	Indicates that the measurement was executed in Small Pupil mode. If measurement cannot be executed due to a small pupil, the measurement conditions are automatically changed to allow the measurement. The measurement value is shown in red. This data cannot be saved to the database.

Ef	Indicates that the measurement was executed without the focus indicator being displayed on the Measurement screen. The error message "No.413:Focus alignment is too off-centered." is displayed in the message box of the Measurement screen. The Offsets indication is shown in red on the Verify Examination Quality screen. The Offsets values displayed in the upper right corner of each map on the Summary screen are shown in red.

5 The Verify Examination Quality screen is displayed.

When the CT measurement is executed for the specified number of times, the Verify Examination Quality screen is automatically displayed.

If the CT measurement is not complete, press the Verify button to display the Verify Examination Quality screen.



Note

- When the OPD and CT measurements for an eye is complete in Single measurement mode, the Verify Examination Quality screen is displayed.

  In Single measurement mode, "Auto Display" of "Verify Exam window" is automatically enabled in the Settings screen (Measurement tab).

6 In the Verify Examination Quality screen, verify the result of image capture and ring edge detection.

Verify the result based on the following criteria:

- No influence from patient's blinking or eyelashes
- Eye opened wide (No gaps in ring)
- No influence from insufficient or excessive tears (No distortion in ring)
- Appropriate alignment (Green offset indication)
- Precisely detected ring edge (Correctly traced)
- No abnormality in map

Enlarged display with overlay items

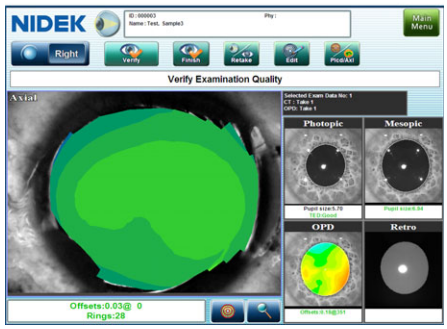
Detected placido ring edges are shown with red and yellow lines. However, the edge of the ring closest to the edge of the Q value analysis area is shown with blue lines. For many purposes, it is important that the edges of the rings inside this blue ring are precisely detected.

Note

- The blue edge does not appear in the enlarged display.
- The Q value analysis area is set in the Settings screen (Parameter tab).

The operations shown below are available in the Verify Examination Quality screen.

When the captured image and detected edges are satisfactory	Press the Verify button to returns to the Measurement screen to perform measurement of the other eye.

If edges need to be edit	Select “Placido” and press the Edit button. See “4.6 Editing Placido Ring Edges” (page 279)
If OPD measurement data needs to be edited	Select “OPD” and press the Edit button. See “4.7 Editing Detected Pupil Edge” (page 285)
When the captured image and detected edges are not satisfactory	Press the Retake button. Pressing this button displays the options: “Retake OPD/CT”, “Retake OPD”, and “Retake CT”. Select the desired measurement mode. The Measurement screen is displayed. Perform additional measurement.
Finishing measurement with only one eye	Press the Finish button. The Verify Result window appears. Check processing of data after measurement.
Toggling display of the edge detection result	Press the edge display button  . Each pressing of this button toggles display of the edge detection result.
Displaying the Axial map and review it	Press the Plcd/Axl button  . Each pressing of this button toggles between the Placido image and the Axial map. Review the Axial map to check that it is not affected by tear fluid or such. 
Enlarging the image and displaying overlay items	Press the enlarge button  . View the overlay items in the enlarged display.
Viewing all the measurement data	Press the All Data button to move to the Verify Multi Measurement screen and display all measurement data. Selected data can be changed.
Stopping measurement	Press the Main Menu button to move to the Main Menu screen without saving the measurement data. The message ‘Data has not been saved. Are you sure you want to return to “Main Menu? Yes/No”’ appears. Press ”Yes” to move to the Main Menu screen.

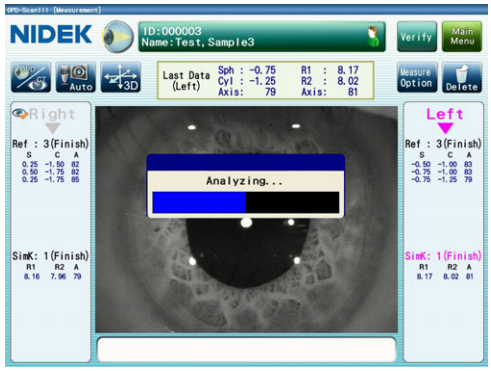
Note

- The placido ring will be illuminated for about 15 seconds before the second measurement to prevent the patient from becoming surprised and blinking. Measurement can be started by pressing the start button while the placido ring is illuminated or after it is turned off in 15 seconds.

7 Press the Verify button to complete measurement of one eye and return to the Measurement screen.

Pressing the Delete button  displays the message, “Are you sure you want to delete the measurement data? Yes/No”. Pressing the Yes button deletes all data being displayed.

8 Switch the eye to be measured, and measure the other eye in the same manner.

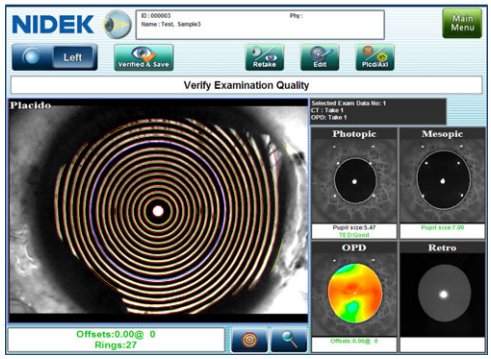


9 When "Finish" is indicated for the CT measurement, the Verify Examination Quality screen is displayed.

Verify them in the same manner as Step 6.

The Verify Examination Quality screen displayed after measurement of both eyes differs from that displayed after measurement of one eye.

Instead of the Verify button, the Verified & Save button is displayed. The Finish button is not displayed.



The operations shown below are available in the Verify Examination Quality screen.

When the captured image and detected edges are satisfactory	Press the Verified & Save button. The Verify Result window appears. Check processing of data after measurement.

In addition, verify the result of image capture and ring edge detection in the same manner as Step 6.

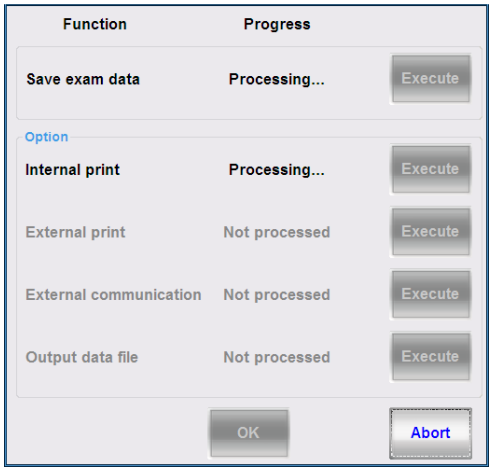
Note

- If the eye (right/left) indication in the screen is switched, the Verified & Save button is not displayed and the Retake button becomes disabled.

10 Pressing the Verified & Save button displays the Verify Result window to show the progress of the processing after the measurement.

The progress of data saving and optional functions is displayed.

Wait until the selected functions are complete.

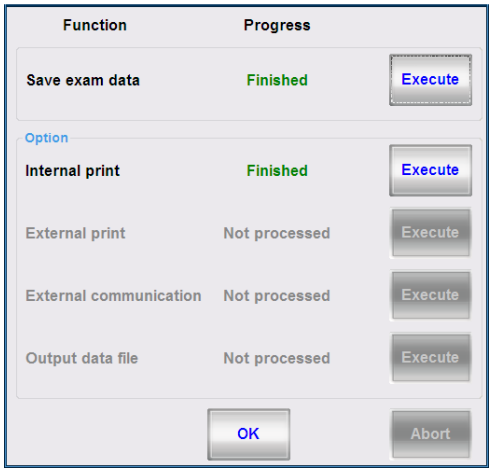


Internal print	Printing of measurement data with the internal printer
External print	Printing of maps with an external color printer
External communication	Data output from RS232C to NIDEK system table
Output data files	Output of text data/map file to EMR

The processing is complete when the indication "Processing" changes to "Finished".

Pressing the Abort button before the processing completes stops the processing.

Pressing the Execute button in the Verify Result window after the processing is finished executes the processing again.



Note

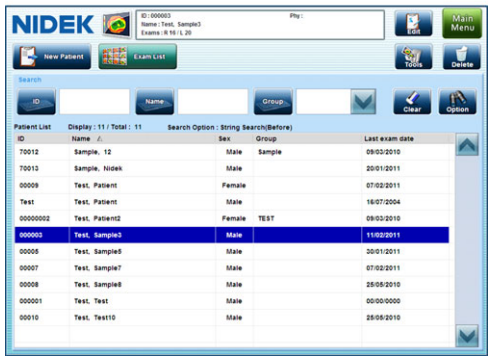
- The optional functions "Internal print", "External print", "External communication", and "Output data files" are enabled with the "Accept Button Handling – Option" parameter in the Settings screen (Measurement tab).
- To perform the patient view simulation in connection with the RT-5100 using the external communication function, see "2.8.5 Patient view simulation using RT data" (page 109).
- If the optional functions "External print" and "Output data files" need to be executed even if they are "Not processed", display the measurement data in a summary and press the Print button, or press the Tool button and select "Data Output".

  The other functions, "Save exam data", "Internal print" and "External communication" cannot be executed with this method.

11 Press the OK button to close the Verify Result window.

Depending on the setting, the Patient List screen or the Summary screen is displayed.

In the respective screen, select the next patient, or view or print maps.



Note

- The screen to be displayed after closing the Verify Result window is set with the "Accept Button Handling – Next Window" parameter in the Settings screen (Measurement tab).

2.5.2 OPD/CT multi measurement (Multi measurement mode)

In Multi measurement mode, sets of data to be saved in the database can be selected from multiple measurements.

To perform measurement in Multi measurement mode, “Multiple” needs to be selected for “Results to Display” in the Settings screen (Measurement tab).

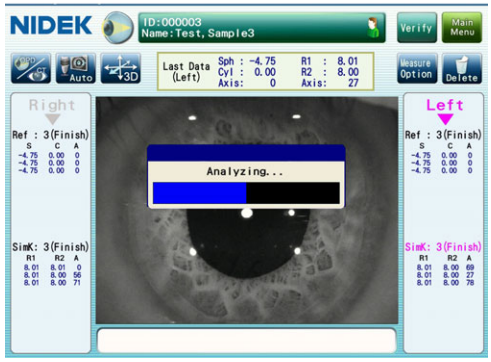
1 Perform alignment and focusing, then start measurement.

For the procedure up to start of the measurement, see “2.5.1 OPD/CT single measurement” (page 66).

2 As in Single measurement mode, perform the OPD and CT measurements of one eye.

Even when “Auto Display” of “Verify Exam Window” is checked in the Settings screen (Measurement tab), the Verify Examination Quality screen is not displayed after the specified number of CT measurements.

3 Switch the eye to be measured, then perform the OPD and CT measurements in the same manner.



4 When the measurements for both eyes is complete, the Verify Multi Measurement screen is displayed.

When “Auto Display” of “Verify Exam Window” is checked in the Settings screen (Measurement tab), the Verify Multi Measurement screen is automatically displayed after the specified number of CT measurements.

If “Auto Display” is not checked or the measurement is not complete, press the Verify button in the Measurement screen to display the Verify Multi Measurement screen.

When the Verify Multi Measurement screen is displayed, data sets that satisfy the specific criteria are selected. If no data satisfies the criteria, no data set is selected.

5 Press and select the OPD and CT measurement data to be saved.

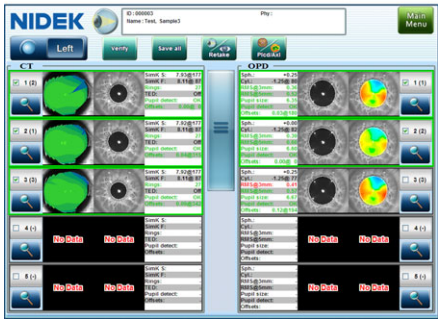
The selected data is framed in green and a check mark is placed on the side of the measurement number.

Pressing the selected data again cancels the selection.

Select the data to be saved based on the criteria below.

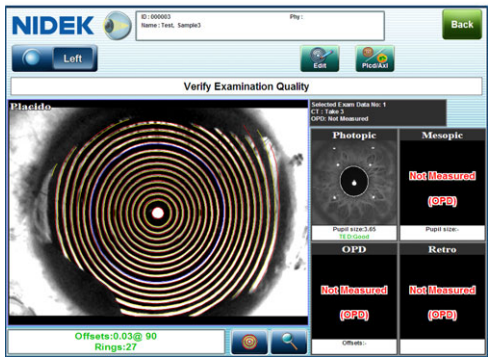
- No influence from patient's blinking or eyelashes
- Eye opened wide (No gaps in ring)
- No influence from insufficient or excessive tears (No distortion in ring)
- Appropriate alignment (Green offset indication)
- Precisely detected ring edge (Correctly traced)
- No abnormality in map

The operations shown below are available in the Verify Multi Measurement screen.

When the captured image and detected edges are satisfactory	Press the Retake button Pressing this button displays the options: "Retake OPD/CT", "Retake OPD", and "Retake CT". Select the desired measurement mode. The Measurement screen is displayed. Perform additional measurement.
Displaying the Axial map and review it	Press the Plcd/Axl button  . Each pressing of this button toggles between the Placido image and the Axial map. Review the Axial map to check that it is not affected by tear fluid or such. 
Enlarging the image	Press the enlarge button (). View the image in the Verify Examination Quality screen.
Stopping measurement	Press the Main Menu button to move to the Main Menu screen without saving the measurement data. The message 'Data has not been saved. Are you sure you want to return to "Main Menu"? Yes/No' appears. Press the Yes button to move to the Main Menu screen.

Pressing the enlarge button () displays the data in the Verify Examination Quality screen.

Pressing the Back button returns to the Verify Multi Measurement screen.



The operations shown below are available in the Verify Examination Quality screen.

If edges need to be edited	Select “Placido” and press the Edit button. See “4.6 Editing Placido Ring Edges” (page 279).
If OPD data needs to be edited	Select “OPD” and press the Edit button. See “4.7 Editing Detected Pupil Edge” (page 285).
Toggling display of the edge detection result	Press the edge display button ( ). Each pressing of this button toggles display of the edge detection result.
Enlarging the image and displaying overlay items	Press the enlarge button ( ). View the overlay items in the enlarged display.

6 Switch the eye (right/left) with the Right/Left button, then select the OPD and CT data to be saved for the other eye in the same manner.

The selected data is framed in green and a check mark is placed on the side of the measurement number.

Pressing the selected data again cancels the selection.

Note

- If the other eye has not been measured, pressing the Right/Left button displays the message, “No data is found.”

7 Press the Verify or Save all button to save the data.

Verify button	Selected data is saved in the database.
Save all button	All data sets are saved in the database. Selection of individual data sets is not necessary.

Note

- Save the data after verifying the measurement result of both eyes.

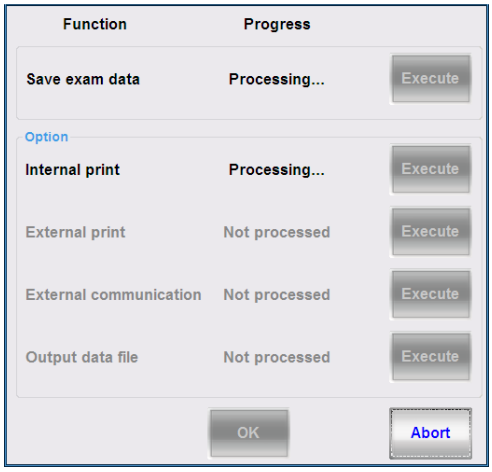
  Trying to save all data after verifying only the data for one eye displays the message “Data for the other eye will be displayed. Both eyes must be verified before saving the data.” Then the data for the other eye is displayed.

- If there is no selected measurement data, this Verify button is disabled.

8 The Verify Result window appears to show the progress of the processing after the measurement.

The progress of data saving and optional functions is displayed.

Wait until the selected functions are complete.

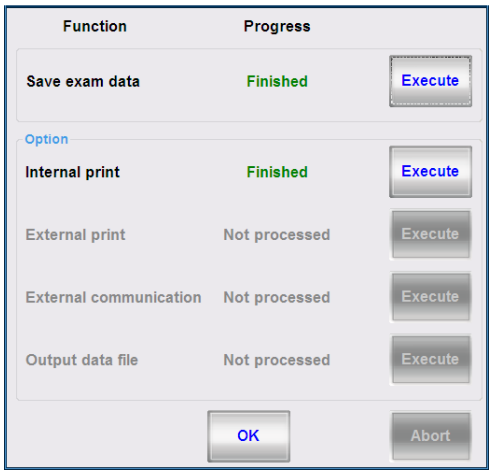


Internal print	Printing of measurement data with the internal printer
External print	Printing of maps with an external color printer
External communication	Data output from RS232C to NIDEK system table
Output data files	Output of text data/map file to EMR

The processing is complete when the indication “Processing” changes to “Finished”.

Pressing the Abort button before the processing completes stops the processing.

Pressing the Execute button in the Verify Result window after the processing is finished executes the processing again.



Note

- The optional functions “Internal print”, “External print”, “External communication”, and “Output data files” are enabled with the “Accept Button Handling – Option” parameter in the Settings screen (Measurement tab).
- To perform the patient view simulation in connection with the RT-5100 using the external communication function, see “2.8.5 Patient view simulation using RT data” (page 109).
- If the optional functions “External print” and “Output data files” need to be executed even if they are “Not processed”, display the measurement data in a summary and press the Print button, or press the Tool button and select “Data Output”.

  The other functions, “Save exam data”, “Internal print” and “External communication” cannot be executed with this method.

9 Press the OK button to close the Verify Result window.

Depending on the setting, the Patient List screen or the Summary screen is displayed.

In the respective screen, select the next patient, or view or print maps.

Note

- The screen to be displayed after closing the Verify Result window is set with the “Accept Button Handling – Next Window” parameter in the Settings screen (Measurement tab).

2.6 OPD Measurement

In OPD measurement mode, only the OPD measurement (objective refractive error) is performed.

2.6.1 OPD single measurement

In OPD Single measurement mode, the best measurement data selected by the device is saved to the database.

To perform measurement in Single measurement mode, “Single” needs to be selected for “Results to Display” in the Settings screen (Measurement tab).

1 Perform alignment and focusing, then start measurement.

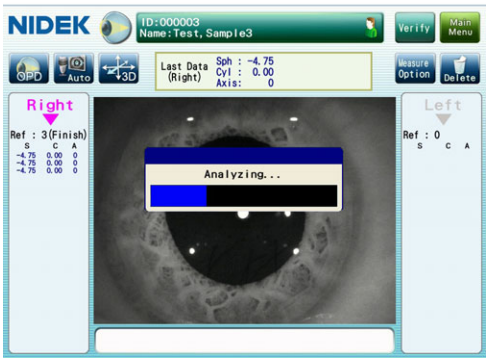
For the procedure up to start of the measurement, see “2.5.1 OPD/CT single measurement” (page 66).

2 Perform the measurement.

When the best alignment and focus are achieved, the OPD measurement automatically starts. (Auto shot function ON)

If the auto shot function is “OFF”, press the start button to start the measurement.

The latest OPD measurement values are displayed in the latest data display in the upper part of the screen.



When the OPD measurement is executed for the specified number of times, Finish” appears on the side of the “Ref” indication, and the OPD measurement is complete.

Note

- The measurement stops if the alignment or focus is off. However, when the alignment and focus are adjusted again and the measurement is performed, the measurement data is added to the memory together with the previous measurement data.
- A maximum of ten times of measurement data can be saved in the memory for the right and left eyes each. When a measurement data set is added to the memory with ten measurement data sets, the oldest data is deleted.

[OPD measurement count]

When the auto-shot function is turned ON		
	When "OPD" of "End Criteria" is "AI"	When the best alignment and focus are achieved, the OPD measurement is continued until the typical value is automatically obtained.
	When "OPD" of "End Criteria" is not "AI"	When the best alignment and focus are achieved, the OPD measurement is continued until the specified number of measurements is executed.
When the auto-shot function is turned OFF		
	When "OPD" of "End Criteria" is "AI"	Pressing the start button executes the OPD measurement once. Pressing and holding the start button continues the OPD measurement until the typical value is obtained.
	When "OPD" of "End Criteria" is not "AI"	Pressing the start button executes the OPD measurement once. Pressing the start button continues the OPD measurement until the specified number of measurements is executed.

Note

- The criteria for completing the OPD measurement is set with the "End Criteria – OPD" parameter in the Settings screen (Measurement tab).
- The OPD measurement can be repeated with fogging by checking "Single Fogging" in the Settings screen (Measurement tab).

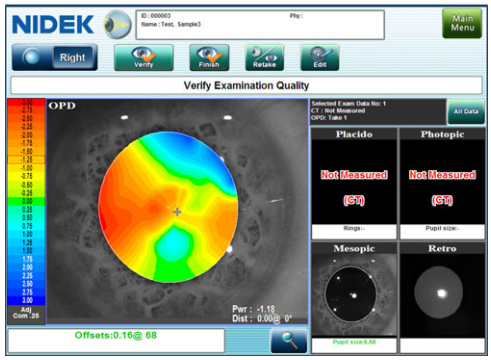
[OPD measurement value display]

If the reliability of the measurement result is low or the measurement was executed with different measurement conditions than the usual, any of the symbols shown below appears to the right of the AR value in the screen.

E	Indicates high RMS data (only when "High RMS Data" is selected under the Measurement tab in the Settings screen). The measurement value is displayed in orange.
*	Indicates that the measurement was executed in Cataract mode. If measurement cannot be executed due to cataract or any other eye abnormality, the measurement conditions are automatically changed to allow the measurement.
#	Indicates that the measurement was executed in Small Pupil mode. If measurement cannot be executed due to a small pupil, the measurement conditions are automatically changed to allow the measurement. The measurement value is shown in red. This data cannot be saved to the database.
Ef	Indicates that the measurement was executed without the focus indicator being displayed on the Measurement screen. The error message "No.413:Focus alignment is too off-centered." is displayed in the message box of the Measurement screen. The Offsets indication is shown in red on the Verify Examination Quality screen. The Offsets values displayed in the upper right corner of each map on the Summary screen are shown in red.

3 The Verify Examination Quality screen is displayed.

When the OPD measurement is complete, the Verify Examination Quality screen is automatically displayed.



Note

- When the OPD measurement for an eye is complete, the Verify Examination Quality screen is displayed.

  In Single measurement mode, “Auto Display” of “Verify Exam window” is automatically enabled in the Settings screen (Measurement tab).

4 Verify the result of image capture.

Verify the result based on the following criteria:

- No influence from patient’s blinking or eyelashes
- Eye is opened wide
- Appropriate alignment (Green offset indication)
- No abnormality in map

The operations shown below are available in the Verify Examination Quality screen.

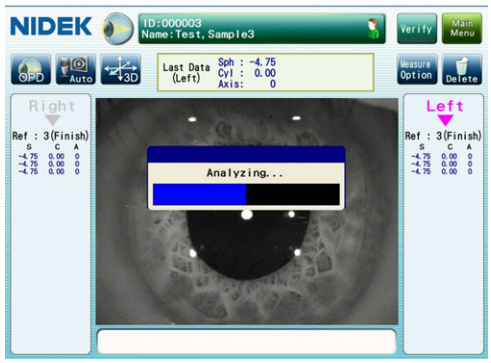
When captured image is proper	Press the Verify button to returns to the Measurement screen to perform measurement of the other eye.
If OPD data needs to be edited	Press the Edit button. See “4.7 Editing Detected Pupil Edge” (page 285).
If captured image is improper.	Press the Retake button. The Measurement screen is displayed. Perform additional measurement.
Finishing measurement with only one eye	Press the Finish button. The Verify Result window appears. Check processing of data after measurement.
Enlarging the image and displaying overlay items	Press the enlarge button  . View the overlay items in the enlarged display.
Viewing all the measurement data	Press the All Data button to move to the Verify Multi Measurement screen and display all measurement data. Selected data can be changed.
Stopping measurement	Press the Main Menu button to move to the Main Menu screen without saving the measurement data. The message ‘Data has not been saved. Are you sure you want to return to “Main Menu”? Yes/No’ appears. Press “Yes” to move to the Main Menu screen.

5 Press the Verify button to complete measurement of one eye and return to the Measurement screen.

Pressing the Delete button 

displays the message “Are you sure you want to delete the measurement data? Yes/No”. Pressing “Yes” deletes all data being displayed.

6 Switch the eye to be measured, and measure the other eye in the same manner.

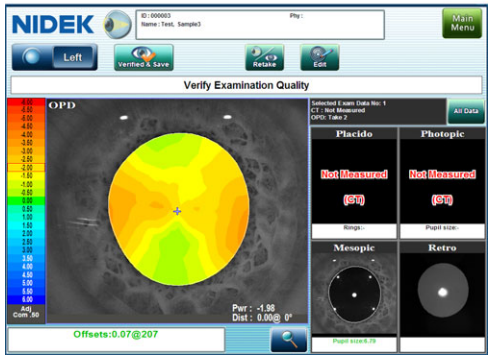


7 When “Finish” is indicated for the OPD measurement, the Verify Examination Quality screen is displayed. Verify the result of image capture.

Verify them in the same manner as Step 4.

The Verify Examination Quality screen displayed after measurement of both eyes differs from that displayed after measurement of one eye.

Instead of the Verify button, the Verified & Save button is displayed. The Finish button is not displayed.



The operations shown below are available in the Verify Examination Quality screen.

Captured image is proper.	Press the Verify & Save button. The Verify Result window appears. Verify the measurement result.

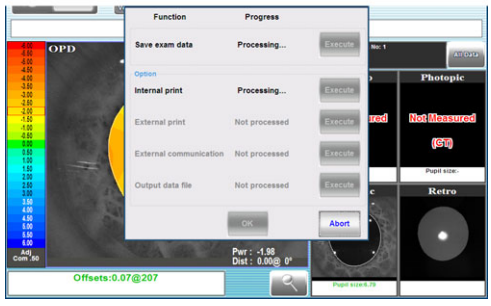
In addition, verify the result of image capture in the same manner as Step 4.

Note

- If the eye (right/left) indication in the screen is switched, the Verified & Save button is not displayed and the Retake button becomes disabled.

8 Press the Verified & Save button to display the Verify Result window that shows the progress of the processing after the measurement.

The procedure for data saving is the same as that in OPD/CT measurement mode.



2.6.2 OPD multi measurement (Multi measurement mode)

In Multi measurement mode, sets of data to be saved in the database can be selected from multiple measurements.

To perform measurement in Multi measurement mode, “Multiple” needs to be selected for “Results to Display” in the Settings screen (Measurement tab).

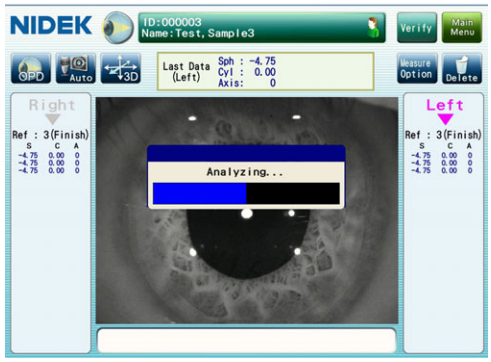
1 Perform alignment and focusing, then start measurement.

For the procedure up to start of the measurement, see “2.5.1 OPD/CT single measurement” (page 66).

2 As in Single measurement mode, perform the OPD measurement of one eye.

See “2.6.1 OPD single measurement” (page 81).

3 Switch the eye to be measured, and measure the other eye in the same manner.



4 When the measurements for both eyes is complete, the Verify Multi Measurement screen is displayed.

When “Auto Display” of “Verify Exam Window” is checked in the Settings screen (Measurement tab), the Verify Multi Measurement screen is automatically displayed after the OPD measurements.

If “Auto Display” is not checked or the measurement is not complete, press the Verify button in the Measurement screen to display the Verify Multi Measurement screen.

When the Verify Multi Measurement screen is displayed, data sets that satisfy the specific criteria are selected. If no data satisfies the criteria, no data set is selected.

5 Press the OPD data to be saved.

The selected data is framed in green and a check mark is placed on the side of the measurement number.

Pressing the selected data again cancels the selection.

Select the data to be saved based on the criteria below.

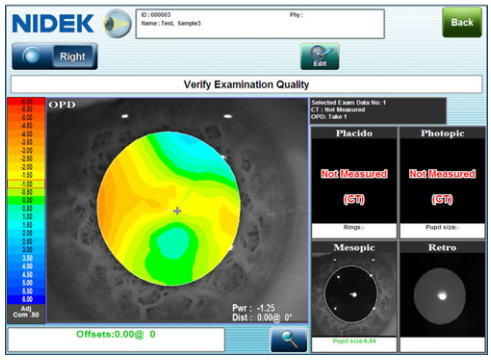
- No influence from patient's blinking or eyelashes
- Eye is opened wide
- Appropriate alignment (Green offset indication)
- No abnormality in map

The operations shown below are available in the Verify Multi Measurement screen.

If captured image is improper	Press the Retake button. The Measurement screen is displayed. Perform additional measurement.
Enlarging the image	Press the enlarge button ( ). View the image in the Verify Examination Quality screen.
Stopping measurement	Press the Main Menu button to move to the Main Menu screen without saving the measurement data. The message 'Data has not been saved. Are you sure you want to return to "Main Menu"? Yes/No' appears. Press the Yes button to move to the Main Menu screen.

Pressing the enlarge button ( ) displays the data in the Verify Examination Quality screen.

Pressing the Back button returns to the Verify Multi Measurement screen.



The operations shown below are available in the Verify Examination Quality screen.

If OPD data needs to be edited	Press the Edit button. See "4.7 Editing Detected Pupil Edge" (page 285).
Enlarging the image and displaying overlay items	Press the enlarge button ( ). View the overlay items in the enlarged display.

6 Switch the eye (right/left) with the Right/Left button, then select the OPD data to be saved for the other eye in the same manner.

The selected data is framed in green and a check mark is placed on the side of the measurement number.

Pressing the selected data again cancels the selection.

Note

- If the other eye has not been measured, pressing the Right/Left button displays the message “No data is found.”

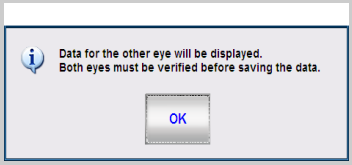
7 Press the Verify or “Save all” button to save the data.

Verify button	Selected data is saved in the database.
Save all button	All data is saved in the database. Selection of individual data sets is not necessary.

Note

- Save the data after verifying the measurement result of both eyes.

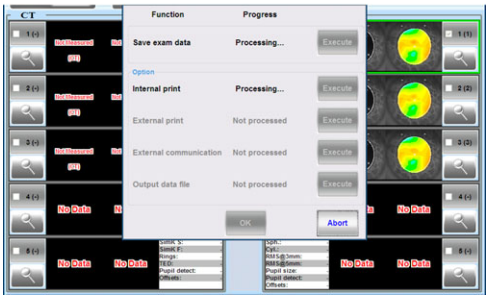
  Trying to save all data after verifying only the data for one eye displays the message “Data for the other eye will be displayed. Both eyes must be verified before saving the data.” Then the data for the other eye is displayed.



- If there is no measurement data, this Verify button is disabled.

8 The Verify Result window appears to show the progress of the processing after the measurement.

The procedure for data saving is the same as that in OPD/CT measurement mode.



2.7 CT Measurement

In CT measurement mode, only the CT measurement (corneal topography measurement) is performed.

2.7.1 CT single measurement

In CT single measurement mode, the best measurement data selected by the device is saved to the database.

To perform measurement in Single measurement mode, “Single” needs to be selected for “Results to Display” in the Settings screen (Measurement tab).

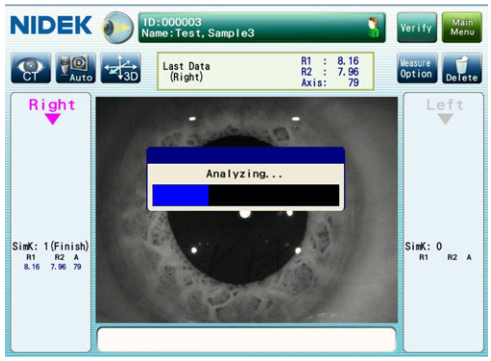
1 Perform alignment and focusing, then start measurement.

For the procedure up to start of the measurement, see “2.5.1 OPD/CT single measurement” (page 66).

2 Perform the measurement.

When the best alignment and focus are achieved, press the start button to start the CT measurement.

In the CT measurement, the auto shot function is disabled. The start button needs to be pressed to start the CT measurement regardless of the auto shot function setting.



① To prepare for the next measurement, have the patient slowly blink once or twice.

▼

② When the best alignment and focus are achieved, press the start button to start the CT measurement.

▼

③ Repeat Steps 1 and 2 to perform the CT measurement several times.

The latest keratometry simulated based on the CT measurement result is displayed in the latest data display in the upper part of the screen.

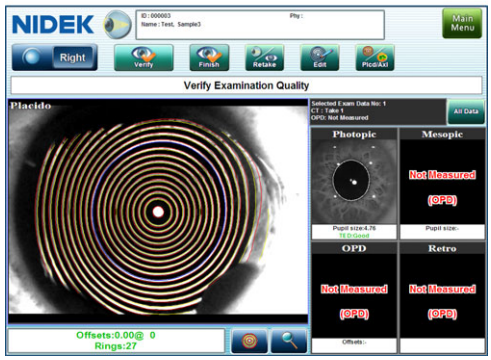
When the CT measurement is executed for the specified number of times, “Finish” appears on the side of the “SimK” indication, and the CT measurement is complete.

Note

- A maximum of ten times of measurement data can be saved in the memory for the right and left eyes each. When a measurement data set is added to the memory with the ten measurement data sets, the oldest data is deleted.

3 The Verify Examination Quality screen is displayed.

When the CT measurement is complete, the Verify Examination Quality screen is automatically displayed.



2

Note

- When the CT measurement for an eye is complete, the Verify Examination Quality screen is displayed.

  In Single measurement mode, “Auto Display” of “Verify Exam window” is automatically enabled in the Settings screen (Measurement tab).

4 Verify the captured image and ring edge detection result.

Verify the result based on the following criteria:

- No influence from patient’s blinking or eyelashes
- Eye opened wide (No gaps in ring)
- No influence from insufficient or excessive tears (No distortion in ring)
- Appropriate alignment (Green offset indication)
- Precisely detected ring edge (Correctly traced)
- No abnormality in map

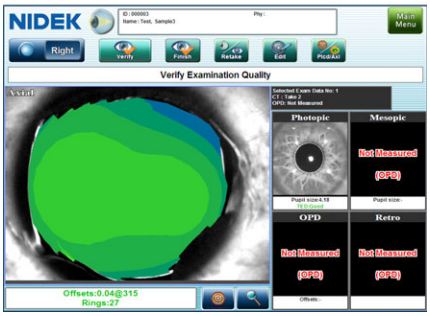
Detected placido ring edges are shown with red and yellow lines. However, the edge of the ring closest to the edge of the Q value analysis area is shown with blue lines. For many purposes, it is important that the edges of the rings inside this blue ring are precisely detected.

Note

- The blue edge does not appear in the enlarged display.
- The Q value analysis area is set in the Settings screen (Parameter tab).

The operations shown below are available in the Verify Examination Quality screen.

When the captured image and detected edges are satisfactory	Press the Verify button to returns to the Measurement screen to perform measurement of the other eye.
If edges need to be edited	Press the Edit button. See “4.6 Editing Placido Ring Edges” (page 279).
When the captured image and detected edges are satisfactory	Press the Retake button. The Measurement screen is displayed. Perform additional measurement.
Finishing measurement with only one eye	Press the Finish button. The Verify Result window appears. Verify the measurement result.
Toggling display of the edge detection result	Press the edge display button  . Each pressing of this button toggles display of the edge detection result.

Displaying the Axial map and review it	Press the Plcd/Axl button  . Each pressing of this button toggles between the Placido image and the Axial map. Review the Axial map to check that it is not affected by tear fluid or such. 
Enlarging the image and displaying overlay items	Press the enlarge button  . View the overlay items in the enlarged display.
Viewing all the measurement data	Press the All Data button to move to the Verify Multi Measurement screen and display all measurement data. Selected data can be changed.
Stopping measurement	Press the Main Menu button to move to the Main Menu screen without saving the measurement data. The message 'Data has not been saved. Are you sure you want to return to "Main Menu"? Yes/No' appears. Press "Yes" to move to the Main Menu screen.

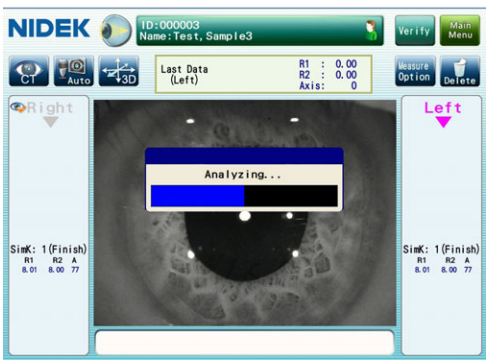
Note

- The placido ring will be illuminated for about 15 seconds before the second CT measurement to prevent the patient from becoming surprised and blinking. Measurement can be started by pressing the start button while the placido ring is illuminated or after it is turned off in 15 seconds.

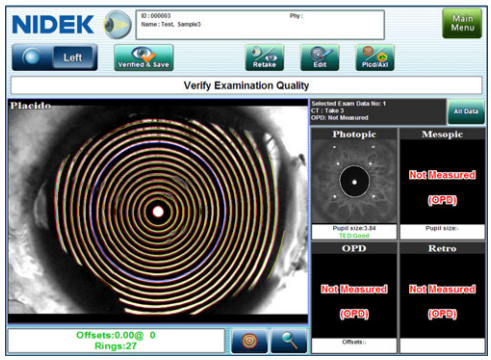
5 Press the Verify button to complete measurement of one eye and return to the Measurement screen.

Pressing the Delete button () displays the message, "Are you sure you want to delete the measurement data? Yes/No". Pressing the Yes button deletes all data being displayed.

6 Switch the eye to be measured, and measure the other eye in the same manner.



7 When “Finish” is indicated for the CT measurement (SimK), the Verify Examination Quality screen is displayed. Verify the result of image capture and ring edge detection.



Verify them in the same manner as Step 4.

The Verify Examination Quality screen displayed after measurement of both eyes differs from that displayed after measurement of one eye.

Instead of the Verify button, the Verified & Save button is displayed. The Finish button is not displayed.

The operations shown below are available in the Verify Examination Quality screen.

When the captured image and detected edges are satisfactory	Press the Verify & Save button. The Verify Result window appears. Verify the measurement result.

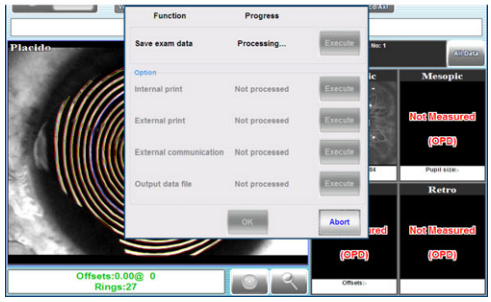
In addition, verify the result of image capture and ring edge detection in the same manner as Step 4.

Note

- If the eye (right/left) indication in the screen is switched, the Verified & Save button is not displayed and the Retake button becomes disabled.

8 Pressing the Verified & Save button displays the Verify Result window to show the progress of the processing after the measurement.

The procedure for data saving is the same as that in OPD/CT measurement mode.



2.7.2 CT multi measurement (Multi measurement mode)

In Multi measurement mode, sets of data to be saved in the database can be selected from multiple measurements.

To perform measurement in Multi measurement mode, “Multiple” needs to be selected for “Results to Display” in the Settings screen (Measurement tab).

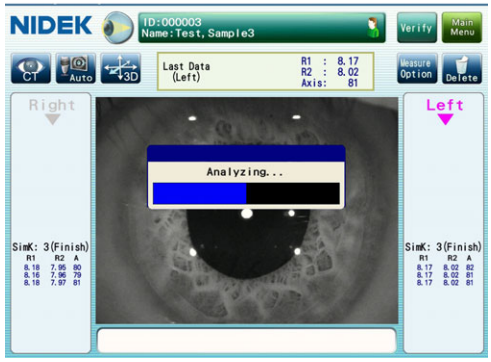
1 Perform alignment and focusing, then start measurement.

For the procedure up to start of the measurement, see “2.5.1 OPD/CT single measurement” (page 66).

2 As in Single measurement mode, perform the CT measurement of one eye.

See “2.7.1 CT single measurement” (page 88).

3 Switch the eye to be measured, and measure the other eye in the same manner.



4 When the measurements for both eyes is complete, the Verify Multi Measurement screen is displayed.

When “Auto Display” of “Verify Exam Window” is checked in the Settings screen (Measurement tab), the Verify Multi Measurement screen is automatically displayed after the specified number of CT measurements.

If “Auto Display” is not checked or the measurement is not complete, press the Verify button in the Measurement screen to display the Verify Multi Measurement screen.

When the Verify Multi Measurement screen is displayed, data sets that satisfy the specific criteria are selected. If no data satisfies the criteria, no data set is selected.

5 Press the CT data to be saved.

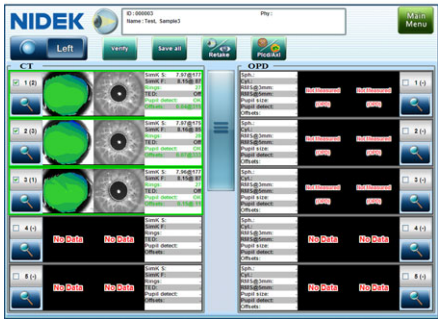
The selected data is framed in green and a check mark is placed on the side of the measurement number.

Pressing the selected data again cancels the selection.

Select the data to be saved based on the criteria below.

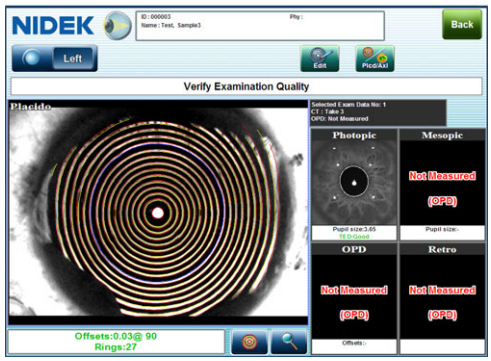
- No influence from patient's blinking or eyelashes
- Eye opened wide (No gaps in ring)
- No influence from insufficient or excessive tears (No distortion in ring)
- Appropriate alignment (Green offset indication)
- Precisely detected ring edge (Correctly traced)
- No abnormality in map

The operations shown below are available in the Verify Multi Measurement screen.

When the captured image and detected edges are satisfactory	Press the Retake button. The Measurement screen is displayed. Perform additional measurement.
Displaying the Axial map and review it	Press the Plcd/Axl button  . Each pressing of this button toggles between the Placido image and the Axial map. Review the Axial map to check that it is not affected by tear fluid or such. 
Enlarging image.	Press the enlarge button  . View the image in the Verify Examination Quality screen.
Stopping measurement	Press the Main Menu button to move to the Main Menu screen without saving the measurement data. The message 'Data has not been saved. Are you sure you want to return to "Main Menu"? Yes/No' appears. Press "Yes" to move to the Main Menu screen.

Pressing the enlarge button () displays the data in the Verify Examination Quality screen.

Pressing the Back button returns to the Verify Multi Measurement screen.



The operations shown below are available in the Verify Examination Quality screen.

If edges need to be edited	Press the Edit button. See “4.6 Editing Placido Ring Edges” (page 279).
Toggling display of the edge detection result	Press the edge display button  . Each pressing of this button toggles display of the edge detection result.
Enlarging the image and displaying overlay items	Press the enlarge button (). View the overlay items in the enlarged display.

6 Switch the eye (right/left) with the Right/Left button, then select the CT data to be saved for the other eye in the same manner.

The selected data is framed in green and a check mark is placed on the side of the measurement number.

Pressing the selected data again cancels the selection.

Note

- If the other eye has not been measured, pressing the Right/Left button displays the message, “No data is found.”

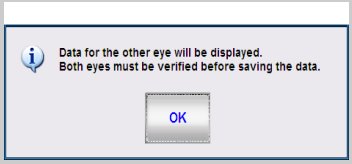
7 Press the Verify or Save all button to save the data.

Verify button	Selected data is saved in the database.
Save all button	All data is saved in the database. Selection of individual data sets is not necessary.

Note

- Save the data after verifying the measurement result of both eyes.

  Trying to save all data after verifying only the data for one eye displays the message “Data for the other eye will be displayed. Both eyes must be verified before saving the data.” Then the data for the other eye is displayed.



- If there is no measurement data, this Verify button is disabled.

8 The Verify Result window appears to show the progress of the processing after the measurement.

The procedure for data saving is the same as that in OPD/CT measurement mode.

2.8 Viewing Maps

There are two methods to display the OPD/CT measurement results in the Summary screen (color map).

1. Displaying measurement data in a summary immediately after measurement

See “2.8.1 Displaying summary from Measurement screen” (page 95).

2. Displaying a summary using the existing measurement data selected in the Patient List screen

See “2.8.2 Displaying summary from Patient List screen” (page 97).

* The difference analysis result and the comparison analysis result can only be displayed with Method 2.

  See “2.10 Difference Analysis Display” (page 124) and “2.11 Comparison Analysis Display” (page 129).

* Summaries are displayed in a map layout specified in advance.

2.8.1 Displaying summary from Measurement screen

To automatically display the summary screen from the Measurement screen after measurement, select “Summary” with the “Accept Button Handling – Next Window” parameter in the Settings screen (Measurement tab) in advance.

Note

- With the “Accept Button Handling – Next Window” parameter, the screen to be displayed after measurement can be selected from the Patient List screen and the Summary screen. For the procedure to set the summary screen to be displayed instead of the Patient List screen, see “2.8.2 Displaying summary from Patient List screen” (page 97).

The procedure below is explained based on the precondition that the summary screen is set to be automatically displayed after measurement. The procedure for displaying the summary screen is not explained.

1 Display the Patient List screen (before measurement).

Press the Measurement button in the Main Menu screen to move to the Patient List screen.

2 Press the row of the patient to be measured.

Pressing an item name (ID, Name, Sex, Group, or Last Exam Date) on top of the patient list sorts the data in ascending order. Pressing the item name once again sorts the data in descending order. The sort order is indicated by (ascending order) or (descending order) on the side of the item name.

To retrieve the desired data, use the Search Option window. See “2.3.5 Patient search” (page 57) for details.

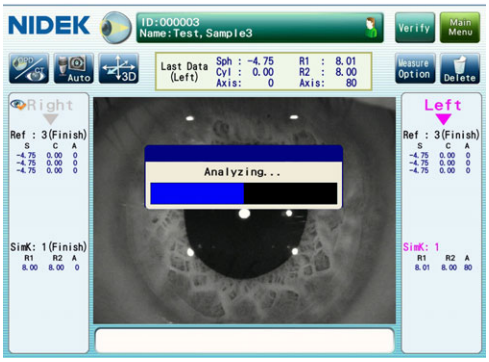
1) Press the Option button to open the Search Option window.

2) Input search conditions and press the OK button.

To cancel the search result and restore the patient list to the original condition, press the Clear button in the Search Option window to initialize the search conditions, then press the OK button.

3 Press the Measurement button to move to the Measurement screen.

4 Perform the measurement.

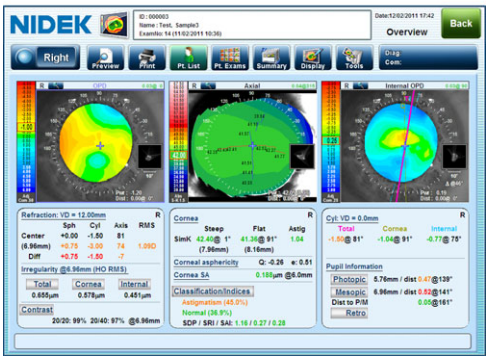


5 After verifying the image, press the button to save the data in the Verify Examination Quality screen or the Verify Multi Measurement screen.

6 The Verify Result window appears to show the progress of the processing after the measurement.

7 After the processing is complete, press the OK button.

The summary screen is displayed and the best measurement data is shown as color maps.



Note

- The type of summary to be used when the summary screen displayed is selected from “Summary List” in the Settings screen (Summary tab).

  The type of summary selected in “Summary List” (indicated with “(Default)”) is displayed by default. (“Overview” in factory setting.)

2.8.2 Displaying summary from Patient List screen

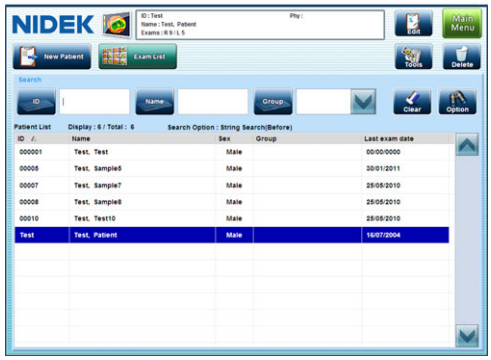
Examination data saved in the database can be called up to be displayed in a summary. When examination data is called up from the database and displayed as maps, maps obtained on different dates can be compared.

1 Display the Patient List screen (before displaying summary).

Press the Patient Files button in the Main Menu screen to move to the Patient List screen (before displaying summary).

2 Press the row of the patient to be displayed in a summary.

For details of patient search in the Patient List screen, see “2.3.5 Patient search” (page 57).

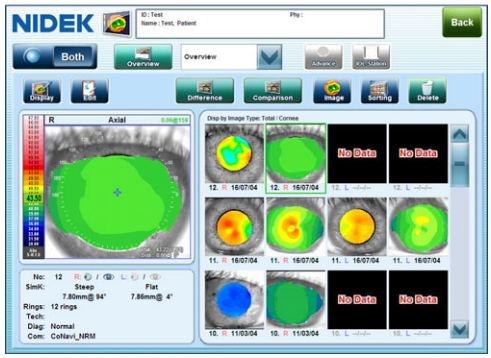


3 Press the Exam List button to move to the Exam List screen.

4 Select the examination data to be displayed in a summary.

Below the thumbnail, the examination number, right/left eye indication, and examination date are displayed. The thumbnail being selected is framed in green.

The map and measurement values for the selected examination data are displayed on the left half of the screen.



For details of operation in the Exam List screen, see “2.9 Selecting Examination Data” (page 118).

Thumbnails are displayed in the order of right eye OPD, right eye CT, left eye OPD, and left eye CT from left to right. If there is no data, “No Data” or “Not Measured” is displayed instead of a thumbnail.

The map and measurement values for the selected examination data are displayed on the left half of the screen.

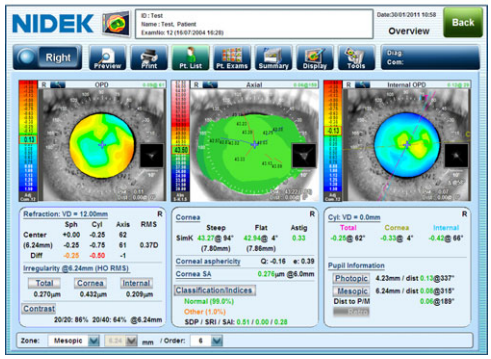
No Data	Neither the OPD measurement nor the CT measurement has been executed, and there is no data for the eye.
Not Measured (OPD)	There is no OPD measurement data.
Not Measured (CT)	There is no CT measurement data.

The data sets to be displayed as thumbnails can be changed with the Image button or the Sorting button.

Image button	Select “Cornea”, “Total”, “Internal”, “Total/Cornea”, “Cornea/Internal”, “Total/Internal”, or “All”.
Sorting button	Select from “by date (sort order)”, “Left eye (OS only)”, and “Right eye (OD only)”. (When the button at the top left of the screen indicates “Both”.) Select from “by date (sort order)”, and “Both eyes (OU)”. (When the button at the top left of the screen indicates “Right” or “Left”.)

5 Press the summary button.

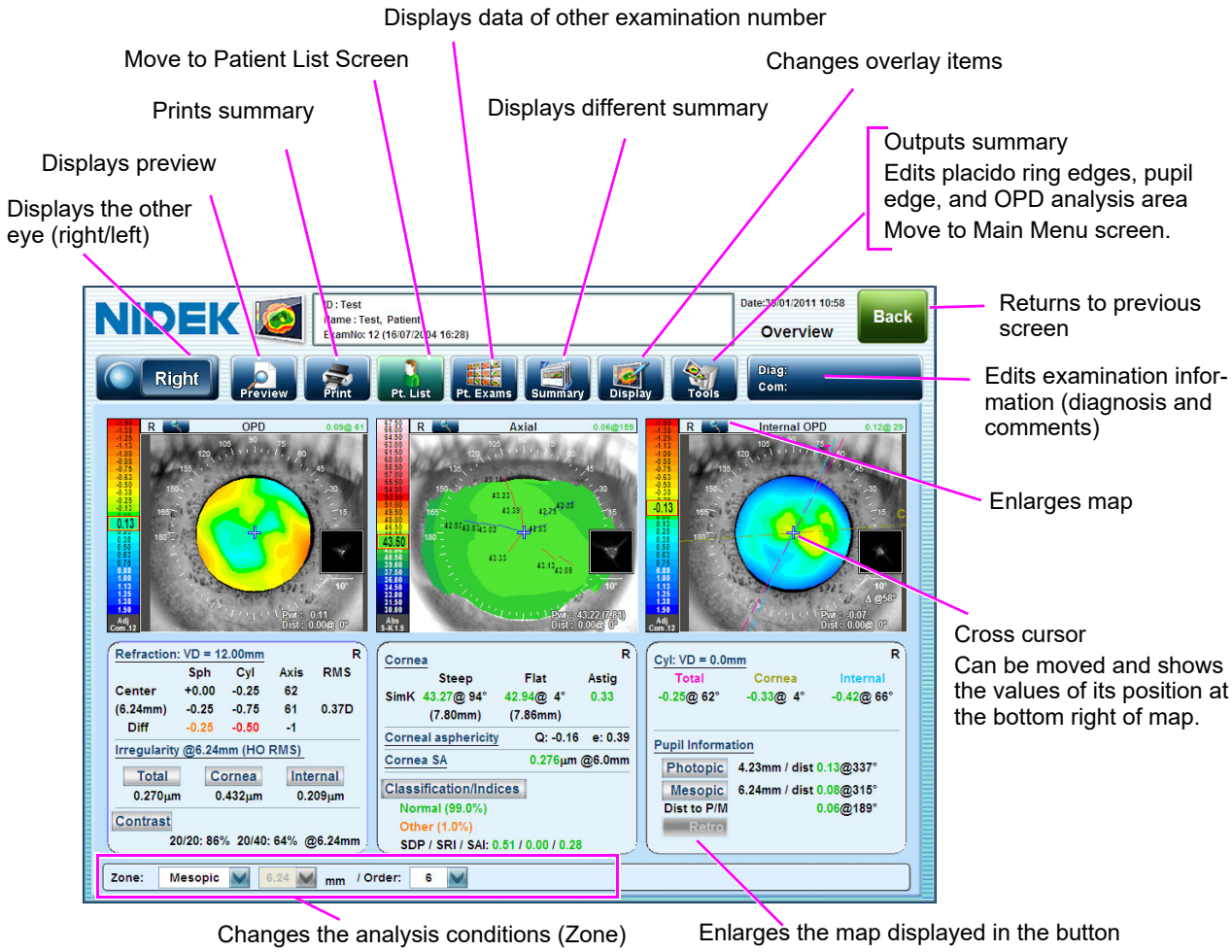
The selected examination data is displayed in the summary screen.



2.8.3 Operation in summary screen

The summary screen allows operations such as viewing measurement data in a summary, selection of different summaries, and printing and outputting summaries.

For details of operation of individual map, see “4.1 Color Maps” (page 158).



Note

- If the Summary screen is displayed directly from the Measurement screen, the Main Menu button is displayed instead of the Back button.

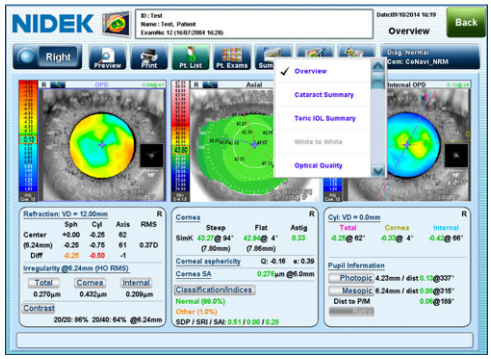
○ Displaying different summary

For registration of summaries (map layout), see “4.3 Setting of Summaries (Map Layout)” (page 239).

1) Press the summary button () in the summary screen.

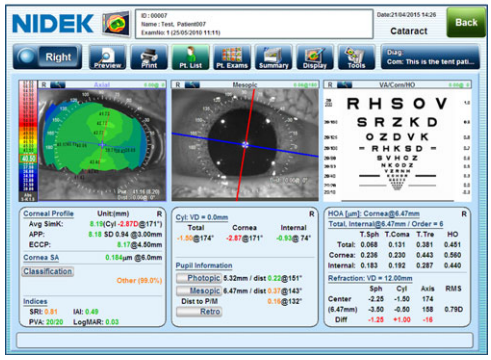
   A list of the existing summaries is displayed.

   There is a check mark on the side of the name of the summary being displayed.



2) Select the desired summary.

   The selected summary is displayed.



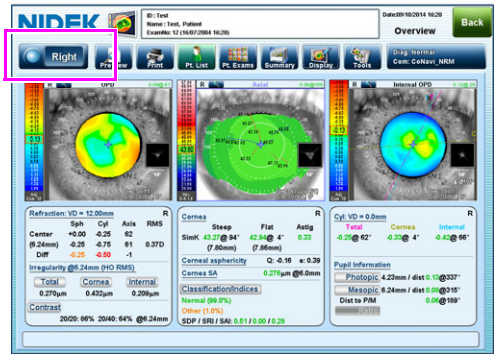
○ Displaying the other eye (right/left)

The summary can be switched between the right and left eyes when both eyes have been measured with the same examination number.

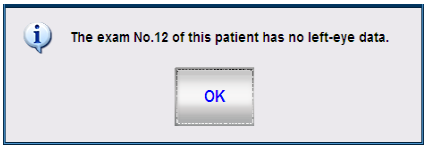
The switching of eyes is available only when exams of both eyes are saved with the same Exam No.

Press the Right or Left button at the top left of the summary screen.

All the displayed maps are switched to the other eye.



If the Right or Left button is pressed even if there is only measurement data for one eye, the message, “The exam No. *** of this patient has not right-eye data” appears.



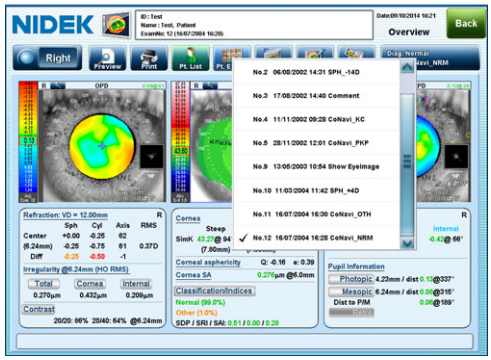
○ Changing examination data

Examination data of the same patient with different examination numbers can be displayed in the summary if multiple measurement data sets have been saved with the same patient ID.

1) Press the Pt. Exams button in the summary screen.

   A list of the examination number and dates of the saved data is displayed.

   There is a check mark on the side of the examination number of the examination data being displayed.



2) Press the examination number of the desired examination data.

   The selected examination data is displayed in the summary screen.

○ Changing overlay items

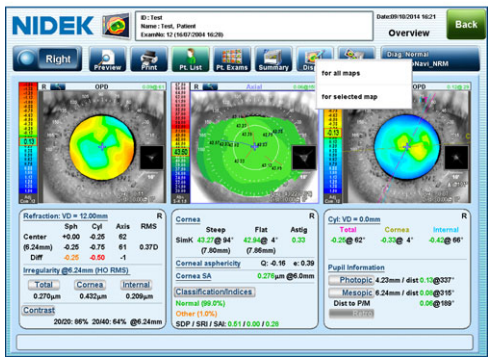
Items to be overlaid on the displayed maps can be changed.

1) Select the map in the summary screen for which the displayed overlay items are to be changed.

   Available overlay items differ depending on the selected map. Some overlay items are common to all maps (for all maps) and others are only for the selected map (for selected map).

2) Press the Display button and select “for all maps” or “for selected map”.

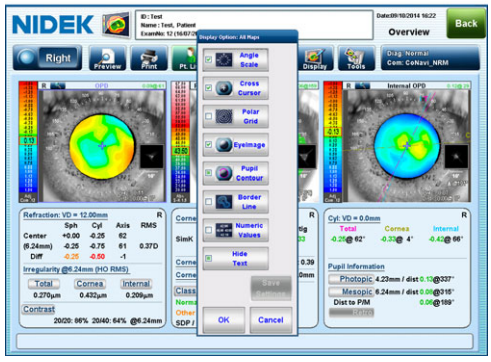
   The Display Option window appears.



Display Option: All Maps

Overlay items common to all maps are listed.

Selection is this window is reflected to all maps.

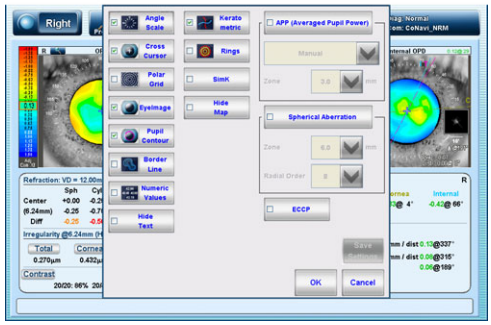


Angle Scale	Displays a protractor-like angle scale.
Cross Cursor	Displays a cross cursor. The cross cursor can be dragged with a finger and displays the refraction (Pwr), corneal curvature radius (Rad), distance from the center (Dist), and axis (Axis) at its position. When the cross cursor is moved in a map, the cross cursor on the other maps are moved to the same position. To move the cross cursor of only a single map, move the cross cursor while pressing the Ctrl key
Polar Grid	Displays a polar grid (circles are about 1 mm apart), cornea apex, and measurement optical axis
Eye Image	Displays image of anterior segment of patient's eye
Pupil Contour	Displays photopic and mesopic images are displayed at the same time when the Eye Image map is displayed. For the OPD, Internal OPD, Wavefront HO, Wavefront Total, and Wavefront Group maps, only the pupil contour is displayed.
Border Line	Toggles display of black lines as borders of colors. It is useful when adjacent colors are similar as in the absolute color scale.
Numeric Values	Displays refraction at specific positions on a map.
Hide Text	Toggles display of the result of analysis.

Display Option: Selected Map

This example is for when the Axial map is selected. The items differ depending on the selected map.

Items "for all maps" are also included. However, selection in this window is reflected only to the selected map.



Keratometric	Displays the maximum and minimum refractive powers and their angles on the circumference of each 3 mm, 5 mm, and 7 mm circle.
Rings	Displays borders of the detected placido rings (red and yellow lines)
SimK	Displays keratometry simulated based on analysis of placido rings.
Hide Map	Toggles display of the color map.

For explanation of overlay items unique to other maps, see the explanation of each map.

Note

- The "Hide Map" item can be set also by selecting "Hide Map" from the menu that appears by right-clicking the map.

Overlay items unique to individual maps

Map	Overlay options
Axial	Keratometric, Rings, SimK, Hide Map, APP (Averaged Pupil Power), Spherical Aberration, ECCP, PSF mini map * The PSF mini map is only for user summaries.

Map	Overlay options
Instantaneous	Keratometric, Rings, Hide Map
Gradient	Rings, Hide Map, Gradient (Zone)
“Refractive”	Keratometric, Rings, Hide Map
Elevation	Wire Frame/Color 2D/Color 3DHide-line removal, Hide Map, Scale
OPD	High Order, Hide Map, PSF mini map * The PSF mini map is only for user summaries.
Internal OPD	Subtract Prism, Rings, Axis Line, Hide Map, PSF mini map * The PSF mini map is only for user summaries.
EyeImage	Placido/Photopic/Mesopic/Retro, Rings, Axis Line (Cornea), Show Retro Mini Map, Processed Retro, WTW
Wavefront	ZS/ZC/ZA, Wavefront Error, Hide Map
ZernikeGraph	RMS, Coefficient
PSF	ZS/ZC/ZA, Wavefront Error, Strehl Ratio “ZS/ZC/ZA” is available only when “OPD” and “Total” (Whole eye aberration) are selected.
MTF Graph	Zone / 4/5/6 mm, Display Format (Log, Linear)
Visual Acuity	ETDRS_whole, ETDRS_partial, Photo (Day), Photo (Night), Siemens star whole, Siemens star partial, Snellen (20/20, 20/40, 20/100, ALL), Landolt (20/20, 20/40, 20/100, ALL), ZS/ZC/ZA, Strehl Ratio, Chart Angle (Right/Bottom/Left/Top), Wavefront Error

3) Press the buttons of the desired overlay items.

A check mark is placed on the selected items.

There are check boxes and radio buttons depending on the overlay items.

4) Press the OK button to close the Display Option window.

When the OK button is pressed, the change in the overlay items is reflected only to the currently displayed summary. The overlay items are restored to the previous setting when the patient or the summary type is changed.

To maintain the change in the displayed overlay items for other patients and maps, press the Save Settings button, then press the OK button.

Note

- When the Save Settings button is pressed, the contents of the Settings screen (Summary tab) is changed as well.

○ Displaying measurement values at selected positions on a map

Measurement values at the selected positions on a map can be displayed.

Displayed measurement values differ depending on the map. Measurement values and the position information are displayed.

1) Displays a cross cursor on the map.

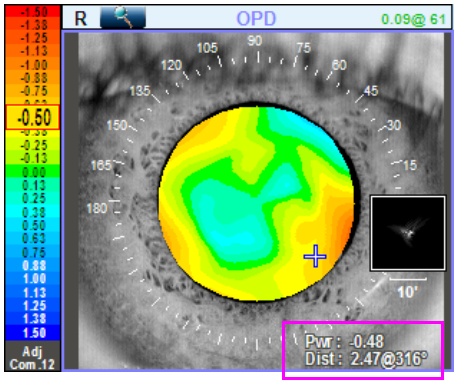
   If the cross cursor is not displayed on the map, select “Cross cursor” in the Display Option window.

   See “Changing overlay items” (page 101) for details.

2) Press the desired position to display the measurement values.

   The cross cursor moves to the specified position, and “(Measurement value), (Distance from center)@(Angle)” is displayed at the bottom right of the map.

   When the cross cursor is moved in a map, the cross cursor on the other maps are moved to the same position.



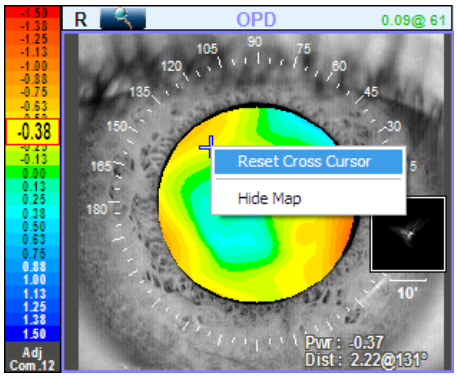
○ Returning cross cursor to initial position

The cross cursor can be returned to the initial position (center of the map).

1) Bring the mouse cursor to the desired map, then right-click on the map.

2) When the pop-up menu is displayed, select “Reset Cross Cursor”.

   Only the cross cursor on the selected map is returned to the initial position.



○ Displaying distance between two points

The distance between the desired two points can be displayed.

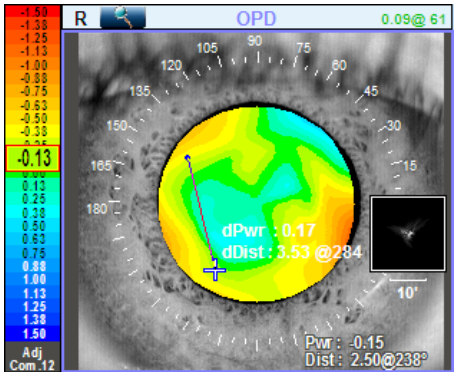
To display the distance in all maps

1) Display the cross cursor in a color map.

   See “Changing overlay items (page 101)“.

2) While pressing the Shift key, press the start point on the map.

   The cursor moves to the start point.



3) While pressing the Shift key, move the cross cursor to the end point.

   The difference in refractive power (dPwr) and the distance and angle (dDist) between the start and end points are displayed.

   Pressing any position of the map without pressing the Shift key returns to the usual cross cursor display.

   The distance between the start and end points are displayed in all maps.

To display the distance in a single map

Select the start and end points for individual maps in the same manner as Steps 1 to 3 above. However, instead of pressing the Shift key in Steps 2 and 3, press the Shift and Ctrl keys at the same time.

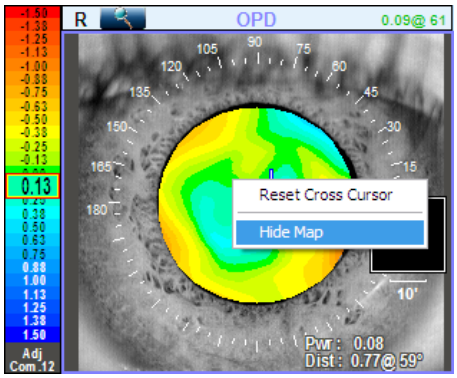
Note

- With the OPD-Scan III, this function is available only when the optional keyboard is connected.

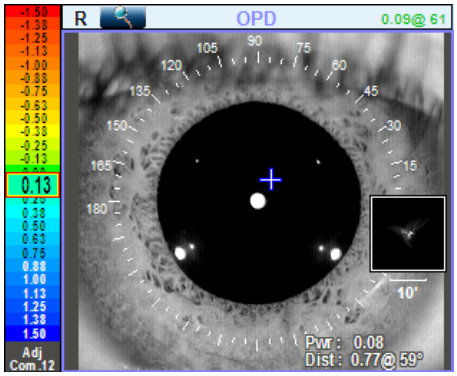
○ Hiding color map

The color map can be hidden.

1) Select “Hide map” from the menu that appears by right-clicking the map.



Only the color map is hidden.



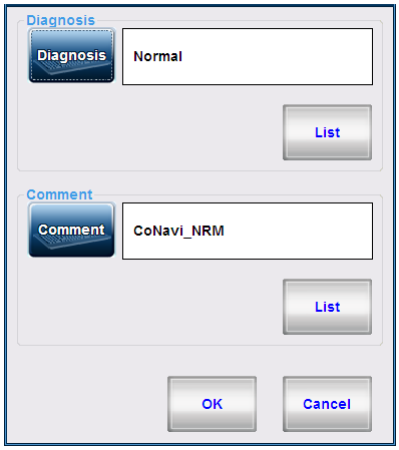
○ Editing examination information

1) Diagnosis and comments can be edited.

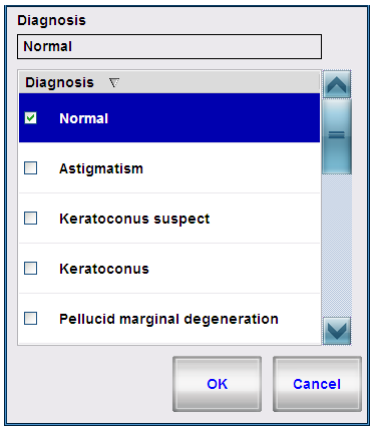
   Press the “Diag: Com:” button below the Back button on the summary screen to display the Diagnosis List window.

2) Input the desired diagnosis and comments in the respective boxes.

   They can be input using the on-screen keyboard or hardware keyboard, or by selecting from the list.

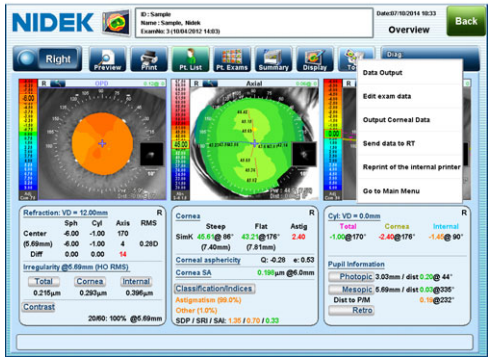


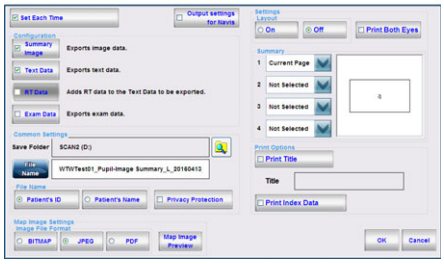
3) To select the diagnosis from the list, multiple items can be selected by checking.



2.8.4 Tool button functions

Select the desired function from the menu that appears by pressing the Tools button.



Data Output	Outputs the data of the summary being displayed to the specified folder. Image data (JPEG/BITMAP/PDF), numerical data (CSV format), and complete examination data can be output. For details of the data output, see "4.5 Outputting Map Data" (page 274). 
Edit exam data	Displays the placido ring edge edit screen. For details of the edge editing, see "4.6 Editing Placido Ring Edges" (page 279). 
Send data to RT	Transfers day and night measurement data to the RT-5100 to perform the patient view simulation using the RT-5100 data. For details, see "2.8.5 Patient view simulation using RT data" (page 109).
Output Corneal Data	Outputs the corneal data in the XML format. The XML file is output to the folder specified with "Save Folder" folder specified under the Data Output tab in the Settings screen. The corneal data of both eyes is output at the same time. If no corneal data exists for either of the eyes, no XML file is output. As the corneal data, the SimK value for ø3.3 mm, SimK values for areas (ø1 mm to ø11 mm) in 1 mm increments, WTW value, and curvature data are output. When the data is output, the message "The file has been successfully output." appears. File name: (Patient ID)_Output date and time (year month day_hour minute second).xml

Reprint of the internal printer	Prints the measurement data again with the internal printer. (OPD-Scan III only) When the measurement is finished, the data automatically saved for printing is printed. The printed data does not reflect the KM value changed by editing the placido ring, or the AR value changed by editing the pupil diameter in the summary screen (The value at the time of measurement is printed). For the patient information and print setting, the data at the time of re-printing is used. The number assigned to the data transferred to the RT shows the order in which the data was transferred to the RT at the time of measurement. The “Sent to RT” and ”Not Send” items for HD Exam indicate whether the data was transferred to the RT at the time of measurement.
Go to Main Menu	Returns to the Main Menu screen. This button needs to be pressed only once, while the Back button needs to be pressed several times, to return to the Main Menu screen.

Note

- “Send data to RT” can also be executed with the “Connected Device” setting changed from “RT-5100 Support” to “EyeCareCard”. When “Send data to RT” is executed, the day and night data is saved to the EyeCareCard.
  In this case, only saving of data is executed. Patient view simulation or reading of data from the EyeCareCard is not executed.
  Using the EyeCareCard, the day and night data can be read with other devices such as the RT-5100.
- The “Reprint of the internal printer” function cannot be used with the data shown below. With the data shown below, the “Reprint of the internal printer” menu is not displayed.
  Data measured with previous version software (V1.11 or earlier)
  Data overwritten or saved as a new file after editing examination data

2.8.5 Patient view simulation using RT data

Corrected patient view can be simulated using the prescription values obtained from subjective refraction with the RT-5100/RT-6100.
First, subjective refraction is performed using the RT-5100/RT-6100 based on the OPD-Scan III measurement data (day/night measurement). Then the results (day/night full corrective power, day/night prescription values, and day/night LM data) are transferred back to the OPD-Scan III. After that, the simulated patient view is displayed in the summary screen, incorporating the SPH and CYL components of the correction value.

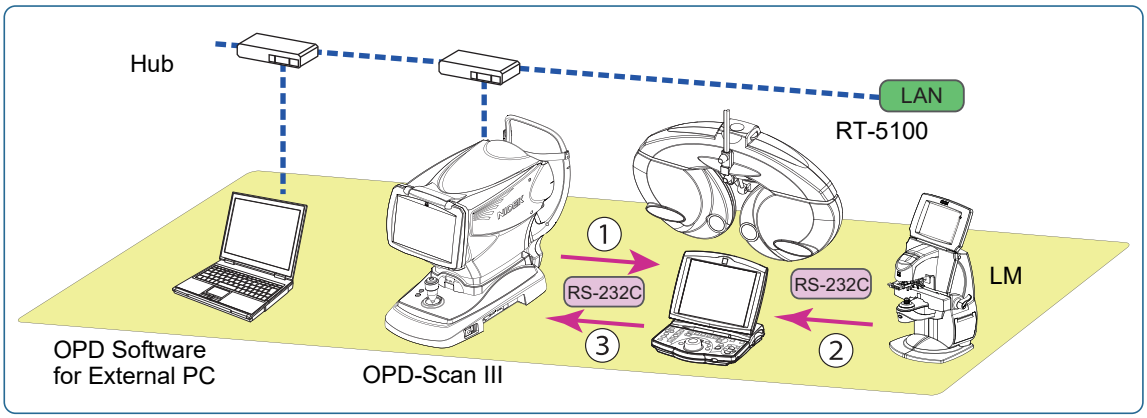
Note

- The patient view simulation can be performed with the PC installed with the OPD Software for External PC.
- The simulation using the correction values can be performed in the PSF, MTF graph, and VA chart maps.

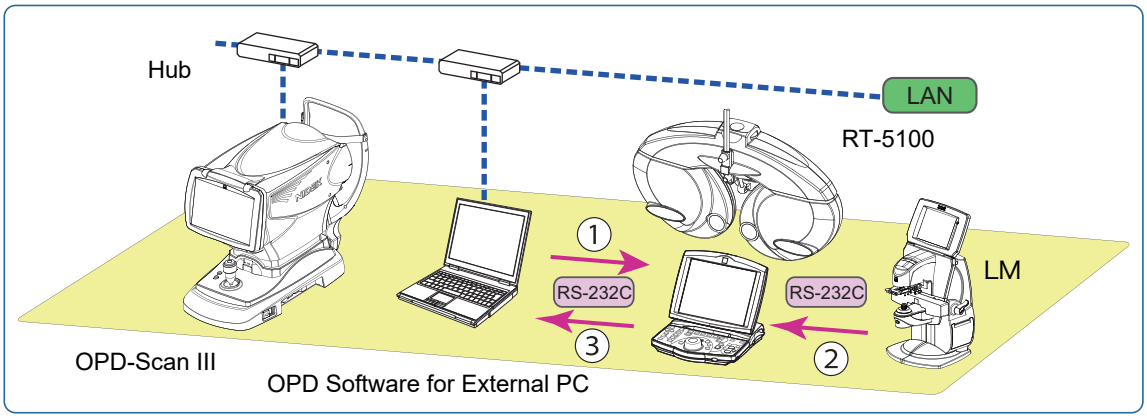
Connectable RT	The following models and versions of the RT-5100 series: Standard ..... W105 (CB: V9.05, RB: V1.19) Plug Package ... PW104 (CB: V9.04Plus, RB: V1.19) Chinese ..... C121 (CB: V5.14, RB: V1.19) Lite ..... L123 (CB: V1.16Lite, RB: V1.19)
	RT-6100

○ Connecting devices

When using with the OPD-Scan III in connection with the RT-5100



When using with a PC (OPD Software for External PC) in connection with the RT-5100



①	Transferring patient ID and measurement data (day/night data) to the RT-5100
②	Measuring the refractive power of the patient's glasses (day/night LM data) and inputting it to the RT-5100
③	Transferring patient ID and measurement data (day/night full corrective power, day/night prescription values, and day/night LM data) back to the OPD-Scan III

Interface cable connection between the OPD-Scan III (or PC) and RT-5100

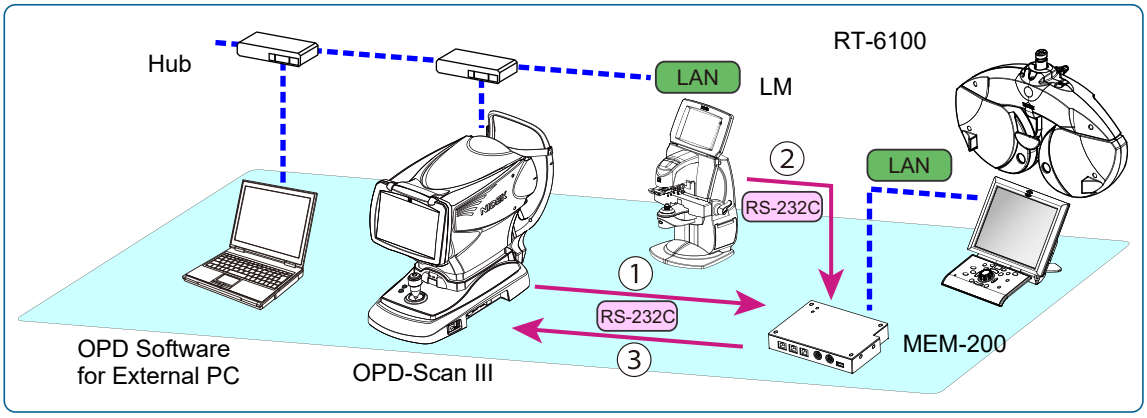
	Output port	RT-5100 input port	Interface cable
OPD-Scan III	COM connector D-Sub 9 pins	Connector for Auto Refractometer (AR) DIN 8 pins	RS-232C cable D-Sub 9 pins — DIN 8 pins
PC (OPD Software for External PC)	Serial port		RS-232C cable D-Sub 9 pins — DIN 8 pins
	USB port		USB–Serial conversion cable + RS-232C cable D-Sub 9 pins — DIN 8 pins

Parameter setting for "Send data to RT" option

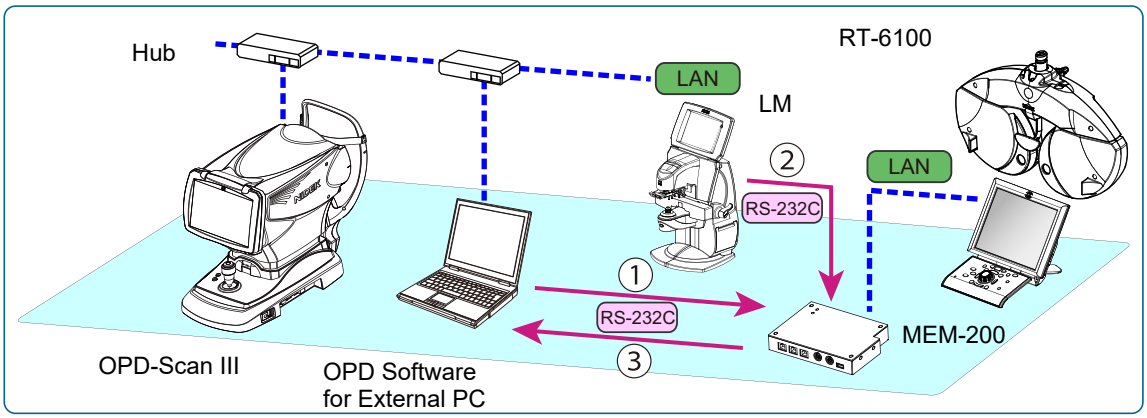
For the OPD-Scan III, set the parameters as shown below.

Measurement tab	"Verified & Save Button Handling" — Options	Select "RS232C Connection".
Communication tab	"OPD/CT mode" — Connected Device	Select "RT-5100 Support". Check "Send HD Exam Data". Check "Send 30sec Refraction".

When using with the OPD-Scan III in connection with the RT-6100 via MEM-200



When using with a PC (OPD Software for External PC) in connection with the RT-6100 via MEM-200



①	Transferring patient ID and measurement data (day/night data) to the RT-6100 via MEM-200
②	Measuring the refractive power of the patient's glasses (day/night LM data) and inputting it to the RT-6100 via MEM-200
③	Transferring patient ID and measurement data (day/night full corrective power, day/night prescription values, and day/night LM data) back to the OPD-Scan III via MEM-200

For the procedure to connect the OPD-Scan III (or computer) and the RT-6100, see the Operator's Manuals of the RT-6100 and MEM-200.

Note

- Data transfer between the RT-6100 requires the MEM-200 (MEMORY BOX).

Parameter setting for "Send data to RT" option

For the OPD-Scan III, set the parameters as shown below.

Measurement tab	"Verified & Save Button Handling" — Options	Select "RS232C Connection".
Communication tab	"OPD/CT mode" — Connected Device	Select "RT-5100 Support". Check "Send HD Exam Data". Check "Send 30sec Refraction".

○ Transferring data from the summary screen to RT

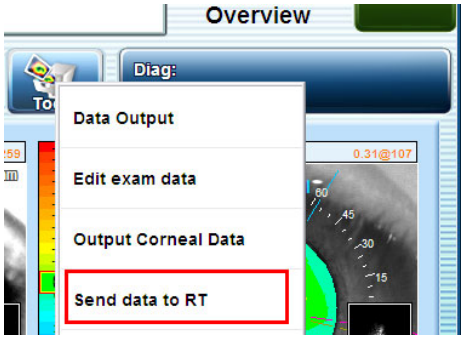
Select and display the desired data from the database, then execute “Send data to RT” with the OPD-Scan III or a PC to which the RT-5100/RT-6100 is connected.

Note

- To transfer data from the OPD Software for External PC, check the connection between the PC and the RT-5100/RT-6100 before activating the software.

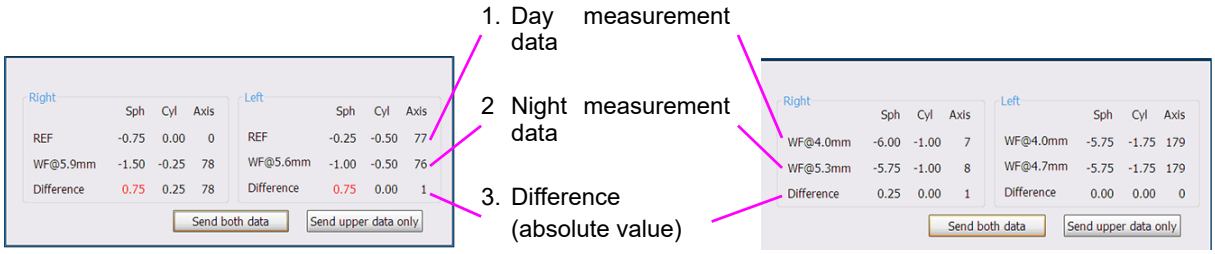
1 Select the desired exam data from the database to display it in the summary screen.

2 Press the Tool button, then select “Send data to RT” from the menu.



3 The HD EYE EXAM screen appears. Press the “Send both data” or “Send upper data only” button to transfer the selected data.

Send both data	Both “1. Day measurement data” and “2. Night measurement data” are transferred to the RT-5100/RT-6100.
Send upper data only	Only “1. Day measurement data” is transferred to the RT-5100/RT-6100. “2. Night measurement data” is not transferred.



AR (refraction) value is transferred as day measurement data

ZS, ZC, and ZA (WF@4.0 mm) are transferred as day measurement data

Pressing the button transfers data to the RT-5100/RT-6100.

Data transferred to the RT-5100 is saved to the relay box memory.

When the RT-5100 receives data properly, the RT-5100 data number is displayed in the screen.

Data transferred to the RT-6100 is saved to the MEM-200 memory, and loaded by the operation of the RT-6100.

Note

- For the day measurement data (ZS, ZC, and ZA values or AR value) displayed in the HD EYE EXAM screen, appropriate data for subjective refraction is automatically selected.

4 After data transfer, leave the summary screen displayed until data output from the RT-5100/RT-6100 is complete.

⚠ **CAUTION** • **Do not change the summary screen display until data from the RT-5100/RT-6100 is received.**

When the summary screen is changed, the RT-5100/RT-6100 data may not be saved properly. In such a case, the message "Data from RT have not been received yet. Do you want to continue?" appears to confirm the execution of the screen change.

5 Load the measurement data with the RT-5100/RT-6100, then perform subjective refraction to obtain day/night full corrective power. In addition, read the LM data from the connected lensmeter.

Note

- For the operating procedure from loading data with the RT-5100/RT-6100 to data output and the settings for them, refer to the Operator's Manuals of the RT-5100, RT-6100, and MEM-200.

6 After completing examination with the RT-5100/RT-6100, output data to the OPD-Scan III (or PC).

In the case of the RT-5100, press the Print button.

When data is output without printing, input the ID No. and press the Out button in the RT-5100 screen.

In the case of the RT-6100, press the Output button.

Day prescription values, night prescription values, and LM data are transferred to the OPD-Scan III and saved to the OPD database.

Note

- Out of day/night full corrective power, day/night prescription values, and day/night LM data, only data that was used for refraction is transferred from the RT-5100/RT-6100 to the OPD-Scan III.

  Simulation cannot be performed in the summary screen using data that is not transferred to the OPD-Scan III.
- If multiple measurement data sets were sent to the RT-5100/RT-6100 (Multi measurement), data sets received from the RT-5100/RT-6100 are saved in association with the best data.
- If any screen other than the summary screen is displayed, the message "RT data can be received only by the Summary window or the Verify Examination Quality window." appears to inform that the data is not properly received. Make sure that the summary screen for the desired patient is being displayed, then output data again from the RT-5100/RT-6100.

  To retry data output from the RT-5100/RT-6100, set the parameter so that data is not cleared after printing or outputting data.

  Set the "Clear after print" parameter of the RT-5100 to No.

  Set the "Clear after output" parameter of the RT-6100 to No.

○ Transferring data at the time of measurement (OPD-Scan III only)

When the OPD-Scan III is used in connection with the RT-5100/RT-6100, finishing the operation after measurement in OPD/CT mode displays the HD EYE EXAM screen where data can be transferred to the RT-5100/RT-6100.

1 In the Verify Examination Quality screen, press the Verify & Save button to finish the operation.

2 The HD EYE EXAM screen appears. Press the "Send both data" or "Send upper data only" button to transfer the selected data.

Perform the same operation as Step 3 of "○ Transferring data from the summary screen to RT" (page 112).

3 When the button is pressed, the progress bar appears, and the data is transferred to the RT-5100/RT-6100.

4 After transferring data, leave the Verify Result window displayed until the RT-5100/RT-6100 completes data output.

⚠ **CAUTION** • **Do not close the Verify Result screen until data from the RT-5100/RT-6100 is received.**

When the Verify Result window is changed, the RT-5100/RT-6100 data may not be saved properly.

5 The subsequent operation of the RT-5100/RT-6100 is the same as "○ Transferring data from the summary screen to RT".

○ Correction result simulation display

Simulated patient view can be displayed in the summary screen using the RT-5100/RT-6100 data saved to the OPD database.

When data has already been received from the RT-5100/RT-6100 in the summary screen, start the procedure from Step 2.

1 Select the desired examination data to display it in the summary screen.

This step can be performed with any network-connected OPD-Scan III or PC.

2 Select any summary containing the PSF, MTF graph, or VA chart.

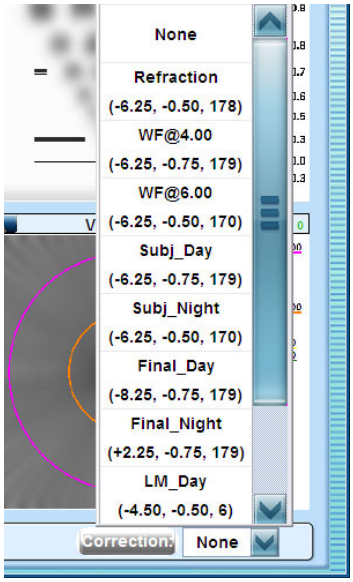
When patient view simulation incorporating prescription values is available, the Correction box appears at the bottom right of the summary screen.

3 In the Correction box, select the correction value to be used for the simulation.

When the correction value is selected, the maps reflecting the correction value are displayed in the summary screen.

In the correction value menu, correction values (SPH, CYL, Axis) are shown for each option.

The six correction values from “Subj_Day” to “LM_Night” are displayed when the RT-5100/RT-6100 data exists.



None	No correction component (OPD-Scan III data only)
Refraction	Normal AR value
WF @4.00	AR value with pupil diameter of 4 mm
WF @6.00	AR value with pupil diameter of 6 mm
Subj_Day	Day full corrective power
Subj_Night	Night full corrective power
Final_Day	Day prescription value
Final_Night	Night prescription value
LM_Day	Day LM data
LM_Night	Night LM data

Note

- The same correction values are reflected to all of the PSF, MTF graph, and VA chart in the summary screen.

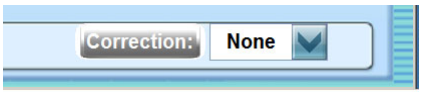
  Different correction values cannot be set for individual maps.

○ Simulation display with varied correction values

Simulated patient views can be displayed with various correction values shown in the Correction box.

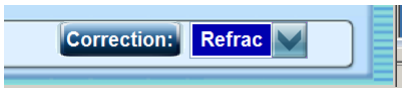
1 Select the summary that contains any of the PSF, MTF graph, or VA chart.

The Correction box is displayed at the bottom right of the summary screen.



2 Select any parameter other than “None” to activate the Correction button.

Each item in the menu of the Correction box shows correction values (Sph, Cyl, and Axis).



3 Press the Correction button to display the Correction Value Input window.

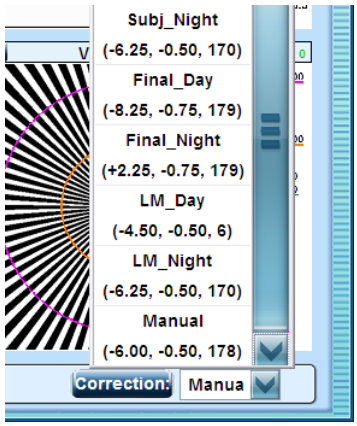
4 In the Correction Value Input window, change the correction values (Sph, Cyl, and Axis) by selecting the desired ones from the drop-down list.

Changing any of the default values activates the Apply button.

5 Press the Apply button to renew the simulated patient view with the selected correction values.

6 Press the OK button to save the current correction values and close the Correction Value Input window.

“Manual (Sph, Cyl, Axis)” is added to the menu of the Correction box.

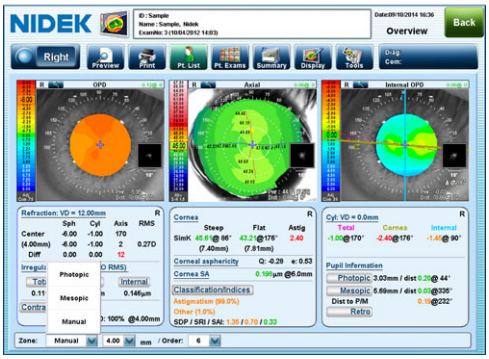


Note

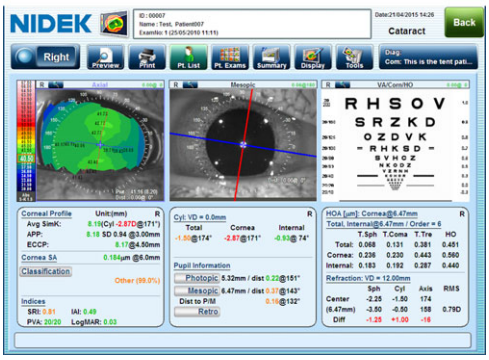
- Only a single set of correction values can be saved as “Manual”. When a new set of correction values is saved, it replaces the previous one.

2.8.6 Changing analysis conditions (Zone)

The analysis conditions can be changed at the bottom of the summary screen. The change of the analysis conditions is effective only for the currently displayed patient.
When the analysis conditions are changed, maps are recalculated and renewed in accordance with the change.



The analysis conditions differ depending on the selected map.



Zone	Photopic, Mesopic, Manual (Diameter can be selected.)
Order	The Zernike analysis order can be selected.
Aberration	Select from “Total”, “High Only”, and “Group” from a list. When “Group” is selected, the Zernike Coefficient Selection window appears that allows selection of the desired group.

Note

- The initial Zone parameter can be set with “Analysis Area” in the Settings screen (Parameter tab).

2.9 Selecting Examination Data

Examination data saved in the database can be selected to be displayed in a summary. Examination data can also be displayed in the Difference and the Comparison screens.
In addition, examination data can be used for the optional Advance function (formerly called OPD-Station) that can be activated from the Exam List screen.

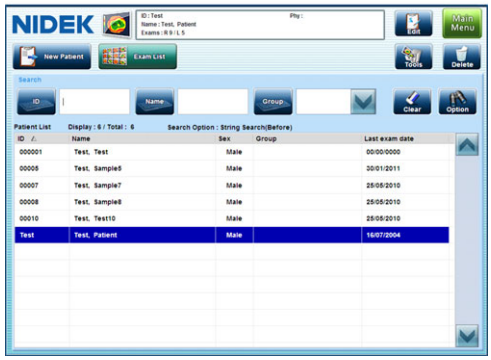
2.9.1 Selecting examination data for summary

1 Display the Patient List screen (before displaying summary).

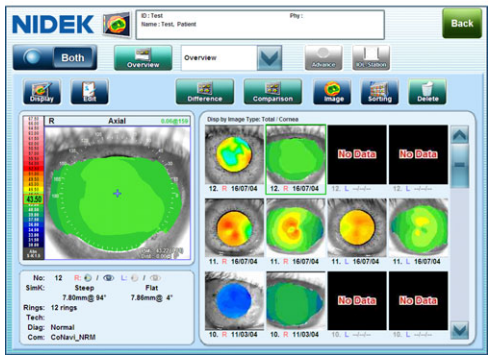
Press the Patient Files button in the Main Menu screen to move to the Patient List screen (before displaying summary).

2 Press the row of the patient to be displayed in a summary.

For details of patient search in the Patient List screen, see “2.3.5 Patient search” (page 57).



3 Press the Exam List button to move to the Exam List screen.



4 Press to select the data to be displayed in a summary from the thumbnail box.

Below the thumbnail, the examination number, right/left eye indication, and examination date are displayed. The thumbnail being selected is framed in green.

The parameters for the thumbnail display can be selected from the menu that appears by pressing the Image button. If there is not data, “No data” or “Not Measured” appears instead of a thumbnail image.

The map and measurement values for the selected examination data are displayed on the left half of the screen.

No Data	Neither the OPD measurement nor the CT measurement has been executed, and there is no data for the eye.
Not Measured (OPD)	There is no OPD measurement data.
Not Measured (CT)	There is no CT measurement data.

Note

- To display examination data in the Difference or Comparison screen, select the examination data in the “Difference: Select Exam” or “Comparison: Select Exam” screen.

  Maps or measurement values cannot be viewed in the “Difference: Select Exam” or “Comparison: Select Exam” screen. View them in advance in the Exam List screen.

5 Press the summary button to display the summary screen.

The selected examination data is displayed in the default summary.

The name of the default summary is shown on the summary button. (“Overview” in factory setting.)

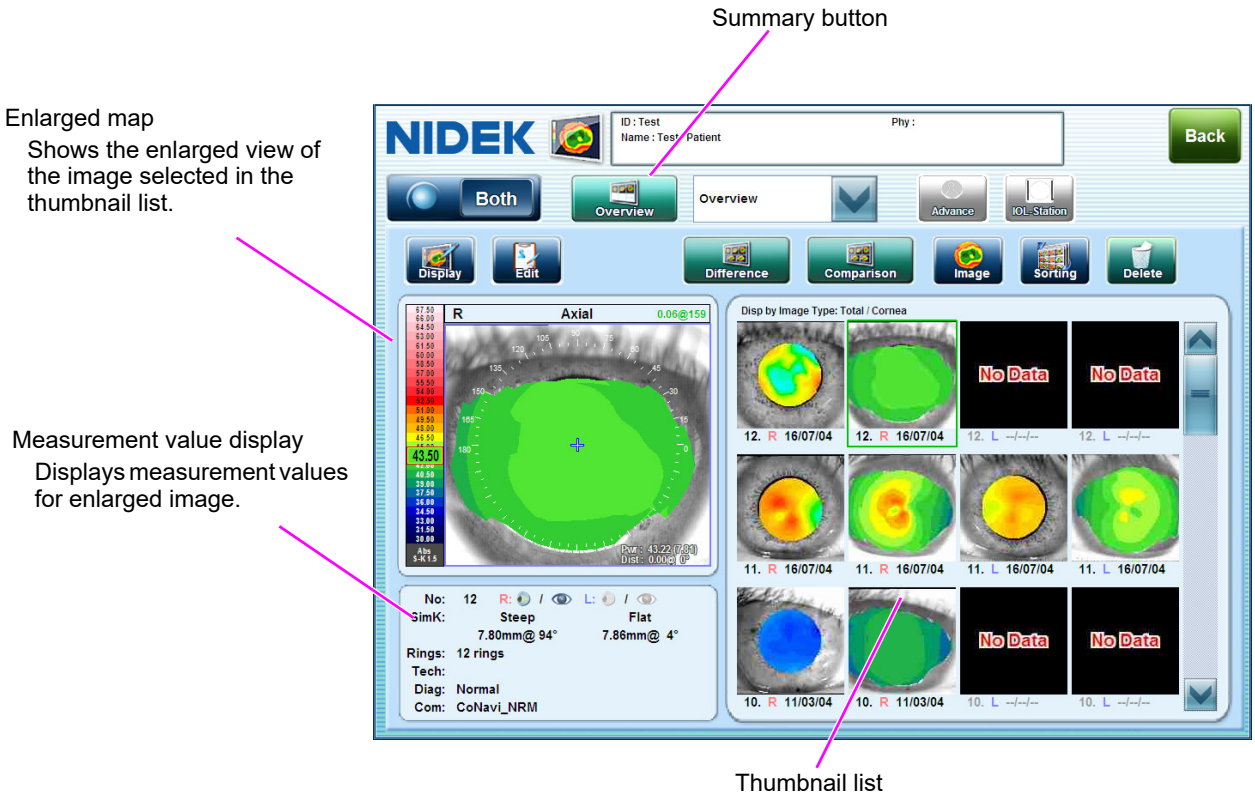
Note

- The default summary can be set with “Set Default” in “Summary List” in the Settings screen (Summary tab).

6 Perform the desired operation such as printing, outputting, or change of the summary in the summary screen.

For details of operation in the summary screen, see “2.8.3 Operation in summary screen” (page 99).

2.9.2 Operation in Exam List screen



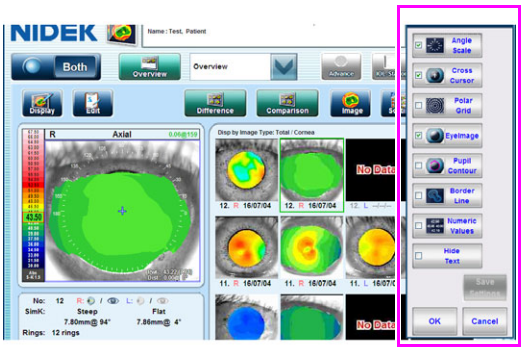
Right/Left button	Used to toggle display of the right and left eye thumbnails. The right eye and left eye display cannot be toggled when both eyes are being displayed.
Summary button	Used to display the selected examination data in the summary screen. The name of the default summary is shown on the summary button. The desired summary can be selected from the drop-down list shown to the right of the button. (The factory setting is “Overview” and can be changed with a parameter setting.)
Advance button (Optional)	Used to activate the Advance (formerly called OPD-Station) function with the currently selected examination data. For details of operation of the Advance function, see the operator’s manual for Advance.
IOL-Station button (Optional)	Not ready yet.
Display button	Used to modify the overlay settings for the enlarged map. Pressing this button displays the Display Option window which allows changing of the overlay items.
Edit button	Used to display or edit the detailed information of the examination data. Pressing this button displays the Edit Exam Information window that shows detailed measurement data and allows input of “Diagnosis”, “Comment”, “Technician”, “VAsc”, and “VAcc”.
Difference button	Two or three examination data sets are compared and the difference is shown with a map. See “2.10 Difference Analysis Display” (page 124) for details.
Comparison button	Two examination data sets are shown with a maximum of three maps each and arranged vertically. See “2.11 Comparison Analysis Display” (page 129) for details.

Image button	Used to change the type of thumbnail list. Select from the menu that appears by pressing the button. Select “Cornea”, “Total”, “Internal”, “Total/Cornea”, “Cornea/Internal”, “Total/Internal”, or “All”.
Sorting button	Used to change the contents of thumbnail list. Select from the menu that appears by pressing the button. Select from “by date (sort order)”, “Left eye (OS only)”, and “Right eye (OD only)”. (When the button at the top left of the screen indicates “Both”.) Select from “by date (sort order)” and “Both eyes (OU)”. (When the button at the top left of the screen indicates “Right” or “Left”.)
Delete button	Displays the Delete Exam screen that allows deletion of examination data.
Back button	Used to move to the Patient List screen (before displaying summary).

○ Display button 

Used to modify the overlay settings for the enlarged map.

Pressing this button displays the Display Option window. Press to check the desired overlay items.



Overlay items

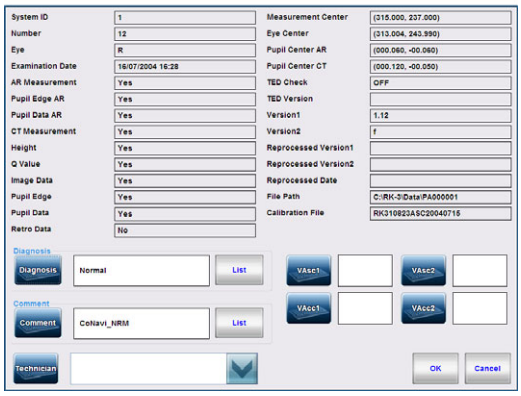
Angle Scale	Displays a protractor-like angle scale
Cross Cursor	Displays a cross cursor. The cross cursor can be dragged with a finger and displays the refractive power (Pwr), corneal curvature radius (Rad), distance from the center (Dist), and axis (Axis) at its position.
Polar Grid	Displays a polar grid (circles are about 1 mm apart), cornea apex, and measurement optical axis
Eye Image	Displays image of anterior segment of patient’s eye
Pupil Contour	Displays the pupil contour in a white line. The color of the line is in accordance with the Text setting for “Map Color” in the Settings screen (Other tab).
Border Line	Toggles display of black lines as borders of colors. It is useful when adjacent colors are similar as in the absolute color scale.
Numeric Values	Displays refraction at specific positions on a map.
Hide Text	Toggles display of the result of analysis.

Button operation

Save Settings button	Used to save the overlay setting. When the overlay setting is changed, the Save Settings button becomes enabled. To use the modified setting regularly, save the setting with the Save Settings button. If the modified setting is not saved, it is effective only for the currently displayed data.
OK button	Used to make the modified setting effective and close the Display Option window.
Cancel button	Used to cancel the modified setting and close the Display Option window.

○ Edit button 

Used to display or edit the detailed information of the examination data.

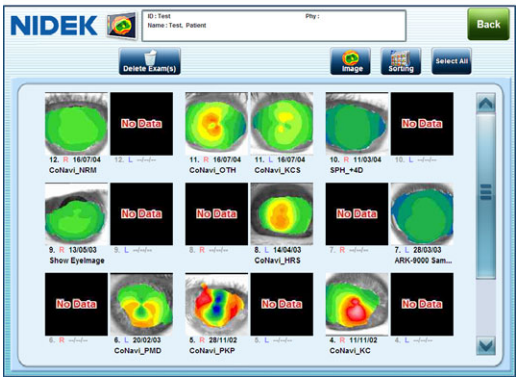


Pressing this button displays the Edit Exam Information window that shows detailed measurement data and allows input of “Diagnosis”, “Comment”, “Technician”, “VAsc”, and “VAcc”.

Information in white text boxes can be edited. Information in gray text boxes cannot be edited.

○ Delete button 

Displays the Delete Exam screen that allows deletion of examination data.



Button operation in Delete Exam screen

Press to select the thumbnail of the examination data to be deleted. The thumbnail of the selected data is framed in green. Multiple examination data sets can be selected.

To cancel the selection, press the selected thumbnail again.

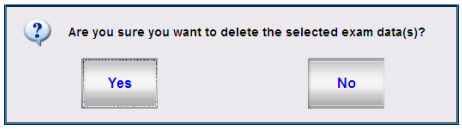
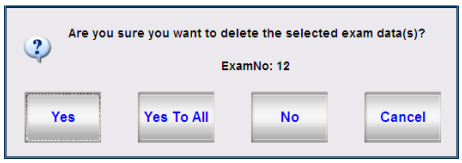
Delete Exam(s) button	Used to delete the examination data of the selected thumbnail. Pressing this button displays the message, “Are you sure you want to delete the selected exam data? Yes/No” Pressing “Yes” deletes the selected examination data. 

Image button	Used to change the type of thumbnail list. Select from the menu that appears by pressing the button. Select from “Cornea”, “Total”, and “Internal”.
Sorting button	Used to toggle the thumbnail list display between the ascending and descending orders of the examination number. Pressing “by date (sort order)” that appears by pressing this button changes the sort order.
Select All button / Cancel All button	Used to select all thumbnails. When all thumbnails are selected, the button changes to the [Cancel All] button. Pressing the button deselects all thumbnails.

Pressing the Delete Exam button while selecting multiple examination data sets displays the message, “Are you sure you want to delete the selected exam data? Exam No: ** Yes/Yes To All/No/Cancel”.

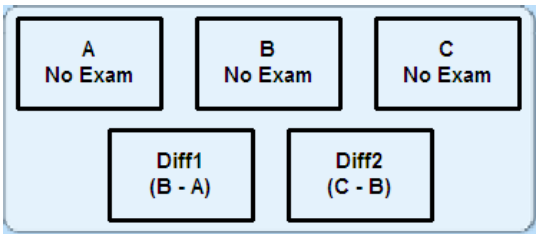


Yes button	Deletes the examination data of the examination number displayed in the message, then displays the confirmation message for the next patient.
Yes To All button	Deletes all the examination data selected in the Delete Exam screen, and closes the message.
No button	Cancels deletion of the examination data of the examination number displayed in the message, then displays the confirmation message for the next patient.
Cancel button	Cancels deletion of all the selected examination data, and closes the message. Examination data deleted before pressing the Cancel button cannot be restored.

2.10 Difference Analysis Display

2.10.1 Selecting data for difference analysis

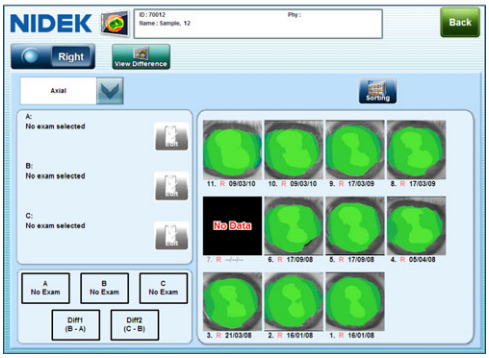
Two or three examination data sets are compared and the difference is shown with a map.
Maps are arranged in the layout below by default. (Diff1 and Diff2 can be changed.)



A to C: Original map to be used for difference analysis
Diff1 (B-A): Map that shows difference between Maps B and A.
Diff2 (C-B): Map that shows difference between Maps C and B.

1 Display the examination data to be used for difference analysis in the Exam List screen.

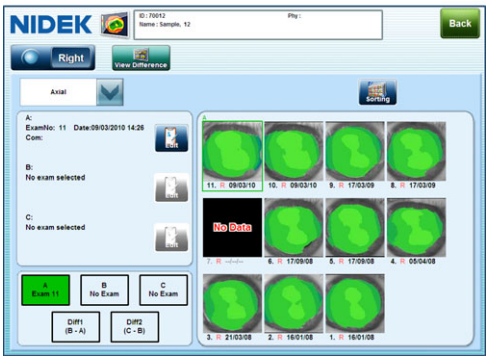
2 Press the Difference button to display the “Difference: Select Exam” screen.



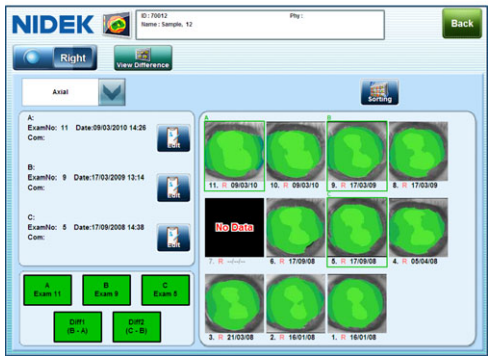
3 Select the thumbnails of the examination data sets to be compared.

Select in the order of A, B, and C.

The selected examination data sets are displayed on the left half of the screen.

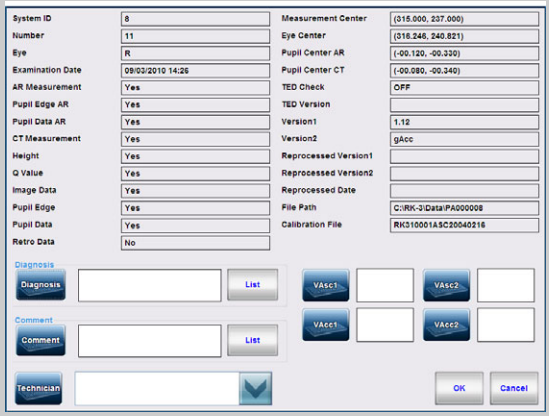


A maximum of three examination data sets can be selected.

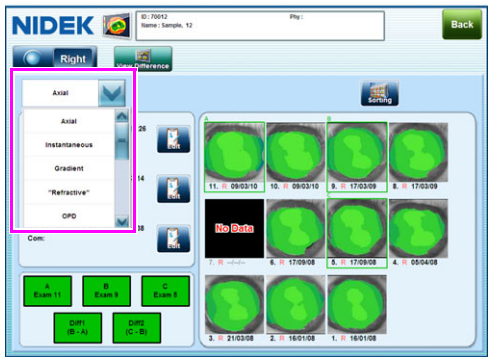


Note

- To view the detailed information of the selected examination data, press the Edit button for each examination data set to display the Edit Exam Information window.



4 Select the map to be used for difference analysis display from the menu that appears by pressing the V button.



Note

- Examination data sets and map type can be changed in the Difference screen.

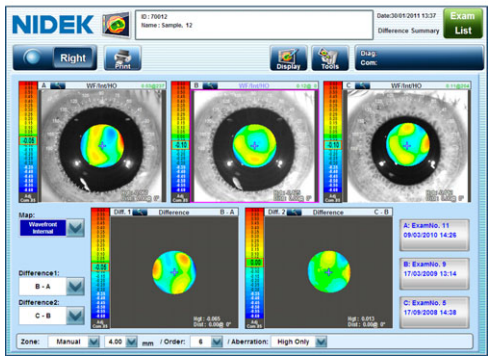
Button operation in “Difference: Select Exam” screen

View Difference button	Used to move to the Difference screen.
Sorting button	Used to toggle the thumbnail list display between the ascending and descending orders of the measurement date.
Right/Left button	Used to toggle display of the right and left eyes.

5 Press the View Difference button to display the Difference screen.

Perform the desired operations such as printing, data output, and changing of display in the Difference screen.

For details of operation in the Difference screen, see “2.10.2 Operation in Difference screen” (page 126).

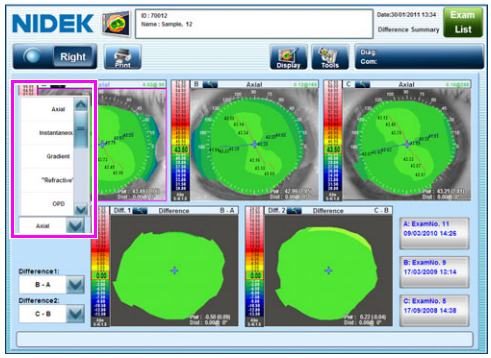


2.10.2 Operation in Difference screen

The Difference screen allows operations such as viewing maps that show difference between examination data sets, changing maps, printing, and data output.

○ Changing maps

Select the desired map from the menu that appears by pressing the Map box.



○ Changing examination data

Select the desired examination data from the list that appears by pressing the examination data button (A), (B), or (C) at the bottom right of the Difference screen.

In the list, the currently selected data sets are indicated with A, B, and C in the Shown column.

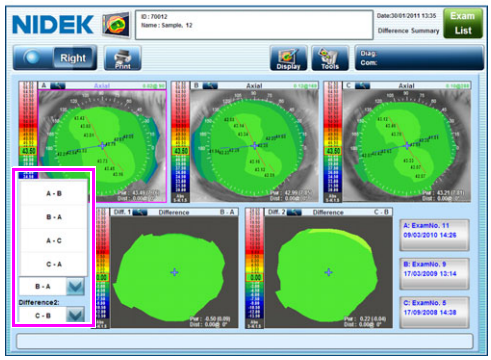
○ Changing difference map

The combination of maps for the difference analysis can be changed.

Select the desired combination from the menu that appears by pressing the Difference1 or Difference2 box.

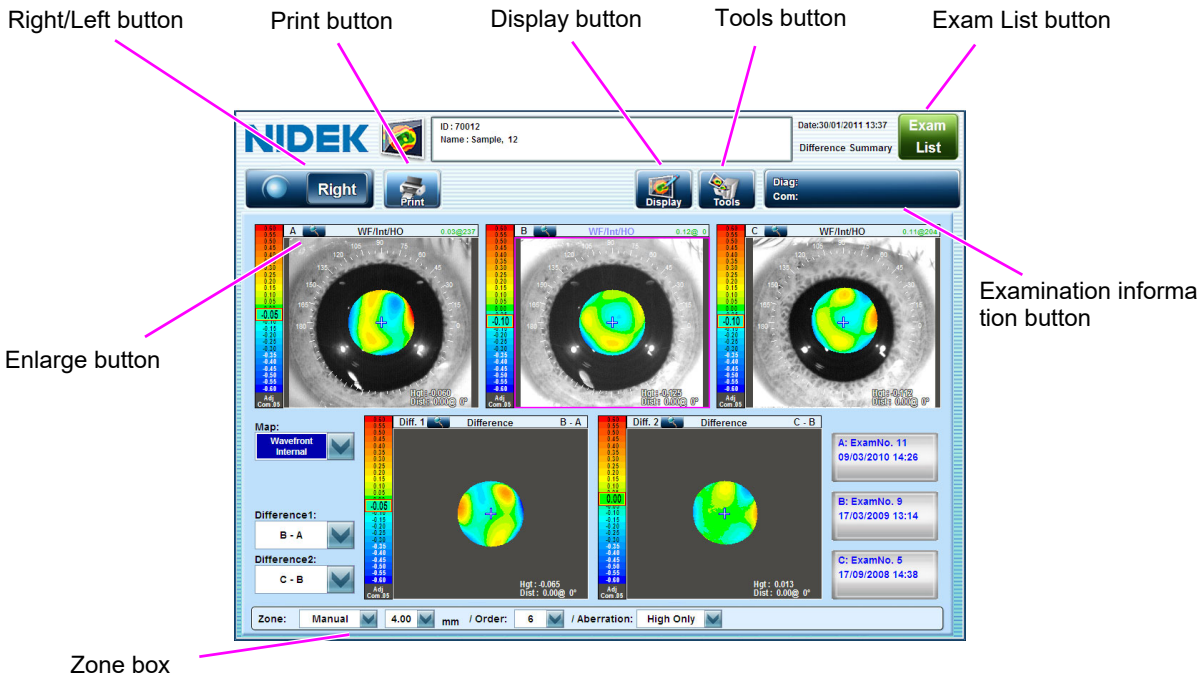
The combination for the Difference1 box can be selected from “A-B”, “B-A”, “A-C”, and “C-A”.

The combination for the Difference2 box can be selected from “B-C”, “C-B”, “A-C”, and “C-A”.



○ Other functions

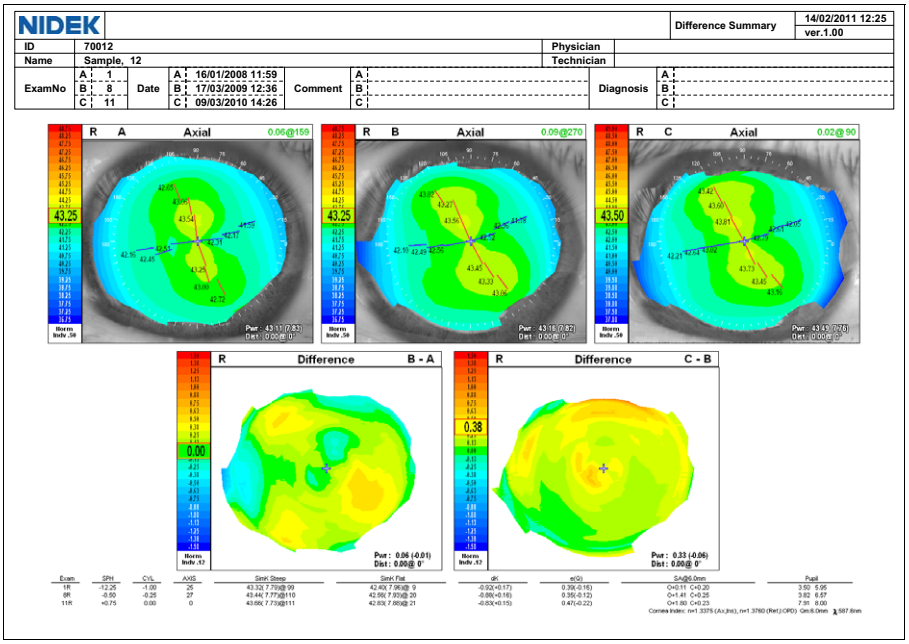
The functions shown below can be executed in the same manner as in the summary screen.



Right/Left button	Used to toggle display of the right and left eye difference analyses. If the other eye has not been measured, the message, “No data is found.” appears.
Print button	Used to print difference analysis result using an external printer.
Display button	Select the map overlay items from the “for all maps” or “for selected map” option.
Tools button	Data output Outputs the data of the difference analysis being displayed to the specified folder. Go to Main Menu Returns to the Main Menu screen.
Examination information button	Used to edit diagnosis and comments.
Exam List button	Used to return to the Exam List screen.
Zone box	Used to change the Zone setting.

See “2.8.2 Displaying summary from Patient List screen” (page 97) for details.

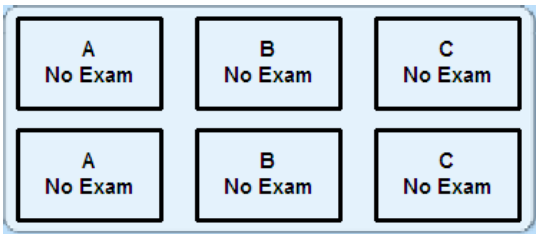
Example of printed difference summary



2.11 Comparison Analysis Display

2.11.1 Selecting data for comparison analysis

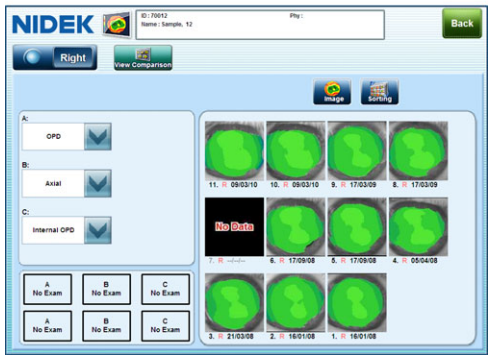
Two examination data sets are shown with a maximum of three maps each and arranged vertically so that they can be easily compared for purposes such as follow-up examination.



Two examination data sets are shown with three maps A to C each and arranged vertically.

1 Display the examination data to be used for difference analysis in the Exam List screen.

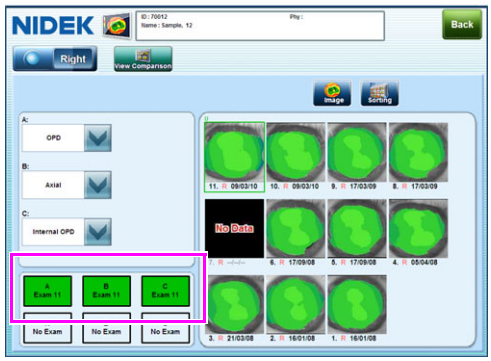
2 Press the Comparison button to display the "Comparison: Select Exam" screen.



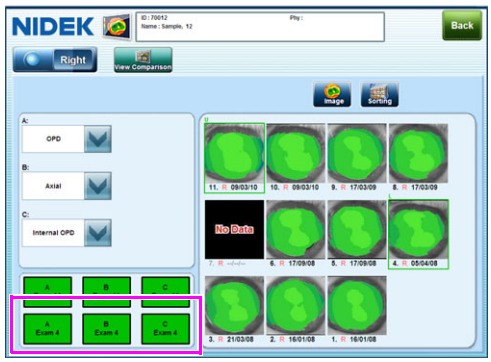
3 Select the thumbnails of the examination data sets to be compared.

Select the examination data in the order of the upper row, and lower row.

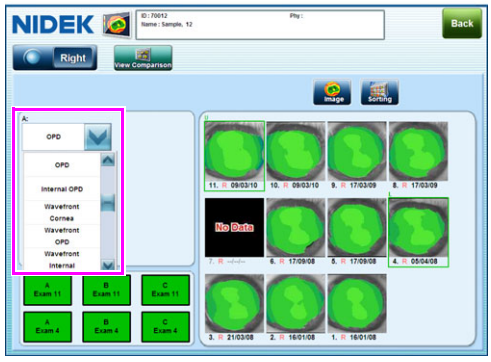
The examination number of the selected examination data is displayed in the upper row boxes at the bottom left of the screen.



Select the examination data for the lower row.



4 Select the map to be used for comparison analysis display from the menu that appears by pressing the V button.



Note

- Examination data sets and map type can be changed in the Comparison screen.

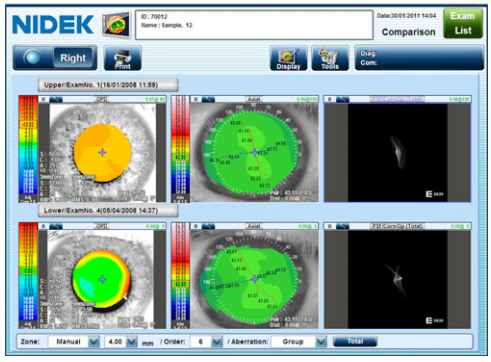
Button operation in “Comparison: Select Exam” screen

View Comparison button	Used to move to the Comparison screen.
Right/Left button	Used to toggle display of the right and left eye thumbnails.
Image button	Select the type of data displayed as thumbnails from “Cornea”, “Total” and “Internal”.
Sorting button	Used to toggle the thumbnail list display between the ascending and descending orders of the measurement date.

5 Press the View Comparison button to display the Comparison screen.

Perform the desired operations such as printing, data output, and changing of display in the Comparison screen.

For details of operation in the Comparison screen, see “2.11.2 Operation in Comparison screen” (page 131).



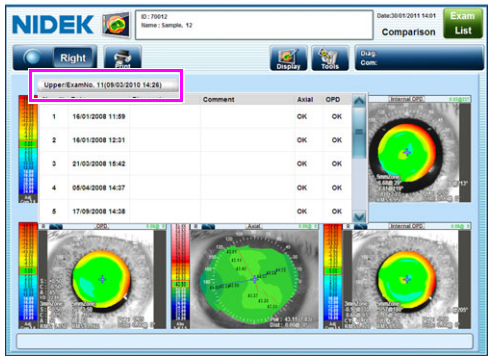
2.11.2 Operation in Comparison screen

○ Changing examination data

Select the desired examination data from the list that appears by pressing the button above the maps.

Press the button above the row (upper/lower) for which the examination data is to be changed.

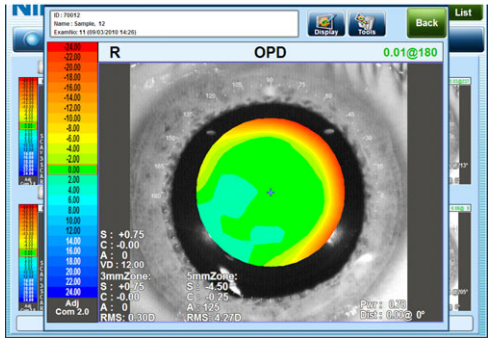
The currently selected data sets are indicated in the upper and lower row buttons.



○ Enlarging map

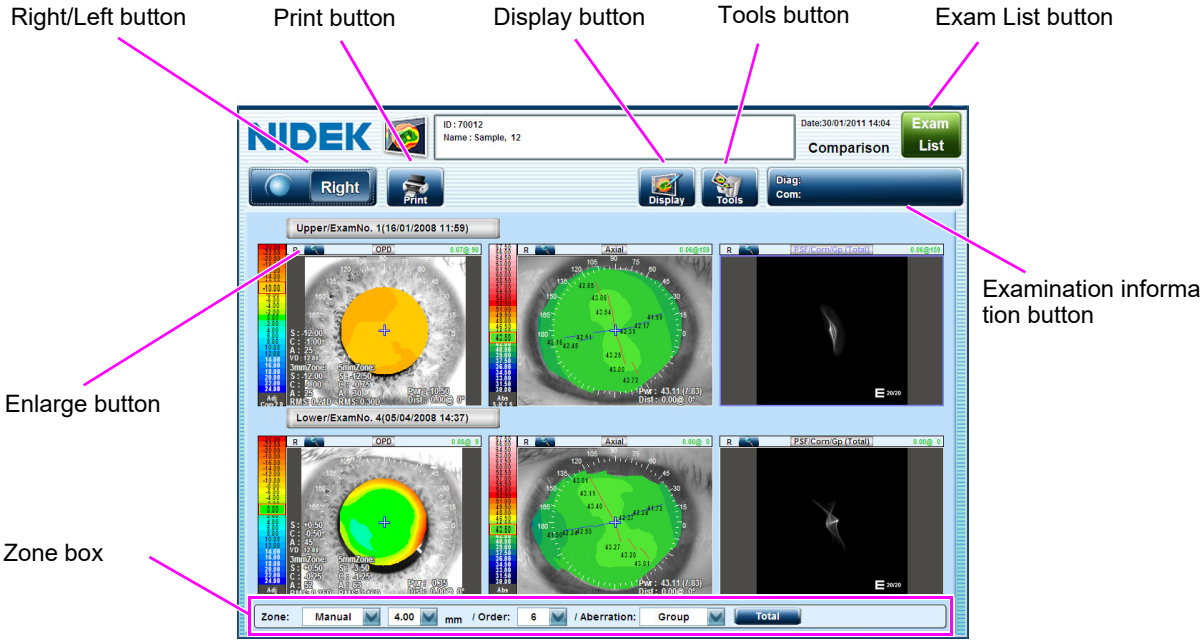
Maps can be enlarged by pressing the enlarge button at the top of each map.

In the enlarged display, the same operation can be performed as in the summary screen.



○ Other functions

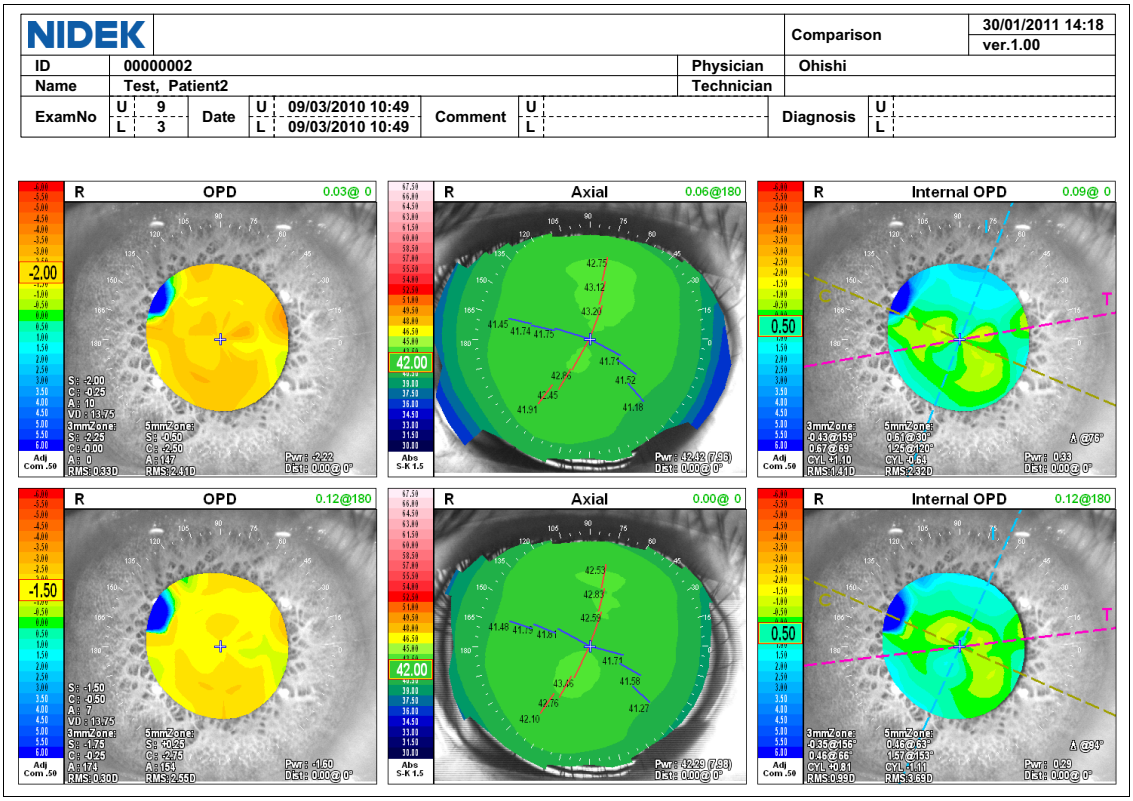
The functions shown below can be executed in the same manner as in the summary screen.



Right/Left button	Used to toggle display of the right and left eye comparison analyses.
Print button	Used to print comparison analysis result using an external printer.
Display button	Select the map overlay items from the “for all maps” or “for selected map” option.
Tools button	Data output Outputs the data of the comparison analysis being displayed to the specified folder. Go to Main Menu Returns to the Main Menu screen.
Examination information button	Used to edit diagnosis and comments.
Exam List button	Used to return to the Exam List screen.
Zone box	Used to change the Zone setting.

See “2.8.2 Displaying summary from Patient List screen” (page 97) for details.

Example of printed comparison analysis



2.12 Printing

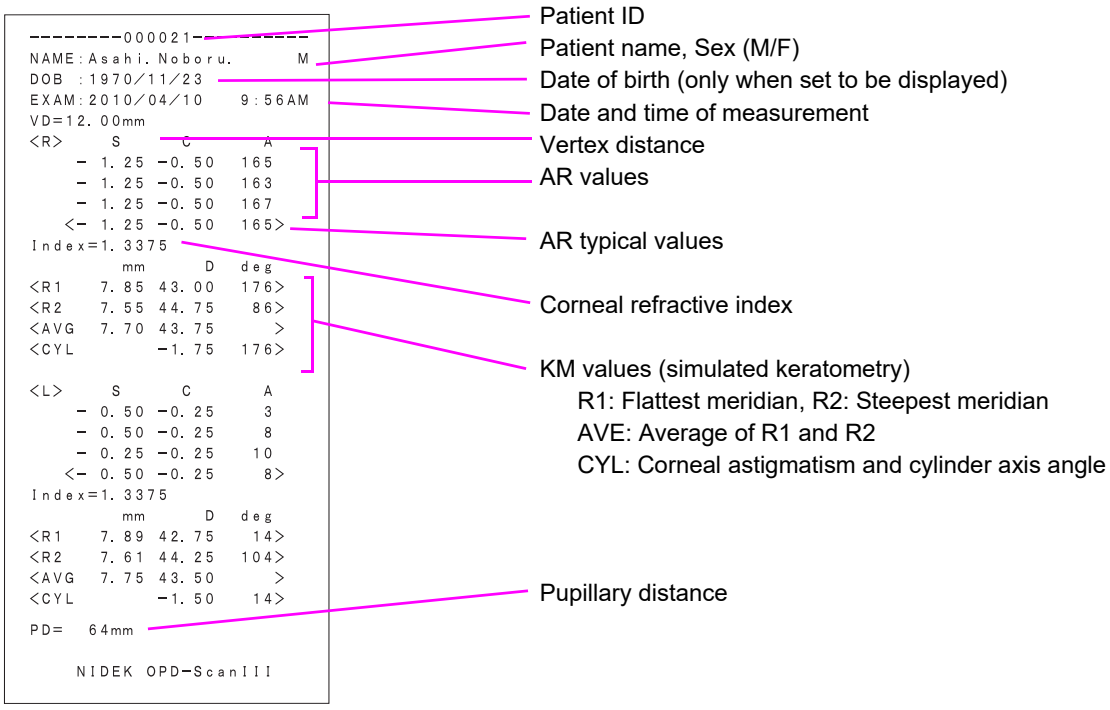
2.12.1 Printing measurement data (Internal printer)

Pressing the Verify & Save button after measurement prints the measurement data with the internal printer.
However, printing is not executed if “Internal Printer” is not checked in “Verify Exam Window – Options” in the Settings screen (Measurement tab).
AR values and KM values (simulated keratometry) are printed.

Note

- Do not touch the printer paper while the printer is in operation.
  Printed characters may become blurred or obscured.
- In the example below, the data is printed in the order of right eye AR values, right eye KM values, left eye AR values, and left eye KM values. However, the order can be changed in the Settings screen to the order of right eye AR values, left eye AR values, right eye KM values, and left eye KM values.
  The setting can be changed with the “Internal Printer – Print Order” parameter in the Settings screen (Print tab).
- If “E” is printed on the side of AR values, the reliability of these values is low.
  When the check mark is removed from either the High RMS Data check box in the Settings screen (Measurement tab) or the Error check box in the Setting screen (Print tab), such low-reliability measurement results are not printed.
- For details of setting for the internal printer, see “5.8.3 Print tab” (page 330).
- Re-printing with the internal printer is performed using the tool button function in the summary screen. For details, see “2.8.4 Tool button functions” (page 107).

[Sample printout 1]



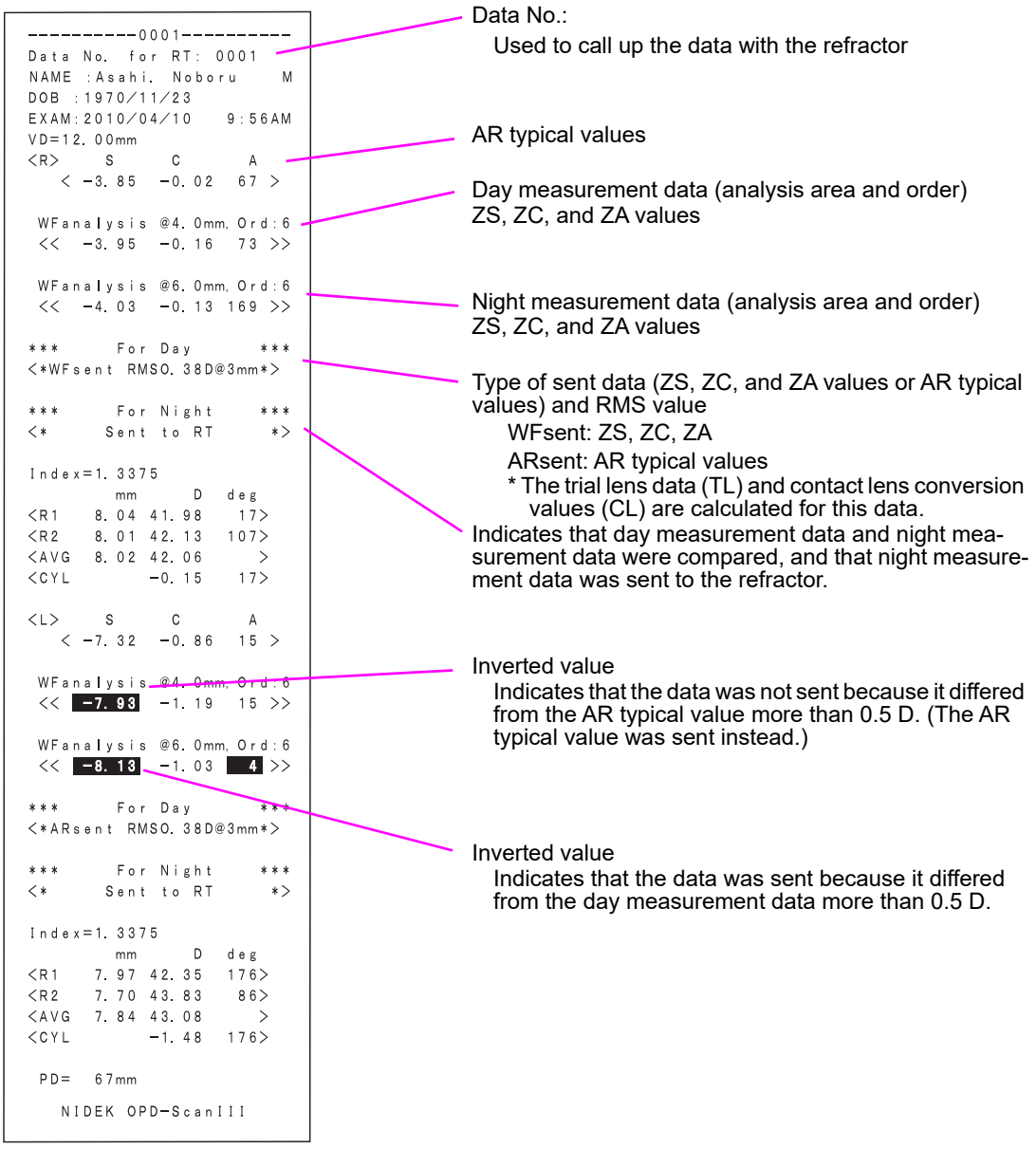
[Sample printout 2]

When “Send HD Exam Data” or “Send 30sec Refraction” in the Settings screen (Communication tab) is enabled, additional data is printed.

Send HD Exam data	Send 30sec Refraction	Data to be transmitted
---	---	AR typical value
---	○	ZS, ZC, ZA values (Day measurement data)*1
○	---	AR typical value ZS, ZC, ZA value (Night measurement data)
○	○	ZS, ZC, ZA values (Day*1 and night measurement data)

*1 Depending on the measurement result, the AR typical value may be transmitted instead of ZS, ZC, and ZA values.

For the method of setting those parameters, see “5.8.4 Communication tab” (page 333).



2.12.2 Printing summary (Color map) (External printer)

Summaries (color maps) can be printed using an external printer.

It is recommended to use any of the following printers in connection with the OPD-Scan III.

Canon PIXUS iP110

* Printing may not be executed properly with other printers.

○ Printing summaries (color maps) from screen for verifying measurement data

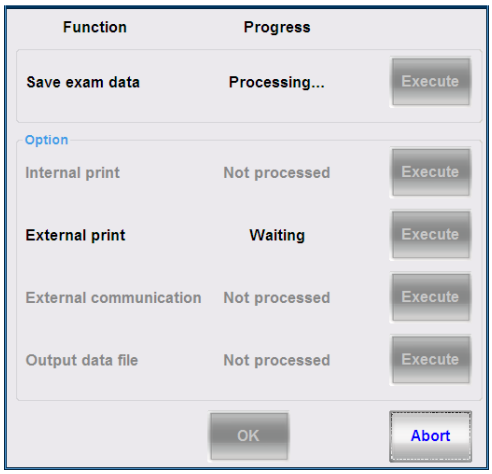
Pressing the Verify & Save button in the Verify Examination Quality screen after measurement prints the summary data with an external printer.

Screen for verifying measurement data

Single measurement	Verify Examination Quality screen
Multi measurement	Verify Multi Measurement screen

Pressing the Verified & Save button displays the Verify Result window to show the progress of the processing.

Printing starts when saving of examination data is complete.

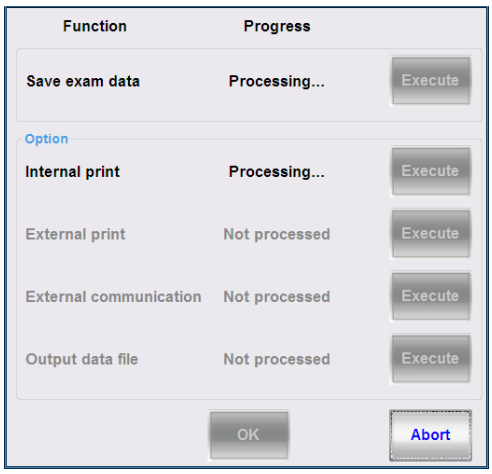


Note

- If the measurement is finished only with one eye, pressing the Finish button also prints the summary with the external printer.

However, printing is not executed if “External Printer” is not checked in “Accept Button Handling” in the Settings screen (Measurement tab).

In such a case, “Not processed” is displayed for “External print” in the Verify Result window.

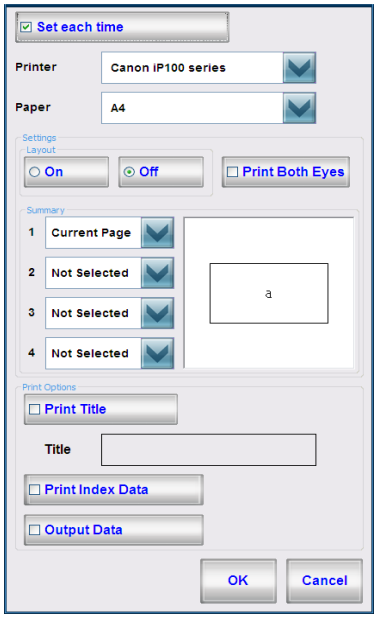


To set the print setting each time printing is executed, check “External Printer – Set each time” in the Settings screen (Print tab) in advance.

The Printer Settings screen appears. The printer setting can be confirmed or changed.

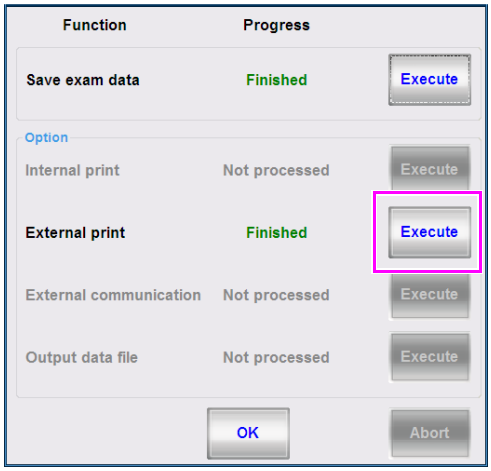
The parameters in the Printer Settings screen are the same as those in the Settings screen (Print tab).

See “5.8.3 Print tab” (page 330) for details.



To execute printing again, press the Execute button for the external printer.

If printing is stopped or canceled, it can be resumed by pressing the Execute button.



○ Printing summaries (color maps) from summary screen

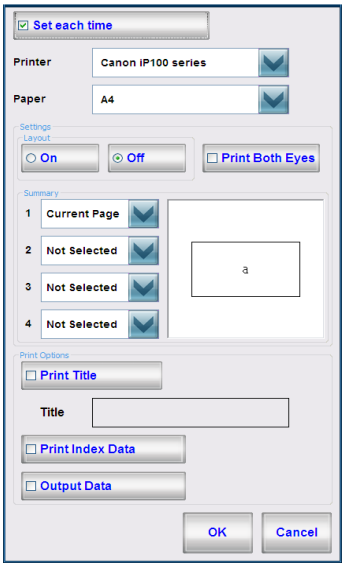
Pressing the Print button in the summary screen prints the summary with an external printer.

To set the print setting each time printing is executed, check “External Printer – Set each time” in the Settings screen (Print tab) in advance.

The Printer Settings screen appears. The printer setting can be confirmed or changed.

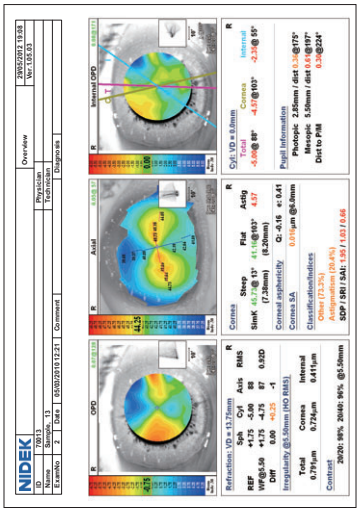
The parameters in the Printer Settings screen are the same as those in the Settings screen (Print tab).

See “5.8.3 Print tab” (page 330) for details.

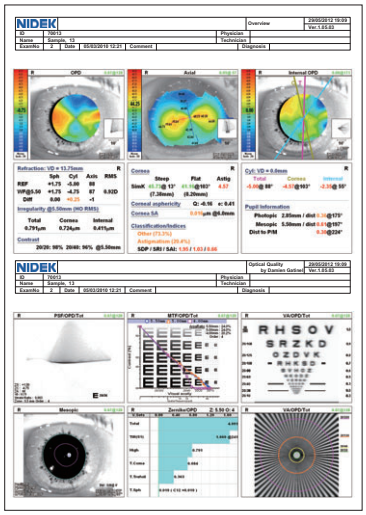


○ Example of printed summary

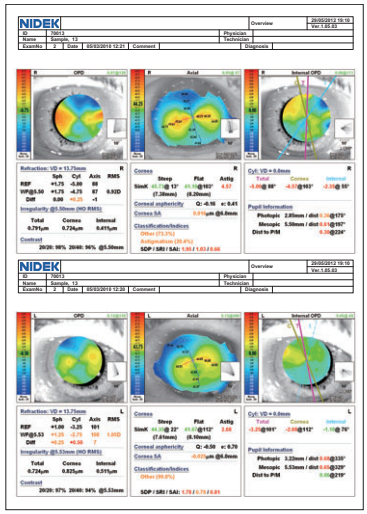
The summary to be used for printing can be set with the Summary parameter in the Settings screen (Print tab) or in the Printer Settings screen (when “Set each time” in the Settings screen (Print tab)) is selected).



Layout: Off



Layout: On
Print Both Eyes: OFF



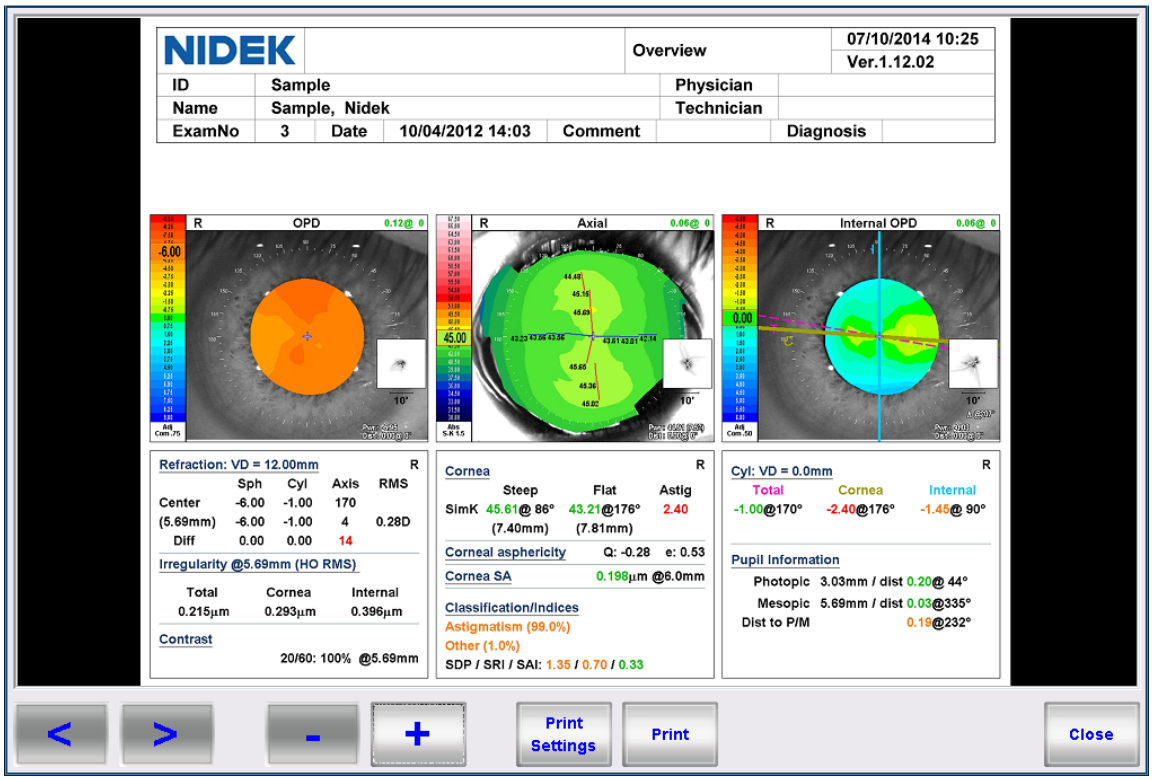
Layout: On
Print Both Eyes: ON

2.12.3 Summary (color map) print preview

Summaries to be printed can be previewed. The contents can be confirmed and changed.
Pressing the Preview button in the summary screen displays the print preview in the Map Image Preview screen.

Note

- The Preview button can be used only when an external printer has been set.
  With the default setting of the OPD-Scan III, no external printer is set. To set an external printer (to add printer driver), contact NIDEK or your authorized distributor.



[<] button	Used to display the previous page. This button can be used when multiple summaries are to be printed.
[>] button	Used to display the next page. This button can be used when multiple summaries are to be printed.
[-] button	Used to reduce the displayed image.
[+] button	Used to enlarge the displayed image. When the image is enlarged, the displayed image can be moved by dragging.
[Print Settings] button	Used to display the Printer Settings screen. When the OK button is pressed after the setting is changed in the Printer Settings screen, the Printer Settings screen is closed and the setting change is reflected in the Map Image Preview screen.
[Print] button	Used to print data with the current print setting. Also when “Set each time” is selected in the Settings screen (Print tab), pressing the Print button immediately starts printing with the specified setting.
[Close] button	Used to close the Map Image Preview screen.

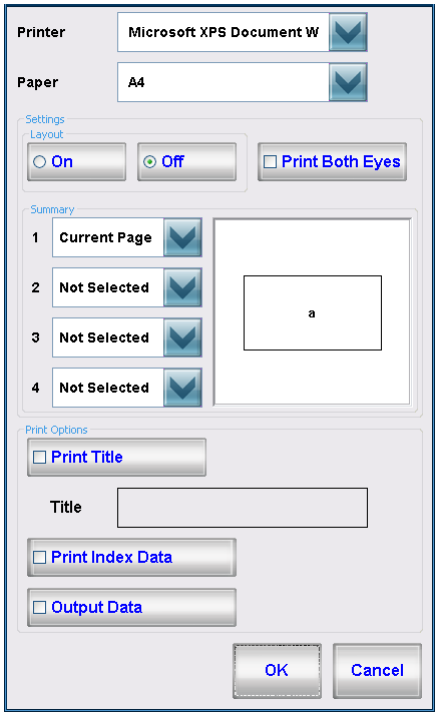
Printer Settings screen

The contents of the Printer Settings screen displayed from the Map Image Preview screen are the same as those in the Settings screen (Print tab), and those in the Printer Settings screen displayed by pressing the Print button from a summary screen.

For details, see “5.8.3 Print tab” (page 330).

However, “Set each time” is not available. In addition, the OK button is provided instead of the Print button.

The settings changed in the Printer Settings screen are reflected in the Settings screen (Print tab).



3. OPERATING PROCEDURE (AR/KM MODE)

This section explains the operating procedure of AR/KM mode. For the same operations as in OPD/CT mode, see “2 OPERATING PROCEDURE (OPD/CT MODE)” (page 45).

3.1 Operation Flow

[Measurement and printing]

Turning on the device

2.2.1 Start up (page 46)
Same procedure as in OPD/CT mode

Inputting patient ID

Only the patient ID can be input.
The patient cannot be selected from the patient list.

Measurement

3.2 Measurement (page 142)
AR/KM measurement, AR measurement, and KM measurement are available.

Printout

3.3 Printing measurement data (Internal printer) (page 153)
After measurement, measurement data can be automatically printed.
With a parameter setting, measurement data can be output via a LAN.

Turning off the device

2.2.3 Shut down (page 48)
Same procedure as in OPD/CT mode

Note

- In AR/KM mode, the same measurement as conducted with a general auto ref-keratometer.
  The measurement values cannot be saved in the database. They need to be printed using the internal printer or output as a file.
- Set the parameters for using AR/KM or OPD/CT mode in the Settings screen (Measurement tab).

3.2 Measurement

Refractive error (AR value) and corneal curvature radius (KM value) within the central area of the cornea are measured.
In AR/KM mode, all operations from measurement of both eyes to printing are executed in the Measurement screen.

Measurement mode

Two types of measurement are available: AR and KM measurements. The measurement mode button allows selection of the AR measurement mode, KM measurement mode, or both.

Measurement mode button	Measurement type
 AR/KM	AR measurement and KM measurement
 AR	AR measurement
 KM	KM measurement

Explanation of measurement

AR measurement	The fundus is scanned with slit-shaped ray bundles and measured in increments of 1° in a 2.6 mm-diameter area to obtain the AR measurement data.
KM measurement	A placido ring image projected over the cornea is captured. The captured image is analyzed to obtain the KM measurement data.

Parameter setting for AR and KM modes

Parameters related to the AR and KM measurements are common with OPD and CT modes. Only the parameters shown below are unique to AR and KM modes. Set them as necessary.

Parameters in Settings screen (Print tab)	Internal Printer	Print Options	Print No. (AR/KM mode)
	Internal Printer	Print Mode	

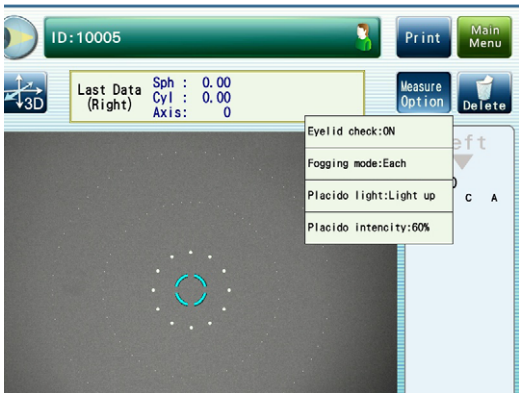
Temporarily enabled function

For convenience, some functions can be temporarily enabled without changing parameters in the Settings screen (Measurement tab).

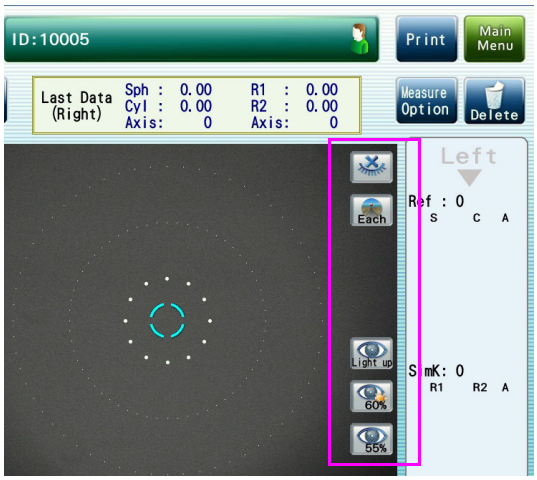
Select the desired functions to be temporarily enabled from the pop-up menu that appears by pressing the Measure Option button.

These temporarily enabled functions are disabled when the Measurement screen is closed.

The contents of the pop-up menu vary depending on the selected mode: AR/KM, AR, or KM.



Icons on the screen indicate the functions that differ from the setting in the Settings screen.

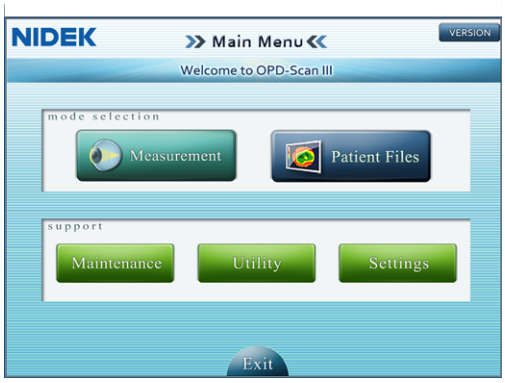


Eyelid check 	Used to toggle display of the error due to eyelid detection between “ON” and “OFF”. This setting is not in the Settings screen. The default setting is “ON”.
Fogging mode 	Used to toggle use of fogging for every AR measurement between “Single” and “Each”.
Placido light 	Used to toggle lighting of the placido light between “Flash” (lit up only during measurement) and “Light up” (always lit up).
Placido intensity 	Used to set the intensity of the placido rings. Selecting this option displays the on-screen numeric keypad. Input the intensity by percentage. Change the intensity if detection of the placido ring fails.
CT measurement internal LED intensity 	Used to set the CT measurement internal LED intensity. Selecting this option displays the on-screen numeric keypad. Input the intensity by percentage in the range from 0 to 100%. The KM measurement value may not be displayed properly if the internal LED (central light) spots cannot be detected properly due to reflection of light by IOL or cataract. In such a case, perform the measurement with the intensity of the LED (central light) lowered, for example, to 50 or 30% of the initial value. That may reduce reflection of light during the measurement.

○ Measurement procedure

1 Turn on power to the device.

The device starts up, and the Main Menu screen opens.



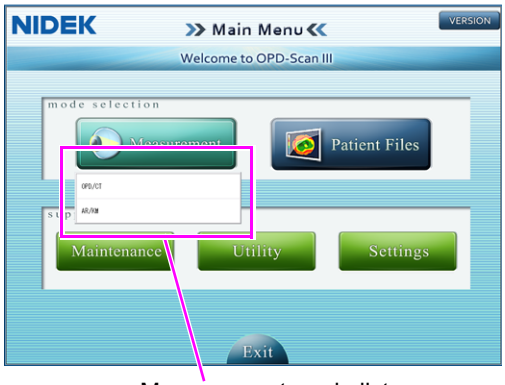
Main Menu screen

2 Press the Measurement button to move to the Patient List screen (before measurement).

With the “Measurement mode” parameter, the method of displaying the Measurement screen differs.

When “Selection list“ is selected

Pressing the Measurement button shows the measurement mode list for the operator to select the desired mode. Selecting “AR/KM” displays the Patient list screen (before measurement).



Measurement mode list

When “AR/KM” is displayed

Pressing the Measurement button displays the Measurement screen in AR/KM mode.

Note

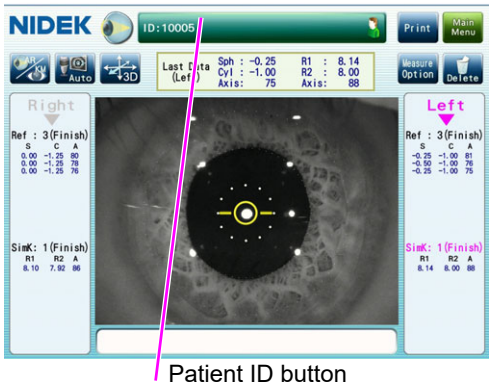
- The “Technician’s Name Entry” parameter is not available in AR/KM mode.

3 Input the patient ID if necessary.

Input the patient ID using the screen keyboard that appears when the patient ID button is pressed.

If the optional barcode reader (or magnetic card reader) is connected, the patient ID can be read from a barcode (or a magnetic card).

1) Press the patient ID button in the Measurement screen to display the screen keyboard.

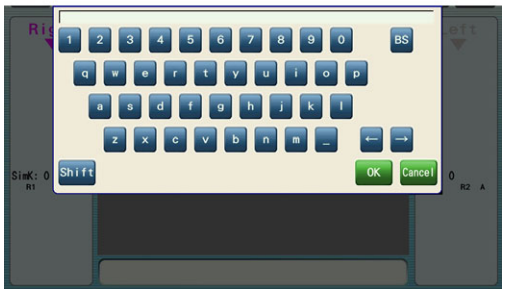


Patient ID button

2) Input the patient ID.

A maximum of 20 characters can be input.

3) Press the OK button to close the screen keyboard.



Operation of screen keyboard

BS	Used to delete one character on the left of the cursor. If any characters are selected (highlighted), all the selected characters become deleted.
← , →	Used to move the cursor one character to the right or left.
Shift	Used to toggle between uppercase and lowercase characters.
OK	Used to save the input characters and close the screen keyboard.
Cancel	Used to discard the input characters and close the screen keyboard.

Note

- To delete the patient ID, delete all characters in the input box with the BS key, then press the OK button.

4 Prepare the patient.

1) Clean the forehead rest and chinrest that come into contact with the patient with clean gauze or absorbent cotton dampened with rubbing alcohol.

If a stack of chinrest paper is on the chinrest, remove one sheet.

2) Instruct the patient to remove glasses or contact lenses, and sit on the chair.

Note

- To obtain accurate measurement from patients who wear contact lenses on a daily basis, it is recommended to have them wear glasses instead of contact lenses for a week before the measurement.
  The shape of the cornea altered by the contact lenses needs to be restored to the original condition.

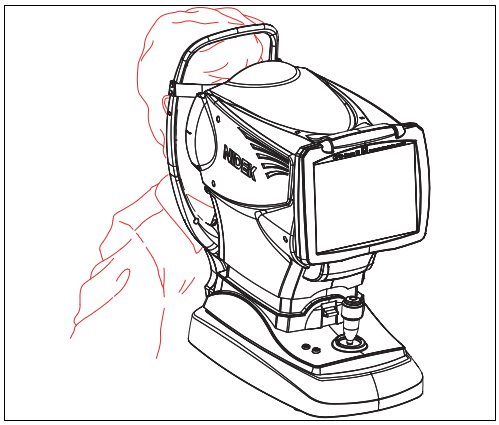
[About over-refraction]

In the case of over-refraction (measurement with glasses worn), the focus indicator may not appear.

Execute the AR measurement at the position where the alignment light becomes the smallest. However, reflection of the measurement light from the glasses may interfere with proper AR measurement.

The KM measurement cannot be executed properly due to causes such as alteration of image magnification by the glasses.

3) Have the patient place their chin on the chinrest as deeply as possible, and their forehead gently on the forehead rest.

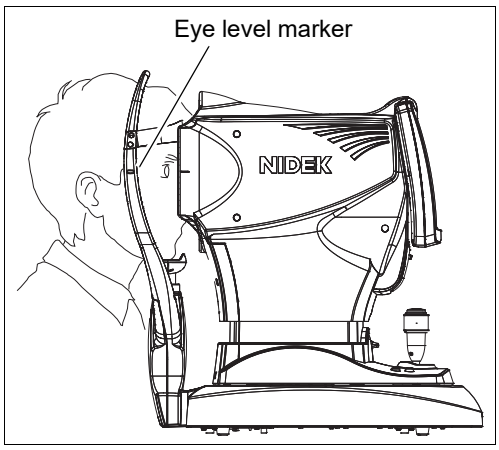


4) Adjust the height of the chinrest with the chinrest up/down button (▲ , ▼) so that the patient's eyes are roughly aligned with the eye level marker.

   Before adjusting the height of the chinrest, let the patient know that the chinrest moves up and down.

   When moving the chinrest up or down, check the patient condition directly.

   If a large deviation with the eye level marker is found, release the chin from the chinrest and then move the chinrest up or down.



Note

- To relax the patient, explain the following before measurement:
  This measurement is for determining the best lens for the patient and for measuring the corneal shape. The weak infrared light and blue light used for measurement do not harm the eyes.

5 Set the measurement conditions as necessary.

Measurement mode

Each pressing of the measurement mode button changes the selected mode as AR/KM  → AR  → KM  → AR/KM →...

The measurement items corresponding to the selected measurement mode are displayed on the screen.

Along both sides of the screen, the AR measurement values (Ref, S, C, A) and the KM measurement values (SimK, S, C, A) are displayed.

Auto shot function

Press the button to select the auto shot function.

 **Manual**	The auto shot function is disabled. Press the start button to start measurement.
 **Auto**	The auto shot function is enabled. Measurement starts automatically when the eye is best aligned and focused. In the KM measurement, the auto shot function is disabled.

Note

- When the auto shot function is used, any operation may not be effective during the time from the auto alignment to the start of the measurement.

Auto tracking function

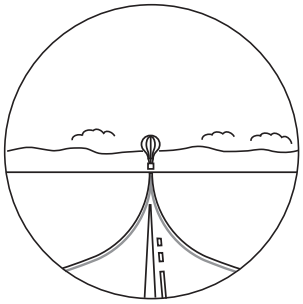
Press the button to select the auto tracking function.

3D **3D**	The auto tracking function in the forward and back, right and left, and up and down directions is enabled.
2D **2D**	The auto tracking function in the right and left, and up and down directions is enabled.
OFF **OFF**	The auto tracking function is disabled. Manually align the device and bring the eye into focus.

Note

- Once the measurement settings above are set, they are maintained in the subsequent measurements.

6 Instruct the patient to look through the measuring window and, when the patient sees a picture of a balloon, watch the center of it with eyes wide open and without straining.



Scenery chart

Note

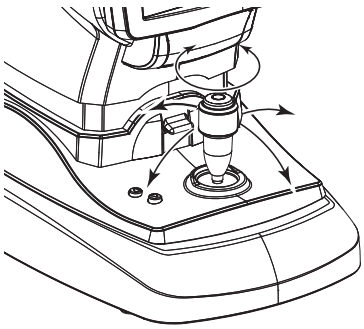
- Instruct the patient not to blink during measurement. For successful measurement, it is recommended to have the patient blink once then open their eyes wide just before measurement.
- Instruct the patient to open both eyes wide during measurement.
  Closing one eye may cause unstable fixation and insufficient opening of the other eye.
- For patients who have difficulty fixating their eyes, the operator should guide the patient's gaze direction by voice.
- If necessary, temporarily enable the desired functions by pressing the Measure Option button.
  See "3.2 Measurement" (page 142) for details.

7 Manipulate the joystick to display the patient's eye on the screen.

By moving the joystick laterally, the main body moves right, left, forward, and backward. By turning the upper part of the joystick, the main body moves up and down.

Align the eye position to the measuring point with right, left, up and down movements.

Adjust the focus with forward and backward movement.



8 Perform alignment and focus adjustment.

The method of alignment and focus adjustment varies depending on the setting of the auto tracking function.

* See “○Measurement procedure” (page 144) for details.

Perform alignment by bringing the alignment light (center of the eye) in the alignment target.

9 Start measurement.

AR/KM measurement

To measure both right and left eyes in AR/KM measurement mode, either Procedure (A) or (B) can be selected.

(A) First the AR and KM measurements are performed for one eye, then the same measurements are performed for the other eye.

Example: AR measurement (right eye) → KM measurement (right eye) → AR measurement (left eye) → KM measurements (left eye)

(B) The AR measurement is performed for both eyes, then the KM measurement is performed for both eyes.

Example: AR measurement (right eye) → AR measurement (left eye) → KM measurement (right eye) → KM measurements (left eye)

In this manual, the measurement procedure is explained with Procedure (A).

When Procedure (A) is used, the accuracy of the PD measurement executed at the same time as the AR measurement may be lowered. This is because the time difference between the AR measurements for right and left eyes is greater in Procedure (A) than (B), and the probability of shift in the pupil position is higher.

The eye to be measured is automatically switched between the right and left eyes when the measuring unit is moved and the eye to be measured is displayed in the screen.

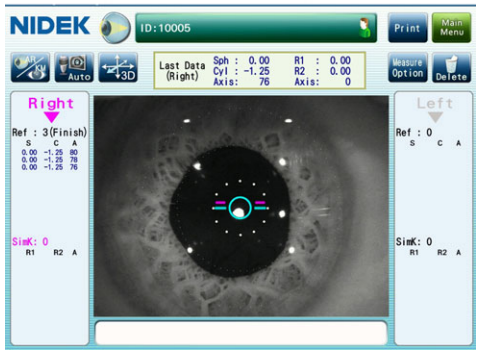
The currently displayed eye (right/left) and measurement mode (AR/KM) are shown in pink in the Measurement screen.

① When the best alignment and focus are achieved, the AR measurement automatically starts (when the auto shot function is enabled).

When the auto shot function is disabled, press the start button to start measurement.

When the AR measurement is executed the specified number of times, “Finish” appears on the side of the “Ref” indication, and the AR measurement is complete.

For the setting of the number of measurements, see “ AR measurement” (page 149).

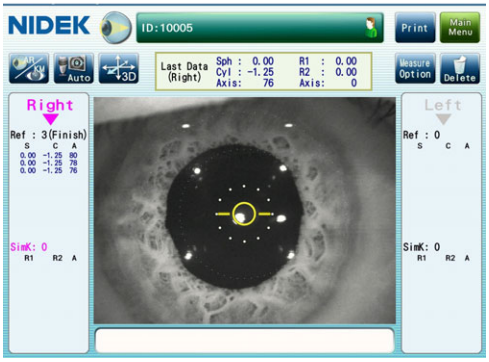


② When the AR measurement is complete, the "SimK" indication for the selected eye in the Eyes/Measurement display is shown in pink.

▼

③ To prepare for the next measurement, have the patient slowly blink once or twice.

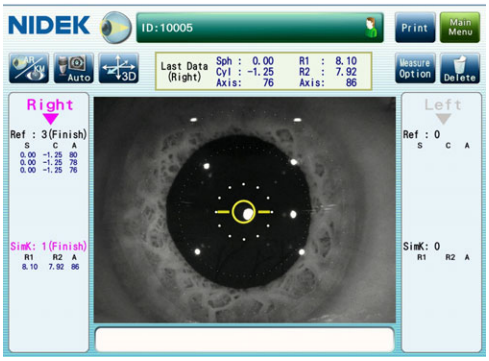
▼



④ When the best alignment and focus are achieved, press the start button to start the KM measurement.

The start button needs to be pressed to start the KM measurement regardless of the auto shot function setting.

When the KM measurement is executed the specified number of times, "Finish" appears on the side of the "SimK" indication, and the KM measurement is complete.



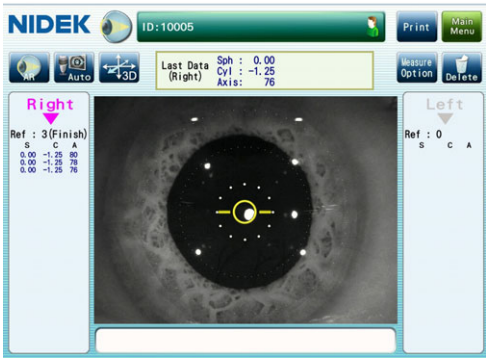
The latest AR measurement and the latest keratometry simulated based on the KM measurement result are displayed in the latest data display in the upper part of the screen.

AR measurement

When the best alignment and focus are achieved, the AR measurement automatically starts (when the auto shot function is enabled).

When the auto shot function is disabled, press the start button to start measurement.

When the AR measurement is executed the specified number of times, "Finish" appears on the side of the "Ref" indication, and the AR measurement is complete.



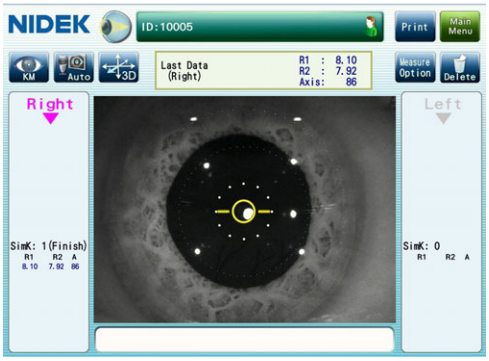
The latest AR measurement is displayed in the upper part of the screen.

KM measurement

When the best alignment and focus are achieved, press the start button to start the KM measurement.

The start button needs to be pressed to start the KM measurement regardless of the auto shot function setting.

When the KM measurement is executed the specified number of times, "Finish" appears on the side of the "SimK" indication, and the KM measurement is complete.



The latest keratometry simulated based on the KM measurement result are displayed in the latest data display in the upper part of the screen.

Inform the patient that the measurement is complete and have them rest comfortably.

Note

- Even when the auto shot function is enabled, the operator can start measurement by pressing the start button.

  If the measurement does not start automatically due to frequent blinks or other causes, the measurement can be started by pressing the start button.
- Instruct the patient not to blink or move their head or eyes during the measurement.
- If the measurement resulted in an error, the possible causes are as shown below. If the error occurs successively, find the cause.
  a. Patient's blink during measurement
  b. Eyelid or eyelashes covering the minimum pupil mark during AR measurement
  c. Eyelid or eyelashes covering the anterior segment illumination spots during KM measurement
  d. Patient's pupil smaller than the minimum pupil mark

     Have the patient sit in a dark room for a while and wait until the pupil diameter becomes large enough for measurement.
  e. Extremely low retinal reflection due to eye disease such as cataract
  f. Extraneous reflection of light on the cornea during measurement
  g. Extremely distorted cornea
- The measurement stops if the alignment or focus is off. However, when the alignment and focus are adjusted again and the measurement is performed, the measurement data is added to the memory together with the previous measurement data.
- A maximum of ten times of measurement data can be saved in the memory for the right and left eyes each. When a measurement data set is added to the memory with ten measurement data sets, the oldest data is deleted.

[AR measurement count]

When the auto-shot function is turned ON		
	When "OPD" of "End Criteria" is "AI"	When the best alignment and focus are achieved, the AR measurement is continued until the typical value is automatically obtained.
	When "OPD" of "End Criteria" is not "AI"	When the best alignment and focus are achieved, the AR measurement is continued until the specified number of measurements is executed.
When the auto-shot function is turned OFF		
	When "OPD" of "End Criteria" is "AI"	Pressing the start button executes the AR measurement once. Pressing and holding the start button continues the AR measurement until the typical value is obtained.
	When "OPD" of "End Criteria" is not "AI"	Pressing the start button executes the AR measurement once. Pressing the start button continues the AR measurement until the specified number of measurements is executed.

Note

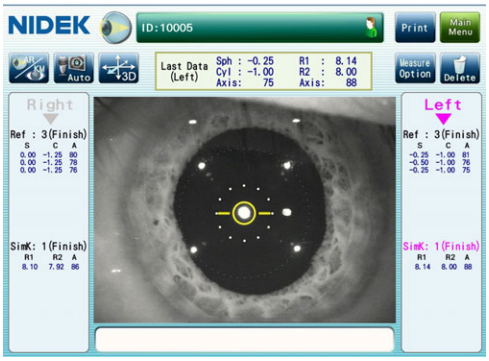
- The criteria for completing the AR measurement is set with the "End Criteria – OPD" parameter in the Settings screen (Measurement tab). (Same setting as that for the OPD measurement)
- The AR measurement can be repeated with fogging by checking "Single Fogging" in the Settings screen (Measurement tab).

[AR measurement value display]

If the AR measurement results need to be used with care, any of the symbols shown below appears to the right of the AR value in the screen.

E	Indicates high RMS data (only when "High RMS Data" is selected under the Measurement tab in the Settings screen). The measurement value is displayed in orange.
*	Indicates that the measurement was executed in Cataract mode. If measurement cannot be executed due to cataract or any other eye abnormality, the measurement conditions are automatically changed to allow the measurement.
#	Indicates that the measurement was executed in Small Pupil mode. If measurement cannot be executed due to a small pupil, the measurement conditions are automatically changed to allow the measurement. The measurement value is shown in red. This data cannot be saved to the database.

10 Switch the eye to be measured, and measure the other eye in the same manner.



11 Release the patient from the chinrest.

Instruct them to remain seated when removing their head from the chinrest. If they stand up at this time, their head may hit the headrest.

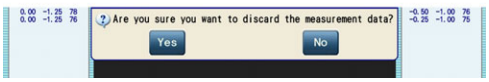
12 Print the measurement result by pressing the Print button.

According to the parameter setting, the measurement data is output via a LAN at the same time as printing of the measurement data.

For details of the printed measurement result, see "3.3 Printing measurement data (Internal printer)" (page 153).

When the OPD-Scan III is connected with the RT, data can be output via the RS-232 port.

13 To measure the next patient, delete the measurement data and repeat from Step 3.



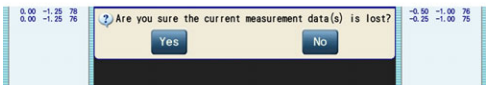
Pressing the Delete button displays the message "Are you sure you want to discard the measurement data? Yes/No". Pressing Yes clears the measurement data and the temporarily enabled functions specified with the Measure Option button.

Note

- Deleting the measurement data does not clear the patient ID. To clear the patient ID, use the screen keyboard that appears by pressing the patient ID button.

To finish measurement, see “2.2.3 Shut down” (page 48).

Pressing the Delete button displays the message asking the operator whether they really intend to discard the measurement data. Check that the data being displayed is recorded, then press Yes to display the Main Menu screen.



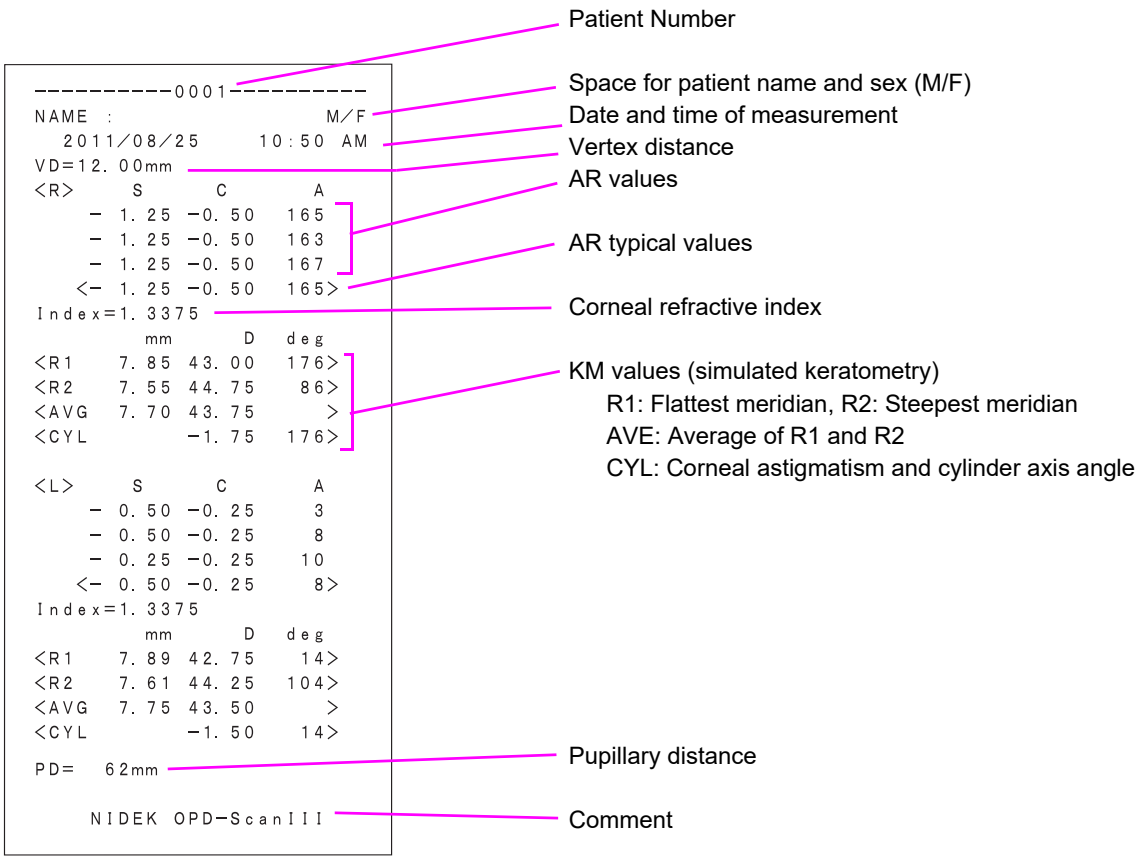
3.3 Printing measurement data (Internal printer)

Pressing the Print button after measurement prints the measurement data with the internal printer. The AR values and KM values (simulated keratometry) are printed.

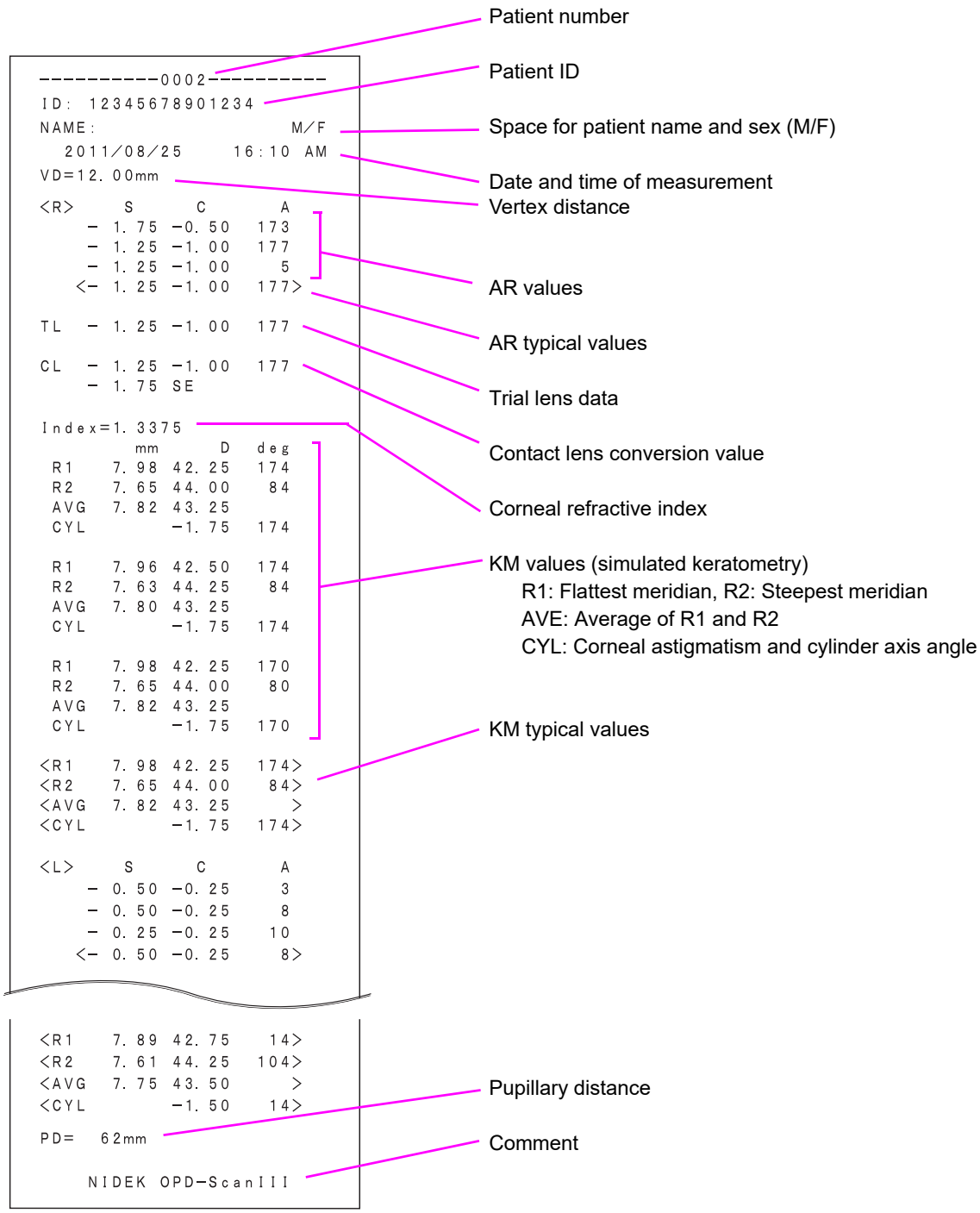
Note

- Do not touch the printer paper while the printer is in operation.
  Printed characters may become blurred or obscured.
- In the example below, the data is printed in the order of right eye AR values, right eye KM values, left eye AR values, and left eye KM values. However, the order can be changed in the Settings screen to the order of right eye AR values, left eye AR values, right eye KM values, and left eye KM values.
  The setting can be changed with the "Internal Printer – Print Order" parameter in the Settings screen (Print tab).
- If "E" is printed on the side of AR values, the reliability of these values is low.
  When the check mark is removed from either the High RMS Data check box in the Settings screen (Measurement tab) or the Error check box in the Setting screen (Print tab), such low-reliability measurement results are not printed.
- For details of setting for the internal printer, see "5.8.3 Print tab" (page 330).

[Sample printout 1]



[Sample printout 2]



*1 Patient ID

Printed when the patient ID is input.

*2 Vertex distance

Distance from the corneal vertex to the posterior surface of the lens of the glasses.

*3 AR typical value

Printed when there are three or more AR measurement values.

*4 SE value (Spherical equivalent value)

Calculated for the AR typical value (or the latest AR measurement value if the AR typical value does not exist) and the contact lens conversion value.

*5 Trial lens data

Calculated by automatically changing the CYL value based on the AR typical value (or the latest AR measurement value if the AR typical value does not exist) to minimize the spherical refractive power of the trial lens.

*6 Contact lens conversion value

Calculated by converting the AR typical value (or the latest AR measurement value if the AR typical value does not exist) with the corneal vertex distance (VD) considered to be 0 (zero).

*7 KM typical value

Printed when there are three or more KM measurement values.

*8 Comment

The desired characters and symbols can be input.

For details, see “5.8.3 Print tab” (page 330).

4. ADVANCED OPERATION

This section provides the following explanations for advanced use of the OPD-Scan III:

Explanation of maps

"4.1 Color Maps" (page 158)

Explanation of preinstalled summaries

"4.2 Explanation of Summaries" (page 218)

Registration of new summaries

"4.3 Setting of Summaries (Map Layout)" (page 239)

Screen operation for when a summary is being displayed (in the summary screen)

Operation	Reference page
Displaying different summary	"○Displaying different summary" (page 100)
Displaying an examination data set with another number from the same patient	"○Changing examination data" (page 101)
Changing the overlay items to be displayed	"○Changing overlay items" (page 101)
Displaying another map for a single map (in a user customized summary)	"○Changing maps" (page 162)
Outputting (or saving) summary data	"4.5.1 Outputting summary image data (Saving maps)" (page 274)
Printing summary	"2.12.2 Printing summary (Color map) (External printer)" (page 135)
Enlarging a map	"○Operation of enlarged map" (page 164)
Printing a map	"○Printing maps" (page 165)
Inputting and changing examination information (diagnosis and comments) for the data being displayed in a summary	"○Editing examination information" (page 106)
Displaying the distance between two points on a map	"○Displaying distance between two points" (page 105)

4.1 Color Maps

Fourteen kinds of maps, including the Axial, Instantaneous, and “Refractive” maps, and eye images (Eye Image) captured during the CT measurement can be displayed in a summary.
In a summary, a maximum of six types of maps can be displayed.

Map types

	Refraction / Aberration	Corneal curvature
Whole eye	OPD (Distribution of refractive error) (see page 187) Wavefront (Aberration) *1 (see page 192) Zernike Graph (Types of aberrations) *2 (see page 200) PSF (Simulated image of point-source light on the retina)*1 (see page 207)	—
Cornea	"Refractive" (Refractive power of corneal surface) (see page 174)	Axial (Corneal curvature radius / Corneal refractive power) (see page 168) Instantaneous (Variation in radius of localized corneal curvatures) (see page 171) Gradient (Slope of cornea) (see page 172) Elevation (Difference in height of cornea compared with spherical surface) (see page 175)
Internal eye	Internal OPD (Aberration in internal eye) (see page 189) Zonal Refraction (Distribution of refractive error) (see page 216)	—

Other displays

Anterior eye segment	Eye Image (Anterior eye segment image: Placido ring, photopic vision, mesopic vision, and retroillumination images)
Whole eye	Topo Classifier (Analysis and classification of cornea based on corneal shape) (see page 178) MTF Graph (Simulated relationship between contrast and visual acuity) *1 (see page 210) Visual Acuity (Simulated view of how visual acuity charts appear to the patient) (see page 213)

*1: The portion of eye (OPD/Cornea/Internal) and the type of aberration data (Total/HO/Group) can be selected.

*2: The portion of eye (OPD/Cornea/Internal) can be selected.

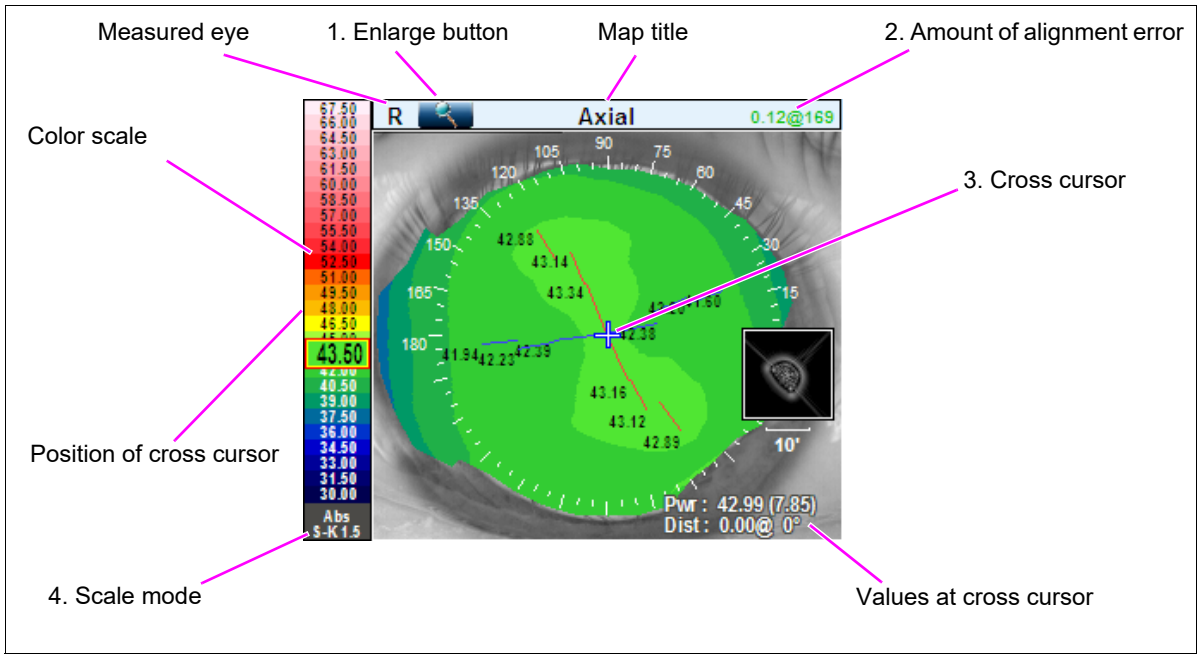
Note

- The Zonal Refraction map is displayed only when AR values obtained with the ARK-9000 is displayed or when a map layout including the Zonal Refraction map is displayed with OPD-Station. It cannot be selected for a user customized summary.

  The Zonal Refraction map cannot be selected in a user customized summary created in the Summary tab screen.

4.1.1 Common items in maps

Operations shown below are common with all maps displayed in the summary.



Note

- "Click" and "Right-click" in the explanation mean a mouse operation. (The touch screen cannot be used for such operations.)

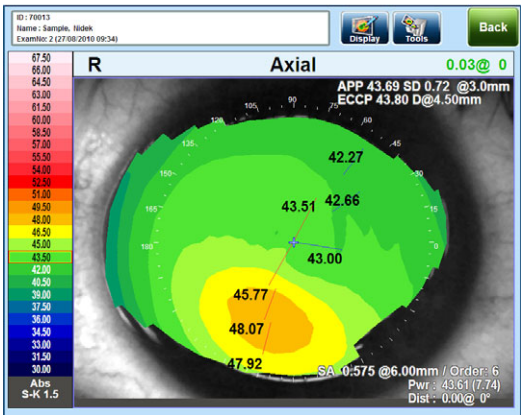
  Use a commercially available mouse.

1. Enlarge button

Enlarges a map in another screen.

The enlarged map allows changing of overlay items, printing of the enlarged map, and outputting of data.

Some overlay items are available only for the enlarged map.



2. Amount of alignment error

Displays the "Distance@Angle" between the measurement optical axis and the cornea apex.

Amount of alignment error (mm)	Color of characters
0 ≤ Amount of alignment error < 0.3	Green
0.3 ≤ Amount of alignment error < 0.4	Yellow
0.4 ≤ Amount of alignment error	Red

If the amount of alignment error cannot be detected, any of the indications shown below appears in red.

Offsets: ---@--	The amount of alignment error during measurement cannot be detected.
Offsets: No data	There is no information on the amount of alignment error because the data was obtained with the ARK-10000 of a version earlier than V1.12.
Offsets: *.**@ *	Measurement is executed without the focus indicator being displayed.

3. Cross cursor

Can be moved and shows the values of its position at the bottom right of map.

To return the cross cursor to the center of the map, right-click the map and select “Reset Cross Cursor”.

4. Scale mode

Shows the color scale mode.

The color scale can be selected for each map in the Settings screen (Map Scale tab).

Abbreviation of scale mode

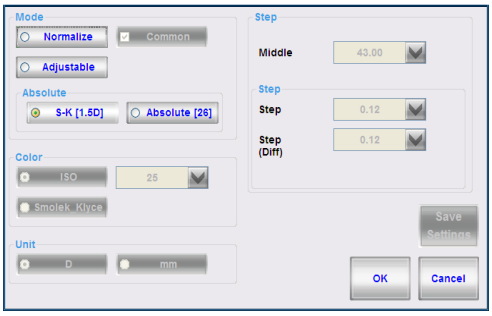
Norm (Normalize)	Indv (Individual)	Numeric (Increments)	Absolute scale (differs for each map data)
	Com (Common)	Numeric (Increments)	Absolute scale (differs for each map type)
Ad (Adjustable)	Com (Common)	Numeric (Increments)	Absolute scale (relative) (differs for each map type) (Setting is changeable.)
Abs (Absolute)	S-K 1.5 (Smolek-Klyce [1.5 D])		Absolute scale, Smolek Klyce scale, 1.5 D increments
	Abs 26 (Absolute [26])		Absolute scale with 26 colors
	S-K 0.5 (Smolek-Klyce2 [0.5])		Absolute scale with 27 colors, 0.5 µm increments

Pressing the color scale indication displays the “Select Scale” screen that allows changing of the color scale setting.

In the Select Scale screen, the color scale mode, color scheme, unit, intermediate value, and increments can be selected.

The parameters in the Select Scale screen are the same as those in the Settings screen (Map Scale tab). For details, see “5.8.8 Map Scale tab” (page 345).

The parameters displayed in the Select Scale screen differ depending on the map.



Select Scale screen

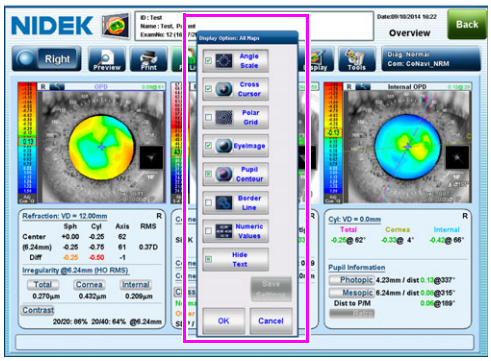
OK button	Used to save the current parameter and close the Select Scale screen. The parameter change is effective only for the currently displayed summary.
Cancel button	Used to cancel the parameter change and close the Select Scale screen.
Save Settings button	Used to apply the current setting to all maps. (Parameters in the Settings screen are overwritten.) Disabled buttons indicate that the corresponding color scale settings are the same as those in the Settings screen. Enabled buttons indicate that the corresponding color scale settings are the same as those in the Settings screen. Pressing the enabled buttons changes the setting in the Settings screen as well.

Note

- To compare changes in a patient's eye over time, or eyes of different patients, it is recommended to always use the same color scale.

○ Changing overlay items

Select the map overlay items from the “for all maps” and “for selected map” options that appear by pressing the Display button.
The available overlay items differ depending on the selected map.



for all maps	Used to change the overlay settings common to all maps. The changed settings are reflected to all maps.
for selected map	Used to change the overlay settings for the selected map. The changed settings are reflected to the selected map.

Note

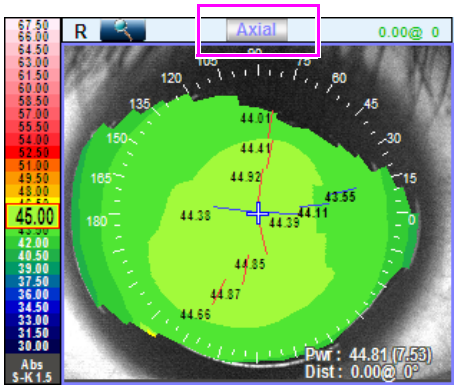
- Some overlay items for “for selected map” are available only for the enlarged map. Overlay items available in the “Display Option: Select Map” screen may differ from those for enlarged maps.

Button operation in Display Option screen

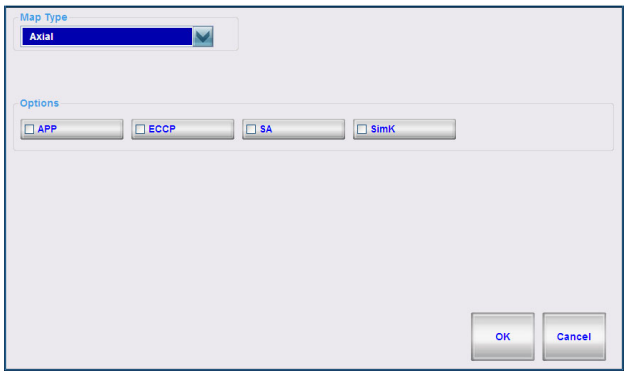
Save Settings button	Used to apply the current setting to all maps. (Parameters in the Settings screen are overwritten.) Disabled buttons indicate that the corresponding settings are the same as those in the Settings screen. Enabled buttons indicate that the corresponding settings are the same as those in the Settings screen. Pressing the enabled buttons changes the setting in the Settings screen as well.
OK button	Used to save the parameter change and close the Display Option screen.
Cancel button	Used to cancel the parameter change and close the Display Option screen.

○ Changing maps

In a user-customized summary, other maps can be displayed while displaying the summary.
The map title is displayed in the form of a button. Pressing this button displays the Select Map Type screen in which the desired map can be selected and displayed.

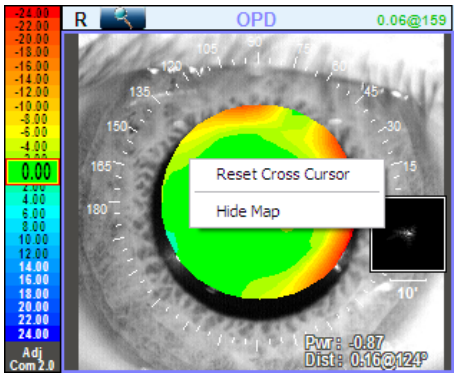


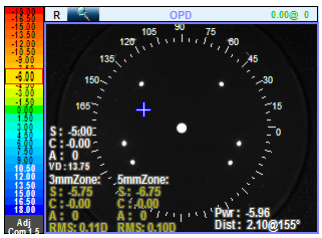
In the Select Map Type screen, display format, optional displays, and wavefront analysis setting can also be selected.
The available items differ depending on the selected map.



○ Right-click operations

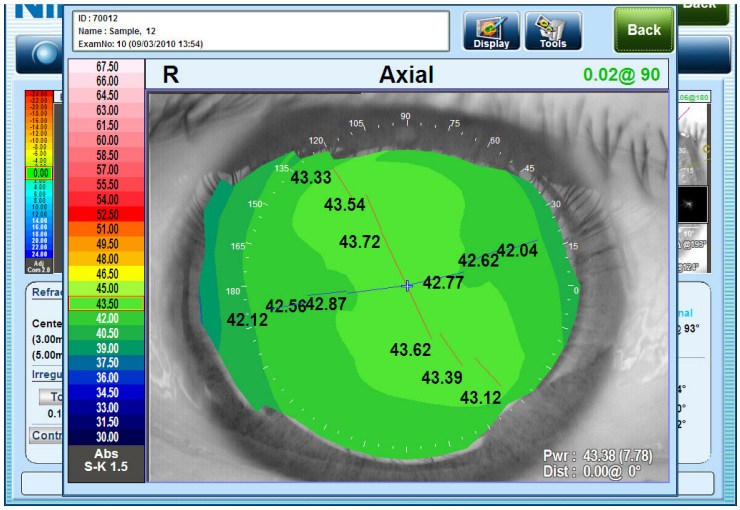
The operations below can be executed from the pop-up menu that appears by right-clicking the map.



Reset Cross Cursor	The cross cursor is returned to the initial position This operation is available when the cross cursor is being displayed.
Hide Map	The color map is hidden. The color map is hidden while displaying the current overlay items. 

○ Operation of enlarged map

The enlarged map allows changing of overlay items and printing of the enlarged map.
Selecting the desired map in the summary screen and pressing the enlarge button enlarges the map in a different screen.
The enlarged map allows changing of overlay items and printing of the enlarged map.



Display button 	Used to display the Display Option screen that allows display of overlay items.
Tools button 	Used to display the pop-up menu which allows selection between “Print” and “Data Output”. When “Print” is selected, the Printer Settings screen appears to print the map. When “Data Output” is selected, the Data Output screen appears to output various data.
Return button 	Used to close the enlarged map and return to the summary screen.

Note

- The right-click operations can be executed also in the enlarged map.
  For details, see “○Right-click operations” (page 163).

○ Printing maps

Enlarged maps can be printed.

Note

- If “Set each time” is not selected in the Settings screen (Print tab), pressing the Print button immediately starts printing with the specified setting.

1) Display the map in the way it is to be printed.

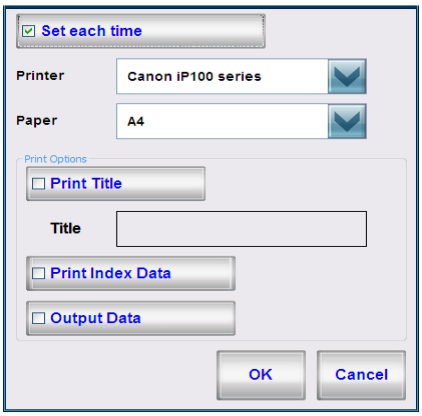
   The map is going to be printed in the way it is being displayed.

2) Press the Print button to display the Printer Settings screen.

3) Confirm the printer settings, and change them if necessary.

   The default settings are selected in the Settings screen (Print tab).

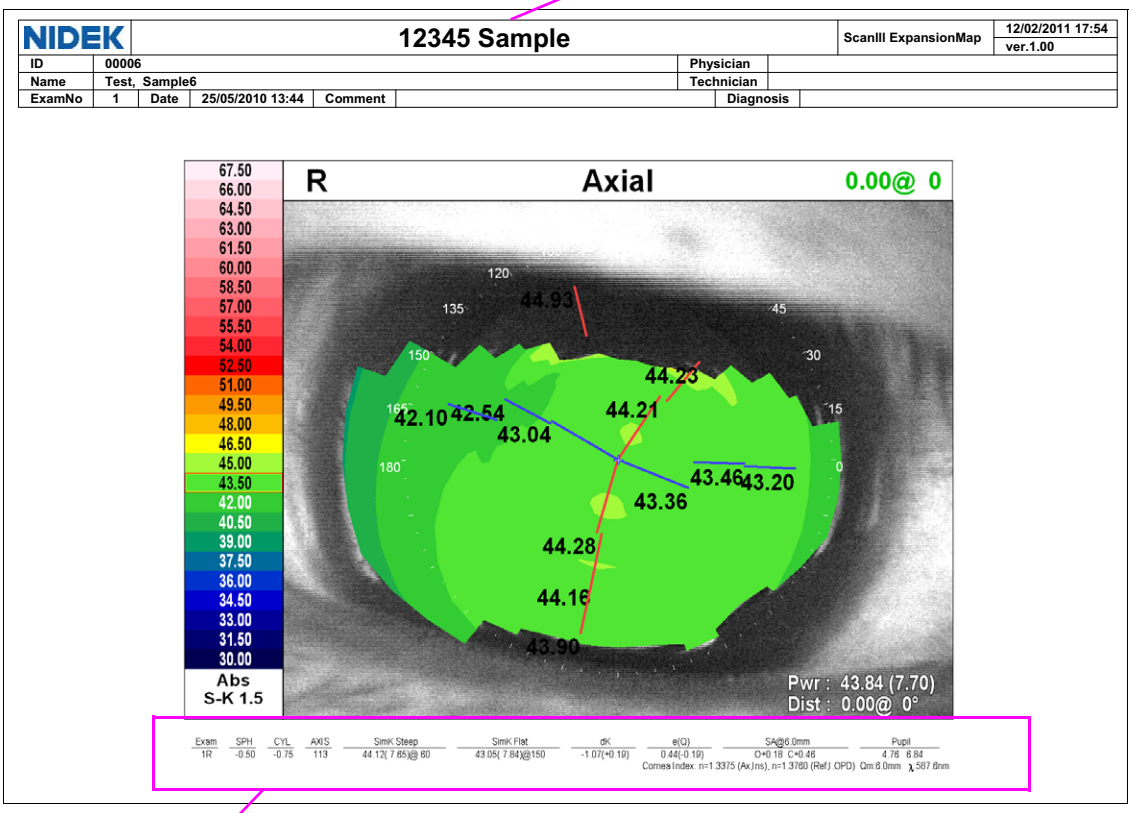
4) Press the OK button to start printing.



Printer Settings screen

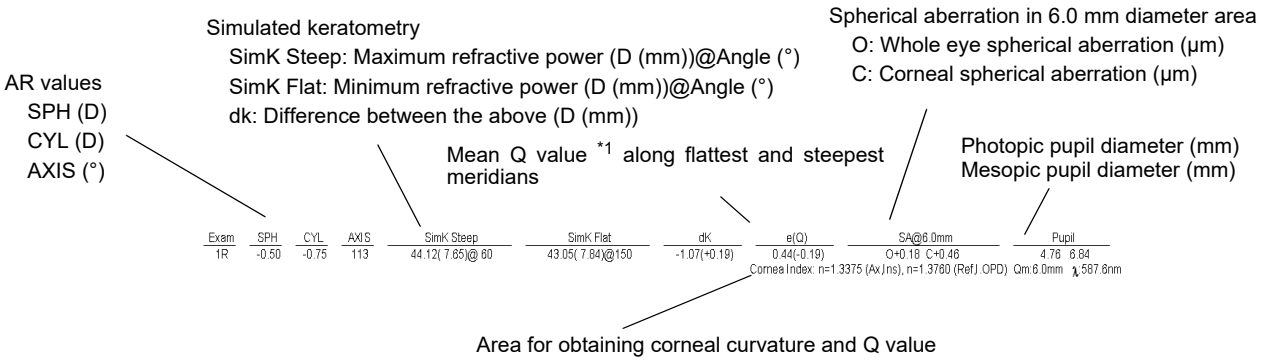
Example of printed map

The specified title is printed.



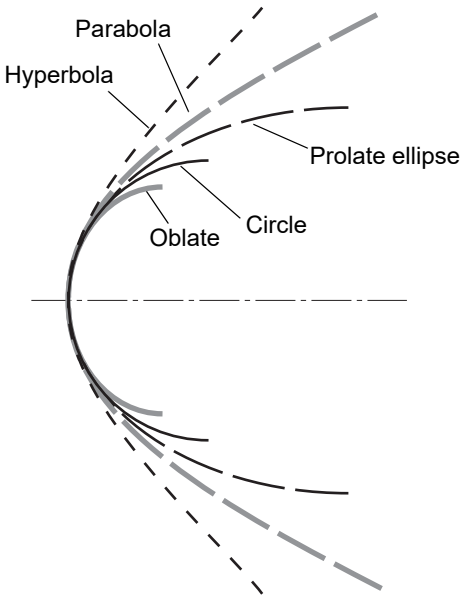
These values are printed by checking “Print Index Data”.

Values printed by checking “Print Index Data”



*1 The Q value shows asphericity of the anterior cornea.

- Q < -1: Hyperbola
- Q = 1: Parabola
- -1 < Q < 0: Prolate ellipse
- Q = 0: Arc of circle
- 0 < Q: Oblate ellipse



$$p = 1 + Q = 1 + K = 1 - S = 1 - e^2$$

p: *aspheric const.* K: *conic const.*
Q: *asphericity* S: *Shape factor.*
e: *eccentricity.*

○ Outputting map data

Image data and text data of the enlarged map can be output.

For details, see “4.5.1 Outputting summary image data (Saving maps)” (page 274).

○ Changing overlay items

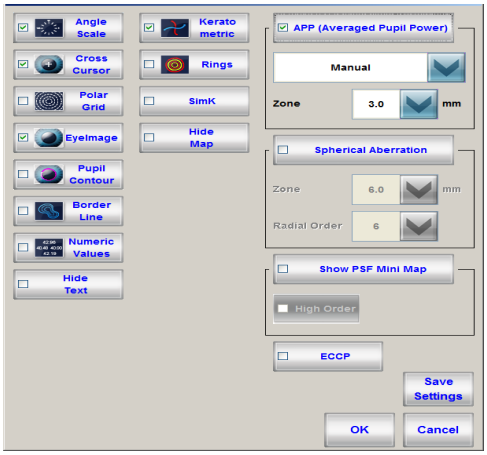
The overlay items set in the enlarged map are reflected as initial display items when they are saved by pressing the Save Settings button.

Note

- The Save Settings button is displayed only when an enlarged map is displayed in the Summary screen. It is not displayed in the enlarged map of the Difference or Comparison screen.

1) Press the Display button to display the Display Option screen.

   The available overlay items differ depending on the selected map.



Display Option screen (Axial map)

2) Select the desired overlay items.

   The selected overlay items are immediately displayed in the enlarged map on the background.

3) Press the OK button to close the Display Option screen.

Note

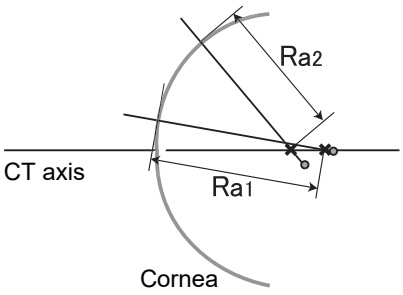
- The settings of the overlay items in the Display Option screen are the same as those in the summary screen.
- Some overlay items are available only for the enlarged map.

4.1.2 Axial map (Corneal curvature radius / Corneal refractive power)

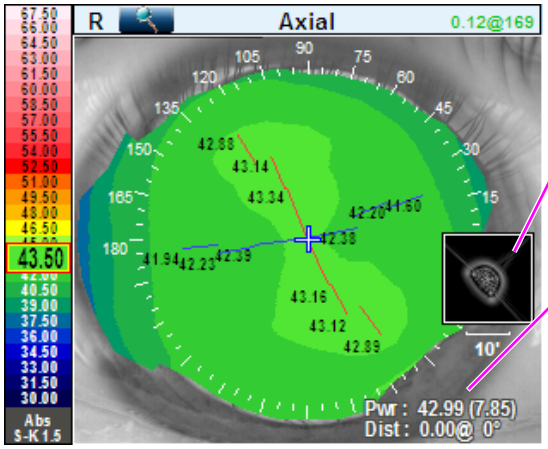
The Axial map shows corneal curvature in diopter.

The unit can be changed to mm.

An eye image captured during the CT measurement is analyzed, and the corneal curvature radius (mm) is measured relative to the measurement axis. The corneal curvature is converted into refractive power (D) using the following formula:



$$P\ [\text{Corneal refractive power (D)}] = \frac{337.5}{r\ [\text{Corneal curvature radius (mm)}]}$$



PSF mini map
(Displayed in Overview summary)

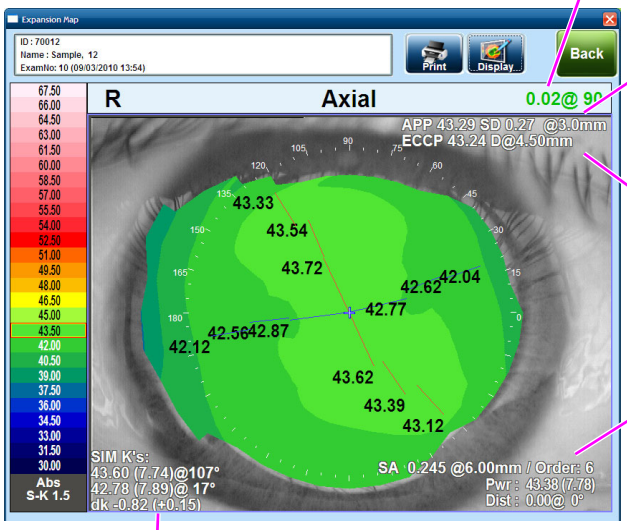
Values at the cross cursor position
Corneal refractive power (Corneal curvature radius)
Distance from the center to the cross cursor@Angle

Color scale

The Axial map color-codes the corneal refractive powers or curvature radiuses. The higher the refractive powers become (smaller curvature radiuses), the warmer the colors on the map become; the lower the refractive powers become (larger curvature radiuses), the cooler the colors on the map become.

○ Analysis values in enlarged map

Amount of misalignment
See “4.1.1 Common items in maps” (page 159)



APP: Averaged Pupil Power
APP: Standard deviation@Analysis area
@P: Photopic
@M: Mesopic
@Diameter mm: Manual

ECCP: Effective Corneal Central Power
ECCP value@Analysis diameter

SA: Spherical aberration
SA value@Analysis area diameter mm/Orde
Order: Upper limit of Zernike order

SIM K’s values:
Refractive power along the steepest meridian (Corneal curvature radius)@Angle
Refractive power along the flattest meridian (Corneal curvature radius)@Angle
dk: Difference in refractive powers between the steepest and flattest meridians (Curvature radius: mm)

SIM K’s

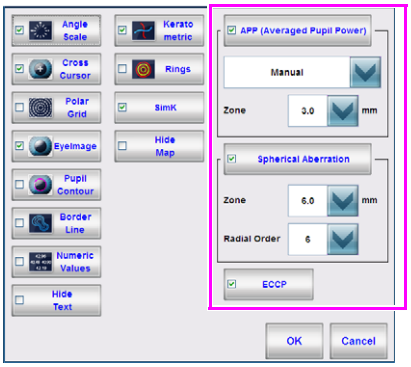
A general keratometer measures about 3 mm area in the center on the cornea and calculates curvature radiuses along the steepest and flattest meridians which cross with each other at right angles and corneal refractive powers. Similarly, SIM K's values include the curvature radiuses along the steepest and flattest meridians that cross each other at right angles and corneal refractive powers based on the data in the 3 mm area in the center on the Axial map.

APP: Averaged Pupil Power

The average of refractive power within the pupil is displayed in the enlarged map.

This value can be used in place of keratometry values, K1 and K2 (D), for IOL power calculation in such cases as follows:

- Eye with corneal apex and pupil center that do not coincide with each other
- Eye with large amount of irregularity
- Eye after corrective surgery



The area of the pupil used for display and calculation of APP is set in the Display Option screen that appears by pressing the Display button in the enlarged map.

Photopic vision	Area within the pupil contour in photopic vision (@P)
Mesopic vision	Area within the pupil contour in mesopic vision (@M)
Manual	Used to specify the desired area (Zone) in diameter. (@Diameter mm) Specify in the range from 3.0 to 9.5 mm. The center of the area is in the middle of the pupil centers in photopic and mesopic visions.

Note

- The area (Zone) can be set in the Display Option screen that appears by pressing the Display button in the summary screen and selecting “for selected map”.

ECCP: Effective Corneal Central Power

This value is obtained by correcting keratometry values, K1 and K2 (D), using the mean corneal refractive power within 4.5 mm-diameter area after myopic refractive surgery and the estimated amount of correction. It is used for determining the IOL power.

The postoperative (LASIK or PRK for myopia) eye is measured, then the postoperative corneal curvature is corrected based on the amount of correction.

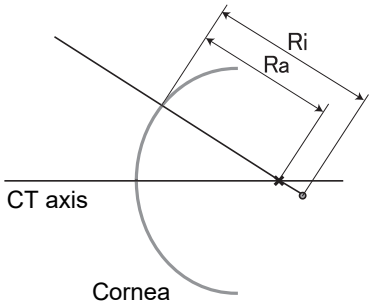
SA: Spherical aberration

This value is a spherical aberration of the specified analysis area (3.0 to 9.0 mm) and order (3rd to 8th).

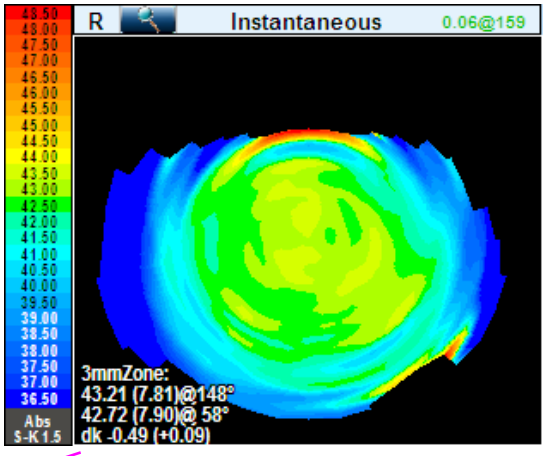
4.1.3 Instantaneous map (Corneal curvature radius / Corneal refractive power)

The Instantaneous map calculates corneal curvature radiuses of localized areas along the meridians whereas the Axial map measures the corneal curvature radiuses relative to the measurement axis. Therefore, the Instantaneous map shows in details the actual geometry of the cornea.
The Instantaneous map is also referred to by different names such as Tangential map.
The same formula used with the Axial map is used to convert the corneal curvature obtained in the Instantaneous map into corneal refractive power.

Ra: Axial radius (mm)
Ri: Instantaneous radius (mm)
Da: Axial power
Da = 1000 × (n-1)/Ra
Di: Instantaneous power
Di = 1000 × (n-1)/Ri
n: Corneal refractive index (1.3375)
Equivalent refractive index of the entire cornea (Cornea Index A)



The Instantaneous map is useful in observation of small variations in the shape of the cornea for purposes such as detection of early keratoconus.



Values obtained within the 3 mm-diameter circle around the center of the cornea
Refractive power along the steepest meridian (Corneal curvature radius)@Angle
Refractive power along the flattest meridian (Corneal curvature radius)@Angle
dk: Difference in refractive power between the flattest and steepest meridians (Corneal curvature radius mm)

Color Scale

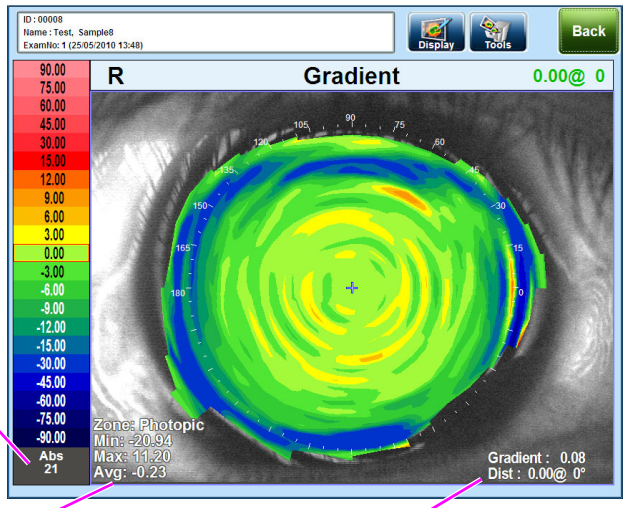
The Instantaneous map color-codes the corneal refractive powers or the curvature radiuses. The higher the refractive powers become (smaller curvature radiuses), the warmer the colors on the map become; the lower the refractive power become (larger curvature radiuses), the cooler the colors on the map become.

4.1.4 Gradient map (slope of cornea)

The Gradient map shows the amounts of variation in corneal curvature radiuses in the form of corneal refractive power.

The same formula used with the Instantaneous map is used to convert the corneal curvature into corneal refractive power.

This map can be used to observe the change in corneal curvature and corneal refractive power. Therefore, it is useful in estimation of healing process after refractive surgery.



Scale mode
Abs 21: Absolute[21]
The scale mode cannot be changed.

Zone: Analysis area
Min: Minimum refractive power
Max: Maximum refractive power
Avg: Average refractive power

Values at cross cursor
Amount of variation in corneal surface refractive power
Distance from center to cross cursor@Angle

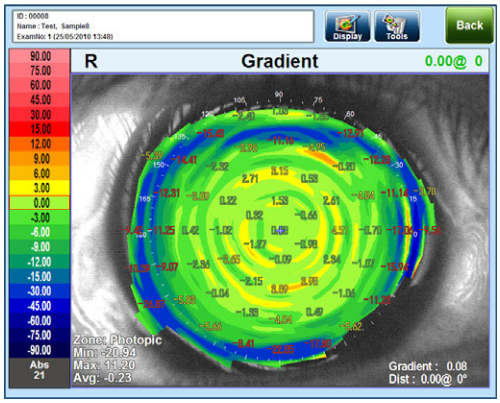
Color scale

The Gradient map color-codes the variation in corneal refractive power. The greater the variation in corneal refractive power becomes, the warmer the color on the map becomes. The smaller the variation becomes, the cooler the color becomes.

○ Values in map

When the “Numeric values” overlay item is selected, the amounts of variation in corneal refractive power on the 2, 4, 6, 8, and 10 mm-circles appear on the map.
The color of the characters changes in accordance with the absolute value of the variation amount.

Absolute value (|σX|) of variation amount in corneal refractive power	Color of characters
|σX| ≤ 3.0	Green
3.0 < |σX| ≤ 6.0	Yellow
6.0 < |σX|	Red

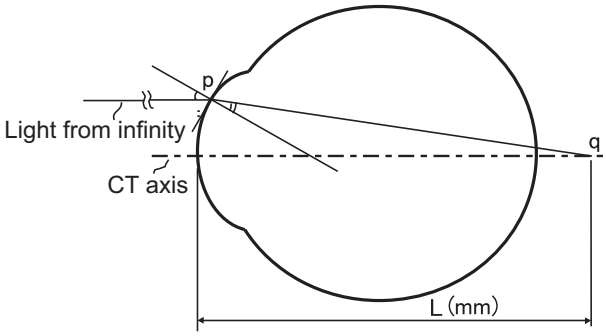


4.1.5 “Refractive” map (corneal surface refractive power)

The “Refractive” map shows the distribution of corneal refractive power calculated using Snell's law.

Because the refractive power is calculated taking into consideration the corneal refractive index (1.3760), the refractive power closer to the actual value is obtained.

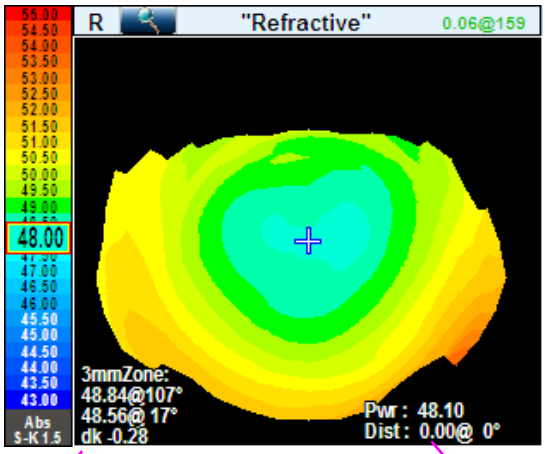
The refractive power in air is displayed in this map. The distribution of corneal refractive power shows information such as the degree of spherical aberration. This map in useful in observing the influence of abnormalities in corneal shape on refractive power.



De (in the eye) = 1,000/L
Dc (In the air) = NR × De

Refractive index of cornea (Default: 1.376)
Refractive index of corneal stroma
(Cornea Index B)

For eyes that underwent refractive surgery, the amount of correction can be observed by comparing the preoperative and postoperative eyes using this map. (A small amount of error may occur because the measurement axis may differ between the preoperative and postoperative eyes.)



Values at the cross cursor position
Corneal refractive power
Distance from center to cross cursor@Angle

Values obtained within the 3 mm-diameter circle around the center of the cornea
Refractive power along the steepest meridian (Corneal curvature radius)@Angle
Refractive power along the flattest meridian (Corneal curvature radius)@Angle
dk: Difference in refractive power between the flattest and steepest meridians (Corneal curvature radius

Color scale

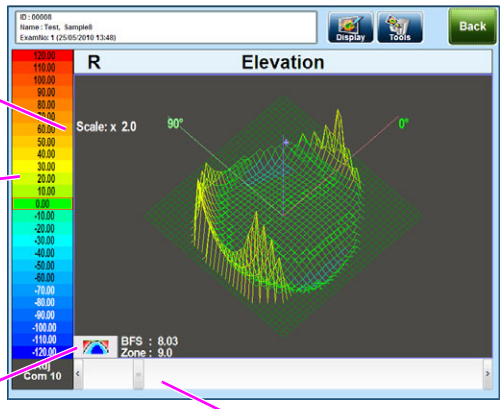
The “Refractive” map color-codes corneal refractive power. The higher refractive power becomes, the warmer the colors on the map become. The lower refractive power becomes, the cooler the colors on the map become.

4.1.6 Elevation map

The Elevation map shows the difference in elevation between the cornea and an overlaid reference sphere.
Usually, the best-fit sphere is used as the reference sphere. However, the reference sphere can be changed as desired.
Because this map shows the difference in elevation, astigmatic components can be observed from the shape. In the case of keratoconus, the cone shape protrudes out of the reference sphere, making it easy to observe the progress. The greater the protrusion is, the warmer the colors in the map become. The smaller the protrusion is, the cooler the colors become. For example, keratoconus is shown with a protrusion in red.
This map can be displayed in the wireframe, color 2D, or color 3D view mode. The view mode can be selected for each map.

Wire frame view

Magnification in the direction of elevation

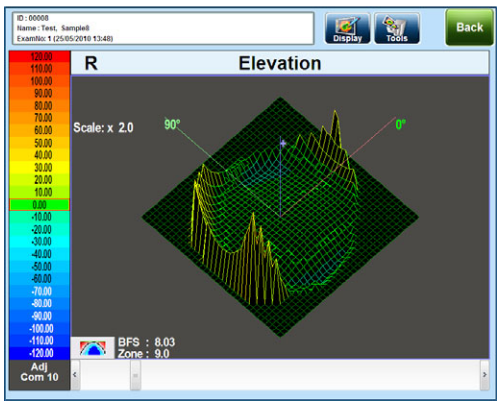


Color scale
Used also as a vertical scroll bar by pressing or dragging.

Pressing this button displays the Best Fit Sphere screen that allows changing of the reference sphere (sphere and target area).

Horizontal scroll bar
Used to rotate the map in the horizontal direction.

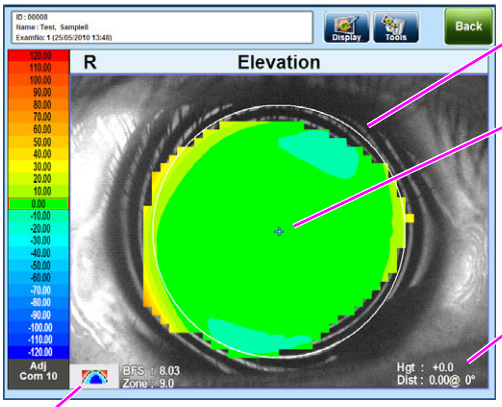
If “Hide-line removal” is selected in the “Display Option: Elevation” screen, wire frames in the back of the wire frames in front are hidden.



Hide-line removal

Color 2D view (Color 2D)

The color 2D view color-codes the elevation. In this view, the right side is always 0º and the top is always 90º.



Best Fit Sphere target area

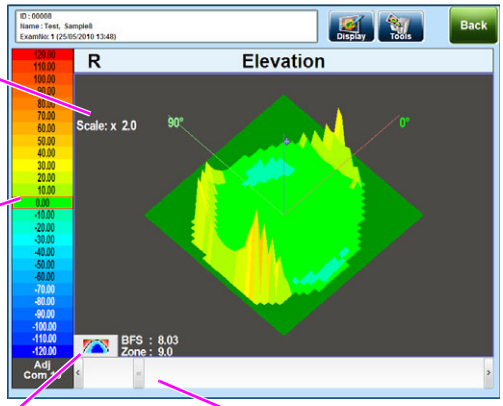
Best Fit Sphere vertex (Small white cross)

Values at the cross cursor position
Hgt: Difference in elevation from the reference sphere
Dist: Distance from center to cross cursor@Angle

Pressing this button displays the Best Fit Sphere screen that allows changing of the reference sphere (sphere and target area).

Color 3D view (Color 3D)

Magnification in the direction of elevation



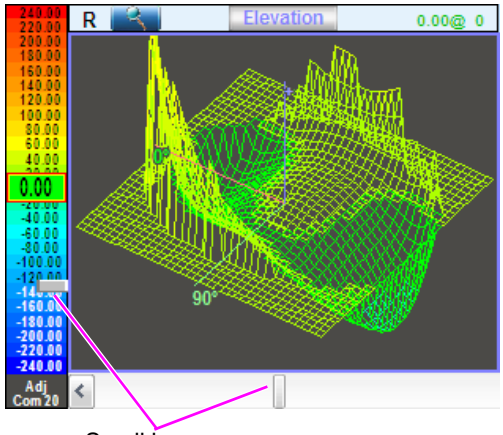
Color scale
Used also as a color scale by pressing and dragging.

Pressing this button displays the Best Fit Sphere screen that allows changing of the reference sphere (sphere and target area).

Horizontal scroll bar
Used to rotate the map in the horizontal direction.

The best-fit sphere is a sphere that can be best fit to the cornea of the applicable area.
By default, the best-fit sphere is a circle relative to the measurement axis that is enlarged to the maximum as long as the effective area (area not obscured by eyelashes or such) is 60% or larger.

The scroll bars in the wireframe and color 3D view modes allow viewing the maps from different angles. The color scale can also be used as a scroll bar by pressing and dragging.



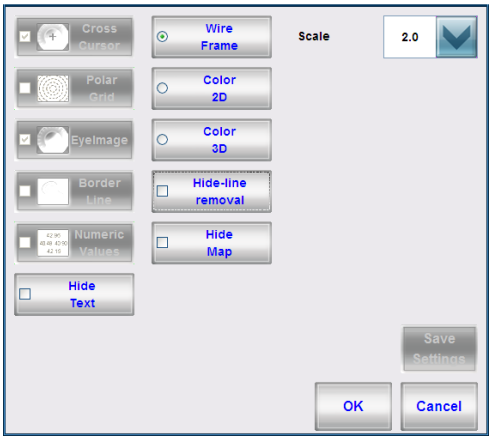
○ Selecting display items for Elevation map

The display items can be selected in the Display Option screen that appears by pressing the Display button in the summary screen and selecting “for selected map”.

In enlarged map, press the Display button to display the Display Option screen.

The display items selected in the enlarged map are disabled when it is closed.

The initial display items for the summary screen can be selected in the Settings screen (Summary tab).



Optional items

Hide-line removal	Hides wire frames in the back of the wire frames in front. (Enabled only in the wireframe view)

The display items below can be selected in the Display Option screen that appears by pressing the Display button in the summary screen and selecting “for all maps”.

Cross Cursor	Moving the cross cursor by dragging it displays specific values at the positions, the distance from the center (Dist), and axis (Axis). (Only in color 2D view)
BorderLine	Toggles display of black lines as borders of colors. (Only in color 2D or 3D view)
Grid	Grid (about 1 × 1 mm), corneal apex, and measurement optical axis (Only in color 2D view)

○ Changing reference sphere

Usually, the best-fit sphere is used as the reference sphere. However, the reference sphere can be changed as desired.

Changing best-fit sphere and target area

1) Click the  button on the Elevation map.

   The Best Fit Sphere box is displayed.

2) Input the desired sphere radius (mm) and target area (mm), then press the OK button.

   The Elevation map is displayed with the input sphere and target area.

   Clicking the  button on the right of the Zone box resets the Zone and BFS boxes to the defaults.

Diameter (mm) of target area

4.1.7 Topo Classifier map

The Topo Classifier map displays either statistics (Corneal Index) or graph (Diagnostic result graph) obtained with the Corneal Navigator function. Whether to display the statistics or the graph can be selected for individual maps.

Corneal Navigator function

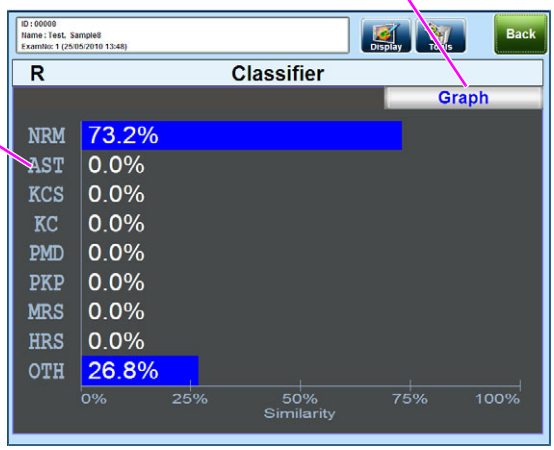
The Corneal Navigator function obtains various indices of corneal shape from CT measurement, inputs them in a neural network, then outputs eye conditions and probabilities of eye diseases (NRM, AST, KCS, KC, PMD, PKP, MRS, HRS, or OTH).

⚠ CAUTION • **The eye conditions and probabilities of eye diseases are output by the Corneal Navigator based on the relationship between the actual condition and diseases, and corneal indices obtained from a large number of cases. Ophthalmologists are responsible for making the final diagnosis taking into consideration other examination results as well.**

Graph view

Indicates graph display. It can be changed to statistics display.

Similarity with each case shown in %



Statistics view

The desired corneal index can be selected by pressing.
The selected index is underlined and displayed in white.

Indicates statistics display. It can be changed to graph display.

Values of corneal indices are shown.

Color of value	Classification
Green	Normal
Yellow	Suspect
Red	Abnormal

Shows the range of normal, suspect, and abnormal values of the selected index (white, underlined index)

4

Graph display

Possible eye conditions and eye diseases output by the neural network are shown. Similarity with each case or condition is shown in percentage (%).

NRM	Emmetropia (0.5 D or less of astigmatism)
AST	Eye with astigmatism exceeding 0.5 D
KCS	Keratoconus suspect *1
KC	Conical Cornea (Clinical Keratoconus) *2
PMD	Pellucid Marginal Degeneration
PKP	Penetrating keratoplasty
MRS	Myopic refractive surgical correction (Myopic Refractive Surgery)
HRS	Hyperopic refractive surgical correction (Hyperopic Refractive Surgery)
OTH	Others (Unclassified variations)

*1 The classification into KCS (keratoconus suspect) is considered to be due to either early-stage keratoconus or a change in the corneal shape by contact lenses.
The decisive diagnosis requires detailed examinations. It is said that the possibility of keratoconus is high if there is a difference over 30 µm in the corneal thickness or over 1.4 D in the keratometry value between the keratoconus-suspect portion of the cornea and the portion symmetric to that portion about the corneal center.

*2 If the probability of KC is 50% or higher, KSI (Keratoconus Severity Index) that shows the severity of keratoconus appears on the bargraph.

Statistics display

Corneal indices obtained from the CT measurement are shown.

The severity of the corneal index values is shown in color.

Color of value	Classification
Green	Normal
Yellow	Suspect
Red	Abnormal

Pressing the abbreviation of the desired corneal index underlines it and displays it in white. In addition, the bar graph appears along the bottom of the screen to show the range of normal, suspect, and abnormal values of the selected index.

SimK S/SimK F: Simulated keratometry (Steep/Flat)

Shows the powers and axes of the steepest and flattest meridians in about 3 mm-diameter area on the cornea. The steepest and flattest meridians are orthogonal with each other.

Values higher than normal are associated with eyes with keratoconus, keratoplasty, or an originally steep cornea. Values lower than normal are associated with eyes with myopic refractive surgery or an originally flat cornea.

MinK: Minimum Keratometry Value

Shows the lowest power and axis in about 3 mm-diameter area on the cornea.

Eyes with irregular astigmatism often have the steepest and flattest meridians not orthogonal with each other. Knowing the lowest refractive power and the axis with the lowest power is useful in planning of astigmatic keratotomy or limbal relaxing incisions (LRI). This type of irregular astigmatism is most often found in eyes with keratoconus, keratoplasty, or trauma, or those that have undergone cataract surgery.

ACP: Average Corneal Power

The ACP is the mean corneal refractive power within the pupil.

This value can be generally considered to be the spherical equivalent of the corneal refractive power. However, a proper value cannot be obtained with eyes that have received decentered ablation or improper keratometry.

CYL: Simulated keratometric cylinder

The difference between SimK S and SimK F is shown as the CYL value.

Values higher than normal eyes are associated with several pathologies, trauma, or surgery.

CVP: Coefficient of Variation of corneal Power

Shows the index representing the power distribution of the entire cornea.

CVP = 1000 × Standard Deviation of corneal Powers (SDP)/Grand average of corneal powers

If this value is high, the cornea shows a multifocal nature. For example, such a case is found in eyes with moderate or severe keratoconus, or during or after keratoplasty. With a high CVP value, proper refractive error correction with glasses is difficult. That makes it all the more important to pay special attention to refraction for such patients to determine whether or not their refractive error can be corrected with glasses.

SDP: Standard Deviation of corneal Power

This value is a standard deviation of the refractive power calculated from the entire cornea.

The SDP value becomes high with eyes that have keratoconus, keratoplasty, or trauma because the range of power for those eyes tends to be wide.

AA: Analyzed Area

This value shows the area of the cornea covered by the analyzed placido rings

This value becomes small with irregular cornea because the area on which the ring cannot be traced is not analyzed. This value becomes small also with eyes that is in the early stage after keratoplasty, or have severe keratoconus or trauma.

CEI: Corneal Eccentricity Index

This value shows an eccentricity that represents asphericity of the cornea.

Positive value	Prolate cornea (normal cornea)
0	Sphere
Negative value	Oblate cornea

An extremely high positive value is obtained with keratoconus eyes. A negative value is obtained with eyes that have undergone myopic refractive surgery or the cornea with its shape altered by contact lenses.

PVA: Potential Visual Acuity

Irregular corneal surface within the pupil reduces the visual function of the eye. The PVA value is affected by the irregularity (SRI).

This PVA value shows the estimated best spectacle-corrected visual acuity. However, this value is analyzed only from the result of topography with a precondition that all portions other than the cornea are properly functioning. It should also be noticed that tear film breakup on the corneal surface considerably influences PVA, and SRI as well. Prolonged gaze at the fixation target by the patient without blinking can cause tear film breakup, increasing the irregularity, producing abnormal PVA and SRI values.

Therefore it is recommended to advise the patient to blink properly for successful measurement. If the PVA value becomes abnormal in spite of the advice, abnormal corneal conditions such as keratoconjunctivitis sicca, corneal shape alteration by contact lens, lamellar keratoplasty, and herpes keratitis are suspected.

LogMAR: Log minimum Angle of Resolution

Visual acuity is a measure of the ability to discriminate between two separate points of light. The LogMAR visual acuity is one of the standard measures to express visual acuity. To convert the LogMAR value into the Snellen visual acuity, multiply the Snellen value (20 or 6 for example) by 10 raised to the power of the LogMAR value, then round the result to the nearest integer.

e.g.: LogMAR=0, 20*10^0 = 20 (Snellen VA = 20/20)
LogMAR=1, 20*10^1 = 200 (Snellen VA = 20/200)
LogMAR =-0.1, 20*10^ -0.1 =16 (Snellen VA = 20/16)

DSI: Differential Sector Index

The corneal surface is divided into eight pie-shaped sectors, each subtending an angle of 45 degrees. Average power in each sector is calculated from area-corrected refractive powers. The DSI shows the greatest difference in average power between any two sectors.

SRI: Surface Regularity Index

The SRI shows local fluctuations on the central cornea, and is related to PVA (potential visual acuity).

A high SRI value indicates that the corneal surface within the pupil diameter is irregular. This value becomes particularly high with eyes that have dry eye syndrome, corneal shape alteration by contact lenses, trauma, or keratoplasty.

SRC: Area compensated Surface Regularity Index

The SRC value is an area-compensated corneal surface irregularity index. It also is an area-weighted SRI (surface regularity index). For details, see the explanation of SRI.

SAI: Surface Asymmetry Index

The SAI value shows corneal asphericity.

This value becomes high with eyes that have keratoconus, keratoplasty, history of decentered myopic refractive surgery, trauma, or corneal shape alteration by contact lenses.

IAI: Irregular Astigmatism Index

The IAI value is an area-compensated summation of refractive power variation on the entire cornea.

This value increases in proportion to the amount of local irregular astigmatism. It becomes high immediately after keratoplasty.

OSI: Opposite Sector Index

The corneal surface is divided into eight pie-shaped sectors, each subtending an angle of 45 degrees. Average power in each sector is calculated from area-corrected refractive powers. The OSI shows the greatest difference in average power between opposite sectors.

CSI: Center-Surrounded Index

The CSI value shows the difference in the average area-corrected refractive power between the central area (3 mm in diameter) and the peripheral area around the central area (3.00 to 6.0 mm).

KPI: Keratoconus Prediction Index

The KPI value is equal to the value described in “Automated keratoconus screening with corneal topography analysis, Invest Ophthalmol Vis Sci 35: 2749-2757” by Maeda N, Klyce SD, Smolek MK, Thomson HW. This value is used in Topo Classifier to distinguish between keratoconus and other cases.

EDP: Elevation/Depression Power

The EDP value shows the average refractive power of the elevated area and that of the depressed area within the pupil. If the pupil cannot be detected, a 4 mm-diameter circle around the CT measurement axis is used. The EDD and EDP values are used to evaluate the size of a central island that can occur as a result of PRK. For the EDP value, refractive powers of 1 D or greater are multiplied by the corresponding areas. The sum of them is divided by the total area to obtain the EDP value. The unit is diopter.

The EDP and EDD values become abnormal with eyes that have corneal astigmatism, keratoplasty, or keratoconus.

EDD: Elevation/Depression Diameter

The EDD value shows the diameter of an assumed circle equivalent to an elevated or depressed area with its refractive power 1 D or more greater than the averaged refractive power within the pupil. The unit is mm.

Index name	Normal range (in green)	Suspect range (in yellow)
SimK S	40.85 [D] < SimK S < 47.92 [D]	39.09 [D] < SimK S ≤ 40.85 [D] 47.92 [D] ≤ SimK S < 49.68 [D]
SimK F	39.65 [D] < SimK F < 45.25 [D]	38.24 [D] < SimK F ≤ 39.65 [D] 45.25 [D] ≤ SimK F < 46.65 [D]
MinK	39.48 [D] < MinK < 45.30 [D]	38.03 [D] < MinK ≤ 39.48 [D] 45.30 [D] ≤ MinK < 46.75 [D]
ACP	40.66 [D] < ACP < 46.48 [D]	39.20 [D] < ACP ≤ 40.66 [D] 46.48 [D] ≤ ACP < 47.94 [D]
CYL	CYL < 1.43 [D]	1.43[D] ≤ CYL < 1.78[D]
CVP	CVP < 27.33	27.33 ≤ CVP < 32.21
SDP	SDP < 1.19 [D]	1.19 [D] ≤ SDP < 1.40 [D]
AA	AA > 66.76 [%]	59.76[%] < AA ≤ 66.76 [%]
CEI	0.07 < CEI < 0.71	-0.09 < CEI ≤ 0.07 0.71 ≤ CEI < 0.88
PVA	PVA > 20/30	20/40 < PVA ≤ 20/30
LogMAR	LogMAR < 0.10	0.10 ≤ LogMAR < 0.30
DSI	DSI < 2.98	2.98 ≤ DSI < 3.44
SRI	SRI < 0.70	0.70 ≤ SRI < 0.89
SRC	SRC < 0.77	0.77 ≤ SRC < 0.97
SAI	SAI < 0.54	0.54 ≤ SAI < 0.62
IAI	IAI < 0.50	0.50 ≤ IAI < 0.54
OSI	OSI < 1.79	1.79 ≤ OSI < 2.21
CSI	-0.10 < CSI < 0.67	-0.29 < CSI ≤ -0.10 0.67 ≤ CSI < 0.86
KPI	KPI < 0.21	0.21 ≤ KPI < 0.23
EDP	EDP < 1.99 [D]	1.99 [D] ≤ EDP < 2.53 [D]
EDD	EDD < 3.76 [mm]	3.76 [mm] ≤ EDD < 5.06 [mm]

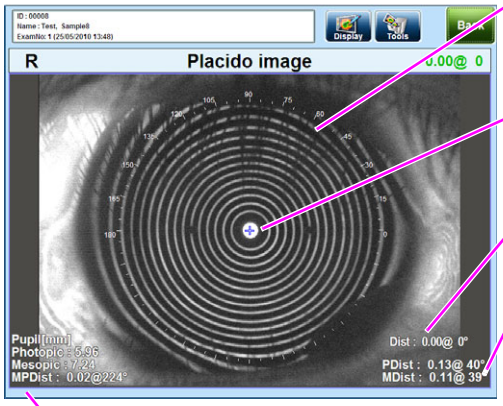
* If a value is beyond these ranges, it is shown in red as an abnormal value.

4.1.8 Eye Image

The Eye Image displays the image captured during measurements.
This image allow the operator to check the alignment and focus conditions.
There are four Eye Image types.

Placido	Image captured during the CT measurement
Photopic	Photopic pupil image (Pupil image during the CT measurement)
Mesopic	Mesopic pupil image (Pupil image during the OPD measurement)
Retroillumination image	Image reflected from the retina for observation of the crystalline lens

Placido image view



Pupil contour
Violet outline: Photopic pupil contour
Cyan outline: Mesopic pupil contour

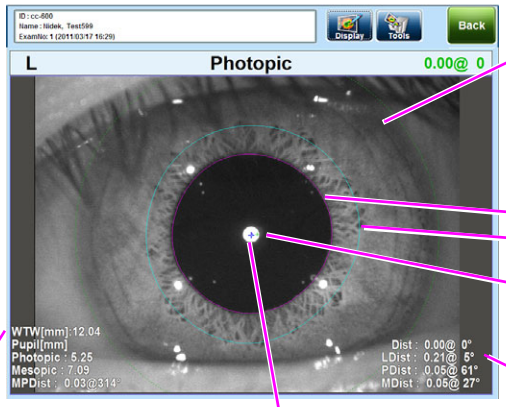
Pupil center
Violet cross: Photopic pupil center
Cyan cross: Mesopic pupil center

Dist: Distance from center to cross cursor@Angle

PDist: Distance from alignment light to photopic pupil center@Angle
MDist: Distance from alignment light to mesopic pupil center@Angle

Pupil (mm) (Pupil diameter)
Photopic: Photopic pupil size (during CT measurement)
Mesopic: Mesopic pupil size (during OPD measurement)
MPDist: Distance between photopic and mesopic pupil centers@Angle

Photopic view



WTW (Corneal diameter) *
Green broken line: Automatic detection
Orange broken line: Manual setting

The indications below are displayed only when the "Pupil Contour" overlay item is selected.

Pupil contour
Violet outline: Photopic pupil contour
Cyan outline: Mesopic pupil contour

Pupil center
Violet cross: Photopic pupil center
Cyan cross: Mesopic pupil center

LDist: Distance from alignment light to limbus center@Angle *

WTW [mm] (Corneal diameter) *

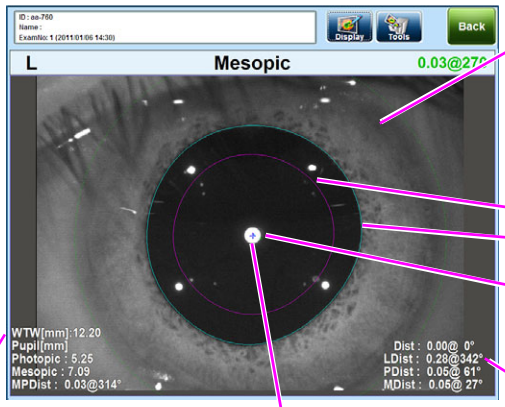
Limbus center *
Green cross: Automatic detection
Orange cross: Manual setting

The items with "*" are displayed when the WTW value is displayed.

Note

- The WTW value and LDist values at the bottom of the map can be added to the analysis values of the Placido image view.
- If the WTW value has been manually specified with the software V1.15 or earlier, “---” is displayed for the LDist value.

Mesopic view



WTW (Corneal diameter) *
Green broken line: Automatic detection
Orange broken line: Manual setting

The indications below are displayed only when the "Pupil Contour" overlay item is selected.

Pupil contour
Violet outline: Photopic pupil contour
Cyan outline: Mesopic pupil contour

Pupil center
Violet cross: Photopic pupil center
Cyan cross: Mesopic pupil center

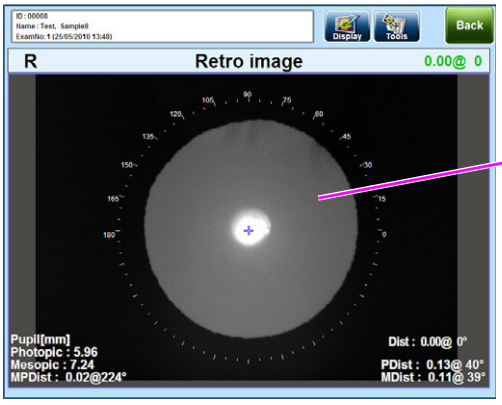
LDist: Distance from alignment light to limbus center@Angle *

WTW [mm] (Corneal diameter) *

Limbus center *
Green cross: Automatic detection
Orange cross: Manual setting

The items with “*” are displayed when the WTW value is displayed.

Retro image view (retroillumination)



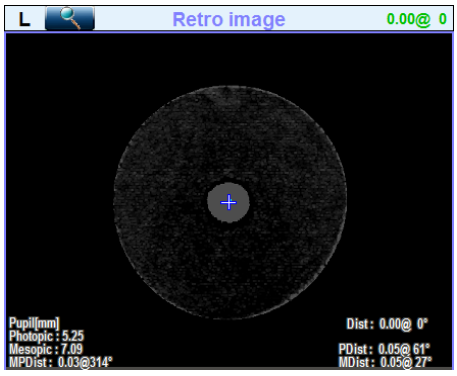
In this image, clouded portions become black shadow.

Retro Image (Retroillumination image)

A retroillumination image can be obtained using the OPD measurement light reflected from the fundus. Opaque portions are displayed as shadows.

The dark spot in the middle of the retroillumination image is light reflected from the cornea. It is not related to the image of the eye interior.

When “Processed Retro” is selected in the Display Option screen, an image closer to the actual image can be displayed. An inverted black-and-white images is displayed to show the clouded part in white.



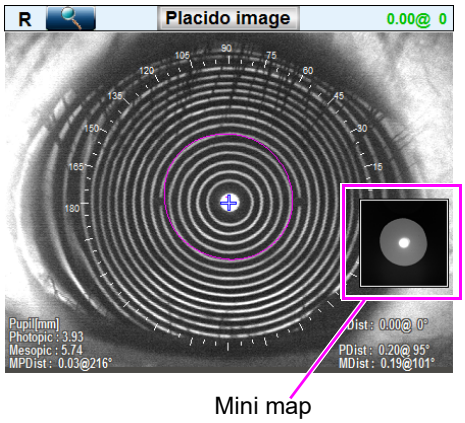
Note

- The retroillumination image is an image of the illuminated fundus observed through the crystalline lens. If there are any clouded portion in the crystalline lens, they are observed as shadows.

○ Retro mini map

The retro (retroillumination image) mini map can be displayed by selecting the “Retro Mini Map” overlay item.

The mini map can be used as a short-cut button to display the Retro image view. Press the mini map to display the Retro image view.



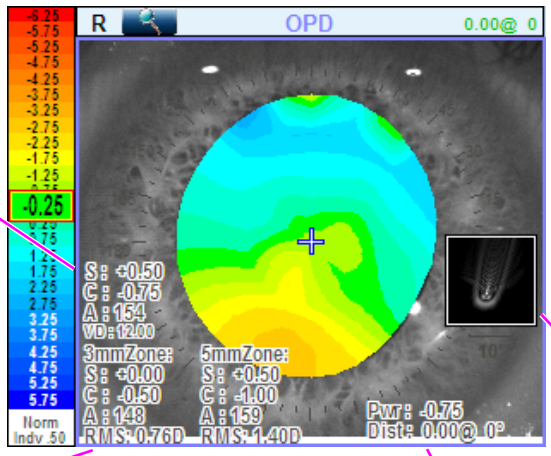
4.1.9 OPD map (Distribution of refractive error)

The OPD map displays the distribution of refractive error obtained in the OPD measurement. It shows the amount of correction needed at each point within the 9.5 mm-diameter area to achieve emmetropia (for the whole eye taking into consideration the corneal and internal refractive errors.)

Unlike conventional auto-refractometers that measure the refractive error of the central part of the eye, the device measures refractive error of the peripheral area as well, enabling display of the distribution of refractive power needed to correct the visual acuity.

The OPD map shows also optical aberration and other information. The values shown in the map is calculated regarding the vertex distance (VD) as 0 (zero). The SCA values at the bottom left of the screen are calculated with the VD as specified in the Settings screen.

The measurement values of the central area are shown (conventional auto refractometer measurement). If the RMS value is larger than 1, the value is displayed in yellow and "High RMS" is indicated.



PSF mini map (Displayed in Overview summary)

The SCA values within the 3 mm and 5 mm areas (Zone) are calculated from a sphere obtained by fitting (least-square method) to the 3 mm and 5 mm spheres of the OPD map data

However, the SCA values are approximated values, the actual distribution of refractive error cannot be represented only with these values. As a measure of reliability of the SCA values, the root mean square fit error (RMS) expressed in the equation shown below is used. When the RMS value is 0 (zero), the SCA values perfectly represent the actual distribution of refractive error. The larger the difference from the actual distribution is, the larger this RMS value becomes. Eyes with regular astigmatism show the RMS value of less than 0.5. If the RMS value is larger than 0.5, the eye is suspected to have irregular astigmatism.

Values at the cross cursor position
Corneal refractive error of OPD (VD=0: Fixed)
Distance from center to cross cursor@Angle

$$RMS = \sqrt{\frac{\sum_{\theta=1}^{360} \{D_{real}(\theta) - D_{SCA}(\theta)\}^2}{360}} \quad [Dptr]$$

RMS value

	Normal	Suspect	Abnormal
3mm Zone	< 0.41	0.41 ≤ < 0.50	0.50 ≤
5mm Zone	< 0.63	0.63 ≤ < 0.77	0.77 ≤

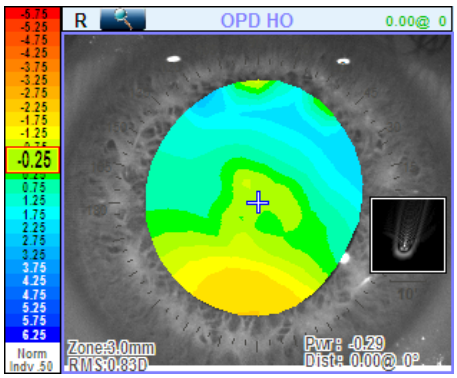
Color scale

The OPD map color-codes the distribution of refractive power needed to achieve emmetropia. The higher refractive power becomes, the warmer the colors on the map become. The lower refractive power becomes, the cooler the colors on the map become.

○ OPD HO map

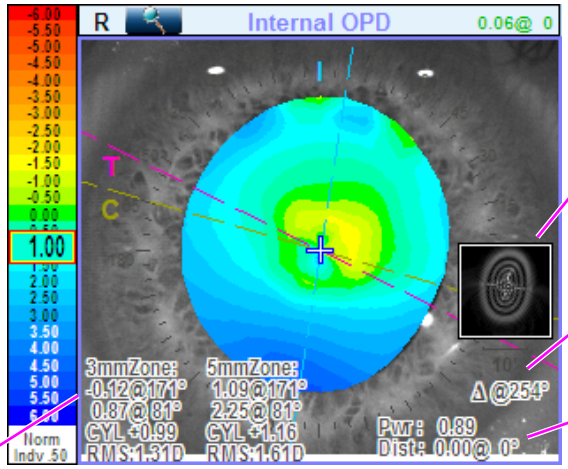
The OPD HO map can be displayed by selecting “High Order” in the Display Option screen for selected map.

In the OPD HO map, the SPH and CYL values of the specific area are subtracted.



4.1.10 Internal OPD map (Distribution of internal eye refractive error)

The Internal OPD map displays the distribution of internal eye refractive error within the area ranging from the posterior surface of the cornea to the retina.
Of the refractive power of the whole eye, the cornea is considered to be responsible for 75% of it, and the crystalline lens to be 25%.
The device measures the distribution of refractive error on the cornea from the corneal topography, and that in the whole eye on the OPD map. These measurements are used to calculate the distribution of the internal eye refractive error and present it as the Internal OPD map. This map shows presence or absence of astigmatism inside the eye (mainly crystalline lens). In most cases, astigmatism occurs on the corneal surface. However, there are cases where lenticular astigmatism cancels out the corneal astigmatism. (About 20% of eyes with astigmatism have internal eye astigmatism.)
When prescribing contact lenses, or performing corneal refractive surgery, it is important to consider both corneal and internal astigmatism.



PSF mini map
(Displayed in Overview summary)

Prism base

Values at the cross cursor position
Corneal surface refractive error
Distance from center to cross cursor@Angle

Values obtained within the 3 mm- and 5 mm- diameter circles around the center of the cornea
Refractive error along the steepest meridian@Angle
Refractive error along the flattest meridian @ Angle
CYL: Difference in refractive errors between the flattest and steepest meridians
(Data is shown in yellow if no pupil contour is obtained.)
The sign of the Cyl data of the internal OPD map is determined by the formula: (dk in "Refractive" map) + (CYL in Internal OPD map) ≒ (CYL in OPD mpa)
The sign shows whether the internal astigmatism increases or cancels out the total astigmatism. (See the table below.)

CYL data sign	CYL setting in the Settings screen (Other tab)	
	+	−
+	The internal refractive errors increase total astigmatism.	The internal refractive errors counteract total astigmatism.
−	The internal refractive errors counteract total astigmatism.	The internal refractive errors increase total astigmatism.

Color scale

The Internal OPD map color-codes the distribution of internal eye refractive error.

The average refractive error is regarded as 0 D (green). The greater refractive error becomes in the negative direction, the warmer the colors on the map become. The greater refractive error becomes in the positive direction, the cooler the colors on the map become.

Note

- In this map, missing data is interpolated and extrapolated to display the data of the 6 mm-diameter area.

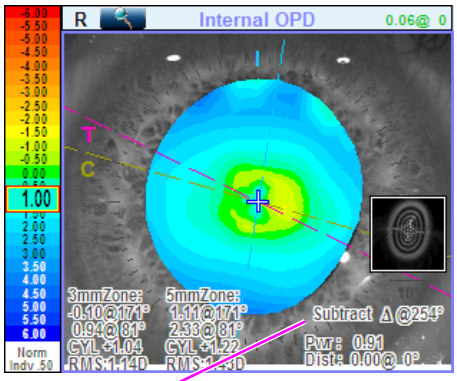
  Only the measurement data within the detected ring within the pupil is reliable. Select the Pupil Contour and Rings overlay items to check the range of properly measured data.

○ Prism subtraction

Prism component can be removed from the map by selecting the Subtract Prism overlay item from the Display Option screen for selected map.

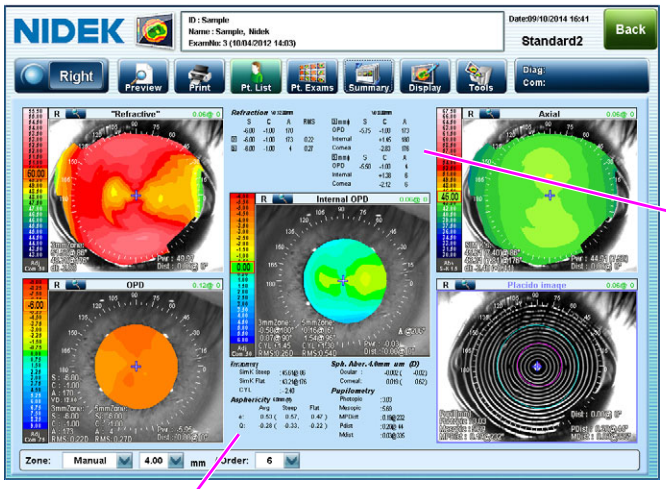
The Subtract value appears in the map to display the value from which the prism component has been subtracted.

The “Subtract Prism” overlay item can be selected also from the pop-up menu that appears by right-clicking the map.



"Subtract"

The “Standard 2” map set is registered to facilitate review of the measurement data. In addition to the Internal OPD map, the map set shows various numeric data of the same eye.



Refractive error:
SCA values obtained from OPD map showing refractive error to be corrected to achieve emmetropia (VD=0)
3: Values in 3 mm-diameter area
5: Values in 5 mm-diameter area
(Data is shown in yellow if no pupil contour is obtained.)

Internal:
Amount of astigmatism in internal optics obtained from OPD map
(Data is shown in yellow if no pupil contour is obtained.)

Cornea:
Corneal surface refractive error along steepest and flattest meridians@Angle obtained from “Refractive” map
(Data is shown in yellow if no pupil contour is obtained.)

Keratometry:
SimK data obtained from the Axial map

Asphericity 6.0mm:
Shows asphericity of the cornea [Avg, R2 (Steep), R1 (Flat)].
e: eccentricity
Q: Q value
"* . * mm" or "* rings" after Asphericity shows the area within which data was obtained "(Changeable)", (m), and (e) shows calculation method.
(m): Q value obtained by fitting an ellipse of the specific diameter to a cross section of the cornea that includes the center (vertex)
(e): Q value obtained by fitting an ellipse of the specific diameter to an area around the center of the cornea (vertex)

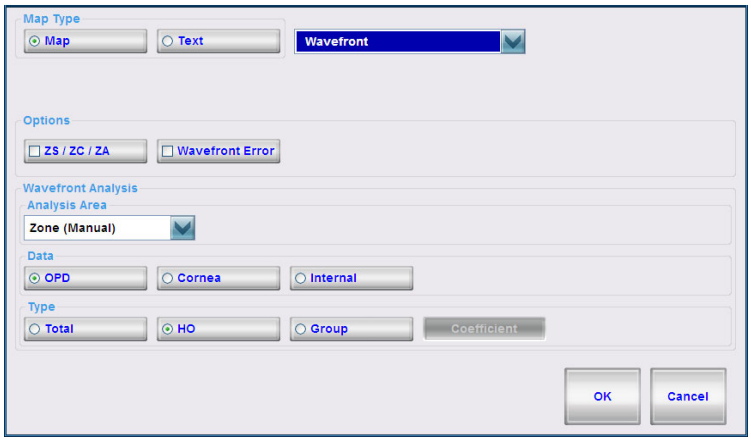
Sph. Aber. 6.0mm um (D):
Spherical aberration (12th term in Zernike pyramid) within 6.0 mm diameter area
The value within ( ) shows the difference between the central and peripheral refractive errors in diopter.
Here, Sph. And Aber. are respectively spherical and aberration.

Pupillometry:
Pupil information during the OPD and CT measurements:
Photopic: Photopic pupil size (during CT measurement)
Mesopic: Mesopic pupil size (during OPD measurement)
MPdist: Distance between photopic and mesopic pupil centers@Angle
Pdist: Distance between alignment target and photopic pupil center@Angle
Mdist: Distance between alignment target and mesopic pupil center@Angle

4.1.11 Wavefront Map

The Wavefront map displays the result of wavefront aberration analysis using Zernike polynomials. Three types of wavefront aberration analysis are available: OPD, Cornea, and Internal. In addition, there are three types of maps are available: Wavefront HO, Wavefront Total, and Wavefront Group.

The wavefront aberration analysis type and map types are selected in the Select Map Type screen that can be displayed form the Settings screen (Summary tab).



1) If necessary, select “ZS/ZC/ZA” and “Wavefront Error” from the Options box.
2) In the Analysis Area box, select “Zone” or “Zone2”.

Note

- Set the parameters for “Zone” and “Zone2” in the Analysis Area box in the Settings screen (Parameter tab).

3) In the Data box, select the type of data to be analyzed.

OPD	Aberration of whole eye including the cornea, crystalline lens, and vitreous body
Cornea	Corneal aberration
Internal	Internal eye aberration

4) In the Type box, select the desired map type.

Total	Wavefront HO map
HO	Wavefront Total map
Group	Wavefront Group map The Coefficient button is enabled, and the desired group can be selected.

5) Press the OK button.

The map is displayed as selected in the Select Map Type screen.

○ Displaying analysis values (overlay item)

To display the “ZS/ZC/ZA” or “Wavefront Error” analysis values, select them in the Display Option screen that appears by pressing the Display button and selecting “for selected map”.

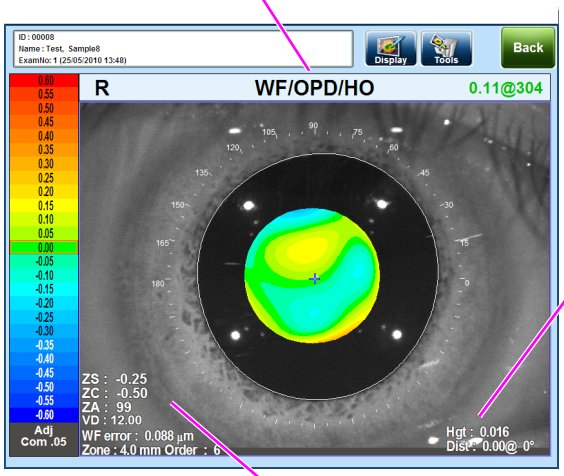
ZS/ZC/ZA	Shows the corneal vertex distance (VD) and the SPH, CYL, and AXIS values within the specific analysis area obtained using Zernike polynomials.
Wavefront Error	Shows “WF error” (aberration amount μm), its Zone (analysis area), and Order.

○ Wavefront HO map (high order aberration)

The Wavefront HO map displays only the higher order aberration from the 3rd to the specified order (up to 8th) of the Zernike pyramid by extracting them from the Wavefront Total map with wavefront analysis using the Zernike polynomials.

Is shows the aberration that cannot be corrected by glasses.

Map title/Data type/Map type



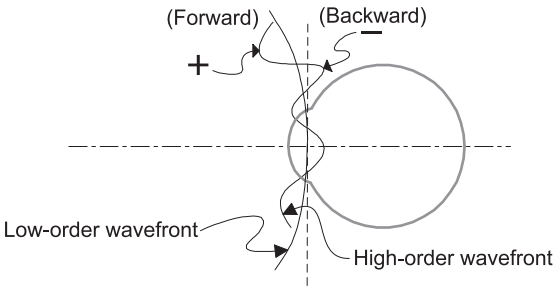
Values at the cross cursor position
Wavefront elevation
Distance from center to cross cursor@Angle

ZS: SPH calculated using the Zernike polynomials within the analysis area
ZC: CYL calculated using Zernike polynomials within the analysis area
ZA: Axis calculated using Zernike polynomials within the analysis area
VD: Corneal vertex distance
RMS wavefront error (The value of the 0th order is not included.)
Zone: Diameter of the area to be analyzed (mm)
Order: Highest analysis order in the Zernike pyramid

Color scale

The Wavefront High Order map color-codes the wavefront shape of the 3rd or higher order.

In the relative color scale, in reference to the wavefront of lower orders (1st to 2nd), the greater the distance of the higher order aberration in the anterior direction becomes, the warmer the color becomes,



and the greater the distance of the higher order aberration in the posterior direction becomes, the cooler the colors become.

In the absolute color scale (Smolek_Klyce2), in reference to the wavefront of lower orders (1st to 2nd), the greater the distance of the higher order aberration in the anterior direction becomes, the cooler the color becomes, and the greater the distance of the higher order aberration in the posterior direction becomes, the warmer the colors become.

Changing the area to be analyzed and the order

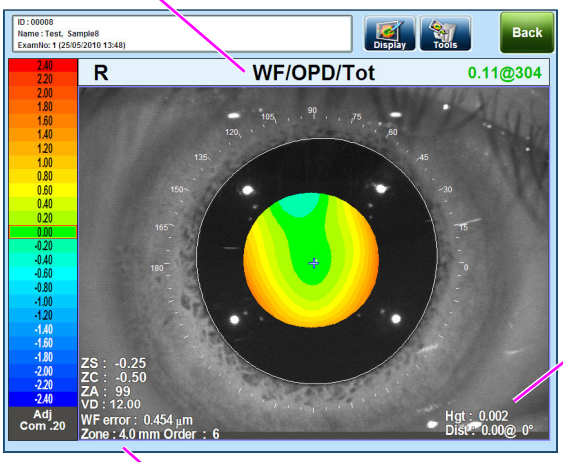
Change “Zone” (analysis area) and Order.

○ Wavefront Total map (whole eye aberration)

The Wavefront Total map displays the difference in wavefront aberration from the wavefront of an aberration-free emmetropic reference eye. (Total wavefront aberration from the 0th to the specified order in the Zernike pyramid)

The values in this map are calculated from the OPD map.

Map title/Data type/Map type



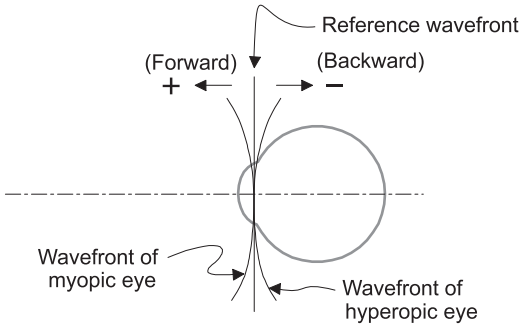
Values at the cross cursor position
Wavefront elevation
Distance from center to cross cursor@Angle

ZS: SPH calculated using the Zernike polynomials within the analysis area
ZC: CYL calculated using Zernike polynomials within the analysis area
ZA: Axis calculated using Zernike polynomials within the analysis area
VD: Corneal vertex distance
RMS wavefront error (The value of the 0th order is not included.)
Zone: Diameter of the area to be analyzed (mm)
Order: Highest analysis order in the Zernike pyramid

Color scale

The Wavefront Total map color-codes the shape of the total wavefront from 0th to the specified order (up to 8th).

In the relative color scale, the greater the distance of the wavefront aberration from the reference wavefront in the anterior direction (myopia) becomes, the warmer the color becomes, and the greater the wavefront aberration in the posterior (hyperopia) direction becomes, the cooler the colors become.

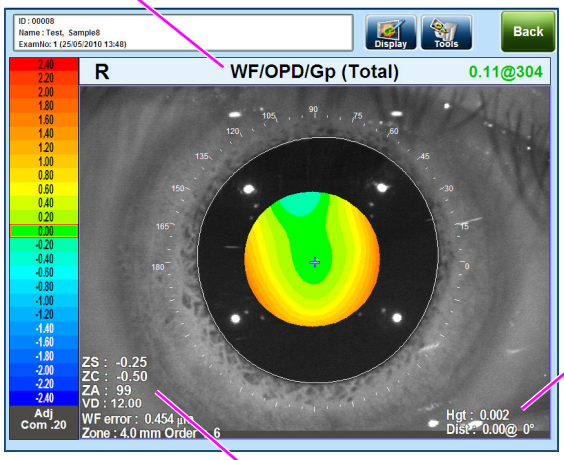


In the absolute color scale (Smolek_Klyce2), the greater the distance in the anterior (myopia) direction becomes, the cooler the colors in the map become, and the greater the wavefront aberration in the posterior (hyperopia) direction becomes, the warmer the colors become.

○ Wavefront Group map (aberration of selected group)

The Wavefront Group map displays only wavefront aberration of the specified groups extracted with wavefront analysis using the Zernike polynomials.

Map title/ Data type/ Map type (Group name)



Values at the cross cursor position
Wavefront elevation
Distance from center to cross cursor@Angle

ZS: SPH calculated using the Zernike polynomials within the analysis area
ZC: CYL calculated using Zernike polynomials within the analysis area
ZA: Axis calculated using Zernike polynomials within the analysis area
VD: Corneal vertex distance
RMS wavefront error (The value of the 0th order is not included.)
Zone: Diameter of the area to be analyzed (mm)
Order: Highest analysis order in the Zernike pyramid

Color scale

In the relative color scale, relative to the reference wavefront, the greater the wavefront aberration in the anterior (myopia) direction becomes, the warmer the colors in the map become, and the greater the wavefront aberration in the posterior (hyperopia) direction becomes, the cooler the colors become.

In the absolute color scale (Smolek_Klyce2), relative to the reference wavefront, the greater the wavefront aberration in the anterior (myopia) direction becomes, the cooler the colors in the map become, and the greater the wavefront aberration in the posterior (hyperopia) direction becomes, the warmer the colors become.

Selecting combination (group) of aberration components to be displayed

1) Press the group name box at the bottom right of the summary screen.

   The Zernike Coefficient Selection dialog is displayed

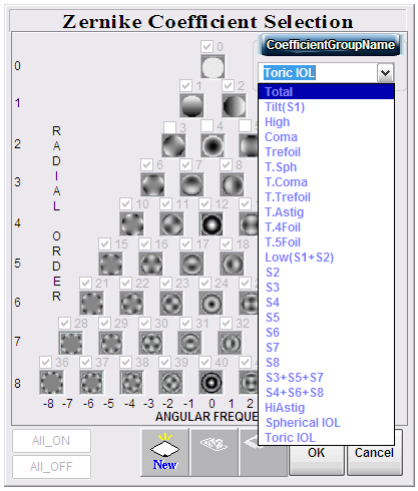
2) Press the V button of the Coefficient Group Name box.

   Registered groups of aberration components are listed.

3) Press the desired group.

   In the Zernike pyramid, the aberration components that are included into the selected group are checked.

4) Press the OK button to return to the summary screen.



Pre-registered groups and aberration components in them

The table below shows the aberration components included in each group in 8rh order. If the order is reduced, aberration components are also reduced in accordance with the order.

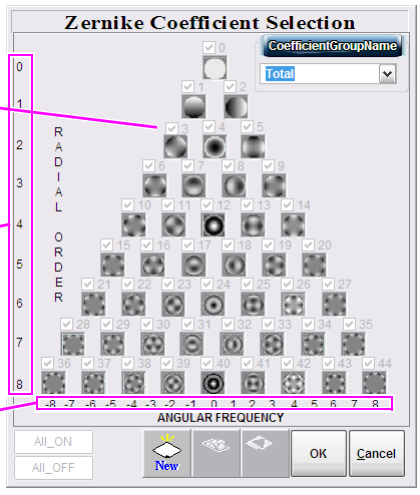
Group name	Coefficient terms	Comments
Total	0 to 44th terms	Total of all terms in 0 to 8th order The map is the same as the Wavefront Total map.
Tilt (S1)	1st and 2nd terms (Tip, Tilt)	Tilt (prism)
High	6th to 44th terms	Total of all terms in 3 to 8th order The map is the same as the Wavefront High Order map.
Coma	7th and 8th terms	3rd Coma
Trefoil	6th and 9th terms	3rd Trefoil
T.Sph	12th, 24th, and 40th terms	Total of higher order spherical aberration
T.Coma	7th, 8th, 17th, 18th, 31st, and 32nd terms	Total of higher order coma aberration
T.Trefoil	6th, 9th, 16th, 19th, 30th, and 33rd terms	Total of higher order trefoil aberration
T.Astig	11th, 13th, 23rd, 25th, 39th, and 41st terms	Total of higher order astigmatism aberration
T.4Foil	10th, 14th, 22nd, 26th, 38th, and 42nd terms	Total of higher order tetrafoil aberration

Group name	Coefficient terms	Comments
T.5Foil	15th, 20th, 29th, and 34th terms	Total of higher order hexafoil aberration
Low (S1+S2)	1st to 5th terms	Total of low order (1st to 2nd) aberration
S2	3rd to 5th terms (Astigmatism, Defocus)	Low order (2nd) astigmatism (CYL) and defocus (SPH) aberrations
S3	6th to 9th terms (Coma,Trefoil)	Total of 3rd order aberration (Coma-like aberration)
S4	10th to 14th terms (Spherical)	Total of 4th order aberration (Sphere-like aberration)
S5	15th to 20th terms (Secondary coma)	Total of 5th order aberration (Coma-like aberration)
S6	21st to 27th terms (Secondary spherical)	Total of 4th order aberration (Sphere-like aberration)
S7	28th to 35th terms	Total of 7th order aberration
S8	36th to 44th terms	Total of 8th order aberration
S3+S5+S7	6th to 9th, 15th to 20th, and 28th to 35th terms	Total of 3rd, 5th, and 7th order aberration (High-order coma aberration)
S4+S6+S8	10th to 14th, 21st to 27th, and 36th to 44th terms	Total of 8th order aberration (High-order spherical aberration)
HiAstig	11th, 13th, 23rd, 25th, 39th, and 41st terms (2ndAstig, 3rdAstig, and 4thAstig)	Higher order astigmatism aberration
Spherical IOL	0th to 3rd, 5th to 44th terms	Total of aberrations other than defocus (SPH) of lower order (2nd)
Toric IOL	0th to 2nd, 6th to 44th terms	Total of aberrations other than astigmatism (CYL) and defocus (SPH) of lower order (2nd)

Note

- When the data is “Cornea” in the VA, PSF, or MTF map, “Spherical IOL” and “Toric IOL” are displayed as additional groups of aberration components.

Zernike Coefficient Selection screen (Zernike pyramid)



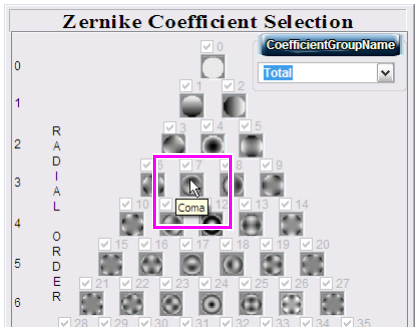
The terms that represent aberration components are the numbers above each image in the Zernike pyramid.order.
Example 3rd term

The vertical axis shows the polynomials order.
Order of axisymmetric components

Angular frequency
Orders are shown in rotational directions in reference to the center.

Pre-registered group names are shown in blue. User-customized groups are shown in black.

Placing the cursor on the Zernike term symbol displays the type of aberration.



Note

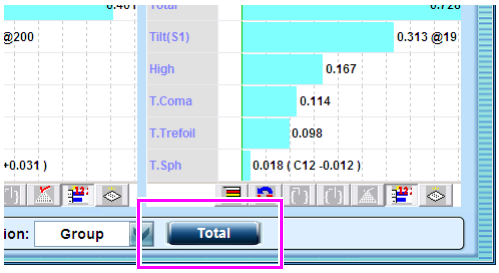
- Selection of a group executed in the Zernike Coefficient Selection screen from the summary screen is temporary.
  The selected group is restored to the previous group when the patient data is changed or when power to the device is turned off. The initially selected group can be selected in the Settings screen (Summary tab).

0	Piston	12	Spherical	24	Spherical	36	Octafoil
1	Tilt (Y)	13	Astigmatism	25	Astigmatism	37	Hexafoil
2	Tilt (X)	14	Tetrafoil	26	Tetrafoil	38	Tetrafoil
3	Astigmatism	15	Pentafoil	27	Hexafoil	39	Astigmatism
4	Defocus	16	Trefoil	28	Heptafoil	40	Spherical
5	Astigmatism	17	Coma	29	Pentafoil	41	Astigmatism
6	Trefoil	18	Coma	30	Trefoil	42	Tetrafoil
7	Coma	19	Trefoil	31	Coma	43	Hexafoil
8	Coma	20	Pentafoil	32	Coma	44	Octafoil
9	Trefoil	21	Hexafoil	33	Trefoil		
10	Tetrafoil	22	Tetrafoil	34	Pentafoil		
11	Astigmatism	23	Astigmatism	35	Heptafoil		

Registration of new groups

1) Press the group name box at the bottom right of the summary screen.

   The Zernike Coefficient Selection screen appears.

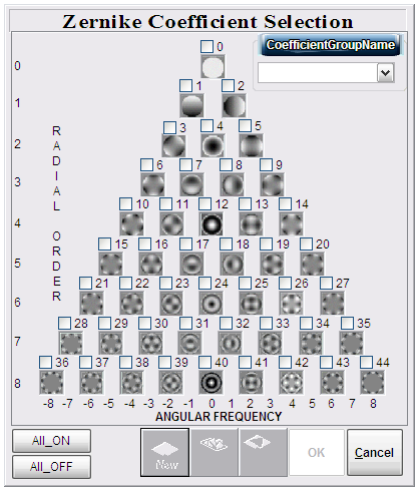


2) Press the New button.

   The Coefficient Group Name box becomes blank, the check marks in the Zernike pyramid disappear.

3) Input the desired group name in the Coefficient Group Name box.

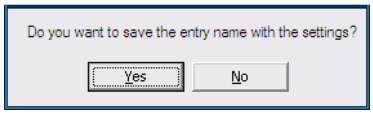
4) In the Zernike pyramid, check the boxes of the aberration components to be displayed in the color map.



All_ON	Checks all aberration components.
All_OFF	Remove check marks from all aberration components.

5) Press  .

   The message window appears.



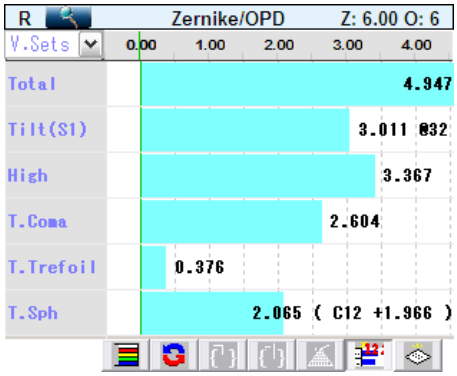
6) Press the Yes button.

   The summary screen is displayed. The Wavefront Group map is displayed and shows the selected combination of aberration components.

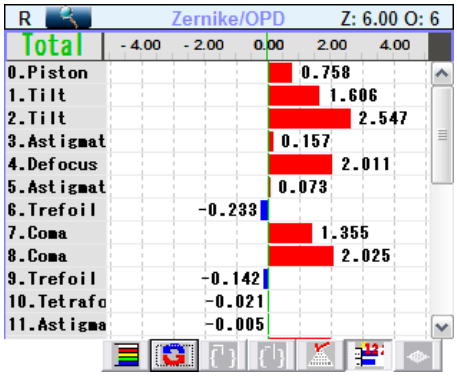
4.1.12 Zernike graph

The Zernike graph displays classified aberration components using the Zernike polynomials. The graph shows aberration conditions both qualitatively and quantatively with classification between lower (1st to 2nd) order aberration that can be corrected with glasses or contact lenses and higher (3rd to 8th) order aberration that causes irregular astigmatism, and classification of aberration components such as sphere, coma, and astigmatism.
There are two types of Zernike graph: RMS graph and coefficient graph.

RMS graph	Calculates root-mean square values of aberration components registered for each group (combination of selected aberration components), then compares several groups.
Coefficient graph	Shows coefficients for a group (combination of selected aberration components).



RMS graph



Coefficient graph

The coefficient and RMS graphs are toggled using the graph toggle button  .

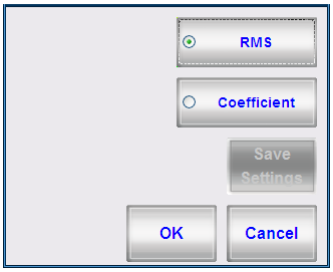
Note

- The wavefront aberration is expanded into multiple terms of Zernike polynomials that represents various types of aberrations. With this device, the expansion is executed into terms of up to 8th order for analysis.

Changing initial setting

The initially displayed Zernike graph in the summary screen can be toggled between the RMS and coefficient graphs.

1) The initially displayed graph can be set in the Display Option screen that appears by pressing the Display button in the summary screen and selecting “for selected map”.
2) Select the desired graph (RMS or coefficient), then press the Save Settings button.
3) Press the OK button to close the Display Option screen.

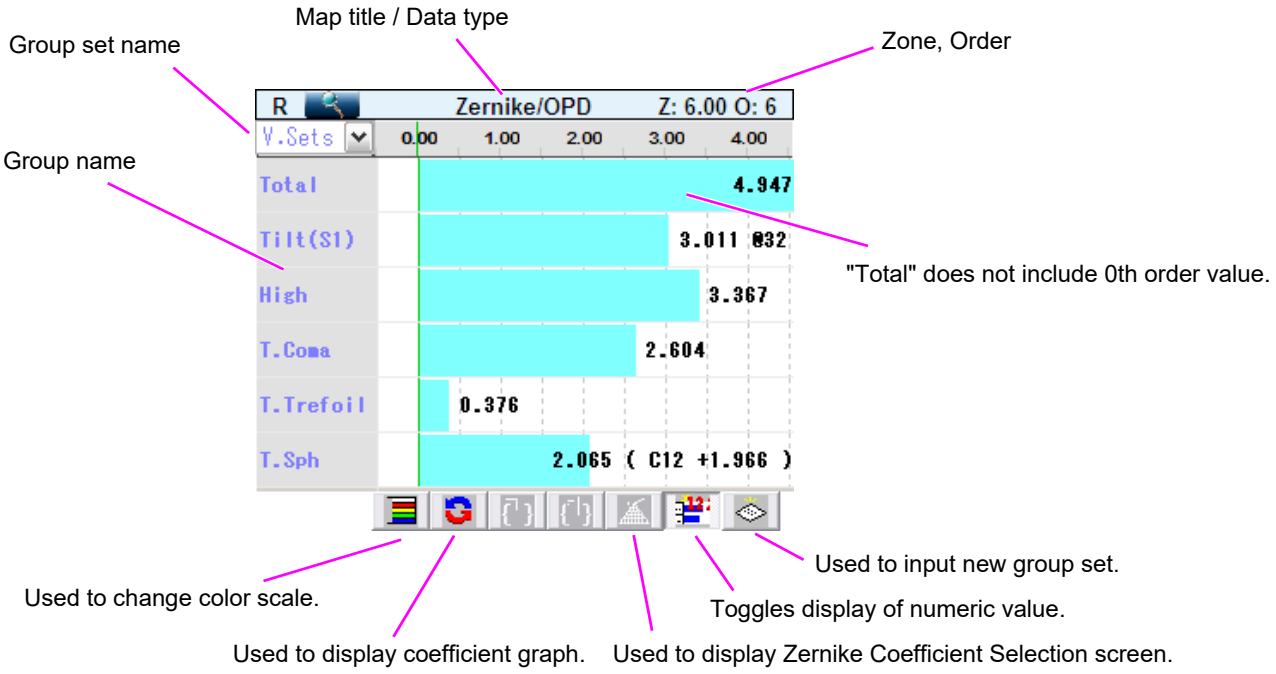


Note

- With Zernike graphs for user-customized summaries, the initially displayed graph can be set in the Settings screen (Summary tab) displayed when the summary is registered.

○ RMS graph (Root-mean square)

The RMS graph displays the amount of aberration in each classified group of aberration components. It shows root-mean square values of aberration components registered for each group.



The value “@ ** “ on the right of the RMS graph shows the axis.
Only the following five groups display the axis.

Group of 1st and 2nd terms (Tilt (S1))

Group of 3rd and 5th terms

Group of 7th and 8th terms (Coma)

Group of 17th and 18th terms

Group of 31st and 32nd terms

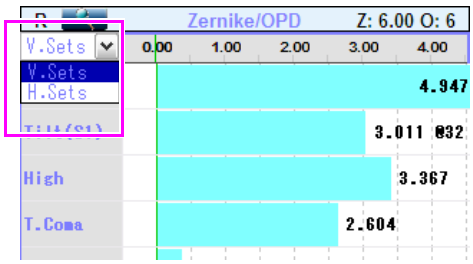
Tilt (S1) and Coma are pre-registered. For other groups, register them if necessary.

Selection of combination of groups (Group set) to be displayed

A group set is a combination of pre-registered groups. The registered groups are displayed in the graph.

1) Press the V button on the side of the group set box at the top left of the screen.

   A list of registered group sets is displayed.



2) Press the desired group set.

   The RMS graph is displayed with the selected group set.

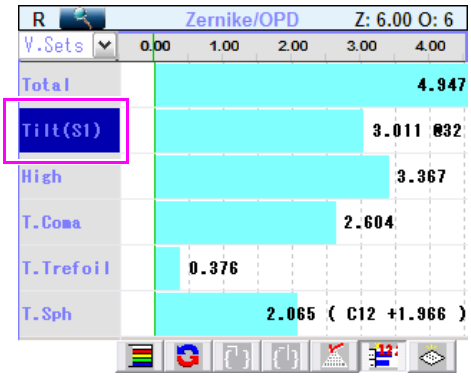
Pre-registered groups sets

V.Sets	Total, Tilt(S1), High, T.Coma, T.Trefoil, T.Sph
H.Sets	Total, Tilt(S1), High, S3+S5+S7, S4+S6+S8

Pre-registered group set names are shown in blue. User-customized group sets are shown in black.

Viewing aberration components included in group

1) Press the desired group name.

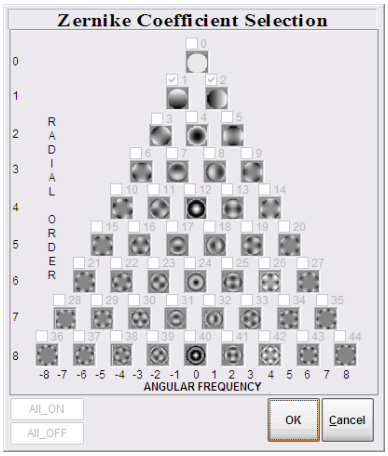


2) Press the tree view button  .

The Zernike Coefficient Selection screen appears. Checked aberration components are included in the group.

3) Press the OK or Cancel button.

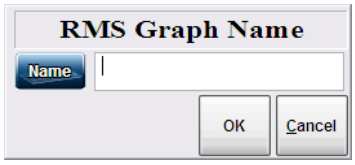
The summary screen is displayed.



Adding new group sets

1) Press the new group button  .

The RMS Graph Name window appears.



2) Input the name of the new group set to be registered.

Press the Name button, then input the name using the on-screen keyboard, or a hardware keyboard.

3) Press the OK button.

The group set is registered with the contents begin displayed and the input name.

4) Add or delete groups as desired.

See “Changing group set (adding groups)” (page 203), “Changing group set (deleting groups)” (page 204).

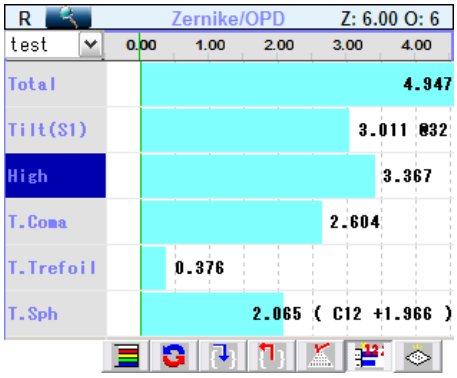
Changing group set (adding groups)

Groups can be added to the existing group sets.

Only to user-customized group sets (displayed in black)

1) Press the desired group name.

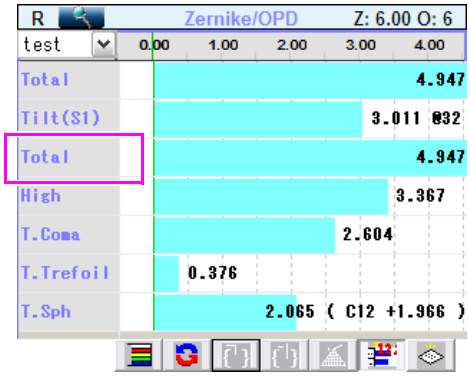
   Select the group in the graph above which the new group is to be added.



2) Press the add button  .

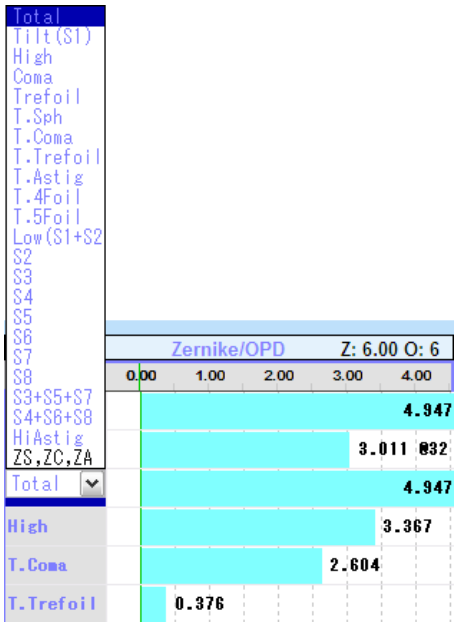
   The new group is added to the specified position.

   In the example shown to the right, “Total” was added above “High”.



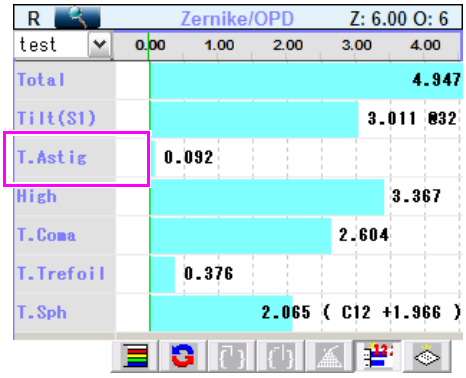
3) Press the row of the added group to display the V button, then press the V button.

   A list of registered groups appears.



4) Press the desired group.

The selected group overwrites the previous one.



Note

- Groups in the registered group sets can be overwritten with the procedure from Step 3 to 4.

Changing group set (deleting groups)

Unnecessary groups can be deleted from the existing group sets.

Only to user-customized group sets (displayed in black)

1) Press the name of the group to be deleted.
2) Press the delete button  .

The selected group is deleted from the graph.

Changing scale

The scale can be changed.

1) Press the scale button  .

The Select Scale screen is displayed.

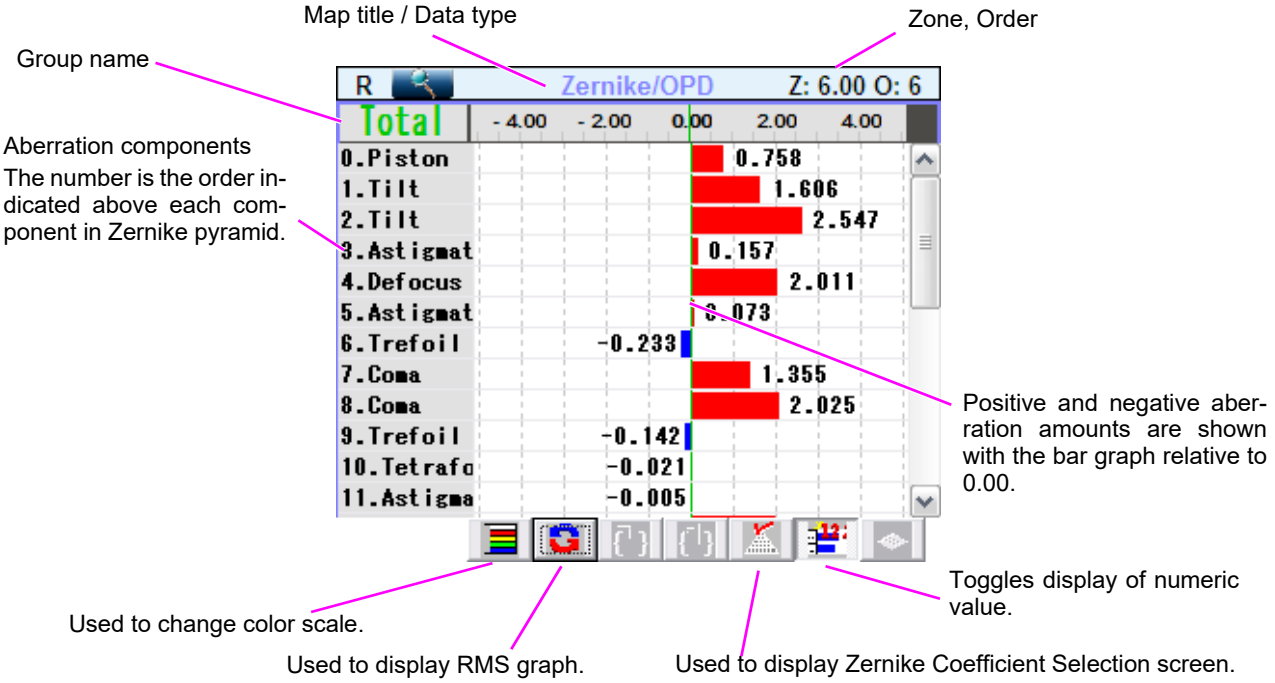
2) Set the mode, middle value, and increments (Steps) for the color scale.

For details of the settings, see “5.8.8 Map Scale tab” (page 345).

3) Press the OK button to close the Select Scale screen.

○ Coefficient graph (0th to 45th term coefficient graph)

The coefficient graph displays the coefficients of aberration components included in the selected group (combination of selected aberration components). Displaying the pre- and postoperative coefficient graphs side by side allows comparison of variation in each aberration component.



Selection of combination of aberration components (group) to be displayed

1) Press the group name box at the top left of the screen.

   The Zernike Coefficient Selection screen appears. Checked aberration components are included in the group being displayed.

2) Press the V button on the side of the group name box.

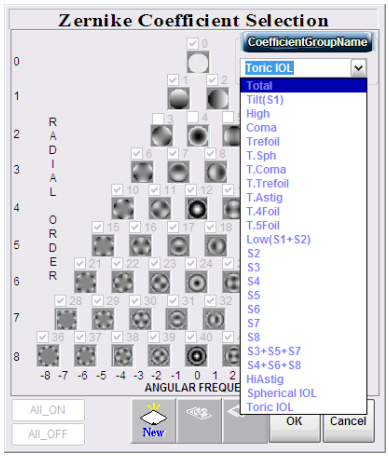
   A list of the registered combinations (groups) of aberration components appears.

3) Press the desired group.

   A check mark is added to aberration components included in the selected group.

4) Press the OK button to return to the summary screen.

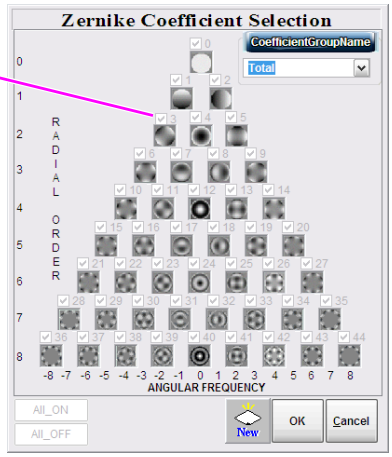
   The coefficient graph is displayed with the selected group.



For the pre-registered groups and aberration components in them, see “4.1.11 Wavefront Map” (page 192).

The terms that represent aberration components are the numbers above each image in the Zernike pyramid.order.
Example 3rd term

Root-mean square values of checked aberration components are shown as bar graphs.



Pre-registered group names are shown in blue. User-customized groups are shown in black.

Selection of combination of aberration components (group) to be displayed

1) Press the group name box at the top left of the screen.

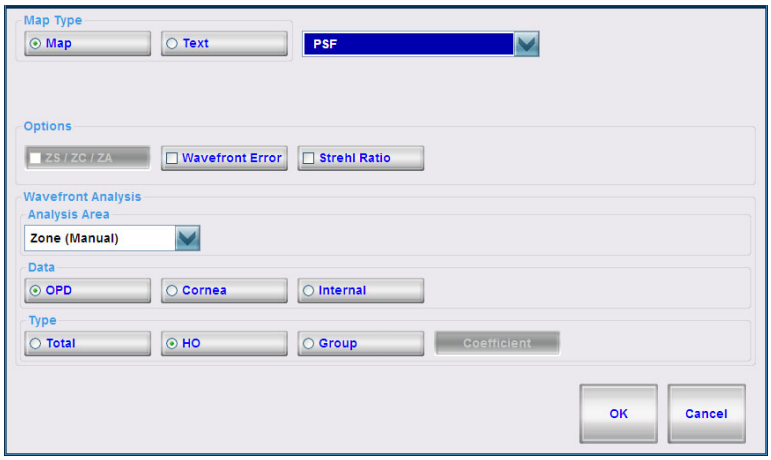
   The Zernike Coefficient Selection screen appears.

2) Select the group with the same procedure from Step 2 to 5 in “ Registration of new groups” (page 198).

4.1.13 PSF map

The Point Spread Function (PSF) simulates how a point source light like a star appears to the patient when they look at it.
This function calculates how a point at far appears to the patient based on the amount of optical aberration of the eye. Take notice that the processing by the optic nerve system of how the brain recognizes the point formed on the retina is not taken into consideration in this calculation. For this reason, the simulation result may differ from the view the patients actually see.

Selecting “PSF” in the Select Map Type screen displays the screen for selecting parameters for wavefront analysis. In this screen, select the type of data to be analyzed and the type of wavefront analysis.



1) Select the desired parameters.

Option (Values to be displayed (Multiple items can be selected.))

ZS/ZC/ZA	Shows the SPH, CYL, and AXIS values within the specific analysis area obtained using Zernike polynomials.
Wavefront Error	Aberration amount μm (0th order value is not included.)
Strehl Ratio	Shows the ratio of the PSF value to the theoretical diffraction limit. The ratio is displayed in the range from 1 to 0. If this value is 0.8 or larger, the eye can be considered as having almost no aberration.

Analysis Area

Zone	Sets the analysis area as specified for “Zone”.
Zone2	Sets the analysis area as specified for “Zone 2”.

Data (to be analyzed)

OPD	Aberration of the whole eye including the cornea, crystalline lens, and vitreous body
Cornea	Corneal aberration
Internal	Internal eye aberration

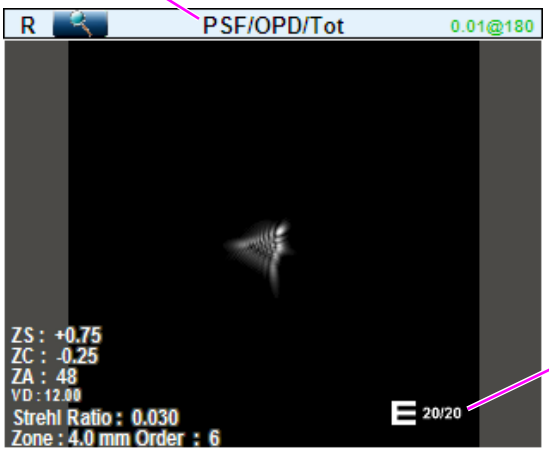
Type (of wavefront aberration)

Total	Total wavefront aberration from the 0th to the specified order in Zernike pyramid
HO	Higher order wavefront aberration from the 3rd to the specified order (up to 8th) in Zernike pyramid
Group	Extracts only wavefront aberration of the specified group. Selecting this button enables the Coefficient button. Press the Coefficient button to display the Zernike Coefficient Selection screen, then select the desired group.

2) Press the OK button to save the setting.

The PSF view of the selected type is displayed.

Map title/Data type/Wavefront analysis type



E chart 20/20

ZS: SPH within analysis area obtained using Zernike polynomials
ZC: CYL within analysis area obtained using Zernike polynomials
ZA: AXIS within analysis area obtained using Zernike polynomials
VD: Corneal vertex distance

Strehl ratio
WF error: RMS wavefront error (Excluding 0th order values)
Zone: Diameter of the area to be analyzed (mm)
Order: Highest analysis order of the Zernike pyramid

○ Displaying analysis values (overlay item)

To display the “ZS/ZC/ZA”, “Wavefront Error”, or “Strehl Ratio” analysis values in the enlarged display, select them in the Display Option screen that appears by pressing the Display button.

The parameters are the same as those in the Option box in the Select Map Type screen.

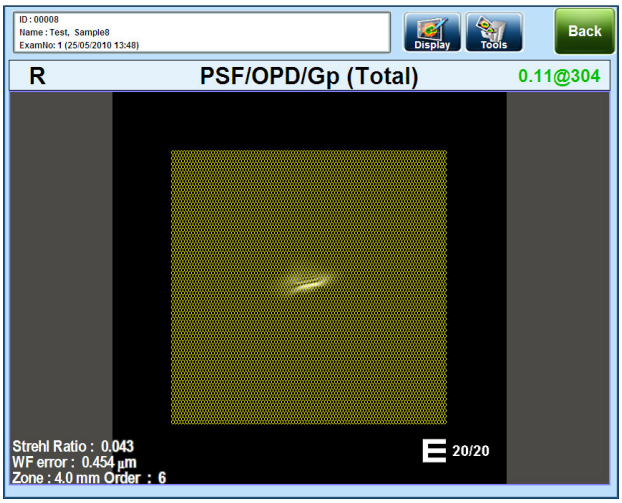
ZS/ZC/ZA	Shows the SPH, CYL, and AXIS values within the specific analysis area obtained using Zernike polynomials. ”ZS/ZC/ZA” is available only when “OPD” and “Total” are selected for the wavefront analysis type.
Wavefront Error	Aberration amount μm (0th order value is not included.)
Strehl Ratio	Shows the ratio of the PSF value to the theoretical diffraction limit. The ratio is displayed in the range from 1 to 0. When this ratio is 0.8 or greater, the eye can be considered to have almost no aberration.

Other overlay items

Selecting “Cell” displays a hexagonal patter simulating ganglionic layer of optic nerve. “Cell” can be selected only when the Display Option screen is displayed by pressing the Display button in the enlarged display.

Cell	Displays a hexagonal pattern simulating ganglionic layer of optic nerve.

The resolution on the retina is analyzed be comparing the size of ganglionic layer of optic nerve and a blurred image.



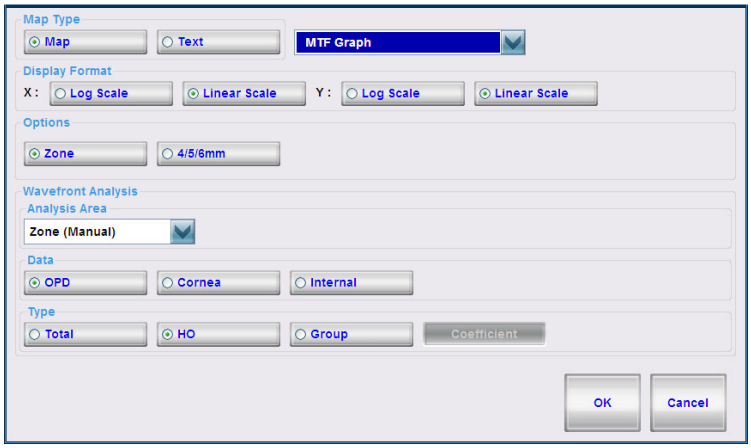
4.1.14 MTF graph (Contrast analysis graph)

The Modulation Transfer Function (MTF) graph shows the contrast needed for the patient to visually identify figures in a visual acuity chart that plots contrast (%) along the vertical axis and visual acuity (VA) along the horizontal axis. Along the horizontal axis, the spatial frequency scale (cpd) is displayed as well.

On the graph, the representative curve of human emmetropic eye (OPD/Total only) are also plotted.

Modulation Transfer Function (MTF) displays the contrast sensitivity that is objectively simulated based on wavefront aberrations.

Selecting “MTF Graph” in the Select Map Type screen displays the screen for selecting the contents of the map. In this screen the type of data to be analyzed and the type of wavefront analysis are selected.



1) In the Analysis Area box, select “Zone” or “Zone2”.

Note

- Set the parameters for “Zone” and “Zone2” in the Analysis Area box in the Settings screen (Parameter tab).

2) Select the data to be analyzed in the Data box.

OPD	Aberration of the whole eye including the cornea, crystalline lens, and vitreous body
Cornea	Corneal aberration
Internal	Internal eye aberration from the posterior surface of the cornea to the retina

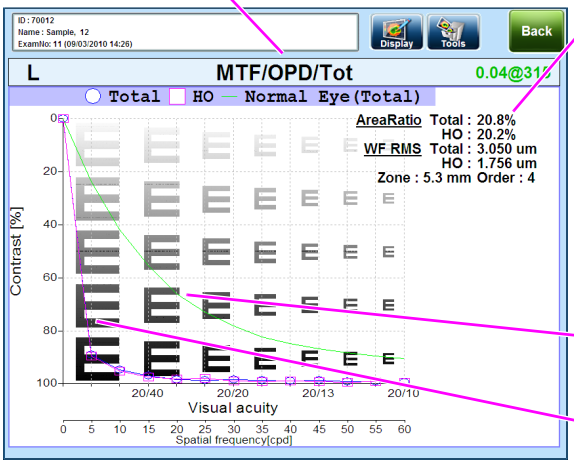
3) Select the wavefront analysis type in the Type box.

HO	Higher order wavefront aberration from the 3rd to the specified order (up to 8th) in Zernike pyramid
Total	Total wavefront aberration from the 0th to the specified order in Zernike pyramid
Group	Extracts only wavefront aberration of the specified group. Selecting this button enables the Coefficient button. Press the Coefficient button to display the Zernike Coefficient Selection screen, then select the group.

4) Press the OK button.

The MTF graph of the selected type is displayed.

Map title/Data type/Wavefront analysis type



AreaRatio:
Ratio between areas defined by curves
Ratio between area bordered with vertical and horizontal axes and Normal Eye curve and area bordered with vertical and horizontal axes and Total curve
The closer the ratio is to 100%, the closer the patient's curve (Total) is to the Normal Eye curve.

WF RMS:
Aberration amount μm (0th order value is not included.)

Zone:
Analysis area

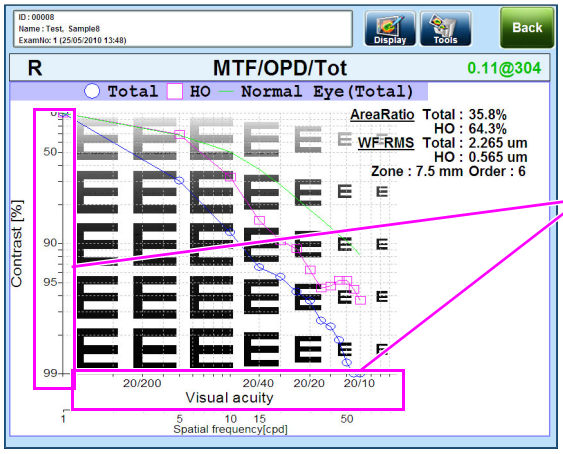
Order:
Highest analysis order of the Zernike pyramid

Normal Eye(Total):
Curve of typical emmetropic eye (green) (only with OPD measurement)

Total:
Patient's MTF curve (blue)

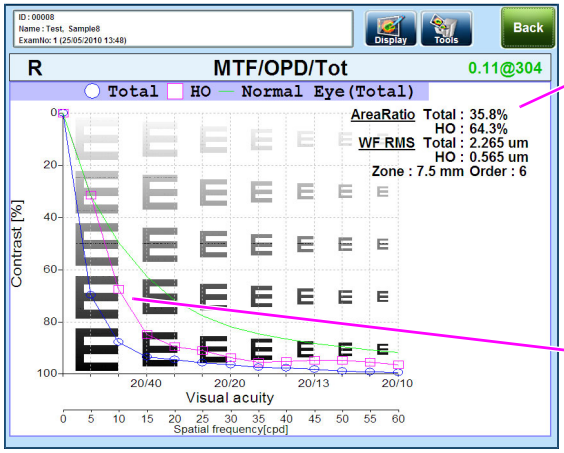
HO:
Patient's MTF curve for higher order aberration only (pink)

When the Log scale (V) overlay option is selected, the vertical axis of the graph is switched to the log scale. When the Log scale (H) is selected, the horizontal axis of the graph is switched to the log scale.



Log scale

Selecting the Zone overlay item displays the Total and HO curves.



AreaRatio:

Ratio between areas defined by curves

Ratio between area bordered with vertical and horizontal axes and Normal Eye curve and area bordered with vertical and horizontal axes and each curve

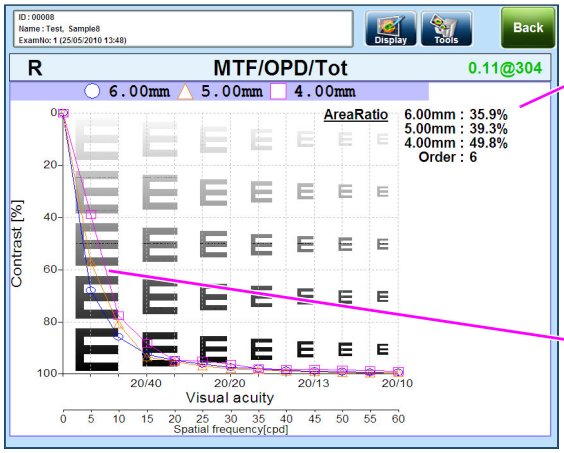
The closer the ratio is to 100%, the closer the patient's curve (Total) is to the Normal Eye curve.

Order:

Highest analysis order of the Zernike pyramid

Patient's MTF curves for Total and HO

Selecting the 4/5/6 mm overlay item displays three curves with different pupil diameters.



AreaRatio:

Ratio between areas defined by curves

Ratio between area bordered with vertical and horizontal axes and Normal Eye curve and area bordered with vertical and horizontal axes and each curve

The closer the ratio is to 100%, the closer the patient's curve (Total) is to the Normal Eye curve.

Order:

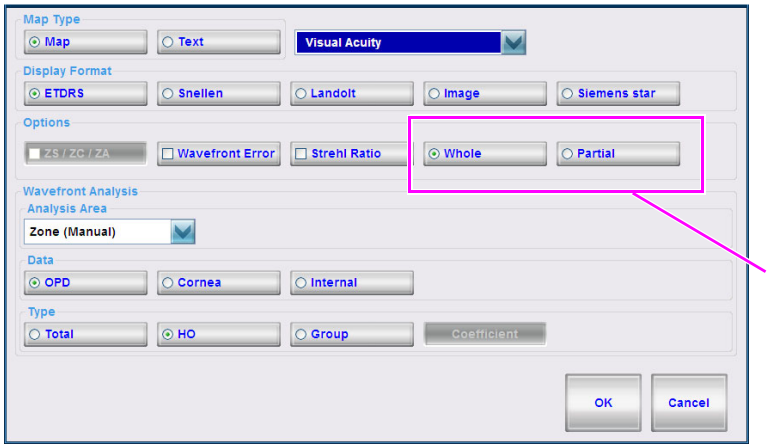
Highest analysis order of the Zernike pyramid

Patient's MTF curves for various pupil diameters

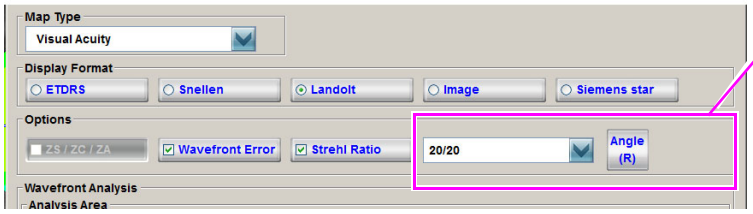
4.1.15 Visual Acuity chart

The Visual Acuity chart displays the view of how the visual acuity chart appears to the patient that is simulated based on wavefront aberrations. The available charts are as follows: ETDRS (Whole/Partial), image, Snellen (20/20, 20/40, 20/100, ALL), Landolt (20/20, 20/40, 20/100, ALL), and Siemens star (Whole/Partial) charts. The Snellen and Landolt charts can be flipped or inverted.

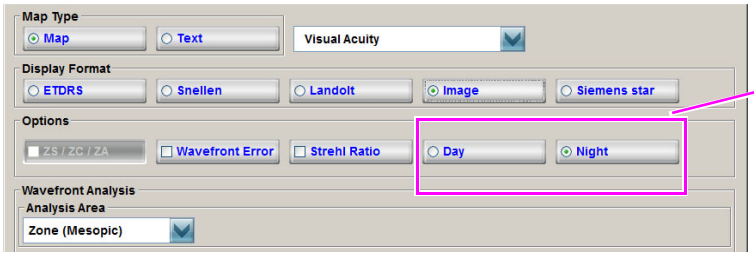
Selecting “Visual Acuity” in the Select Map Type screen displays the screen for selecting parameters for wavefront analysis. On this dialog, select the type of data to be analyzed and type of wavefront analysis.



For the ETDRS and Siemens star charts, select “Whole” or “Partial”.



For the Snellen and Landolt charts, select the visual acuity and angle.
Selecting “ALL” displays the 20/20, 20/40, and 20/100 charts vertically.



For Image, select “Day” or “Night”.

1) Select the data to be analyzed in the Data type box.

OPD	Aberration of the whole eye including the cornea, crystalline lens, and vitreous body
Cornea	Corneal aberration
Internal	Internal eye aberration from the posterior surface of the cornea to the retina

2) Select the wavefront analysis type in the Type box.

HO	Higher order wavefront aberration from the 3rd to the specified order (up to 8th) in Zernike pyramid
Total	Total wavefront aberration from the 0th to the specified order in Zernike pyramid
Group	Extracts only wavefront aberration of the specified group.

3) Press the OK button.

The Visual Acuity chart view of the selected type is displayed.

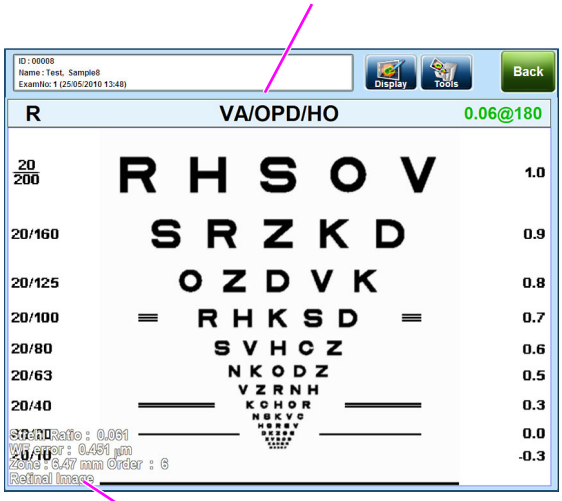
Note

- The Visual Acuity chart is created by processing chart images and the PSF image that show how a point source light appears to the patient to simulate how charts appear to the patient.

  For the setting of visual acuity display, see “5.8.7 Parameter tab” (page 341).

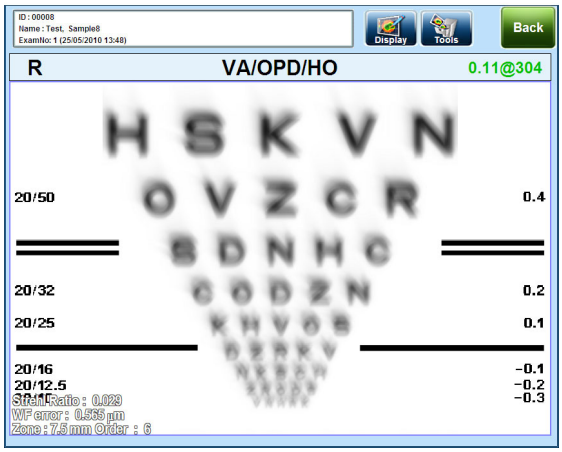
ETDRS chart_Whole

Map title/Data type/Wavefront analysis type

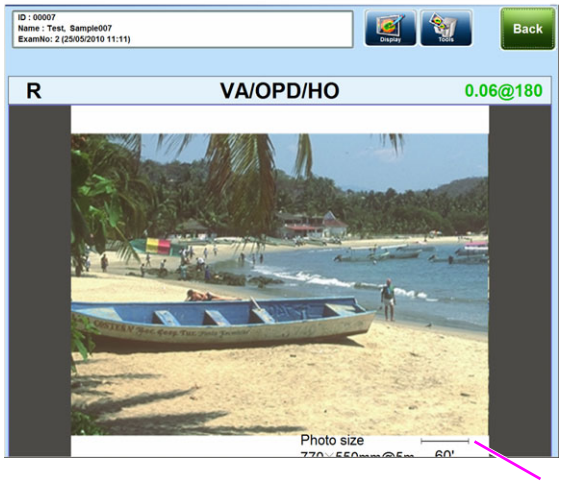


Strehl ratio
WF error: RMS wavefront error (excluding 0th order values)
Zone: Diameter of the area to be analyzed (mm)
Order: Highest analysis order of the Zernike pyramid
Setting of visual acuity display (Retinal Image / Patient View Image)

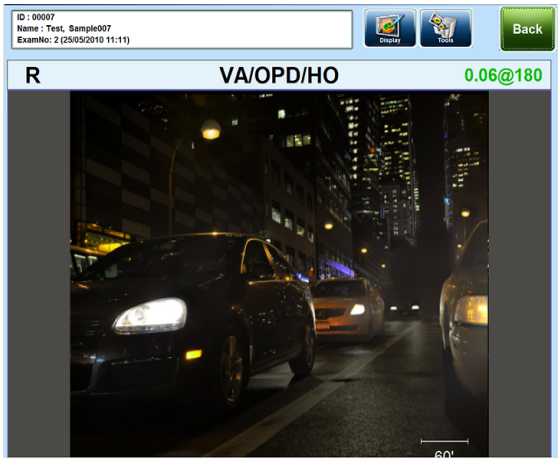
ETDRS chart_Partial



Scenic chart (Day)



Scenic chart (Night)



Scale (1 graduation: 60 minutes)

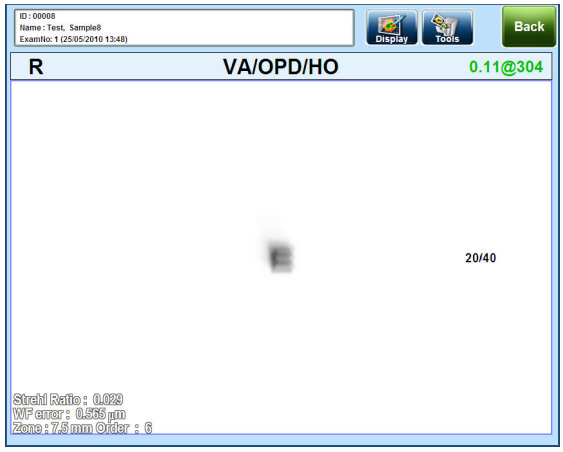
Note

- The scenic chart does not simulate how the scenery actually appears to the patient, but simulates how the scenic picture appears to the patient at a distance of 5 m.

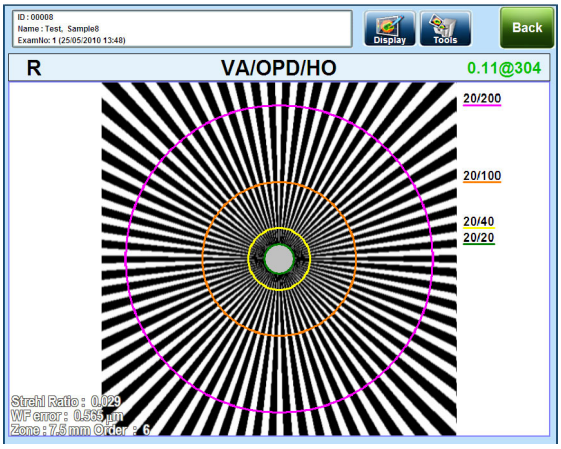
  An indication “Photo size 770 × 550 mm@5 m” means that the chart simulates how the scenic picture of 770 × 550 mm appears to the patient at a distance of 5 m.

4

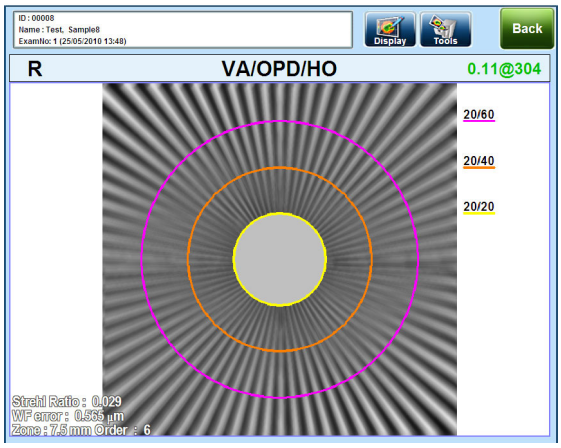
Snellen chart
(or Landolt chart)



Siemens star chart (Whole)



Siemens star chart (Partial)



4.1.16 Zonal Refraction map

The Zonal Refraction map displays the distribution of refractive error obtained in the OPD measurement. The 6 mm-diameter area around the center of the cornea is divided into three zones: C (center), M (middle), and P (periphery). Each zone shows its maximum and minimum refractive errors and their directions.

The refractive error displayed in this map is the amount of correction needed to achieve emmetropia (for the whole eye taking into consideration the corneal and internal refractive errors.)

Unlike conventional auto-refractometers that measure the refractive error of the central part of the eye, the device measures refractive error of the peripheral area as well, enabling display of the distribution of refractive power needed to correct the visual acuity.

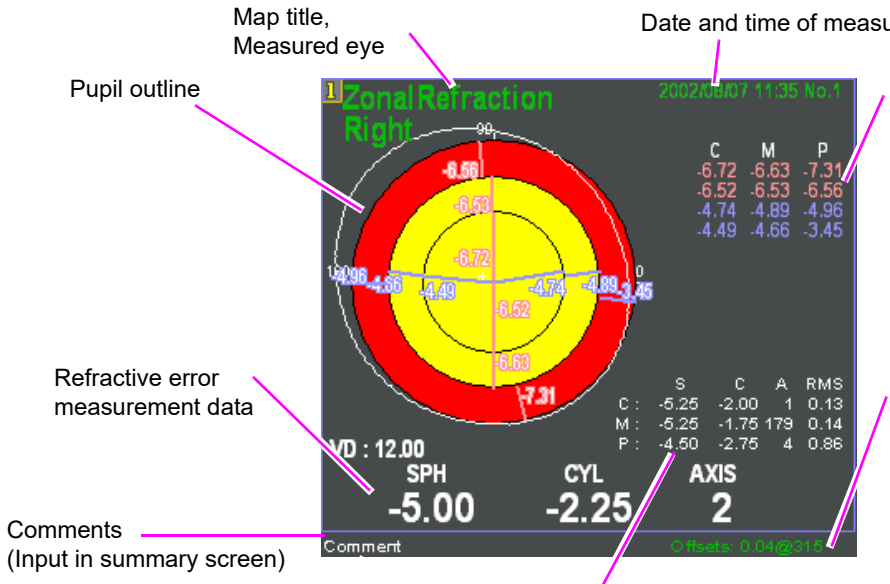
The refractive error measurement data displayed at the bottom of the screen is obtained with the vertex distance set on the Settings screen (Parameter tab).

Other values are calculated considering that the vertex distance is 0 (zero) (unchangeable).

Note

- The Zonal Refraction map is displayed only when AR values obtained with the ARK-9000 is displayed or when a map layout including the Zonal Refraction map is displayed with OPD-Station. It cannot be selected for a user customized summary.

  The Zonal Refraction map cannot be selected in a user customized summary created in the Summary tab screen.



Amount of alignment error	Color of character
0 ≤ Amount of alignment error < 0.3	Green
0.3 ≤ Amount of alignment error < 0.4	Yellow
0.4 ≤ Amount of alignment error	Red

The SCA values within the C, M, and P zones are calculated from spheres obtained by fitting (least-square method) to the OPD measurement data of these zones. However, these SCA values are approximated values, the actual distribution of refractive error cannot be represented only with these values. As a measure of reliability of the SCA values, the root mean square fit error (RMS) expressed in the equation shown below is used. When the RMS value is 0 (zero), the SCA values perfectly represent the actual distribution of refractive error. The larger the difference from the actual distribution is, the larger this RMS value becomes. Eyes with regular astigmatism show the RMS value of less than 0.5. If the RMS value is larger than 0.5, the eye is suspected to have irregular astigmatism.

$$RMS = \sqrt{\frac{\sum_{\theta=1}^{360} \{D_{real}(\theta) - D_{SCA}(\theta)\}^2}{360}} \quad [Dptr]$$

Color of each zone

The color of each zone in the Zonal Refraction map shows the degree of astigmatism.

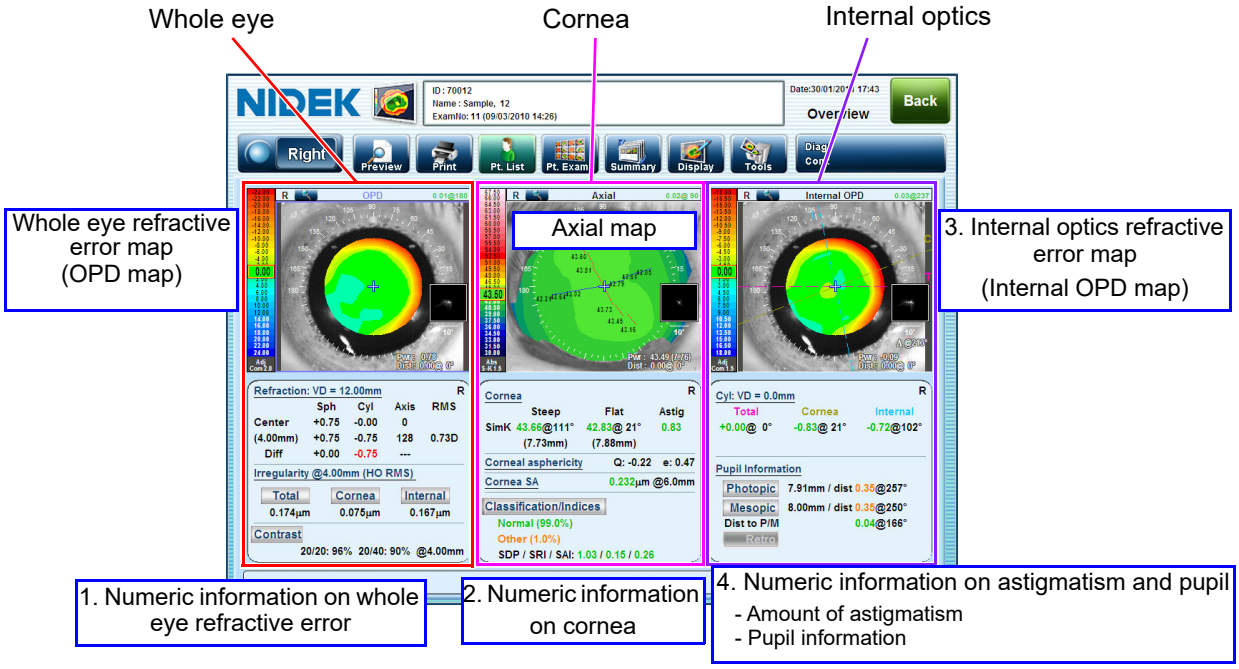
Color	Green	Yellow	Red
CYL value	0.00 ≤ CYL ≤ 0.75	0.75 < CYL ≤ 2.00	2.00 < CYL

4.2 Explanation of Summaries

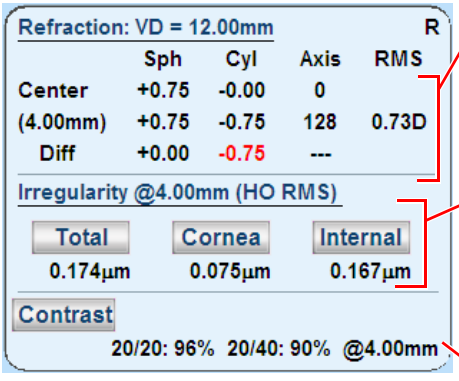
Combinations of maps (map sets) created for various purposes are pre-registered as summaries.

4.2.1 Overview

The Overview summary displays information on the patient's eye in three sections: whole eye, cornea, and internal optics. With this summary, characteristic information on these sections can be viewed in a single page.



1. Numeric information on whole eye refractive error



Objective refractive error information

Displays multiple refractive error values.

The displayed values are selected with the "Refraction Display Format" parameter in the Settings screen (Parameter tab).

Top – Standard refractive error measurement value

Middle – Refractive error measurement within specified diameter area (Reference value for night visual acuity)

Bottom – Difference between the above

Higher order aberration information

Displays the RMS values of higher order aberration for whole eye, cornea, and internal optics.

Pressing the desired button displays the corresponding Wavefront HO map.

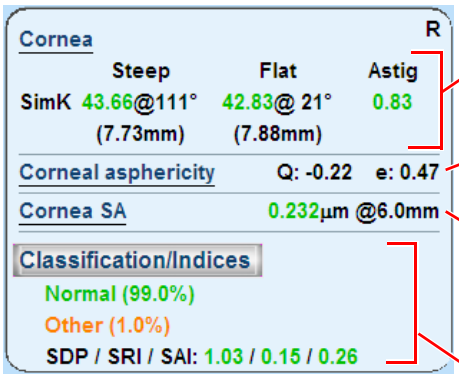
- If the mesopic pupil diameter is smaller than the specified analysis area when "Common Settings - Analysis Area - Total / Internal Options - Reduce to pupil size" in the Settings screen (Parameter tab) is checked, the Total and Internal refraction information is not displayed.

Contrast information

Displays the minimum contrast that enables visual identification of the chart based on analysis of the MTF graph.

Pressing the button displays the MTF graph.

2. Numeric information on cornea



Corneal curvature information

SimK value

Bottom – Corneal curvature within the area specified with “Zone”

Corneal asphericity index

Q and e values

Corneal spherical aberration

Displays the value of coefficient C12 from the result of Zernike analysis of cornea.

This value is useful for selection of aspheric IOL.

The analysis area diameter is 6.0 mm and unchangeable.

Cornea analysis information

Displays the classification of corneal shape obtained with Corneal Navigator.

The SDP, SRI, and SAI indexes show characteristics of cornea.

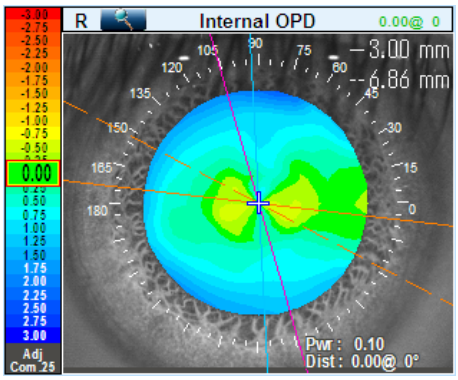
If the value is red, corneal shape may be abnormal.

SDP: Standard Deviation of corneal power (entire cornea)

SRI: Surface Regularity Index (Index of irregularity of central corneal surface)

SAI: Surface Asymmetry Index (Index of asymmetry of cornea)

3. Internal optics refractive error map (Internal OPD map)



Astigmatism axis display

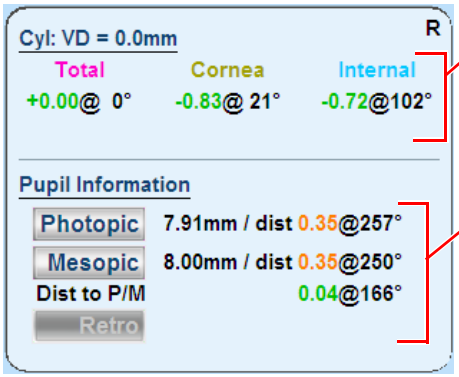
Displays astigmatism axes of whole eye, cornea, and internal optics, enabling visual confirmation of their differences.

In addition, the line thickness changes in proportion to the amount of astigmatism, enabling visual confirmation of the effect of astigmatism on the visual function.

Thickness of astigmatism axis

Cyl < 1.43D	1 dot broken line
1.43D ≤ Cyl < 1.78D	2 dot solid line
1.78D ≤ Cyl	3 dot solid line

4. Numeric information on astigmatism and pupil



Astigmatism information

Displays the amount of astigmatism in whole eye, cornea, and internal optics.

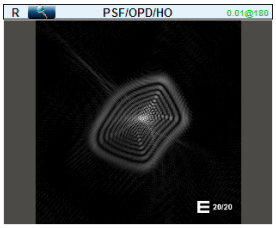
Amount of astigmatism within 3 mm diameter area

Pupil information

Displays the pupil diameter and the distance between pupil center and corneal vertex in photopic and mesopic visions, and the distance between the pupil centers in photopic and mesopic visions.

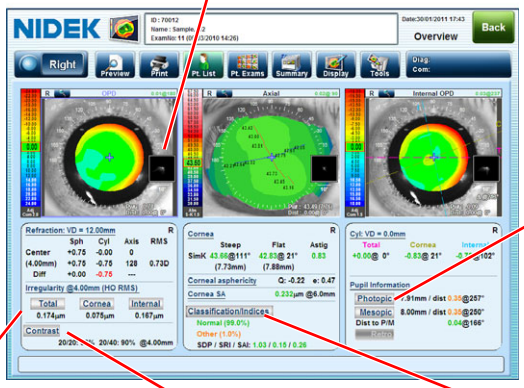
Pressing the Photopic, Mesopic, or Retro button displays the enlarged display of the corresponding anterior segment image.

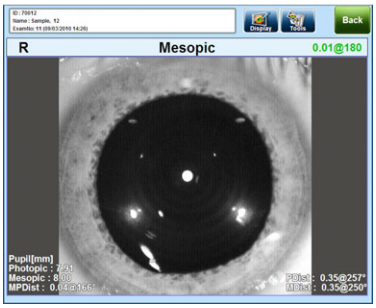
If more detailed information is needed in the Overview summary, press the corresponding buttons and display the necessary maps or information.



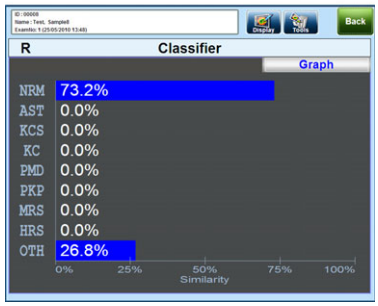
Pressing the PSF image icon changes the map to the PSF image.

PSF image

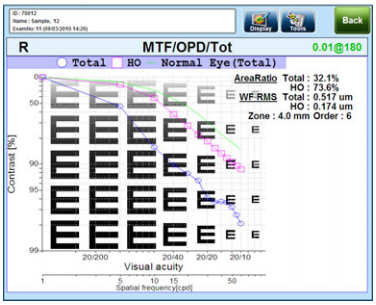




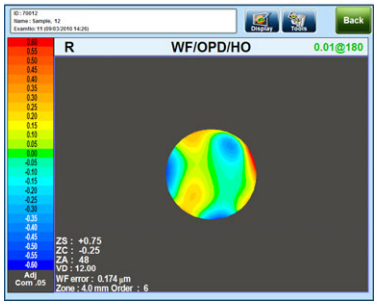
Anterior segment image (ex. mesopic vision)



Topo Classifier



MTF graph

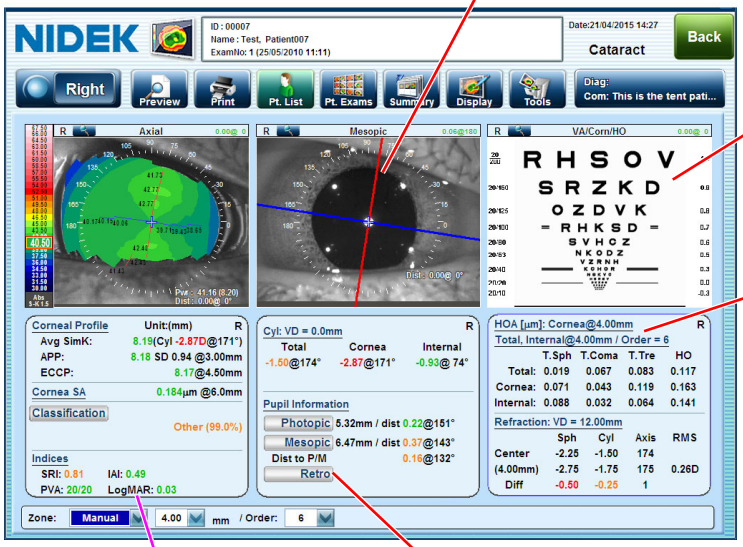


WF HO map

4.2.2 Cataract

The Cataract summary displays information useful before and after cataract surgery.

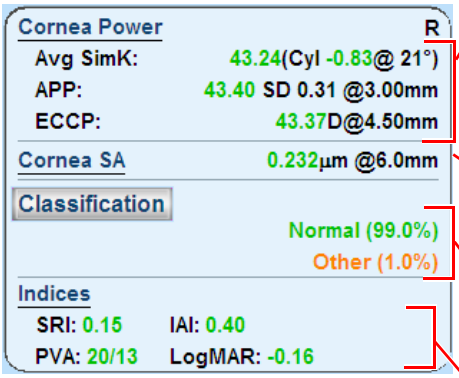
Astigmatism axis on cornea
Red – SimK steepest meridian
Blue – SimK flattest meridian



Patient view simulation
Simulates how chart appears to patient with higher order aberration components.
This simulated view can be used to predict the patient's view after cataract surgery.

Higher order aberration information
Displays higher order aberrations for whole eye, cornea, and internal optics.
If this value is large, the visual function is affected. So, this information is useful in finding which section of the eye (whole eye, cornea, or internal optics) has a disease.

Retro button
Displays an enlarged retroillumination image obtained using the refraction measurement.
It allows easy confirmation of clouding of the crystalline lens and the IOL position.



Corneal refractive power for IOL power calculation
Avg. SimK - Mean SimK value along flattest and steepest meridians
APP: Mean refractive power within pupil
This value is useful when the distance between corneal vertex and pupil center is large.
The analysis area diameter is 3.0mm (initial value).
ECCP: Effective Corneal Central Power
This value is effective even with eyes that have history of refractive surgery.
The analysis area diameter is 4.5 mm and unchangeable.

Corneal spherical aberration
Displays the value of coefficient C12 from the result of Zernike analysis of cornea.
This value is useful for selection of aspheric IOL.

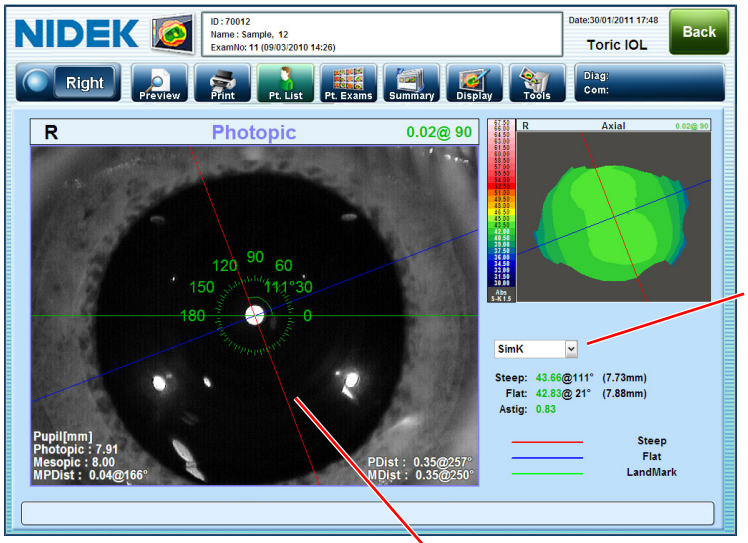
Classification
Displays the classification of corneal shape obtained with Corneal Navigator.

Indices
Displays typical indices that express characteristics of corneal shape.

4

4.2.3 Toric IOL

This Toric IOL summary exclusively for toric IOLs displays simulated degree gauge and axis marker used for toric IOL.



Type of corneal astigmatism axis

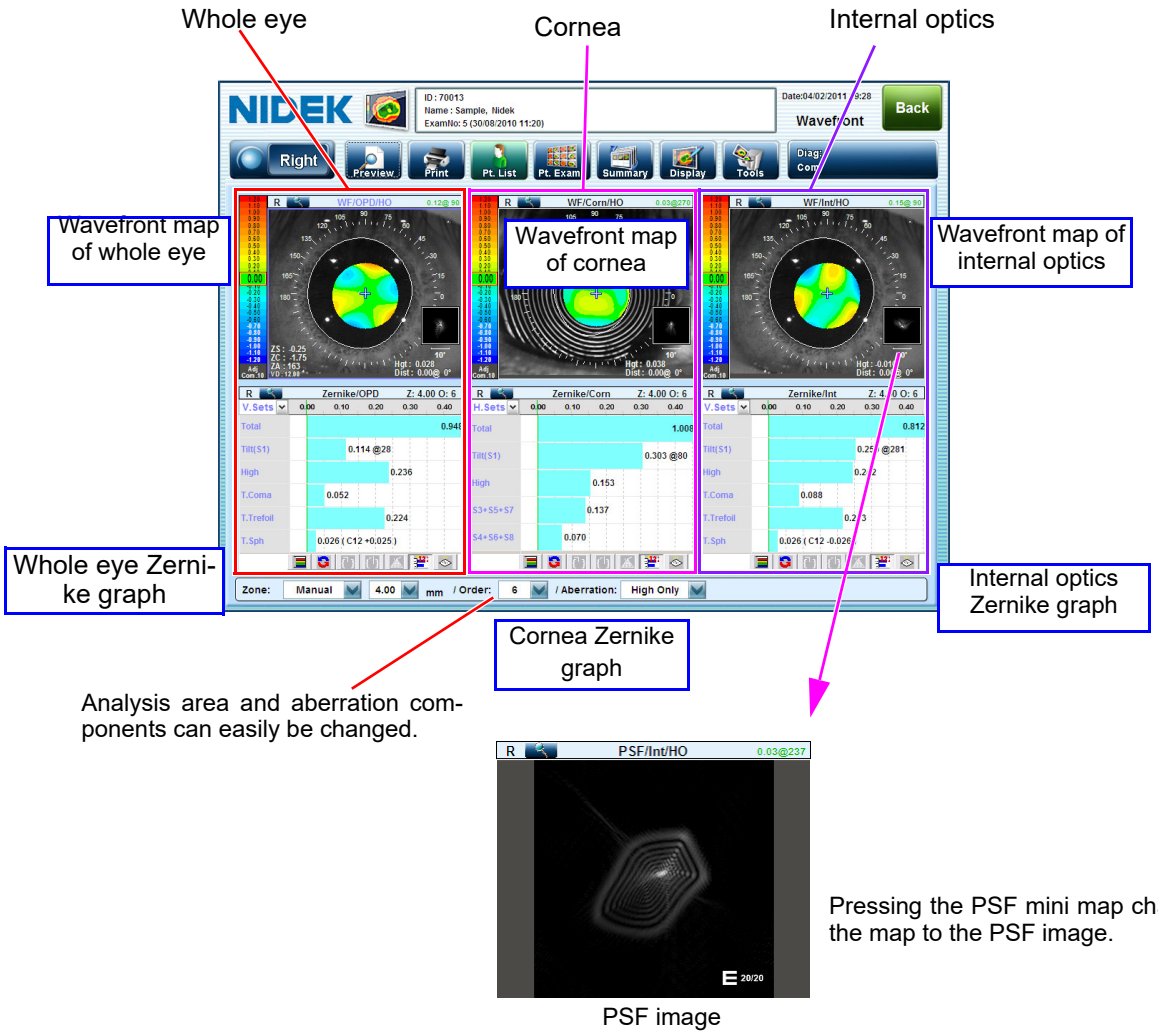
The type of the steepest and flattest meridians displayed on the anterior segment image can be selected from “SimK”, “Zone”, and “Zernike”.

Axis of degree gauge

Pressing any characteristic point (iris pattern or sclera blood vessel) on the anterior segment moves the 0 degree axis and the green line to that point.
Graduations of the degree gauge can be enlarged to the desired size by dragging along the green line.

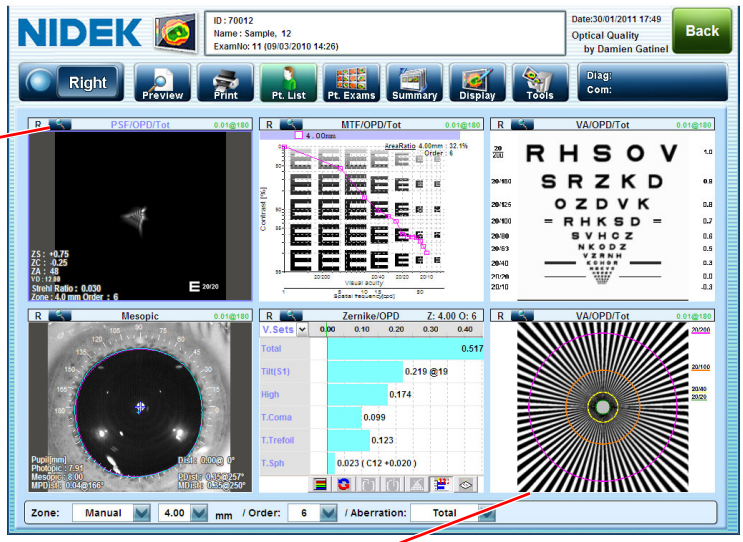
4.2.4 Wavefront

The Wavefront summary displays the wavefront maps and Zernike graphs for the whole eye, cornea, and internal optics.



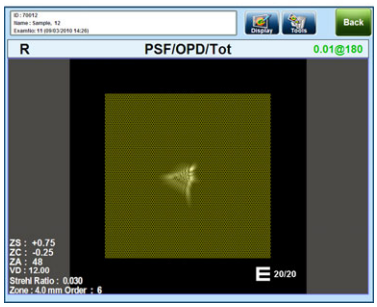
4.2.5 Optical Quality

The Optical Quality summary displays information on how images appear to the patients. This summary was co-developed with Dr. Gatinel.



PSF

Allows comparison between PSF and ganglionic layer of optic nerve in the enlarged image.



Siemens star map

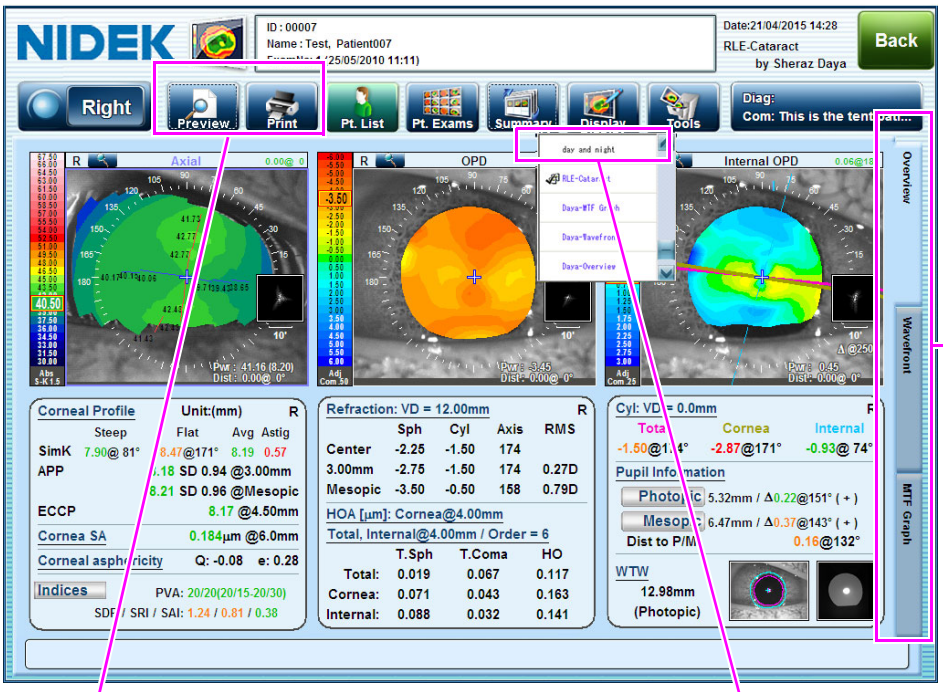
Displays astigmatism axis and visual acuity at the same time. By looking at the star pattern on which circles define various visual acuities, the visually identifiable visual acuity value is found.

4.2.6 RLE-Cataract (Summary group)

The RLE-Cataract summary group displays examination items useful before and after Refractive Lens Exchange (cataract surgery mainly to correct refractive error). The RLE-Cataract summary group consists of three summaries. The display can be changed by pressing the tabs on the right side of the screen.

This summary was co-developed with Sheraz M Daya, MD.

RLE-Cataract	Daya-Overview (6 maps)	Axial Map, Axial Daya Text, OPD Map, OPD Daya Text, Internal OPD Map, Internal OPD Daya Text
	Daya-Wavefront (6 maps)	Wavefront Cornea (Lo Astig / HO), Wavefront OPD (Lo Astig / HO), Wavefront Internal (Lo Astig / HO)
	Daya-MTF Graph (3 maps)	MTF Graph (Cornea, OPD, Internal)



Tabs

Used to select the summary to display.

The contents of the print preview and printed sheet differ from those of other summary screens.

The data is printed with the print setting exclusively for RLE-Cataract summary group that is different from the print setting in the Settings screen.

For the RLE-Cataract summary group, the icon to represent a summary group appears on the side of the summary group name.

The same icon appears in the summary list in the Exam List screen and the Settings screen.

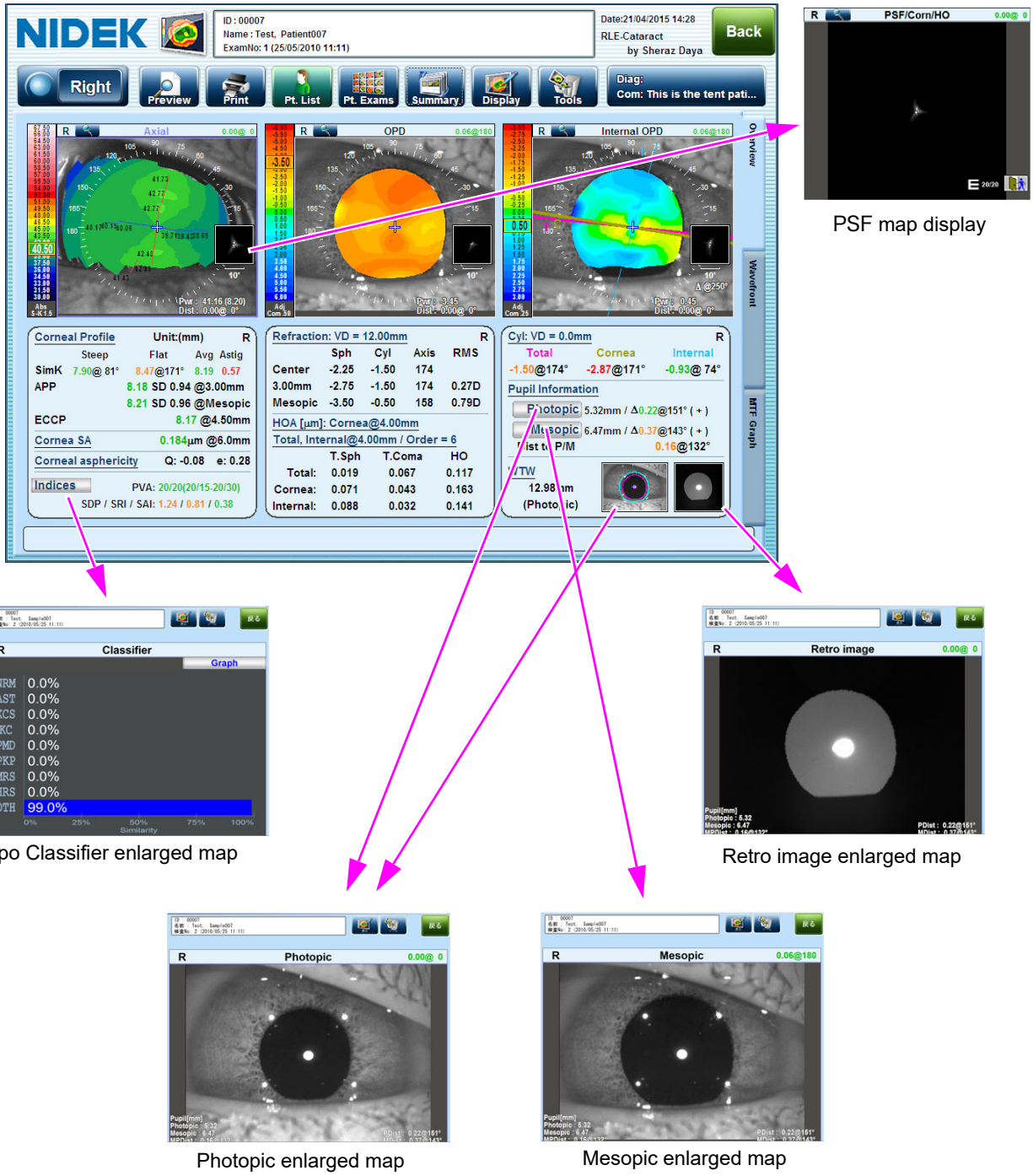
Note

- Each of the three summaries, Daya-Overview, Daya-Wavefront, and Daya-MTF Graph can also be displayed as a single summary. In a single summary display, the tabs on the right side of the screen do not appear.
- No display option is available for the RLE-Cataract summary group. The display options need to be set for each of the three summaries, Daya-Overview, Daya-Wavefront, and Daya-MTF Graph.

Note

- The summary image and text data sets output from the RLE-Cataract summary groups are saved with the group's unique file name.

○ Daya-Overview summary



PSF map display

Topo Classifier enlarged map

Retro image enlarged map

Photopic enlarged map

Mesopic enlarged map

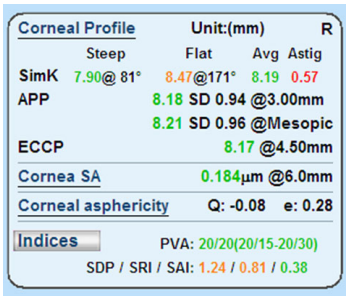
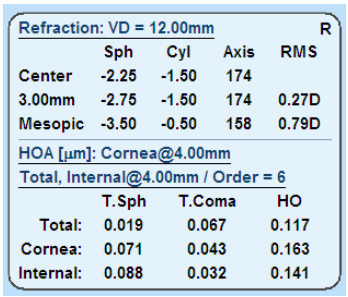
Map display options

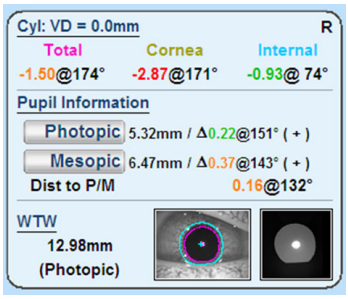
The options (overlay items) shown below are provided by default.

Axial map	Angle Scale, Cross Cursor, Eye Image, Keratometric, PSF Mini Map
OPD map	Angle Scale, Cross Cursor, Eye Image, Hide Text, PSF Mini Map
Internal OPD map	Angle Scale, Cross Cursor, Eye Image, Hide Text, Axis Line, PSF Mini Map

Text maps

Text maps exclusively for Daya-Overview summaries

	Axial Daya Corneal profile information SimK value APP: Mean refractive power within pupil Within an unchangeable 3.00 mm-diameter analysis area In mesopic vision ECCP: Effective Corneal Central Power within an unchangeable 4.5 mm-diameter analysis area Corneal spherical aberration Displays the value of coefficient C12 from the result of Zernike analysis of cornea within an unchangeable 6.0 mm-diameter analysis area Corneal asphericity index Q and e values Corneal indices Indices that show the characteristics and shape of the cornea [Indices] button: Shows an enlarged Topo Classifier map.
	OPD Daya Objective refractive error information Top – Standard refractive error measurement value Middle – Refractive error measurement value within a 3.0 mm-diameter analysis area Bottom – Refractive error measurement value in mesopic vision Higher order aberration information RMS values of the 6th order aberration for whole eye, cornea, and internal optics within a 4.00 mm-diameter analysis area * Although the analysis conditions can be changed in the Daya-Wavefront summary screen, the RLE-Cataract summary group is supposed to be used with the preset analysis conditions.



Internal OPD Daya

Astigmatism information

The amount of astigmatism in whole eye, cornea, and internal optics.

Pupil information

Photopic pupil diameter / Distance@direction from alignment light to the center of photopic pupil center (–: Nasal / +: Temporal)

Mesopic pupil diameter / Distance@direction from alignment light to the center of mesopic pupil center (–: Nasal / +: Temporal)

Distance@direction from photopic pupil center to mesopic pupil center

[Photopic] button: Shows an enlarged photopic map.

[Mesopic] button: Shows an enlarged mesopic map.

WTW (Pupil diameter)

Depending on the measurement conditions, “Manual”, “Photopic”, “Mesopic”, or “------(no value)” is displayed.

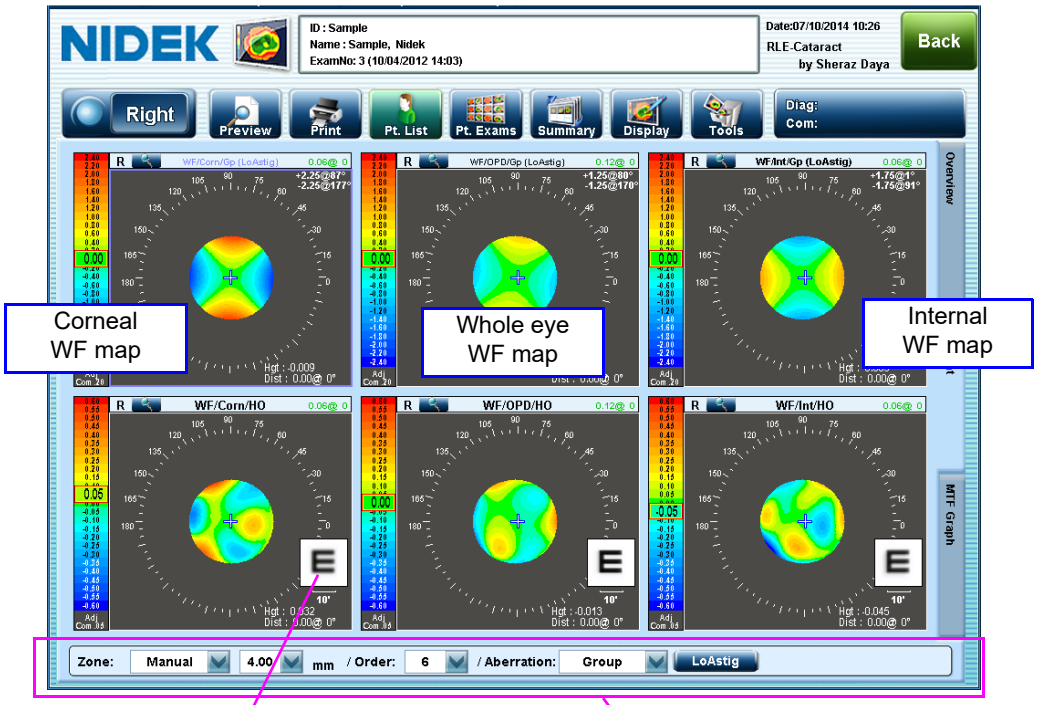
Photopic mini map: Shows an enlarged photopic map.

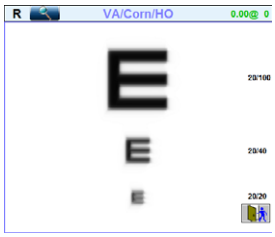
Pupil contour is displayed in the mini map.

Retro mini map: Shows an enlarged retroillumination image map.

○ Daya-Wavefront summary

WF maps can be displayed from the corneal, whole eye, and internal data types.





Snellen chart

The analysis area and the aberration components to be analyzed can easily be changed.

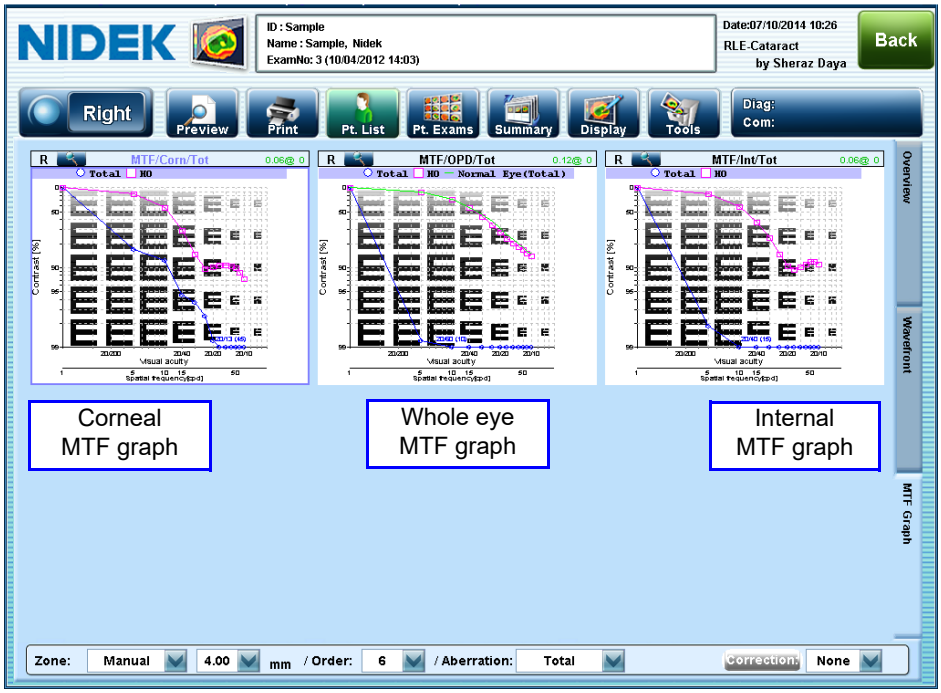
For the RLE-Cataract summary group, the analysis area diameter is automatically set to 4.00 mm, the analysis order to the 6th, and the analysis aberration group in the upper row to LoAstig.

* Although the analysis conditions can be changed in the Daya-Wavefront summary screen, the RLE-Cataract summary group is supposed to be used with the preset analysis conditions.

Map	Aberration	Display option
Wavefront Cornea Group	Lo Astig(3, 5)	Angle Scale, Cross Cursor, Cylinder (+, -)
Wavefront Cornea HO	HO	Angle Scale, Cross Cursor, Snellen (20/40) mini map Pressing the mini map displays a Snellen chart.
Wavefront OPD Group	Lo Astig(3, 5)	Angle Scale, Cross Cursor, Cylinder (+, -)
Wavefront OPD HO	HO	Angle Scale, Cross Cursor, Snellen (20/40) mini map Pressing the mini map displays a Snellen chart.
Wavefront Internal OPD Group	Lo Astig(3, 5)	Angle Scale, Cross Cursor, Cylinder (+, -)
Wavefront Internal OPD HO	HO	Angle Scale, Cross Cursor, Snellen (20/40) mini map Pressing the mini map displays a Snellen chart.

○ Daya-MTF Graph summary

MTF maps can be displayed from the corneal, whole eye, and internal data type.
The Daya-MTF Graph summary is used to confirm the simulated contrast of images as viewed by the patient. By default, the contents of this summary is not printed or output.



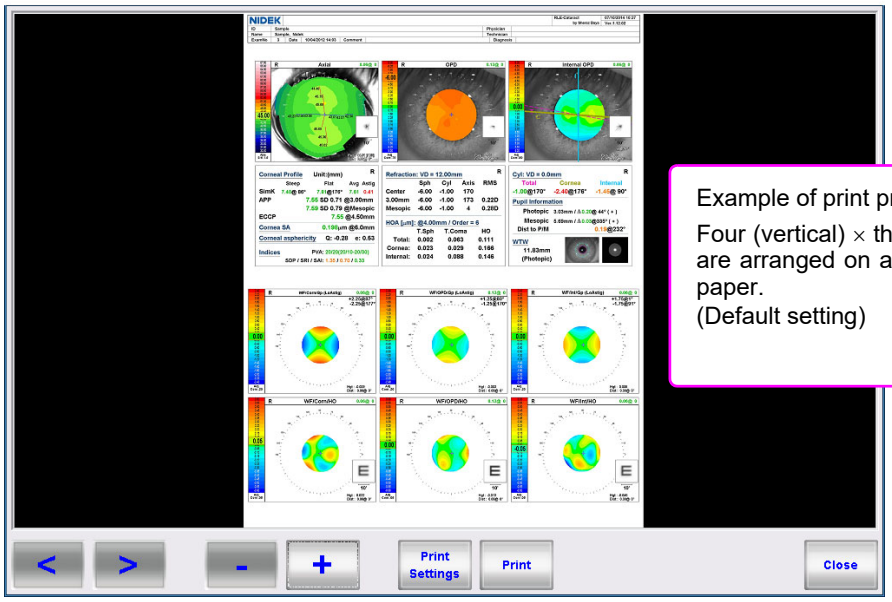
Map	Display option
MTF Graph Cornea	Log scale (V), Log scale (H), Hide Text
MTF Graph OPD	Log scale (V), Log scale (H), Hide Text
MTF Graph Internal	Log scale (V), Log scale (H), Hide Text

○ Printing of RLE-Cataract summary group

By default, a total of 12 maps including the Daya-Overview and Daya-Wavefront summaries is printed in the predetermined arrangement on an A4 paper. The Daya-MTF Graph summary that is mainly used for confirmation on the screen is not printed by default.

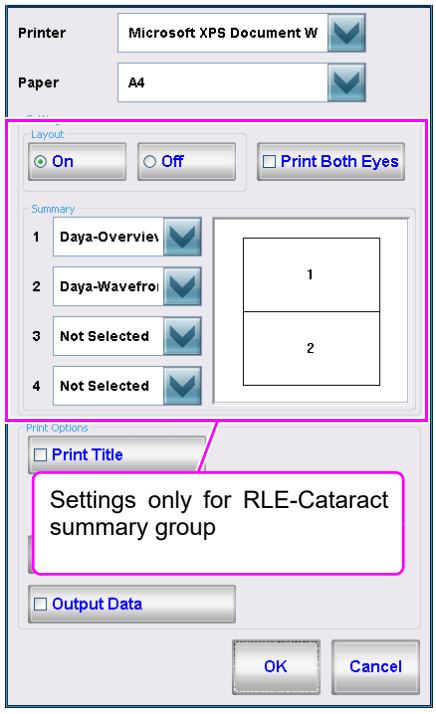
Note

- The RLE-Cataract summary group is printed in its unique arrangement.
  The possible combination of the printed summaries is Daya-Overview, Daya-Wavefront, and Daya-MTF Graph summaries. Other summaries cannot be printed.
  For the printer settings other than the printed summary, the settings in the Settings screen (Print tab) are used.



Example of print preview
Four (vertical) × three (horizontal) maps are arranged on an portrait-oriented A4 paper.
(Default setting)

The default setting for printing of the RLE-Cataract summary group is as shown to the right. To change the contents to be printed shown in the preview image, change the setting in the Printer Setting screen.



○ File name at the time of data output

When the data of RLE-Cataract summary groups is output, the group's unique file names are used.

Summary image data

The data is output in the same arrangement as the printed image.

For the file name, the summary group name (RLE-Cataract) is assigned instead of the summary name.

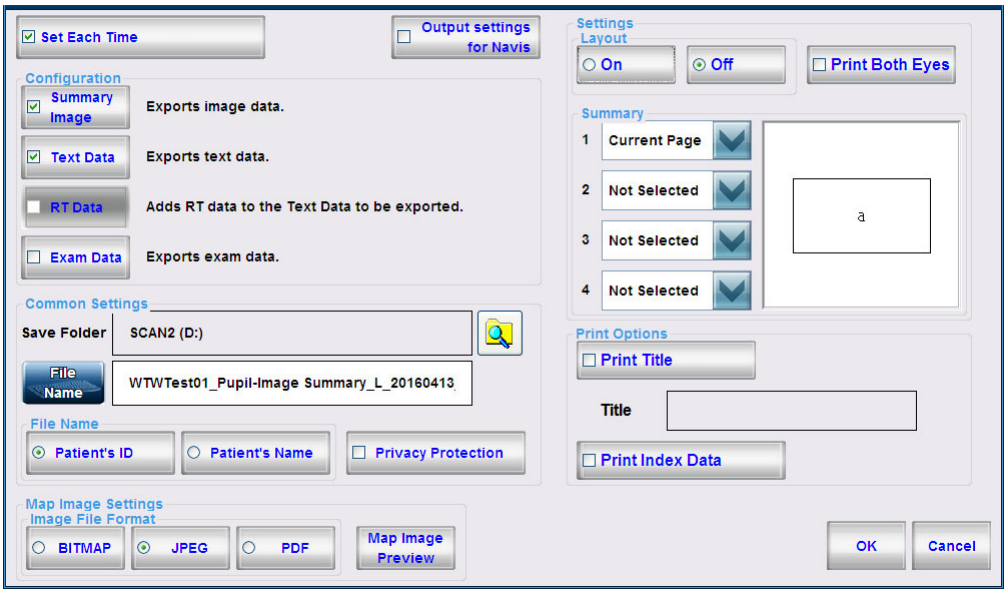
ID (or name)_RLE-Cataract_Eye_Year Month Day_Hour Minute Second.(Extension)

If multiple files are output, a page number is added to the file name.

ID (or name)_RLE-Cataract-Page No._Eye_Year Month Day_Hour Minute Second.(Extension)

The page number does not appear in the file name in the Data Output screen.

If the file name is manually input, "-" and the page number are added to the end of the input file name.



Text data output

The text data of the summaries selected to be printed is output as a file for each summary.

For the file name, "summary group name - summary name" are assigned instead of the summary name.

ID (or name)_RLE-Cataract-Summary name_Eye_Year Month Day_Hour Minute Second.(Extension)

* Summary name: Daya-Overview, Daya-Wavefront, Daya-MTF Graph

If the file name is manually input, "-" and the summary name are added to the end of the input file name.

4.2.7 Other summaries

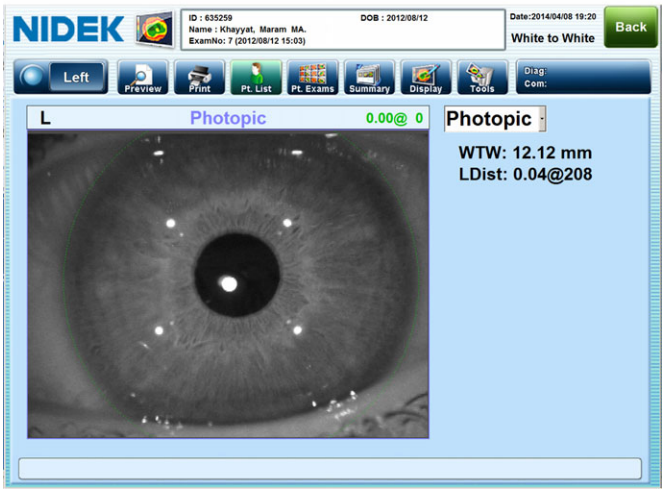
○ White to White Summary

The White to White summary automatically detects the corneal diameter.

This diameter can be used to estimate the area of the ciliary body.

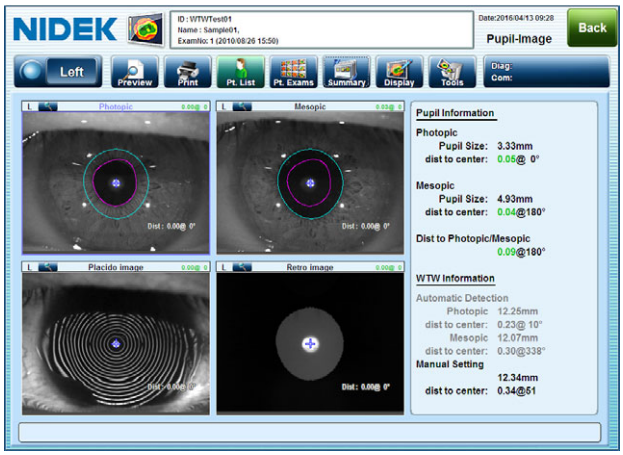
The diameter of the cornea also can be used for selection of phakic IOLs or for IOL power calculation formulas such as Holladay II that require the diameter of the cornea.

Data obtained using the OPD-Scan III can be displayed in the White to White summary.



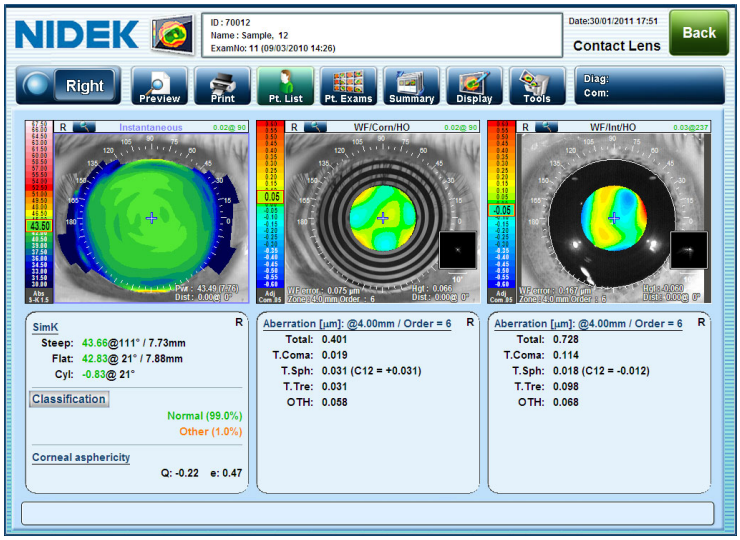
○ Pupil Image Summary

The Pupil-Image summary displays photopic vision image, mesopic vision image, placido ring image, retroillumination image, pupil information, and WTW information.



○ Contact Lens Summary

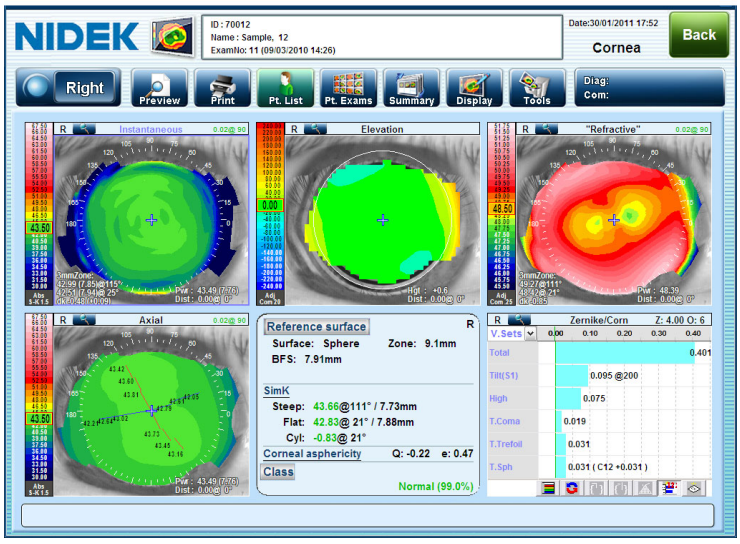
The Contact Lens summary exclusive for contact lenses displays information necessary to create contact lenses such as eccentricity.



○ Cornea Summary

The Cornea summary displays maps and information for the cornea.

For the Elevation map, a sphere or ellipse can be selected for the reference surface.



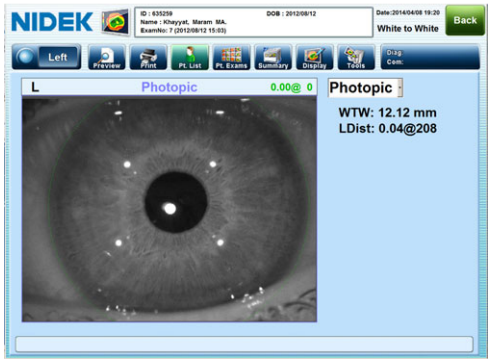
4.2.8 Calculating corneal diameter (White to White)

The corneal diameter can automatically be detected. The corneal diameter can also be measured manually using an image.
In addition, the amount of shift of the limbus center (distance from alignment light to limbus center) is displayed.

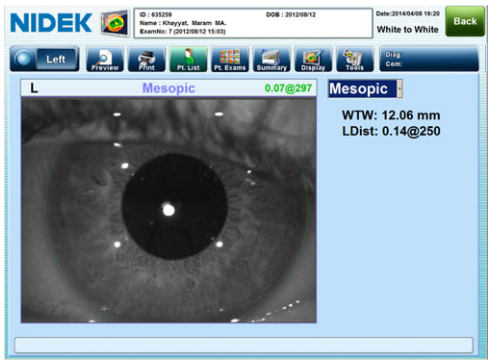
1 Display the White to White summary.

The automatically detected edge of the cornea is displayed with a green broken line.

The calculated corneal diameter (WTW) and the amount of shift of the limbus center (LDist: Distance@Direction from alignment light) are displayed.

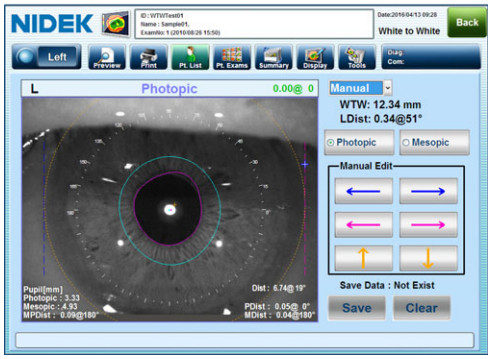


2 Check the edge in the mesopic and photopic vision images by toggling them from the drop-down list.



3 Check the image. If the detected edge (edge of the cornea) needs to be edited, select “Manual” from the drop-down list to display the Edit screen.

The arrow buttons appear in the screen, and two vertical lines (blue and pink) tangent to the circle are displayed.

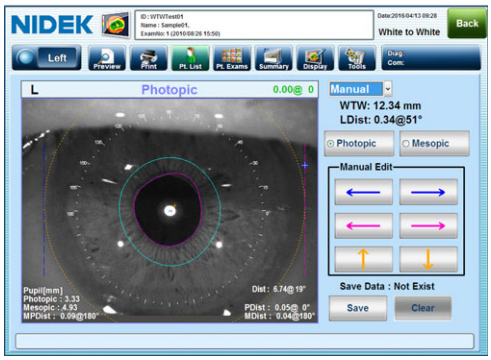


4 To toggle between the mesopic and photopic vision images, press the Photopic or Mesopic button.

5 Press the arrow buttons to adjust the circle to the edge of the cornea.

The WTW value and LDist value change with the movement of the circle.

Changing either the WTW value or LDist value from the default value activates the Save button.



Right and Left directions	The vertical lines are moved with [←] and [→]. They can be moved also by dragging on the image.
Up and down directions	The circle is moved with [↑] and [↓]. It can be moved also by dragging the inside of the circle on the image.

6 Press the Save button to save the WTW value and LDist value.

The indication “Save Data: Not Exist” changes to “Saved Data: Exist”.

The Save button becomes inactive and the Clear button becomes active. To delete the saved WTW value and LDist value, press the Clear button.

Note

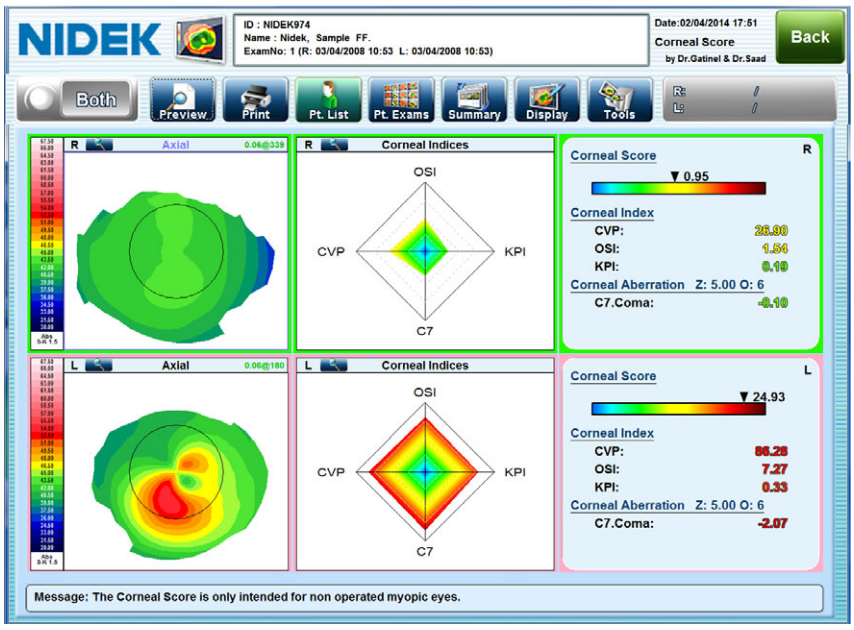
- If the manually specified WTW value has been saved, the initial screen displayed when the White-to-White summary screen is opened is the “Manual” screen.

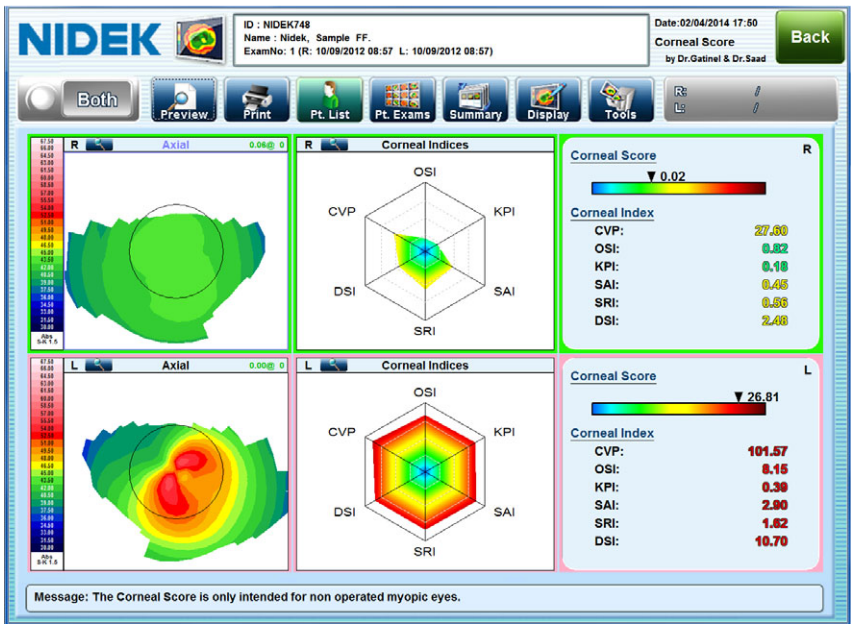
4.2.9 Corneal Score (optional)

Keratoconus is an asymmetric, progressive eye disease that eventually affects both eyes.
Corneal Score, invented by Dr. Damien Gatinel and Dr. Alain Saad, helps detection of primary keratoconus and subclinical keratoconus. It combines corneal indices with high order aberrations data in a discriminant function to calculate a Corneal Score for each analyzed cornea.
A positive Score (>0) reflects a suspicious cornea or a cornea at risk for Lasik while a negative Score (<0) reflects a normal cornea.

Note

- Corneal Score helps the ophthalmologist in analyzing the cornea. It is the result of a statistical model. Ophthalmologists are responsible for making the final diagnosis taking into consideration other examination results as well.
- Corneal Score is an index that provides the possibility of keratoconus for eyes with no history of eye surgery. It cannot be used for eyes with history of refractive surgery or for hyperopic eyes.





Corneal Score Summary consists of three kinds of maps.

The first one (on the left of the screen) is the Axial Placido map that shows the distribution of corneal curvature.

The second one (in the middle of the screen) represents, in a radar chart, a selection of the corneal indices and high order aberrations data used in the Corneal Score algorithm. The radar chart is filled using a color scale from green for normal values to red for abnormal values.

The third one (on the right of the screen) is the Corneal Score text map that shows the numeric value of the Corneal Score and of each index displayed in the Corneal Indices map.

4.3 Setting of Summaries (Map Layout)

The layout of maps to be displayed or printed as a summary can be set in the Settings screen (Summary tab).
Several summaries are pre-registered. User-customized summaries can be registered as well.

Note

- Parameters changed in the Settings screen are maintained even by turning off power to the device.
- The contents of pre-registered summaries cannot be changed.

4.3.1 Registering new summaries

Frequently used map layouts, map types, eye (right or left), and overlay items can be registered as summaries.

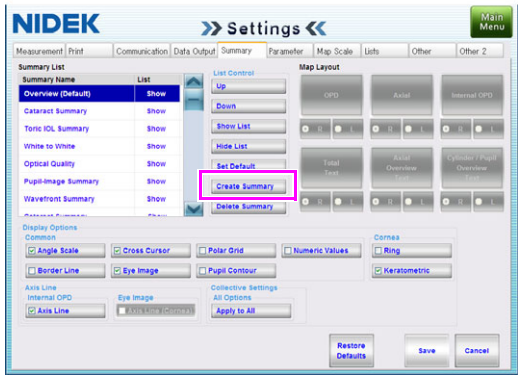
1 Press the Settings button in the Main Menu screen to display the Settings screen.

2 Press the Summary tab.

3 Press the Create Summary button to display the Create Summary screen.

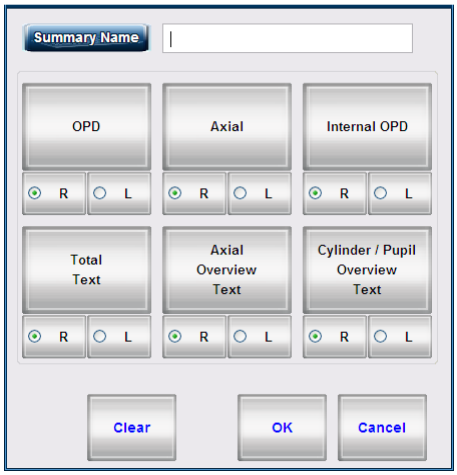
The map layout initially displayed in the Create Summary screen is the map layout of the summary selected when the Create Summary button is pressed.

To create a new summary based on a specific summary, select the desired summary before pressing the Create Summary button.



4 Input the summary name.

Use the on-screen keyboard that appears by pressing the Summary Name button or a hardware keyboard.



5 Select the right or left eye for each map.

Press the R or L button.

To select maps for both eyes, select the right eye for the maps in the upper row, and the left eye for the maps in the lower row.

To select maps for only one eye, select the right eye or the left eye for all maps. The right and left eyes can be toggled also in the summary screen.

Pressing the Clear button changes the setting of the six maps to the Axial maps of the left eye.

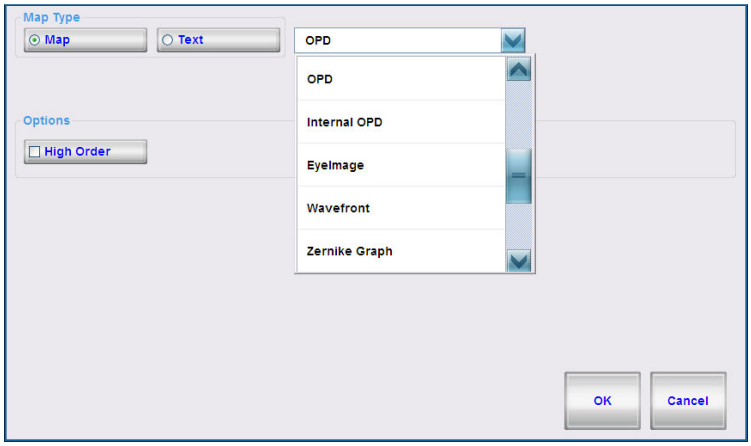
Note

- For the summary that displays maps for both eyes, those for the right eye are framed in green, and those for the left eye are framed in pink.

6 For each map, select the map type.

1) Press the position of the map to be changed.

   The Select Map Type screen is displayed.



2) Select Map or Text in the Map Type box, then select the desired map type from the drop-down menu that appears by pressing the V button.

Map (Image map)	Axial, Instantaneous, Curvature Gradient, “Refractive”, Elevation, Topo Classifier, OPD, Internal OPD, EyeImage, Wavefront, Elevation, Zernike Graph, PSF, MTF Graph, Visual Acuity, No Map
Text (Text map)	Axial - Overview, Axial - Cataract, Instantaneous, Cylinder/Pupil - Overview, Cylinder/Pupil - Cataract, Total, Wavefront Cornea HO/Ref, Wavefront Cornea HO, Wavefront Internal HO, No Map

   Selecting a map displays parameters available for the map.

3) Set the necessary parameters such as display format, analysis area, data, and type.

4) After setting the necessary parameters, press the OK button.

5) Select the desired maps for the remaining five positions with the same procedure of Steps 1 to 4.

Available parameters

Map Type	Display Format	Options	PSF mini map
Axial	—	APP, ECCP, SA, SimK	Displayable
Instantaneous	—	—	—
Gradient	—	Gradient	—
“Refractive”	—	—	—
Elevation	Wire Frame/ Color2D/Color3D	Hide-Line removal	—
Topo Classifier	Statistic/Graph	—	—
OPD	—	High Order	Displayable
Internal OPD	—	Subtract Prism	Displayable
EyeImage	Placido, Mesopic, Photopic, Retro	Axis Line Type, Show Retro Mini Map, WTW, Processed Retro	—

Map Type	Display Format	Options	Analysis Area	Data	Type
Wavefront	—	ZS/ZC/ZA, Wavefront Error	Analysis Area	OPD/Cornea/ Internal	Total/HO/Group
Zernike Graph	RMS/Coefficient	—	Analysis Area	OPD/Cornea/ Internal	—
PSF	—	ZS/ZC/ZA, Wavefront Error, Strehl Ratio	Analysis Area	OPD/Cornea/ Internal	Total/HO/Group
MTF Graph	X, Y	Zone, 4/5/6mm	Analysis Area	OPD/Cornea/ Internal	Total/HO/Group
Visual Acuity	ETDRS, Snellen, Landolt, Image, Siemens star	ZS/ZC/ZA, Wavefront Error, Strehl Ratio, Whole/Partial, Day/ Night	Analysis Area	OPD/Cornea/ Internal	Total/HO/Group

Note

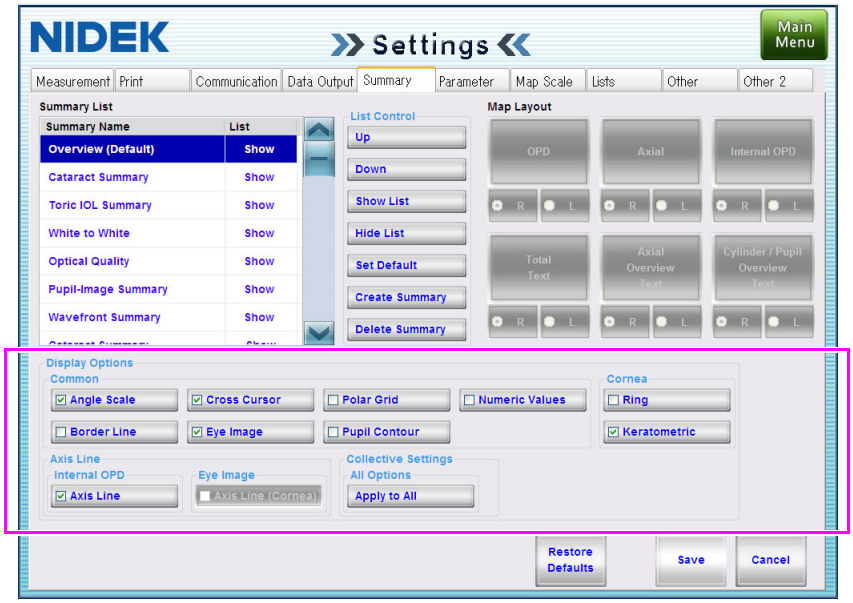
- The analysis area can be set with the following text maps.
  Axial - Cataract, Cylinder/Pupil - Overview, Cylinder/Pupil - Cataract, Total, Wavefront Cornea HO/ Ref, Wavefront Cornea HO, Wavefront Internal HO
- With Axial - Overview text map, Cornea SA / Total SA are available as option.

7 Press the OK button in the Create Summary screen.

The new summary is added to the summary list.

User-customized summaries are displayed in black, indicating that they can be edited.

8 Select the desired overlay items.



[Display Options]

Common

Angle Scale	Angle scale shaped as a protractor
Cross Cursor	Shows the refractive power (Pwr), cornea curvature radius (Rad), distance from the center (Dist), and Axis of the position it is dragged to.
Polar Grid	Polar grid (circles are about 1 mm apart), cornea apex, and measurement optical axis
Numeric Values	Displays refractive powers (Pwr) at multiple positions in a map.
Border Line	Toggles display of black lines as borders of colors. It is useful when adjacent colors are similar as in the absolute color scale.
Eye Image	Pupil image at the time of measurement
Pupil Contour	When the Eye Image map is displayed, the Photopic and Mesopic images are displayed at the same time. For the OPD and Internal OPD maps, the area outside the pupil contour is shaded.

Cornea

Ring	Displays detected edges of the placido rings (displayed with red and yellow lines).
Keratometric	Displays maximum and minimum refractive powers and their angles on the 3 mm, 5 mm, and 7 mm circles.

Axis Line - Internal OPD

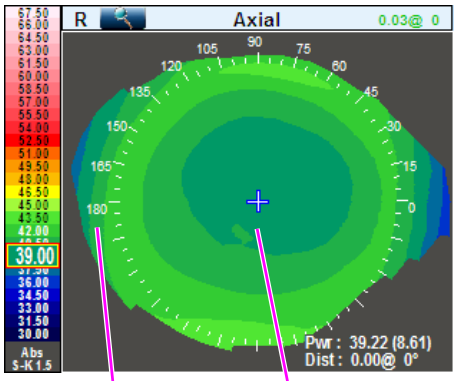
Axis Line	Displays the astigmatism axis angle for Cornea, Total and Internal.

Axis Line - Eye Image

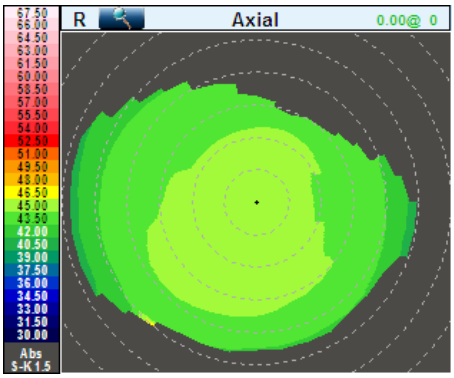
Axis Line (Cornea)	Displays SimKs along the steepest meridian (red) and flattest meridian (blue) in the map.

Pressing the Apply to All button in the “All Options - Collection Settings” box applies the current settings in the “Common - Display Options” box to all summaries.

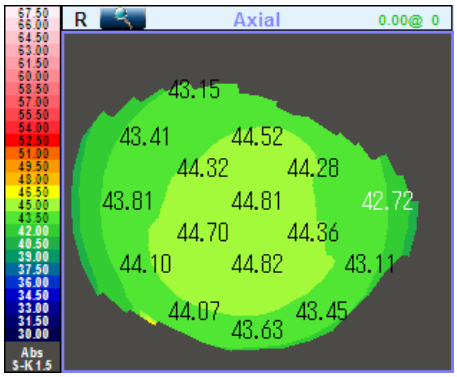
However, the displayed overlay items differ by the map.



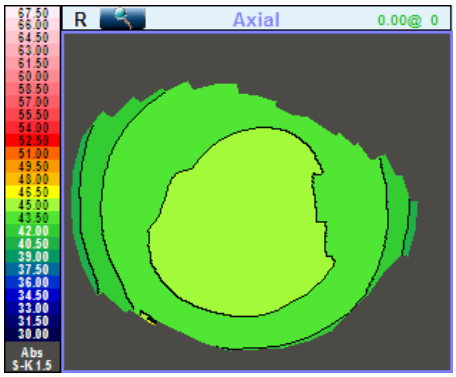
Angle Scale Cross Cursor



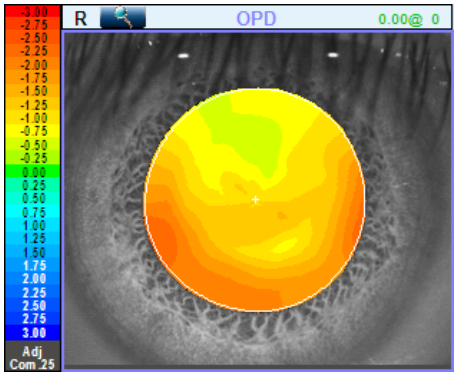
Polar Grid



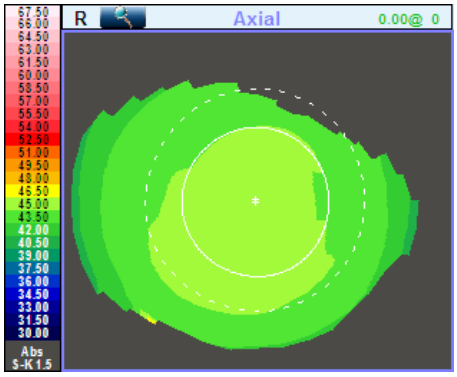
Numeric Values



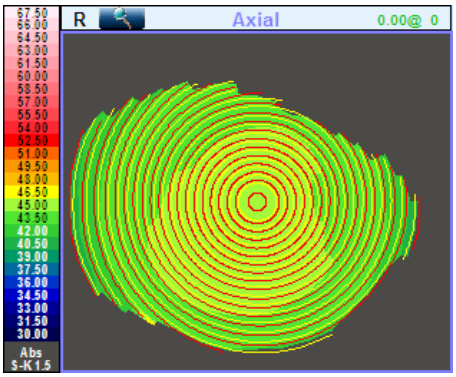
Border Line



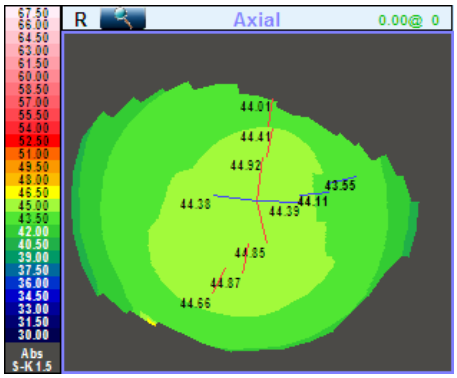
Eye Image



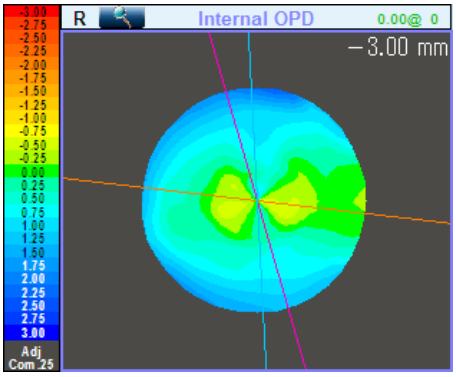
Pupil Contour



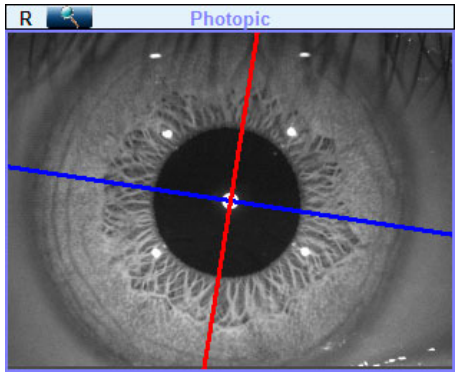
Ring



Keratometric



Axis Line (3mm)



Axis Line (Cornea)

9 Check that “Show” is indicated in the List column in the summary list.

If “Hide” is indicated, the summary is not listed in the summary screen. Select the summary and press the Show List button to indicate “Show” in the List column.

To delete the summary from the list in the summary screen, select the summary and press the Hide List button to indicate “Hide” in the List column.

Show	”Show” is indicated in the List column for the selected summary. The selected summary is listed in the summary screen.
Hide	”Hide” is indicated in the List column for the selected summary. The selected summary is not listed in the summary screen. ”Hide” cannot be indicated for the default summary.

10 Specify the position of the summary in the summary list.

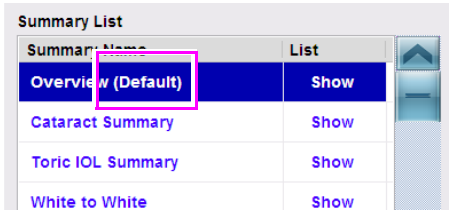
The order of the summary lists is reflected to the list in the summary screen.

Up	Moves up the selected summary by a row.
Down	Moves down the selected summary by a row.

11 To set a summary to the default summary, select the summary and press the Set Default button.

The type of summary selected in “Summary List” (indicated with “(Default)”) is displayed by default.

”Default” is indicated on the side of the summary name in the summary list.



12 Press the Save button to save the setting.

13 Press the Main Menu button to return to the Main Menu screen.

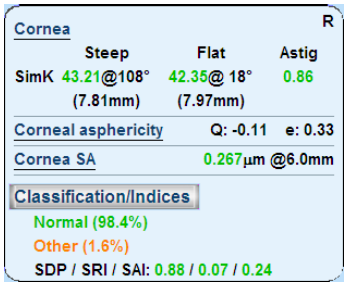
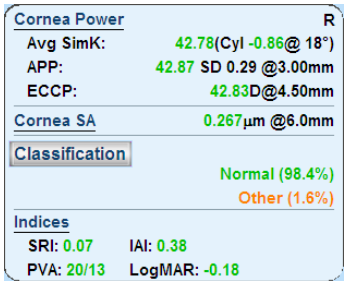
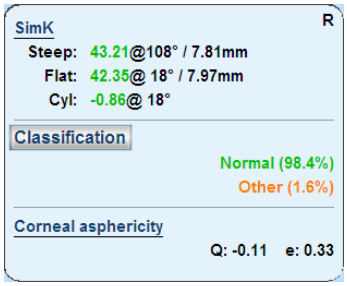
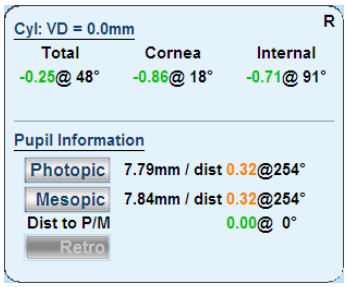
If there is any parameter change that has not been saved, the message “Would you like to save the changes? Yes/No/Cancel” appears.

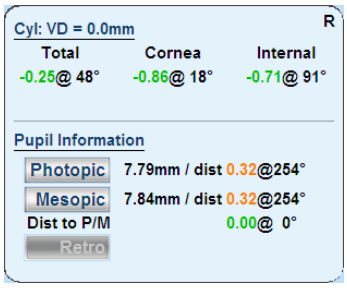
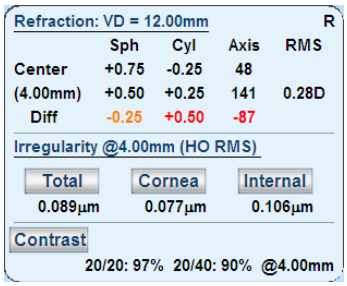
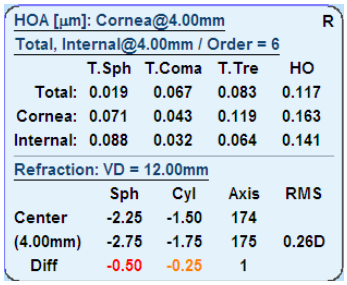
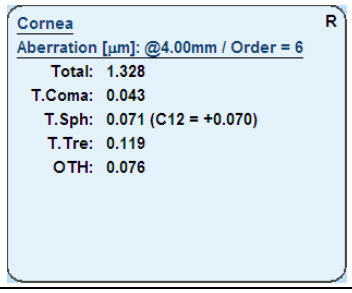
○ Text map

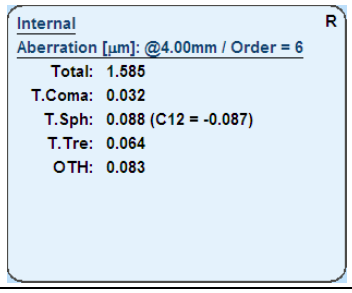
Nine types of text maps are available.

Note

- If the RMS value of “WF@6mm” of the OPD measurement is HiRMS (1.01 D or higher), the measurement value is shown in orange. In such a case, “E” is indicated in the RMS field for Refraction.

	Axial - Overview Corneal curvature information SimK value Corneal asphericity index Q and e values Corneal spherical aberration (or Total spherical aberration) Displays the value of coefficient C12 from the result of Zernike analysis of cornea (or whole eye). The analysis area diameter is 6.0 mm and unchangeable. Classification/Indices Displays the classification of corneal shape obtained with Corneal Navigator. The SDP, SRI, and SAI indexes show characteristics of cornea. If the value is red, corneal shape may be abnormal.
	Axial - Cataract Corneal refractive power for IOL power calculation Avg. SimK - Mean SimK value along flattest and steepest meridians APP: Mean refractive power within pupil ECCP: The analysis area diameter is 4.5mm and unchangeable. Corneal spherical aberration information Displays the value of coefficient C12 from the result of Zernike analysis of cornea. The analysis area diameter is 6.0 mm and unchangeable. Indices Displays typical indices that express characteristics of corneal shape.
	Instantaneous Corneal refractive power information Refractive power along steepest meridian@Angle (curvature radius) Refractive power along flattest meridian@Angle (curvature radius) Difference between refractive powers along steepest and flattest meridians@Angle Corneal asphericity index Q – Q value e - Eccentricity
	Cylinder/Pupil - Overview Astigmatism information Displays the amount of astigmatism in whole eye, cornea, and (3 mm diameter) internal optics. Pupil information Displays the pupil diameter in photopic and mesopic visions, the amount of shift from the pupil center to the corneal vertex in photopic and mesopic visions, and the distance between the pupil centers in photopic and mesopic visions.

<table>
<tr>
<td> 
</td>
<td>Cylinder/Pupil - Cataract
Astigmatism information
Displays the amount of astigmatism in whole eye, cornea, and internal optics.
Pupil information
Displays the pupil diameter in photopic and mesopic visions, the amount of shift from the pupil center to the corneal vertex in photopic and mesopic visions, and the distance between the pupil centers in photopic and mesopic visions.</td>
</tr>
<tr>
<td> 
</td>
<td>Total
Objective refractive error information
Top – Standard refractive error measurement value
Middle – Refractive error measurement within specified diameter area (Reference value for night visual acuity)
Bottom – Difference between the above
* The displayed values are selected with the “Refraction Display Format” parameter in the Settings screen (Parameter tab).
Higher order aberration information
Displays the RMS values of higher order aberration for whole eye, cornea, and internal optics.
• If the mesopic pupil diameter is smaller than the specified analysis area when “Common Settings - Analysis Area - Total / Internal Options - Reduce to pupil size” in the Settings screen (Parameter tab) is checked, the Total and Internal refraction information is not displayed.
Contrast information
Displays the minimum contrast that enables visual identification of the chart based on analysis of the MTF graph.</td>
</tr>
<tr>
<td> 
</td>
<td>Wavefront Cornea HO/Ref
Higher order aberration information
Displays the RMS values of higher order aberration for whole eye, cornea, and internal optics.
Objective refractive error information
Top – Standard refractive error measurement value
Middle – Refractive error measurement within specified diameter area (Reference value for night visual acuity)
Bottom – Difference between the above
* The displayed values are selected with the “Refraction Display Format” parameter in the Settings screen (Parameter tab).</td>
</tr>
<tr>
<td> 
</td>
<td>Wavefront Cornea HO
Corneal higher order aberration information
Displays the RMS values of higher order aberration.</td>
</tr>
</table>

	Wavefront Internal HO Internal eye higher order aberration information Displays the RMS values of higher order aberration.

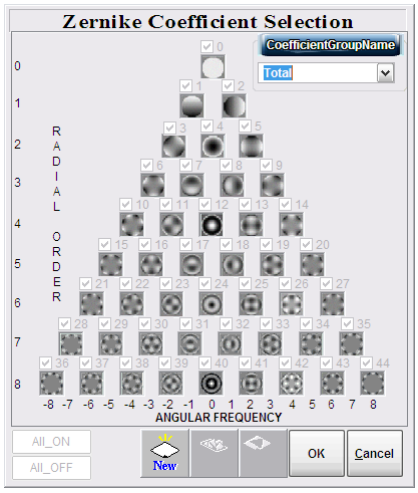
○ When selecting Wavefront Group map

When “Group” is selected for “Type” in registration of a new summary, the Coefficient button becomes enabled.

To select a group other than “Total”, press the Coefficient button to display the Zernike Coefficient Selection screen that allows selection of the desired combination (group) of aberration components.

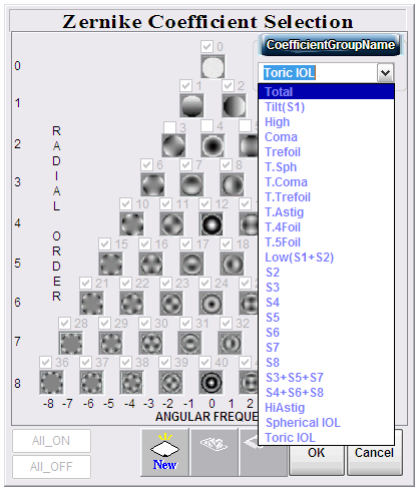
[Selecting combination (group) of aberration components to be displayed]

1 Press the Coefficient button in the Select Map Type screen to display the Zernike Coefficient Selection screen.



2 Press ▼ on the side of the Coefficient Group Name box.

Registered groups of aberration components are listed.



3 Press the desired group name.

Aberration components checked in the Zernike pyramid are displayed in the map.

4 Press the OK button to save the setting.

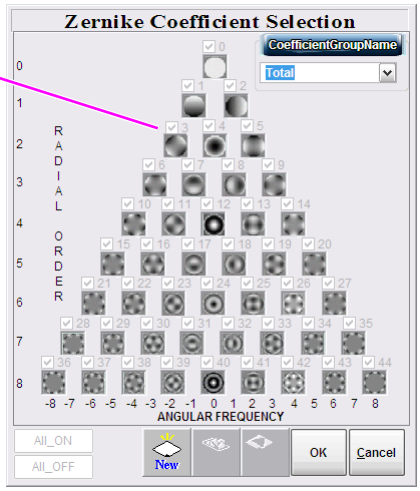
The screen returns to the Select Map Type screen.

Note

- Pre-registered groups (combinations of aberration components) show their aberration components for the 8th order. If the order is reduced, aberration components are also reduced in accordance with the order.

Total	0th to 44th terms The map is the same as the Wavefront Total map.
Tilt (S1)	1st and 2nd terms (Tip, Tilt)
High	6th to 44th terms The map is the same as the Wavefront High Order map.
Coma	7th and 8th terms (Coma)
Trefoil	6th and 9th terms (Trefoil)
T.Sph	12th, 24th and 40th terms
T.Coma	7th, 8th, 17th, 18th, 31st and 32nd terms
T.Trefoil	6th, 9th, 16th, 19th, 30th and 33rd terms
T.Astig	11th, 13th, 23rd, 25th, 39th and 41st terms
T.4Foil	10th, 14th, 22nd, 26th, 38th and 42nd terms
T.5Foil	15th, 20th, 29th and 34th terms
Low (S1+S2)	1st to 5th terms
S2	3rd to 5th terms (Astigmatism, Defocus)
S3	6th to 9th terms (Coma, Trefoil)
S4	10th to 14th terms (Spherical)
S5	15th to 20th terms (Secondary coma)
S6	21st to 27th terms (Secondary spherical)
S7	28th to 35th terms
S8	36th to 44th terms
S3+S5+S7	6th to 9th terms, 15th to 20th terms, 28th to 35th terms
S4+S6+S8	10th to 14th terms, 21st to 27th terms, 36th to 44th terms
HiAstig	11th, 13th, 23rd, 25th, 39th and 41st terms (2ndAstig, 3rdAstig, 4thAstig)
Spherical IOL	0th to 3rd, 5th to 44th terms
Toric IOL	0th to 2nd, 6th to 44th terms

The terms that represent aberration components are the numbers above each image in the Zernike pyramid.
Example 3rd term



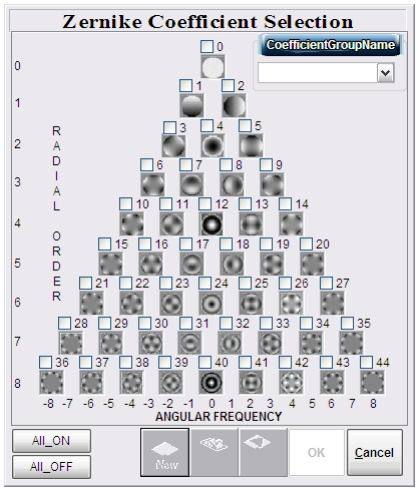
Pre-registered group names are shown in blue. User-customized groups are shown in black.

[Registering new group]

User-customized groups can be registered.

1 Press the New button ( ) in the Zernike Coefficient Selection screen.

The Coefficient Group Name box becomes blank, and check marks are removed from all check boxes in the Zernike pyramid.



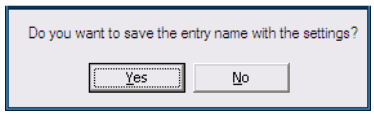
2 Input the group name in the Coefficient Group Name box.

3 Check the aberration components in the Zernike pyramid to be displayed in the color map.

All_ON button	Used to select all the aberration components.
All_OFF button	Used to remove check marks from all aberration components.

4 Press the save button ( ).

The message “Do you want to save the entry name with the settings? Yes/No” appears.



5 Press the Yes button to save the setting.

The new group is registered and the message becomes closed.

Press the No button to close the message without saving the new group. The Zernike Coefficient Selection screen returns to the condition of Step 1.

6 Press the OK button to close the Zernike Coefficient Selection screen.

The screen returns to the Select Map Type screen.

[Editing existing group]

User-registered groups (shown in black) can be edited. Pre-registered groups (shown in blue) cannot be edited.

1 Select the group to be edited from the list that appears by pressing the button on the side of the Coefficient Group Name box.

2 Check the aberration components in the Zernike pyramid to be displayed in the color map.

3 Press the OK button to close the Zernike Coefficient Selection screen.

The screen returns to the Select Map Type screen.

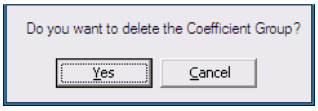
[Deleting existing group]

User-registered groups (shown in black) can be deleted. Pre-registered groups (shown in blue) cannot be deleted.

1 Select the group to be deleted from the list that appears by pressing the button on the side of the Coefficient Group Name box.

2 Press the delete button ().

The message “Do you want to delete the Coefficient Group? OK/Cancel” appears.



3 Press the OK button to delete the selected group.

4 Press the OK button to close the Zernike Coefficient Selection screen.

The screen returns to the Select Map Type screen.

4.3.2 Editing existing summary

Settings (map types, eye (right or left), and overlay items) for the existing summaries (user-customized) can be edited.

Note

- For the pre-registered summaries (shown in blue), settings other than the overlay items cannot be edited.

1 Press the Settings button in the Main Menu screen to display the Settings screen.

2 Press the Summary tab.

3 Select the desired summary from the summary list.

4 Change the map type, eye (right or left), and overlay items as necessary, then save the setting change.

Map Type	Select the desired map type in the Select Map Type screen that appears by pressing the desired map button in the Map Layout box. The map type can be changed only with user-customized summaries.
R/L	Select the R (right) or L (left) button in the Map Layout box. The map type can be changed only with user-customized summaries.
Overlay	Select the desired overlay items in the Display Options box in the Settings screen (Summary tab).

For details, see “4.3.1 Registering new summaries” (page 239).

4.3.3 Deleting existing summaries

User-customized summaries can be deleted.

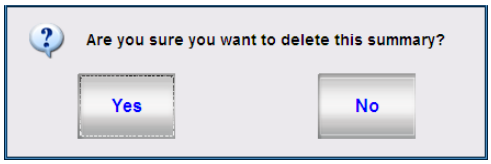
Note

- Pre-registered (default) summaries cannot be deleted. Selecting a pre-registered summary and pressing the Delete Summary button displays the message “Default summary cannot be deleted.” appears.
- A user-customized summary selected as the default summary cannot be deleted. To cancel them, cancel their selection as the default summary in advance.

1 Select the summary to be deleted from the summary list in the Settings screen (Summary tab).

2 Press the Delete Summary button.

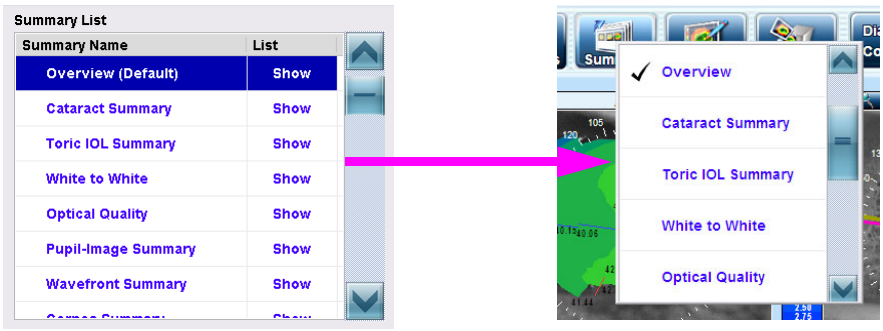
The message, “Are you sure you want to delete this summary? Yes/No” appears.



3 Pressing the Yes button deletes the selected summary from the summary list.

4.3.4 Other operations in summary list

Summaries shown in the summary list can be changed with the List Control buttons. The order of the summary lists is reflected to the list in the summary screen.



Up button	Moves up the selected summary by a row.
Down button	Moves down the selected summary by a row.
Show List button	“Show” is indicated in the List column for the selected summary. The selected summary is listed in the summary screen.
Hide List button	”Hide” is indicated in the List column for the selected summary. The selected summary is not listed in the summary screen. ”Hide” cannot be selected for the default summary.
Set Default button	”Default” is indicated on the side of the summary name in the summary list. The default summary is initially displayed in the summary screen.

4.4 OPD Database Manager

The device manages data using the database management software, OPD Database Manager. Operation of database such as setting, selection, and backup is performed in the OPD Database Manager screen.

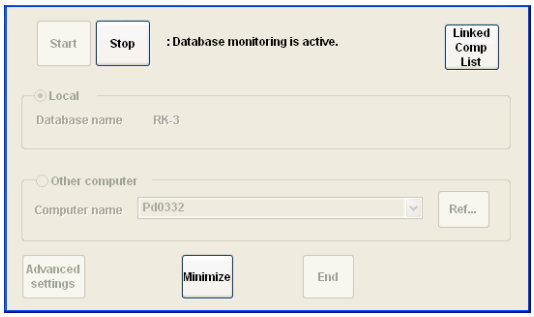
4.4.1 Creating database

Multiple databases can be created and the desired database can be selected. (For the method of selecting the database, see “4.4.2 Switching database (Local database)” (page 258).)
A maximum of five databases can be newly created.

> However, a new database cannot be created in the device (SSD). A new database can be created in an external hard disk connected to the device.

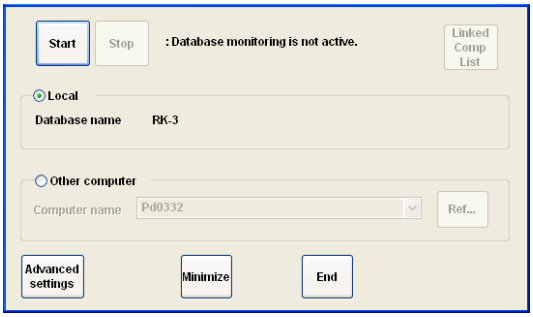
Even on PCs, a new database cannot be created if “Other Computer” is selected in the “OPD Database Manager” screen. Create a new database with OPD Database Manager on the PC on which the database is stored.

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

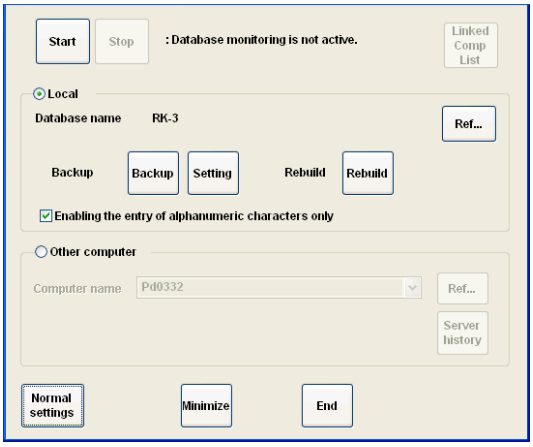


2 Stop connection to the database by pressing the Stop button.

> If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)

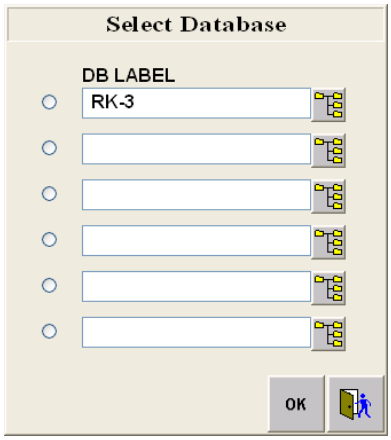


3 Press the Advanced settings button to open the advanced settings.



4 Press the “Ref...” button.

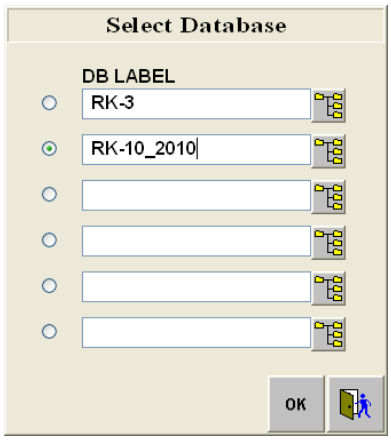
The Select Database dialog box is displayed.



5 Select a radio button to the right of any blank DB LABEL boxes.

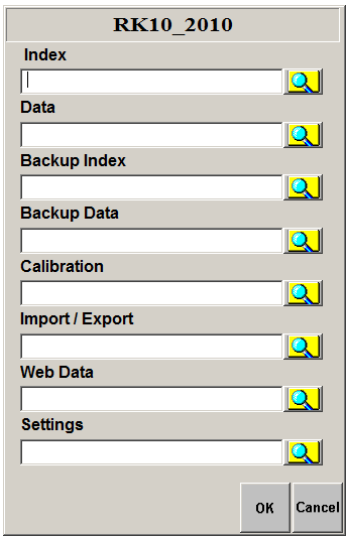
6 Enter the database name in the selected DB LABEL box.

Example: RK-10_2010



7 Press the button on the right of the box.

The folders in which the database is to be stored are displayed.

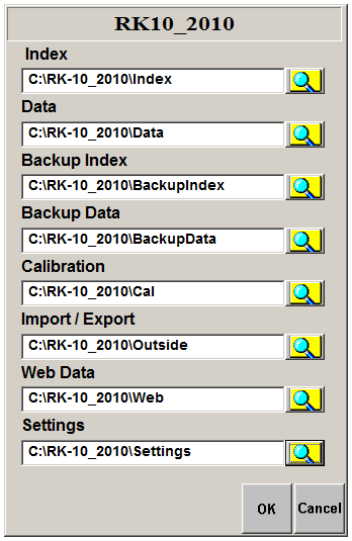


8 Using the keyboard, input the target folder name in each box from “Index” to “Settings” in which the database is to be created.

Name the folders according to the table below.

Entry box	Folder name
Index	...\Index
Data	...\Data
Backup Index	...\BackupIndex
Backup Data	...\BackupData
Calibration	...\Cal
Import/Export	...\Outside
Web Data	...\Web
Settings	...\Settings

* With the device, the “C:” folder cannot be selected.



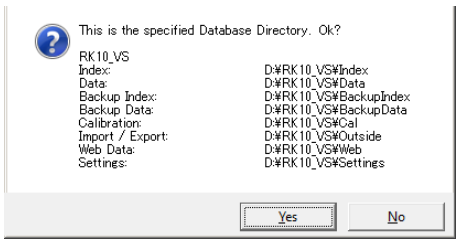
9 Press the OK button.

If any folders input in Step 8 do not exist, a message is displayed for each to ask whether or not to create the folder. Press the Yes button for each.

The screen returns to the Select Database screen.

10 Press the OK button.

The Message dialog box is displayed.



11 Press “Yes”.

12 Press the  button.

The screen returns to the OPD Database Manager screen.

13 Press the Start button to restart the connection to the database.

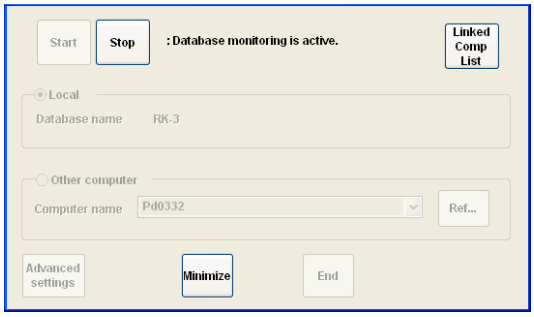
14 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

4.4.2 Switching database (Local database)

The desired database can be selected from multiple databases.

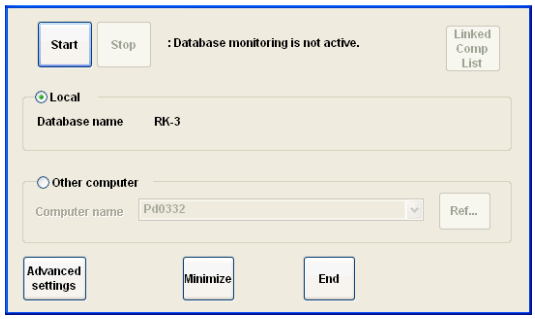
To use a database on another OPD Database Manager-installed computer on the network, see “4.4.3 Using database in another PC on network” (page 260).

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

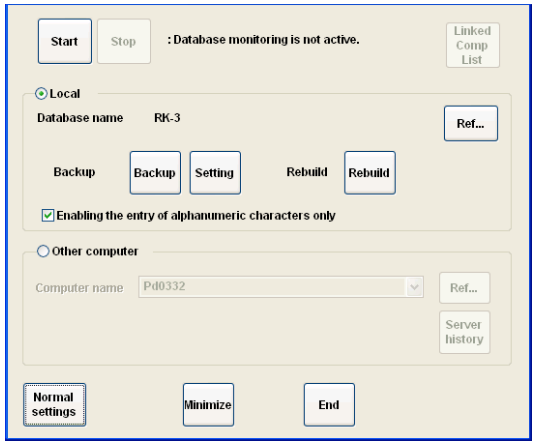


2 Stop connection to the database by pressing the Stop button.

If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)

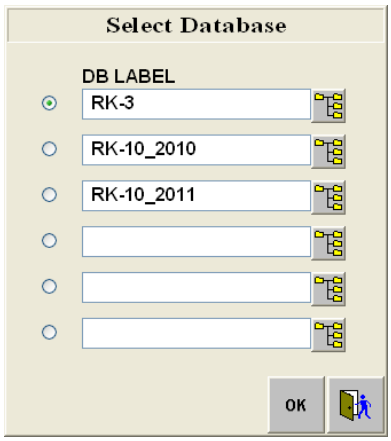


3 Press the Advanced settings button to open the advanced settings.



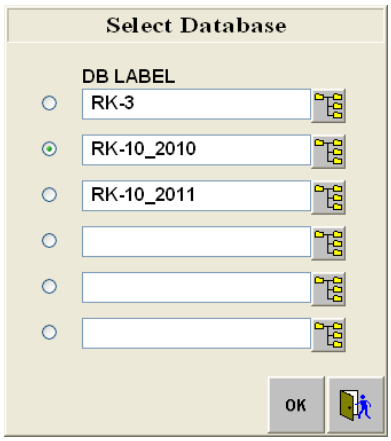
4 Press the “Ref...” button.

The Select Database dialog box is displayed.



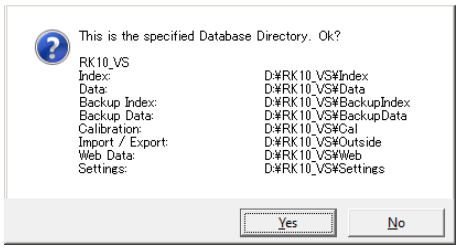
5 Select the radio button of the database to be used.

Press the folder button ( ) on the right to confirm or edit the folder on which the database is stored.



6 Press the OK button.

The Message dialog box is displayed



7 Press the Yes button.

8 Press the button.

The screen returns to the OPD Database Manager screen.

9 Press the Start button.

The OPD-Station is connected to the database selected in Step 5.

10 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

4.4.3 Using database in another PC on network

To use another database on the network, select “Other Computer” in the OPD Database Manager screen.
In such a case, back up the database with OPD Database Manager on the computer on which the database is stored.

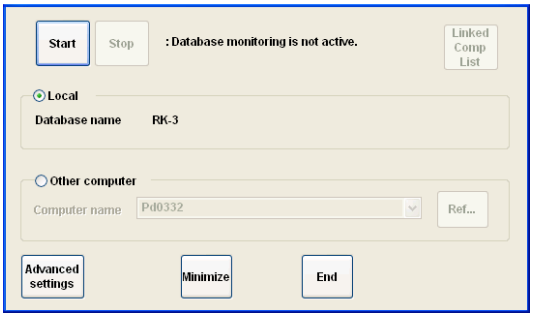
Note

- OPD Database Manager (V2.30 or later) needs to be installed on the computer to be connected.

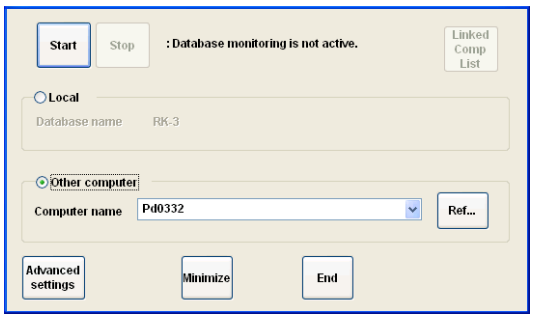
  Computers with OPD Database Manager of earlier versions cannot be connected. Update OPD Database Manager to the latest version. (The OPD-Scan III software does not need to be updated.)

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

2 Stop connection to the database by pressing the Stop button.



3 Select “Other Computer”.



4 Press the “Ref...” button to display the dialog box for browsing for other computers, select the name of the computer on which the database to be used is stored, then press the OK button.

If the computer name cannot be found, enter the computer name in the “Computer name” box using the keyboard.

5 Press the Start button to connect to the specified database.

6 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

4.4.4 Database backup

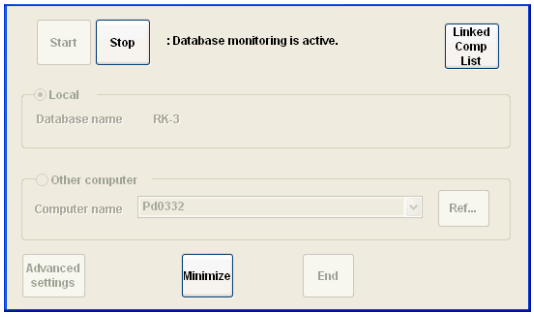
It is recommended to regularly back up the database in case of a database crash. The database is backed up in the directory specified in the Backup Data box in the Select Database dialog box.
Even on PCs, the database cannot be backed up if “Other Computer” is selected in the OPD Database Manager screen. Back up the database with OPD Database Manager on the PC on which the database is stored.

Note

- If the SSD (C drive) in the device is specified as the location to store the database, the database cannot be backed up with the procedure described below.

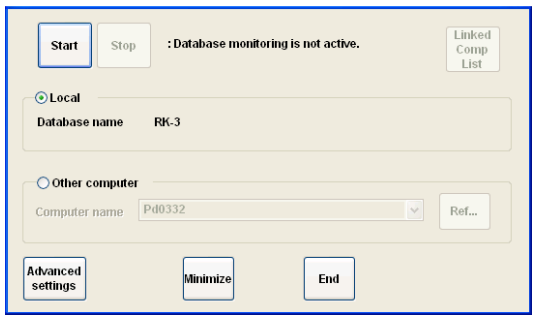
  The database can be backed up by specifying an external storage (such as an external hard disk drive) as the location to store the database.

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

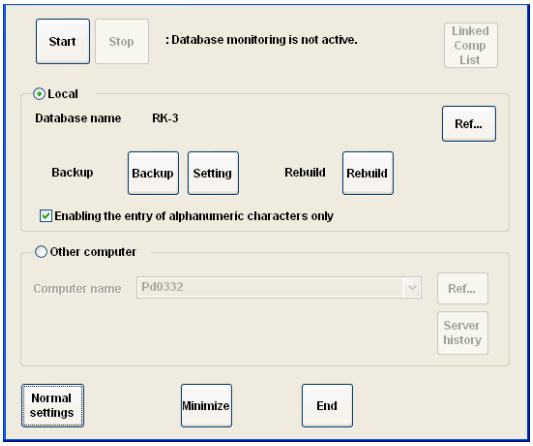


2 Stop connection to the database by pressing the Stop button.

If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)

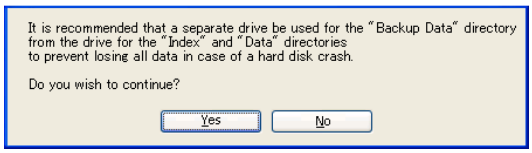


3 Press the Advanced Settings button to open the advanced settings.



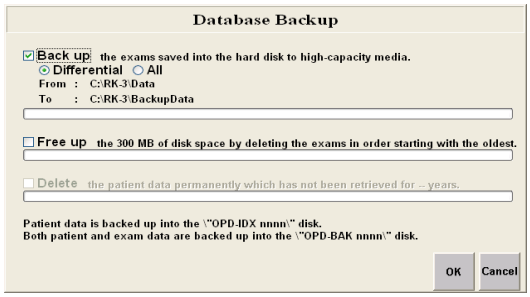
4 Press the Backup button.

If the message 'It is recommended that a separate drive be used for the "Backup Data" directory from the drive for the "Index" and "Data" directories to prevent losing all data in case of a hard disk crash. Do you want to continue?' appears, read the message and press the Yes button to continue.



The Database Backup dialog box is displayed.

If both backup destination and database are located in the same drive, a message appears to recommend the operator to select the backup destination in another drive.



Yes	Backs up the data in the same drive.
No	Cancels the backup process.

5 Check the desired backup type.

Back up: Backs up data. The backed-up data is saved and can be used for rebuilding the database. There are two optional methods for the backup as follows:

Differential	Backs up only the data added or modified after the last backup. Usually, select this option.
All	Backs up the whole database including the existing backup data. Select this option when changing the location to store the backup data in such cases as a corruption of the storage media.

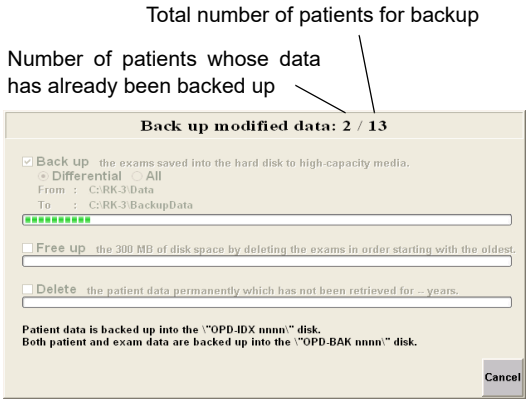
Free up	Deletes data to free up the hard disk space by the specified amount after data backup. For the method to specify the space to free up, see “4.4.7 Setting data deletion condition” (page 269). The data set that has not been used for the longest time is deleted first.
Delete	Deletes patients whose data has not been used for the specified years. This option allows deletion of data after the specified retention period. For the method to specify the retention period, see “4.4.7 Setting data deletion condition” (page 269).

Note

- When data is backed up with the “All” option, the previous backup data is no longer available even if it is backed up in another media (such as a DVD-RAM).

6 Press the OK button.

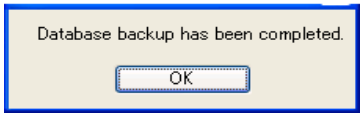
The backup progress is displayed.



The backup may take long.

The backup can be stopped by pressing the Cancel button. When the backup is cancelled, backup of data before pressing the Cancel button is effective.

When the backup is complete, the message “Database backup has been completed.” appears.



7 Press the OK button.

The screen returns to the OPD Database Manager screen.

8 Press the Start button to restart connection to the database.

9 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

⚠ CAUTION

- **Be sure to back up data on a storage disk such as a DVD-RAM.**
  If the internal hard disk is corrupt, the stored data becomes unreadable. Storage media such as CD-R, CD-RW, or DVD-R that need writing software cannot be used for backup.
- **Operators are responsible for managing obtained data.**
  NIDEK assumes no responsibility for any loss of data.

4.4.5 Rebuilding database

If the database crashes, rebuild the database from backup data or data remaining in the data folders. Database cannot be rebuilt if “Other Computer” is selected in the “OPD Database Manager” screen. Rebuild the database with OPD Database Manager on the PC on which the database is stored.

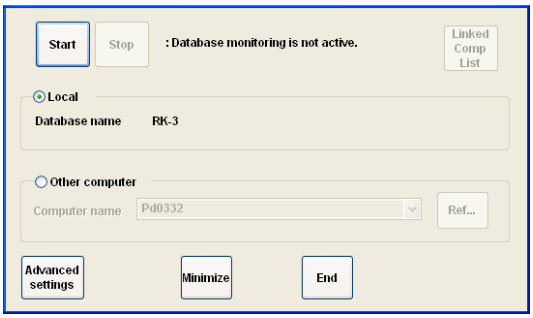
Note

- If the SDD (C drive) in the device is specified as the location to store the database, the database cannot be backed up with the procedure described below.

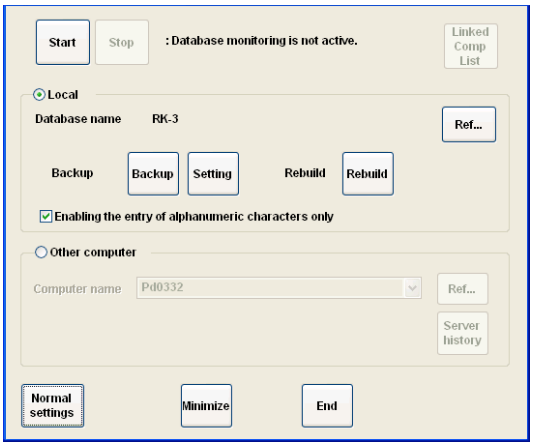
1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

2 Stop connection to the database by pressing the Stop button.

If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)

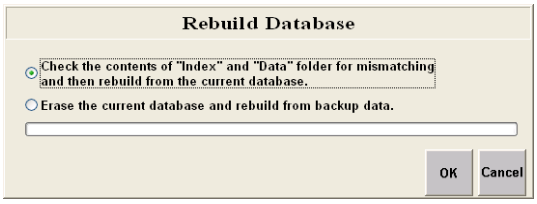


3 Press the Advanced settings button to open the advanced settings.



4 Press the Rebuild button.

The Rebuild Database dialog box is displayed.



5 Check the desired rebuild type.

Check the contents…	Rebuilds the database using the currently used data folders.
Erase the current…:	Restores backed-up data after replacing the whole device or the internal SSD due to failure or other causes.

⚠ **CAUTION**

- **Rebuilding the database with the "Erase the current" option completely erases the current database. Use precaution when selecting this option.**

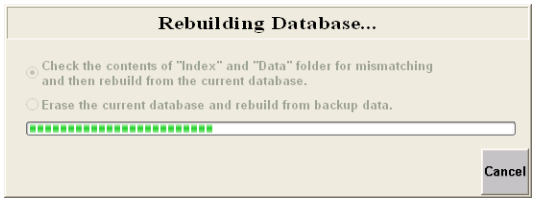
  To retain the currently used database, back it up in advance.

- **If data in the database is deleted after backing up the data on an external storage media, the deleted data cannot be restored even by rebuilding the database using the "Check the contents" option.**

6 Press the Rebuild button.

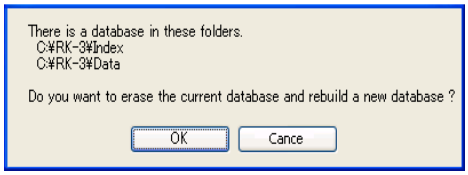
When the **"Check the contents…"** option has been selected:

The rebuilding of the database is started and progress bar is shown. The rebuilding may take some time. Go to Step 8.



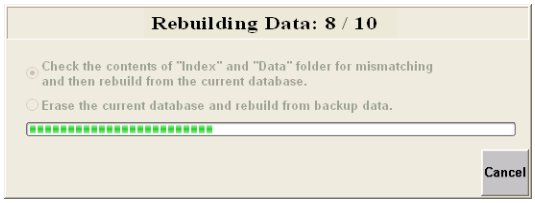
When the **"Erase the current…"** option has been selected:

The message dialog box as shown to the right is displayed. Go to Step 7.



7 Press the OK button.

Rebuilding of the database is executed.



8 When the rebuilding of the database is complete, the message "Rebuilding of database has been completed." appears.

9 Press the OK button.

The screen returns to the OPD Database Manager screen.

10 Press Start button to restart connection to the database.

11 Press Minimize button to minimize the OPD Database Manager screen to the task tray.

4.4.6 Setting destination of data backup, import, and export

The destination for data backup, import, and export can be set.

⚠ **CAUTION**

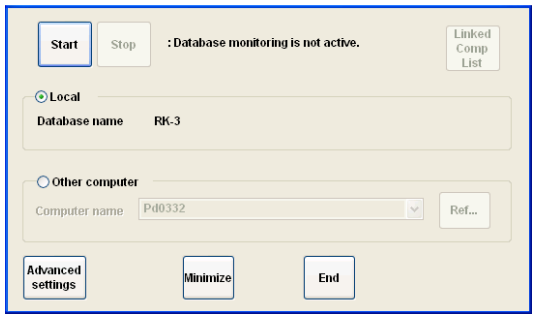
- **After changing the target location in the Backup Data field in the Select Database dialog box, be sure to perform the first backup with the "All" backup option.**
- **If any improper storage location is input in any of the Index, Data, Backup Index, or Backup Data fields, examination data may be lost.**

  When changing the initial storage locations, consult NIDEK or your authorized distributor.

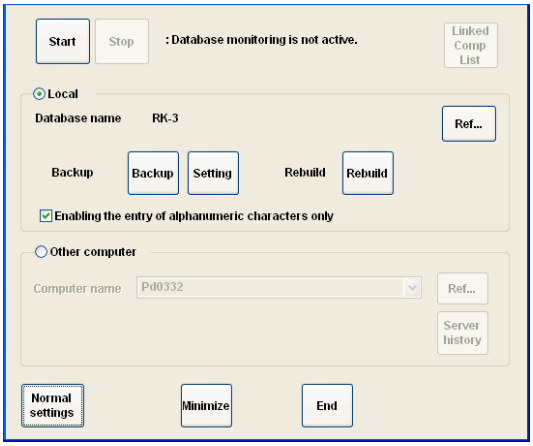
1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

2 Stop connection to the database by pressing the Stop button.

If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)

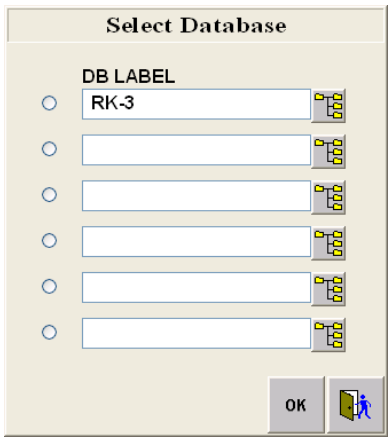


3 Press the Advanced settings button to open the advanced settings.



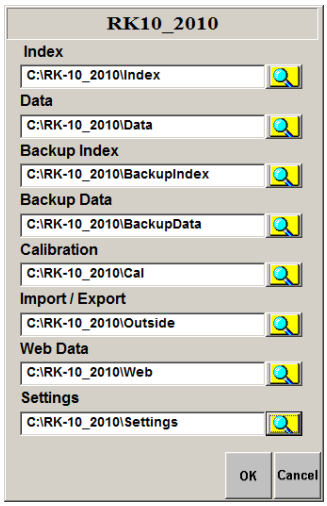
4 Press the Ref... button.

The Select Database dialog box is displayed.



5 The database being selected with the radio button is being used. Press the button on the right.

The folders in which the database is stored are displayed.



6 Change the desired items.

Select the desired drive or directory. The destination can be selected also by pressing the button on the left and selecting the desired destination.

Entry box	Explanation
Index	Storage location of the database index. An external storage device or the internal SSD cannot be specified in this field.

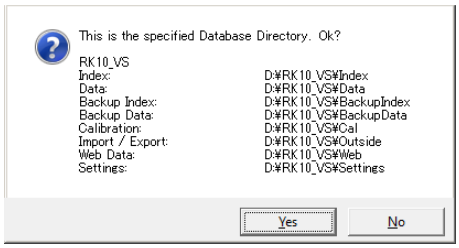
Entry box	Explanation
Data	Storage location of the examination (analysis) data. An external storage device or the internal SSD cannot be specified in this field. The same folder selected for the Backup Data or Import/Export field cannot be selected.
Backup Index	Storage location of a copy of the index file created when the system is shut down. The copy is used when rebuilding the database. An external storage device or the internal SSD cannot be specified in this field.
Backup Data	Database backup destination. The same folder selected for the Data or Import/Export field cannot be selected. After changing the backup destination, be sure to perform the first backup with the “All” backup option. The internal SSD cannot be specified in this field.
Calibration	Location where the calibration and nomogram files are stored.
Import/Export	Data import or export destination. The same folder selected for the Data or Backup Data field cannot be selected.
Web Data	Folder used only for the OPD-Scan III VS (for prescription glasses) The folder needs to be created even for the OPD-Scan III.
Settings	

7 Press the OK button.

The Select Database dialog box is displayed.

8 Press the OK button.

The Message dialog box is displayed.



9 Press the Yes button.

10 Press the  button to exit the edge edit mode.

The screen returns to the OPD Database Manager screen.

11 Press the Start button to restart the connection to the database.

12 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

○ Backing up to external storage device

Data can be backed up to an external storage device (such as USB hard disk) connected to the USB port.

USB external storage device → Connect it to the USB connector.

As for the connection method of each external storage device, refer to the manual of the device.

To back up data to an external storage device, specify the target directory in the Backup Data field.

To manage storage media (such as a DVD-RAM), be sure to adhere an identification label to each volume.

Note

- The USB port is designed for hot plug. As long as data is not being read or written, the external storage device can be removed without a removal procedure.

4.4.7 Setting data deletion condition

The condition for deletion of data at the time of the backup can be specified.

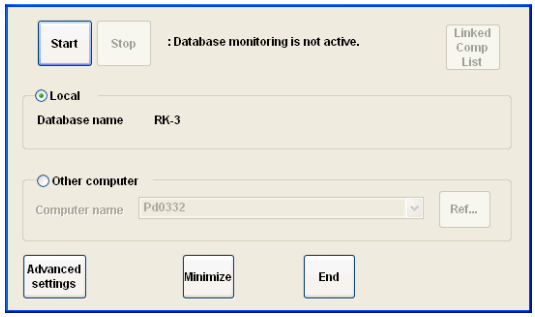
Note

- If the SDD (C drive) in the device is specified as the location to store the database, the database cannot be backed up with the procedure described below.

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

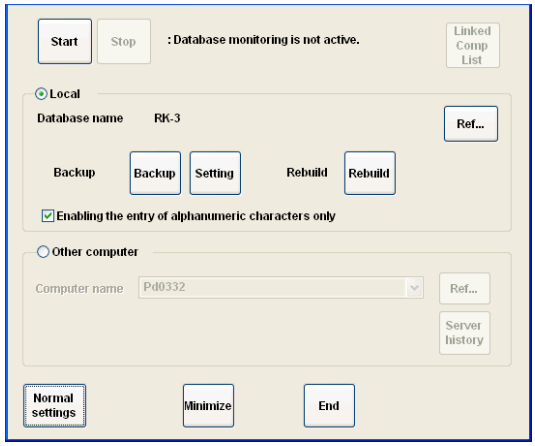
2 Stop connection to the database by pressing the Stop button.

If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)

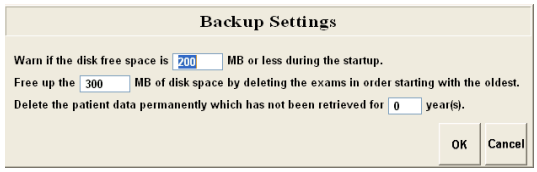


3 Press the Advanced Settings button to open the advanced settings.

4 Press the Setting button.



The Backup Setting dialog box is displayed.



5 Set the desired data deletion condition.

Warn if the disk free…:	If free space of the internal SDD is less than the capacity specified in this field (unit: MB), the message appears during the device startup to recommend the operator to free up backup space.
Free up…	This value is the target space to free up for the internal SDD (unit: MB). When the free-up backup is executed, data is deleted so that the free space specified in this field is created. To use data deleted by the free up backup, retrieve the data from an external storage media.
Delete patient data permanently…	Patients whose data has not been used for the years specified in this field are deleted at the time of backup by checking “Delete”. If this field is “0” (zero), “Delete” cannot be checked. To check “Delete”, input the desired value in this field (in increments of 1 year).

6 Press the OK button.

The screen returns to the OPD Database Manager screen.

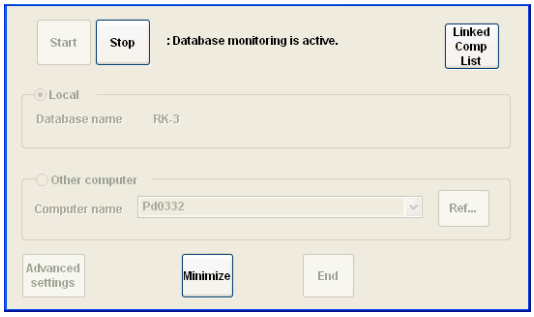
7 Press the Start button to restart the connection to the database.

8 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

4.4.8 List of connected computers

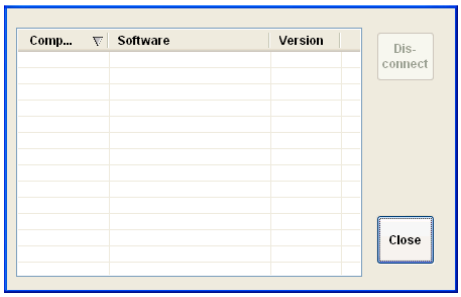
A list of computers being connected to the local database can be viewed.

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.



2 Press the Linked Comp List button.

The Linked Computer List screen appears.



Note

- Connection with computers can be terminated by selecting the computers to be disconnected and pressing the Disconnect button. When computers are disconnected in this method, the database cannot be accessed from these computers, and software such as Final Fit that runs on them becomes inactive, resulting in a loss of data.

To prevent such troubles, be sure to check the status of the computers to be disconnected in advance.

3 Press the Close button.

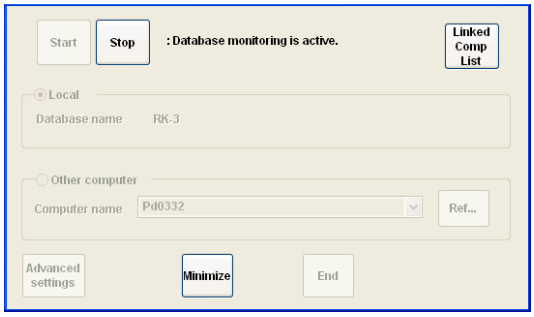
The screen returns to the OPD Database Manager screen.

4 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

4.4.9 List of computers that have been connected before

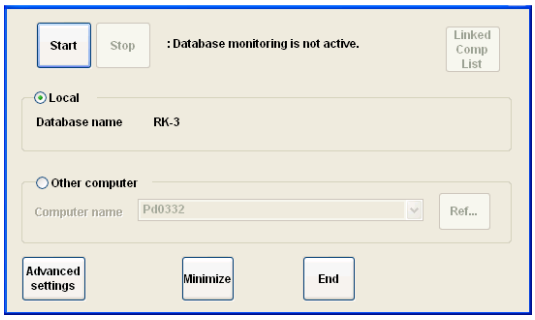
A list of computers that have been connected before can be viewed.

1 Press the Database button in the Maintenance screen to display the OPD Database Manager screen.

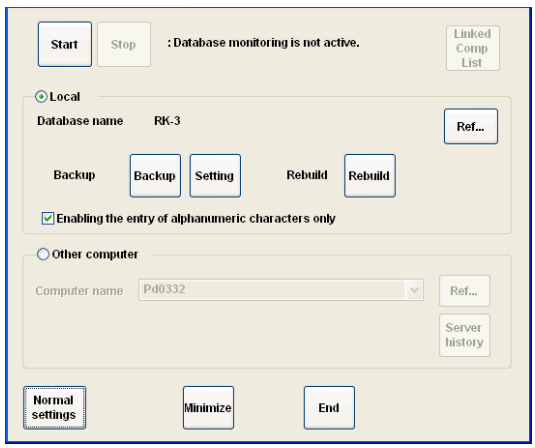


2 Stop connection to the database by pressing the Stop button.

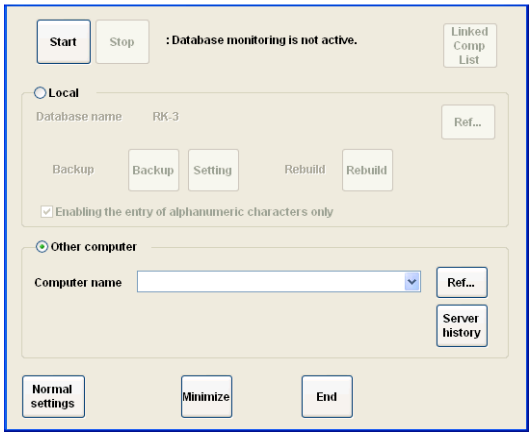
If other network-connected OPD-Scan IIIs are using the database on the device, stop connection to the database with all the OPD-Scan IIIs in advance. (Click the Stop button in the OPD Database Manager screen with each device.)



3 Press the Advanced Settings button to open the advanced settings.

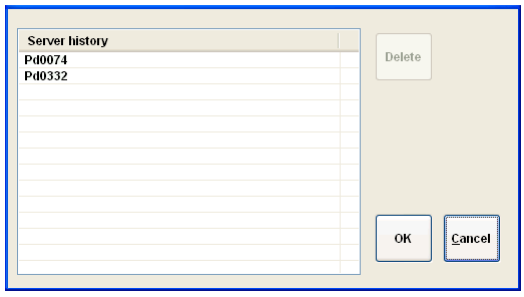


4 Select “Other computer”.



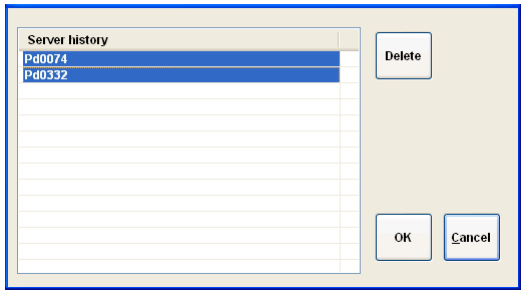
5 Press the Server history button to display the Server history screen.

A list of computers that have been connected before can be viewed.



6 If necessary, delete computer names.

To delete computer names from the list, select the desired computer name and press the Delete button.



7 Press the OK button.

The screen returns to the OPD Database Manager screen.

If the Cancel button is pressed, the screen returns to the OPD Database Manager screen without deleting any computer name.

8 Restore the original setting of “Local” or “Other computer”, then press the Start button to restart connection to the database.

9 Press the Minimize button to minimize the OPD Database Manager screen to the task tray.

4.5 Outputting Map Data

Image and numeric data in the summary being displayed can be output.
Data can be output in the summary screen (including difference and comparison analyses) or any screen for displaying maps.
There are four types of data to choose from to be output from the summary screen. Multiple types can be selected.

For details, see “4.5.1 Outputting summary image data (Saving maps)” (page 274).

Summary image	Outputs the contents of a summary as an image (JPEG or BITMAP).
Text data	Outputs numeric data being displayed in the map as comma-deliminated texts (CSV format). The text data can be used with various spreadsheet software or for other various purposes.
RT data	The data received from the RT is added to the numeric data (CSV format) on the map and output.
Examination data	Outputs complete measurement data being displayed in a summary. This data is output in a folder with the system ID name that contains multiple files. The output data can be imported to the database in other devices. This operation is available when a summary other than the difference or comparison analysis summary is being displayed.

Note

- Parameters for outputting data can be set in the Settings screen (Data Output tab).
  There are parameters for data type, output destination, file name, image file format, and others.
  When the data is output with “Set Each Time” selected in the Data Output tab, the Export Data screen is displayed to allow confirmation and changing of the data output parameters. When “Set Each Time” is not selected, data is immediately output in accordance with the setting.

4.5.1 Outputting summary image data (Saving maps)

Image data in the summary being displayed can be saved in the specified folder.

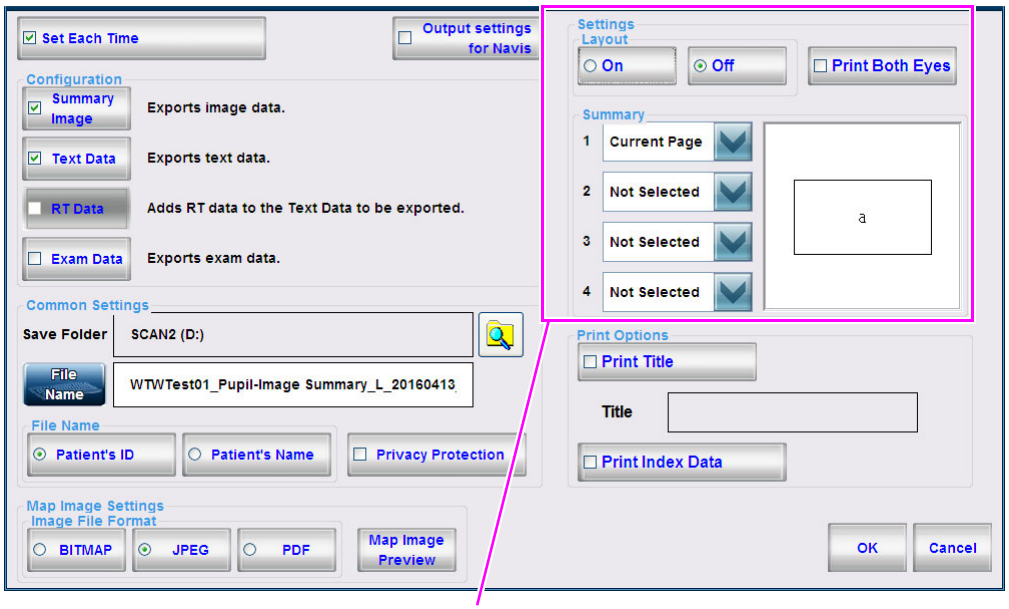
1 Display the desired summary in the summary screen.

For the difference or comparison analyses data, display the Difference or Comparison screen.

Information such as the overlay items and analysis area in the maps are also output as displayed in the screen. Be sure to confirm such information before outputting data.

2 Press the Tools button, then select “Data Output” from the menu.

The Data Output screen appears.



If “Summary Image” is selected, the items, “Layout” and “Print Both Eyes”, are displayed.

3 Confirm or change the setting for data output.

Note
- When the map is enlarged, the item “Configuration - Exam Data” is not available.

Set Each Time

Displays the Data Output screen when “Data Output” is selected to allow confirmation and changing of the data output setting. When the check mark is removed, the Data Output ceases to appear each time “Data Output” is selected.

Note
- When the check mark for “Set Each Time” is removed, it can be checked again in the Settings screen (Data Output tab).

Output settings for NAVIS

Check this item to output data to NAVIS.

When this item is checked, the file name becomes unchangeable, the privacy protection is disabled, and images are saved as Jpeg files (unchangeable).

Note
- When “Output setting for NAVIS” is checked, a file for information identification (extension “.OPD”) is output along with the image data.

Configuration

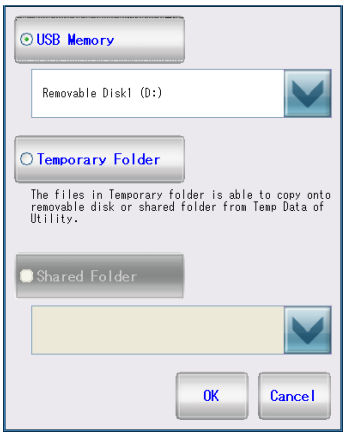
Select the type of data to be output from summary image, text data, and examination data. Multiple items can be selected.

Save Folder

Select the location to save data in the Select Folder screen that appears by pressing the folder reference button( ).

Available locations are displayed. If there are multiple locations, select from the drop-down list.

In case of the OPD software for external PC, specify the desired folder in the folder reference screen



USB Memory	Saves data in the USB flash drive. Connect a USB flash drive in advance to the USB port.
Temporary Folder	Saves data in the temporary folder. Data is copied to a removal disk or shared folder afterwards with the Temporary Data button in the Utility screen.
Shared Folder	Saves data in a shared folder. A shared folder needs to be created in advance.

File Name

If a summary image or text data is selected, set the name of the output file.

The file name can be input manually using the on-screen keyboard that appears by pressing the File Name button or a hardware keyboard.

Select the automatically assigned file name in the File Name box.

Patient's ID	Attaches the patient ID in front of the file name. ID_Summary name_Year Month Day_Hour Minute Second.(Extension) If “Privacy Protection” is selected, this additional information is not attached to the file name.
Patient's Name	Attaches the first and last names of the patient in front of the file name. Fist and last name_Summary name_Year Month Day_Hour Minute Second.(Extension) If “Privacy Protection” is selected, the initials of the patient name are attached to the file name.
Privacy Protection	Attaches minimum personal information to file names. Select this item to avoid identification of patients by file names. When this item is selected, the patient ID is not attached and only the initials of the patient name are attached to file names. This item is useful when creating data used for presentation in academic conferences.

The parameters below are set when “Summary Image” is selected.

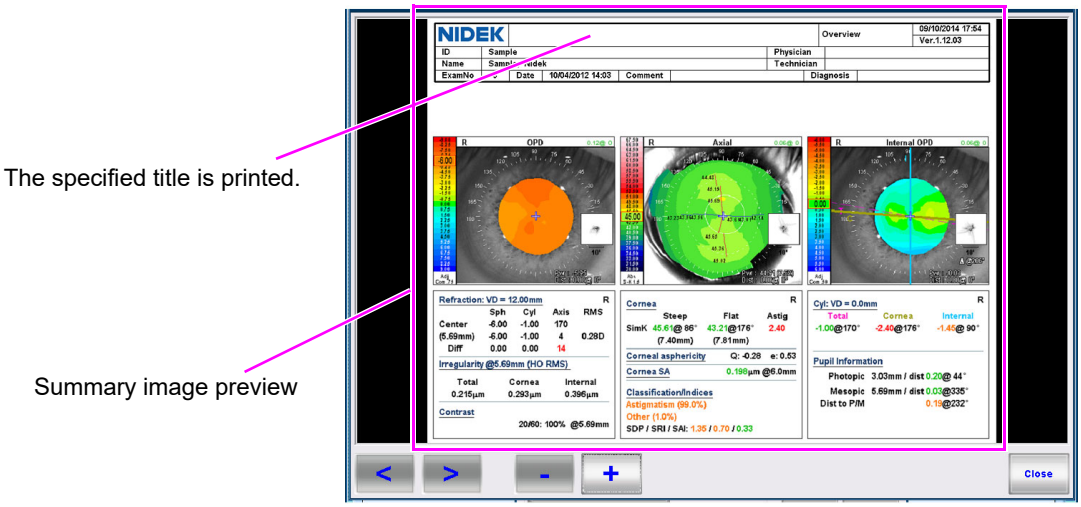
Image File Format

Summary and map images are output as Jpeg, BMP (bitmap), or PDF files.

BITMAP	Saves image data as a BMP (extension “.bmp”) image. Images are saved without being compressed.
JPEG	Saves image data as a Jpeg (extension “.jpg”) image. Images are saved after being compressed. Compared to the BMP file, the Jpeg file becomes smaller, however the image quality may become lower.
PDF	Saves image data as a PDF (extension “.pdf”) file. With commercially available PDF editing software, multiple PDF files can be combined into a single file.

Map Image Preview button

Displays a preview of the format of the summary to be output.



[<] button	Used to display the previous page.
[>] button	Used to display the next page.
[-] button	Used to reduce the displayed image.
[+] button	Used to enlarge the displayed image. When the image is enlarged, the displayed image can be moved by dragging.
[Close] button	Used to close the Map Image Preview screen.

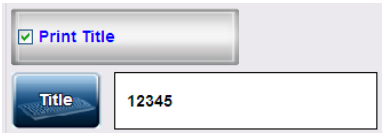
Output settings for NAVIS button

Check this item to output data to NAVIS.

When this item is checked, the file name becomes unchangeable, the privacy protection is disabled, and images are saved as Jpeg files (unchangeable).

Print Title

To display the title at the top of the summary, check this item and input the desired title.



Output Index Data

Check this item to print index data at the same time as data output. For details of the index data, see “〇 "Printing maps (Page 165)"”.

4 Press the OK button to execute data output.

The Export Data screen becomes closed.

Pressing the Cancel button closes the Export Data without executing data output.

4.6 Editing Placido Ring Edges

Edges (red and yellow lines) of detected placido rings may be deviated from the captured placido ring images or partly broken. Such edges can be edited.
There are four tools for edge editing: Move, Extend, Close and Erase.

Edge editing procedure

① Entering the edge edit mode.
↓
② Specifying the edge to be edited. ←
↓
③ Edit the edges using the edge edit function. ——
↓
④ Saving the modified data.

Move	Used to move the center of the selected arc to adjust it to the captured placido ring.
Extend	Used to change the length or direction of the selected line by moving its ends.
Close	Used to fill gaps of broken edges.
Erase	Used to erase unnecessary parts of edges.

Note

- To edit edges of placido rings, the data needs to satisfy the following conditions:
  (1) There is a calibration data used when the data was measured.
  (2) There is a placido ring image.
- The edited placido ring edges are used for calculations for maps or other data. Be sure to edit the placido ring edges so that they match the placido ring image captured in the CT measurement.

Edge edit mode (Reprocess screen) can be entered with the following operations:

Press the Edit button in the Verify Examination Quality screen after measurement.

Select the desired examination data in the summary screen, then select “Edit exam data” from the menu that appears by pressing the Tools button.

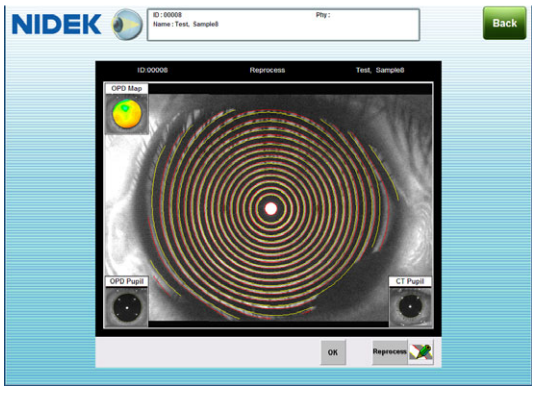
4.6.1 Entering the edge edit mode (Tools)

1 Select the desired map in the summary screen to select the examination data the edge of it is to be edited.

It is necessary for selection of right or left eye when both eyes are displayed in a summary.

2 Select “Edit exam data” from the menu that appears by pressing the Tools button.

The Reprocess screen appears.



Note

- Thumbnails of the OPD Pupil (pupil image at the time of OPD measurement), OPD Map (OPD measurement data), and CT Pupil (pupil image at the time of CT measurement) images are displayed at the corners of the screen.

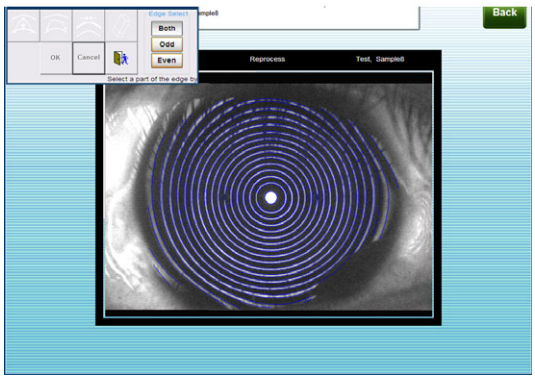
  When any of the thumbnails is pressed, the pupil image of the thumbnail replaces the image in the center of the screen.

If the selected data cannot be edited, the errors shown below appear.

Error	Description
The calibration file of the exam could not be loaded. Reprocessing has been canceled.	The examination data has not calibration file. Copy the calibration file.
No calibration file of the exam exists in the database. Reprocessing has been canceled.	
The exam has no captured placido image. Reprocessing has been canceled.	The placido image is not saved in the database.
This data isn't OPD-Scan's.	The data is not obtained by the ARK-9000, ARK-10000 or OPD-Scan III.

3 Press the  button to activate Edge edit mode.

The tools dialog box is displayed and the detected edges are shown in blue.



4.6.2 Selecting Edges

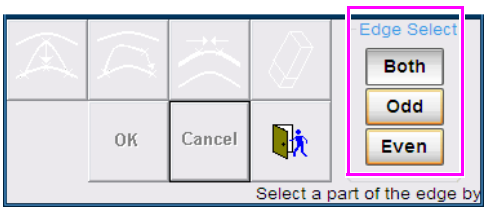
Available tool buttons become automatically enabled depending on the condition of the selected edge. Select appropriate tools.

Shape of selected edges	Available tools
Edge with no gap 	Move, Erase
Edge with an open end 	Extend, Erase
Edge with a gap 	Close, Erase
Edge with more than one gap 	Erase

As necessary, select the edge to be edited with the Edge Select buttons.

Select from “Both”, “Odd” and “Even”. The edges being selected are displayed in blue.

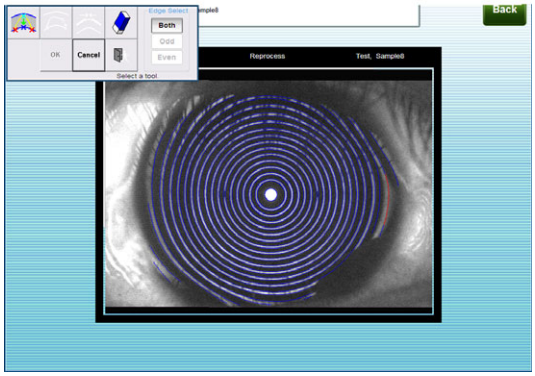
The Edge Select buttons are used to make tracing of the intended edge easier.



Select the desired edge by tracing.

The specified portion of the edge turns red.

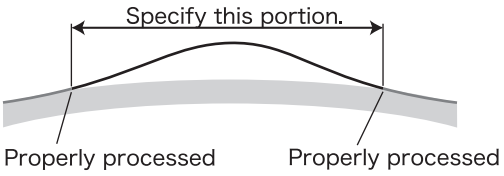
To cancel selection of the edge (to change the red edge to blue), press the Cancel button.



4

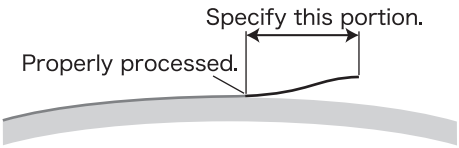
○ Selecting edge for moving it (Move)

Select the portion of the edge that is deviated from the placido ring image.



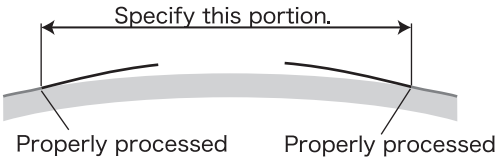
○ Selecting edge for moving its end (Extend)

Left-click to select the portion of the edges the end of which is to be moved.



○ Selecting edge for closing gaps in edges (Close)

Trace both of the edges of the broken line to select them.

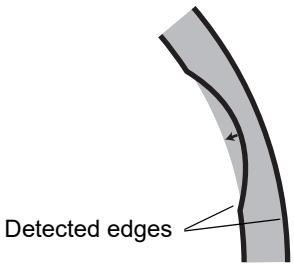


4.6.3 Editing edges

The selected portion of an edge can be edited.

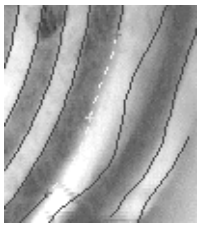
○ Using Move tool

The Move tool is used when a portion of the detected edge is deviated from the placido ring image.



1 Press the  button.

The selected portion of the edge becomes yellow, and the cyan cross mark appears in the center of the portion.



2 Move the cyan cross mark to the edge of the captured placido ring.

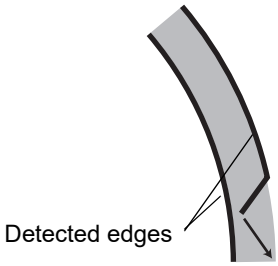
3 Check that the yellow portion is aligned with the captured placido ring edge, then press the OK button.

The detected edge is edited in accordance with the yellow line.

To cancel editing with the Move tool, press the Cancel button.

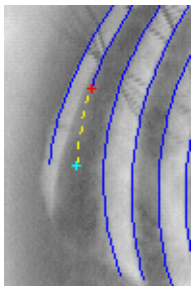
○ Using Extend tool

The Extend tool is used when an open end in the detected edges is deviated from the captured placido ring image.



1 Press the  button.

The selected portion of the edge becomes yellow, and the cyan cross mark appears at the open end.



2 Move the cyan cross mark to the desired position so that the yellow line is aligned to the captured placido ring.

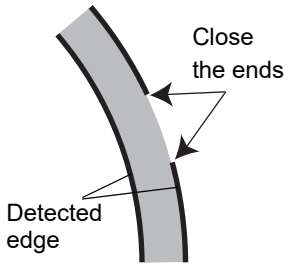
3 Check that the yellow portion is aligned with the captured placido ring edge, then press the OK button.

The detected edge is edited in accordance with the yellow line.

To cancel editing with the Extend tool, press the Cancel button.

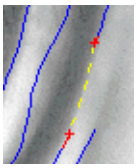
○ Using Close tool

The Close tool is used when there are any gaps in the detected edge.



1 Press the  button.

The selected line and the gap are connected with a yellow line.



2 Check that the yellow portion is aligned with the captured placido ring edge, then press the OK button.

The detected edge is edited in accordance with the yellow line.

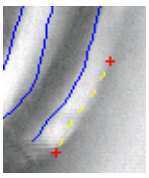
To cancel editing with the Close tool, press the Cancel button.

○ Using Erase tool

The Erase tool is used when there are any improper portions in the detected edge.

1 Press the  button.

The selected portion of an edge becomes yellow.



2 Check that the yellow portion can be erased.

The yellow portion of the edge is erased.

To cancel editing with the Erase tool, press the Cancel button.

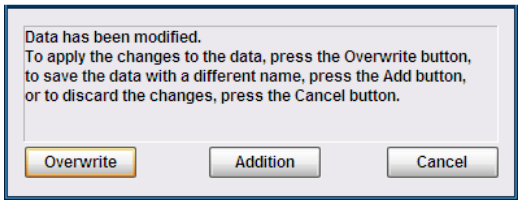
4.6.4 Saving data after edge editing

1 Press the  button to close Edge edit mode.

The screen returns to the Verify Select Examination Quality screen.

2 After check the edges, press the OK button to close the Verify Select Examination Quality screen.

A confirmation dialog box appears.



3 Select any of the options below when saving the data.

Overwrite	Overwrites the original data. (The original data is deleted.)
Addition	Adds the data with a new examination number.
Cancel	Cancels saving of the data.

Note

- If Edge edit mode is entered from the Verify Examination Quality screen, the Addition button is not displayed.

4.7 Editing Detected Pupil Edge

If the eyelid or shadow of the eyelid partially covers the pupil, the pupil edge may not be traced properly. In such a case the traced edge of the pupil can be corrected using Edge Edit mode.
If the pupil edge is not detected properly, the position and size of the pupil cannot be calculated accurately, making the analysis results (such as the Wavefront map) less reliable.
Two tools are available for editing pupil edge: Move and Erase.

 **Move**	Used to move the pointers on the line to adjust the line to the pupil edge.
 **Erase**	Used to erase portions of the line that are deviated from the pupil edge. Pressing the OK button after erasing a line places a new arc in place of the erased line.

Note

- To edit the pupil edge, the data needs to satisfy the following condition:
  There is a pupil image obtained in the CT or OPD measurement.
- The edited pupil edge is used to calculate values such as the pupil diameter and pupil position. Be sure to edit the pupil edge so that it matches the pupil image captured in the CT or OPD measurement.

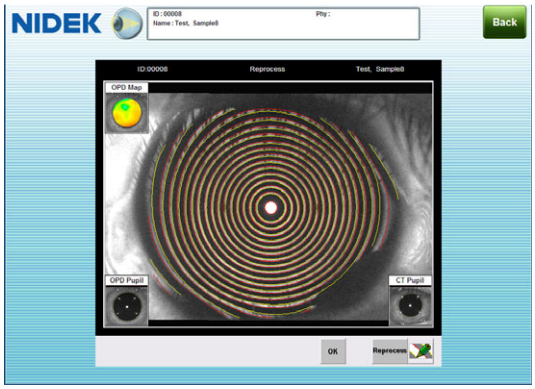
4.7.1 Entering pupil edge edit mode

1 Select the desired map in the summary screen to select the examination data the edge of it is to be edited.

It is necessary for selection of right or left eye when both eyes are displayed in a summary.

2 Select “Edit exam data” from the menu that appears by pressing the Tools button.

The Process screen appears.



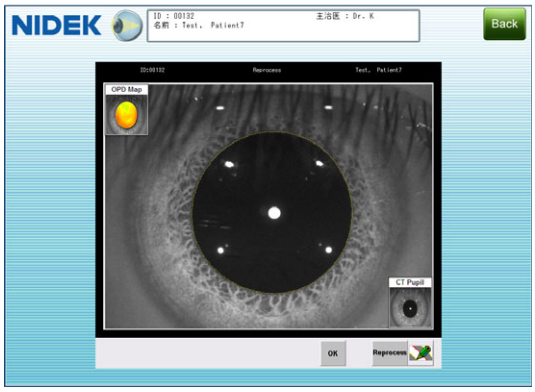
Note

- Thumbnails of the OPD Pupil (pupil image at the time of OPD measurement), OPD Map (OPD measurement data), and CT Pupil (pupil image at the time of CT measurement) images are displayed at the corners of the screen.
  When any of the thumbnails is pressed, the pupil image of the thumbnail replaces the image in the center of the screen

If the selected data cannot be edited, the error shown below appears.

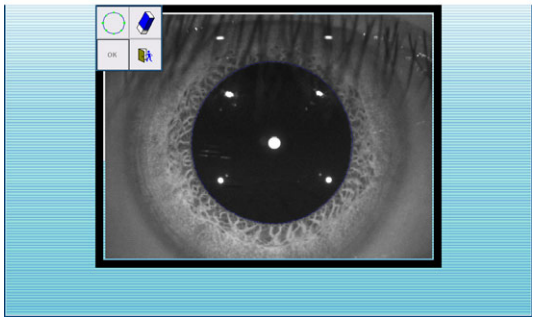
Error	Description
This data isn't OPD-Scan's.	The data is not obtained by the ARK-9000, ARK-10000 or OPD-Scan III.

3 Press the thumbnail of the OPD Pupil (pupil image at the time of OPD measurement) or CT Pupil (pupil image at the time of CT measurement) image to displayed it at the corners of the screen.



4 Check that the yellow line is placed properly along the pupil edge. If the line is not placed properly, click the button to enter Edge Edit mode.

The edit tools appear, and the detected edge becomes blue.



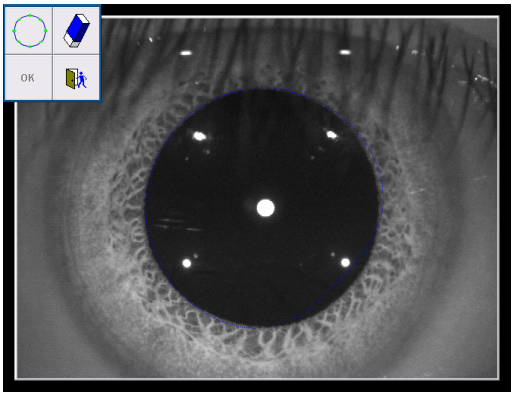
4.7.2 Erasing pupil edges (Erase)

The Erase tool is used when the detected pupil edge is deviated from the actual pupil edge.

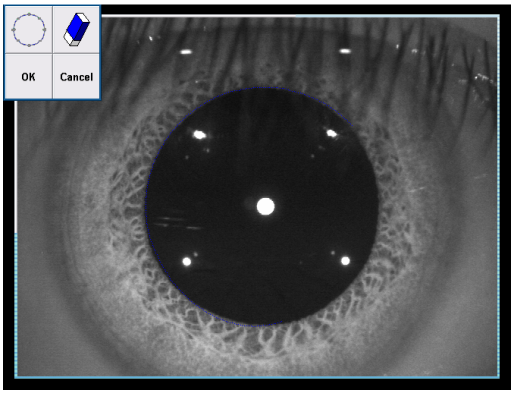
1 Enter Edge edit mode.

See “4.7.1 Entering pupil edge edit mode” (page 285).

2 Press .

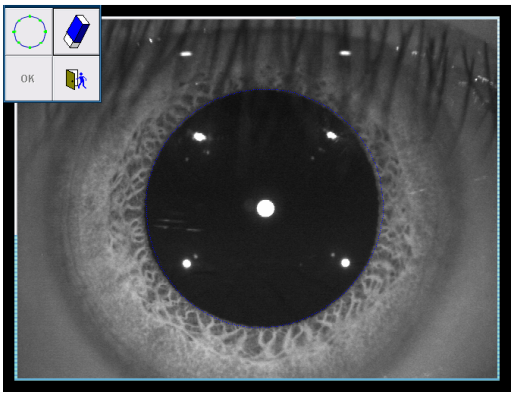


3 Trace the portion of the detected pupil edge to be deleted.



4 Press the OK button.

A new arc is drawn for the erased portion.



Note

- Even if the entire pupil edge is erased, a new pupil edge is drawn by pressing the OK button.

4.7.3 Moving pupil edges (Move)

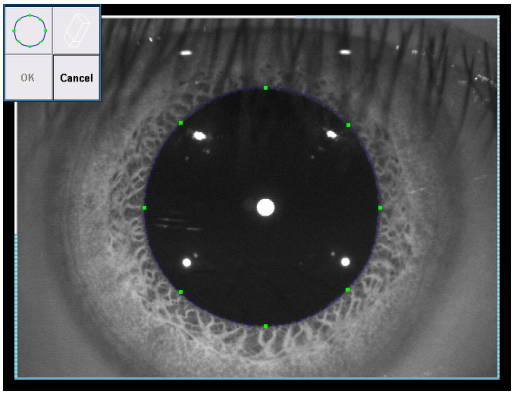
The Move tool is used to move portions of the detected pupil edge that are deviated from the actual pupil edge.

1 Enter Edge edit mode.

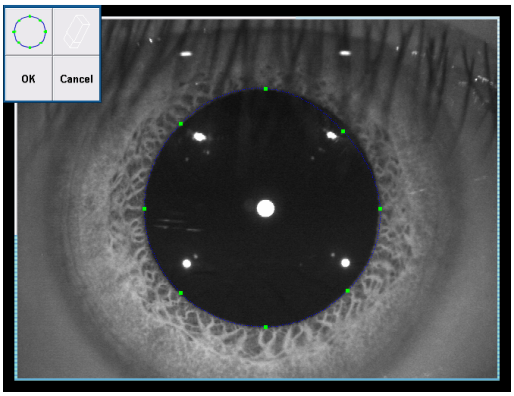
See “4.7.1 Entering pupil edge edit mode” (page 285).

2 Press  .

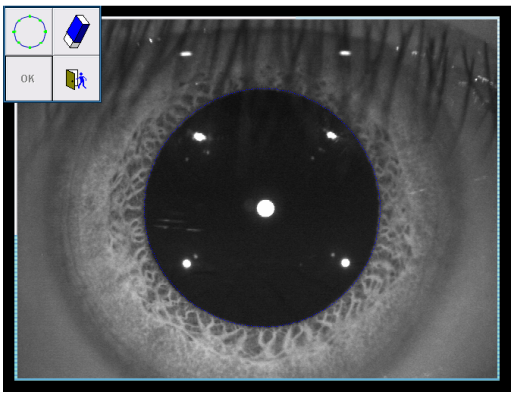
Eight pointers (green points) appear.



3 Hold and drag the pointer on the deviated portion of the detected pupil edge so that the deviated portion fits the actual pupil edge.



4 When the deviation of the detected pupil edge is complete, press the OK button.



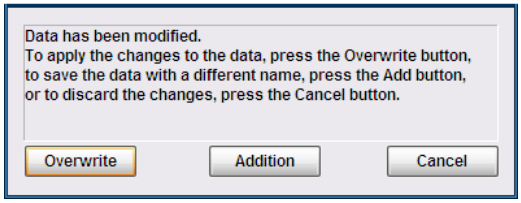
4.7.4 Saving edited data

1 Press the  button to close Edge edit mode.

The screen returns to the Verify Select Examination Quality screen.

2 After checking the edges, press the OK button to close the Verify Select Examination Quality screen.

A confirmation dialog box appears.



3 Select any of the options below when saving the data.

Overwrite	Overwrites the original data. (The original data is deleted.)
Addition	Adds the data with a new examination number.
Cancel	Cancels saving of the data.

Note

- If Edge edit mode is entered from the Verify Examination Quality screen, the Addition button is not displayed.

4.8 Editing OPD analysis area

If the eyelid or shadow of the eyelid partially covers the pupil, the analysis area within the pupil may not be detected properly. In such a case, the area to be excluded from the analysis can be specified. The Erase tool is used to edit the OPD analysis area.

Erase	Shades the area to be excluded from the analysis. Pressing the OK button executes analysis again excluding the specified area.

Note

- The OPD analysis area can only be edited with data that contains OPD measurement data.

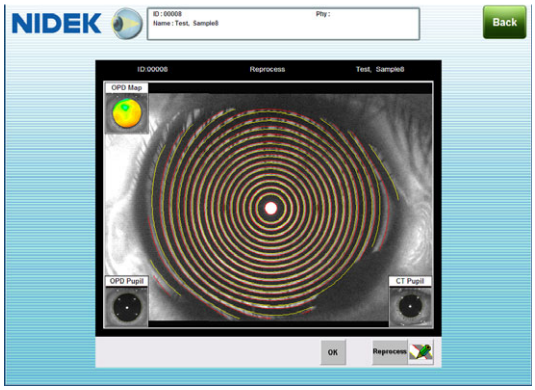
4.8.1 Entering OPD analysis area edit mode

1 Select the desired map in the summary screen to select the examination data the OPD analysis area of it is to be edited.

It is necessary for selection of right or left eye when both eyes are displayed in a summary.

2 Select “Edit exam data” from the menu that appears by pressing the Tools button.

The Reprocess screen appears.



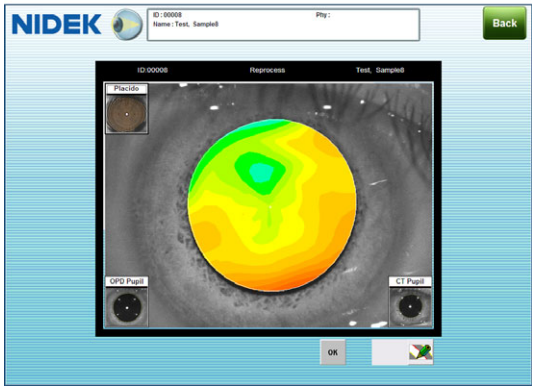
Note

- Thumbnails of the OPD Pupil (pupil image at the time of OPD measurement) and CT Pupil (pupil image at the time of CT measurement) images are displayed at the corners of the screen.

  When any of the thumbnails is pressed, the pupil image of the thumbnail replaces the image in the center of the screen.

3 Press the OPD measurement data (OPD Map) to display it in the center of the screen.

4 Check that the yellow line is properly tracing the pupil edge. To exclude any portion of the area from the analysis, press the button to enter OPD analysis area edit mode.



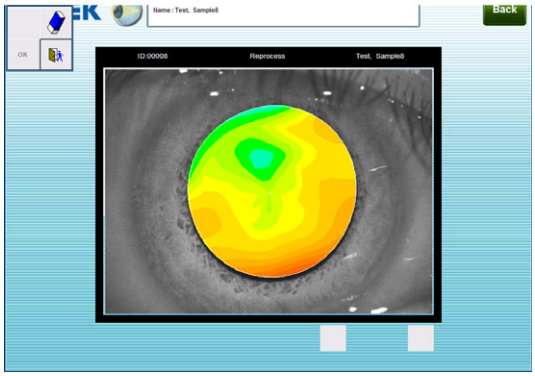
4.8.2 Erasing analysis area (Erase)

The desired area can be excluded from the analysis.

1 Enter OPD analysis area edit mode.

See “4.6.1 Entering the edge edit mode (Tools)” (page 279).

2 Press .

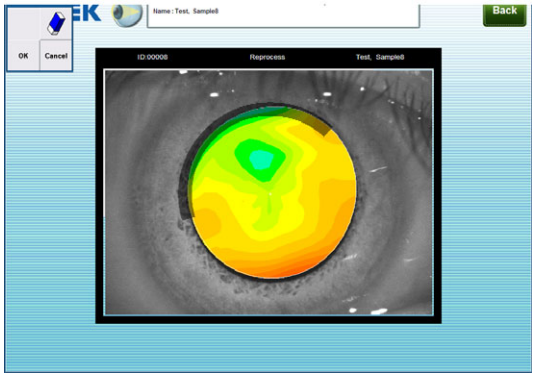


3 Trace the portion of the map to be erased.

The traced portion is shaded along the edge.

4 Press the OK button.

The data of the shaded portion is cleared, and the OPD map is recalculated.

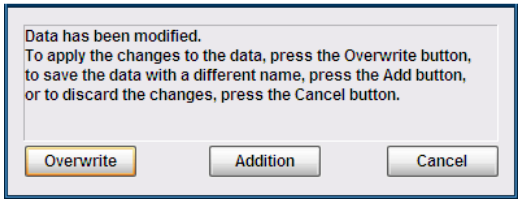


5 Press the Exit button ( ) to close OPD analysis area edit mode.

The Reprocess screen appears.

6 Press the OK button.

A confirmation screen appears.



7 Select any of the options below when saving the data.

Overwrite	Overwrites the original data. (The original data is deleted.)
Addition	Adds the data with a new examination number.
Cancel	Cancels saving of the data.

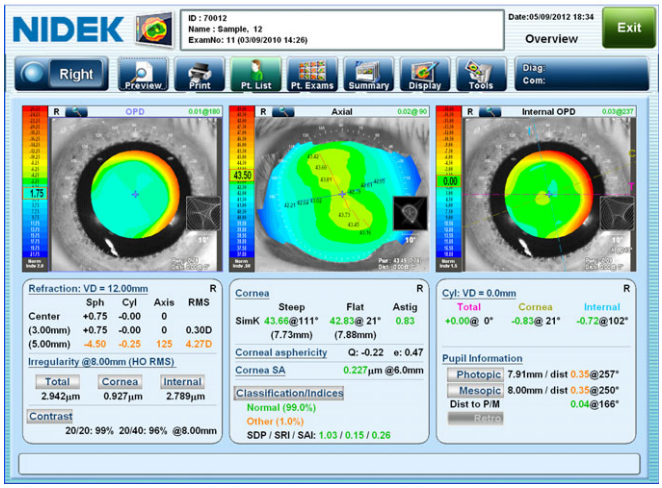
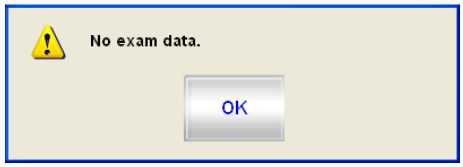
Note

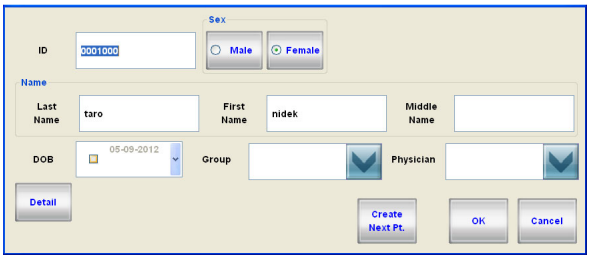
- If OPD analysis area edit mode is entered from the Verify Examination Quality screen, the Addition button is not displayed.

After saving the data as specified, the Reprocess screen is closed.

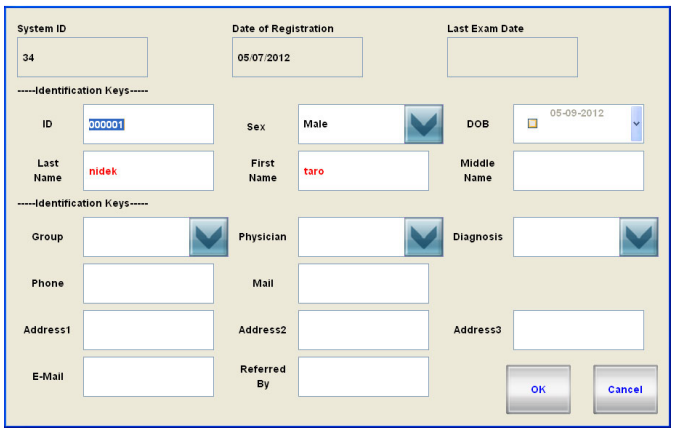
4.9 Starting OPD-Scan III from OPD Software for External PC

By the command from the OPD Software for External PC, the OPD-Scan III can be started and the measurement data for the specified patient can be displayed.
For command specifications, contact NIDEK or your authorized distributor.
Even with the same ID, the initial screen displayed in response to the command differs depending on the data stored in the OPD-Scan III database as shown below.

Data on database	Initially displayed screen
Measurement data exists for the patient of the specified ID	The latest measurement data is displayed.  However, if there are measurement data sets for both eyes, the right eye measurement data is displayed. Depending on the command, the Exam List screen can also be displayed. Pressing the Exit button shuts down the OPD-Scan III.
Measurement data does not exist for the patient of the specified ID	The message “No exam data.” appears.  Pressing the OK button shuts down the OPD-Scan III.

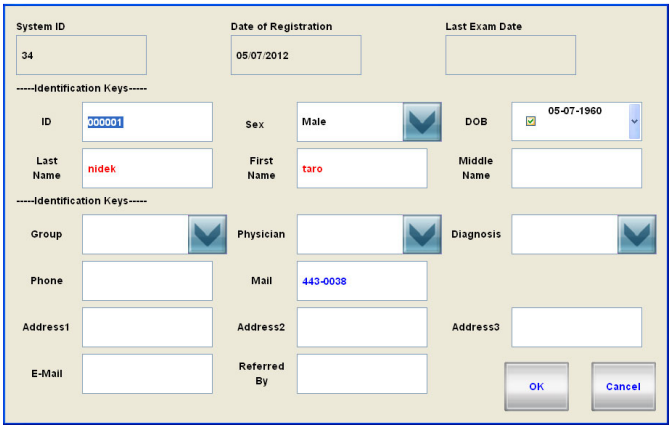
<table>
<tr><th>Data on database</th><th>Initially displayed screen</th></tr>
<tr><td>No patient data exists with the specified ID.</td><td>The screen for creating patient data with the specified ID appears.
 

* Example of screen when data “ID=000100, First name=taro, and Last name=nidek” was received
The transmitted data is shown with black characters.
If sex is not specified “female” is selected by default.

Input necessary information, then click the OK button.
The Select Patient window appears with the created patient data selected.</td></tr>
<tr><td>The patient name of the specified ID differs from the saved patient name</td><td>The screen for editing the patient information appears.
 

* Example of screen when data “ID=0000001, First name=taroA, and Last name=nidekA” was received
The contents of this screen are the patient information registered to the OPD-Scan III. Different information is shown in red.

Change the information as necessary, then click the OK button. The summary screen appears with the patient data of the specified ID selected.
When the Cancel button is clicked, the changed information is not reflected to the screen.</td></tr>
</table>

Data on database	Initially displayed screen
For the specified ID, extra information not even saved to the database has been received.	The patient information screen appears.  * Example of screen when data “ID=0000001, First name=taro, Last name=nidek, and date of birth=1975/01/01” was received. Added extra information is displayed in blue. Check the contents, then click the OK button. The summary screen appears with the patient data of the specified ID selected. When the Cancel button is clicked, the OPD-Scan III is shut down without saving the currently input patient information to the database.

Note

- If the OPD-Scan III has already been started, the message below appears. In such a case, shut down the OPD-Scan III, then transmit the command again.

5. MAINTENANCE

5.1 Troubleshooting

In the event that the device does not work correctly, attempt to correct the problem according to the following table before contacting NIDEK or your authorized distributor.

Symptom	Remedy
The LCD does not turn on.	• The power cord may not be connected properly. Reconnect it securely. • The power switch may not have been turned on. Check the power switch.
The screen suddenly changes.	• Power saving mode may have been activated. Press any button to exit power saving mode
The main body cannot be moved laterally.	• The locking lever may be locked. Flip up the locking lever.
Data is not printed out.	• Check the printer paper. If the paper has been used up, load a new printer paper. • The Internal Printer box may not be checked in the Options field on the Settings screen (Measurement tab). Check the setting.
The printer does operate, however, printed results cannot be obtained.	• The printer paper may be loaded with the wrong side up. Set it with the correct side up.
Printer paper does not feed.	• Make sure that printer paper may not be set straight and the core of the roll is misaligned. Open the printer cover and make sure that printer paper is properly loaded.

Symptom	Remedy
The auto tracking function or auto shot function does not work.	• The auto tracking function or auto shot function may not have been turned on. Turn them on with the tracking button or auto shot button. • Room illumination may be reflecting on the cornea. Change the location and try measurement again. • The auto tracking function or auto shot function may not work on some eyes such as keratoconus or recently-operated cornea. In such cases, turn off the auto tracking function and start measurement. • The patient who has substantial ocular ataxia or who cannot fixate his or her eyes, the auto tracking function or auto shot function may not work. In such cases, turn off the auto tracking function and start measurement. • If the device is installed in the vicinity of a window where the device is exposed to sunshine, light interference may adversely affect these functions. Change the location and try measurement again.
A measurement error appears.	• The patient may have blinked during measurement. Instruct the patient not to blink and try measurement again. • The eyelid or eyelashes may obstruct measurement. Instruct the patient to open his/her eye wider. If the patient cannot open wider, lift the patient’s lid, paying attention not to press against the eyeball. • The pupil may be too small for measurement. Have the patient sit in a dark room for a while until the pupil enlarges enough and try measurement again. • The data may exceed the measurable limit.

If the symptom cannot be corrected with the above actions, contact NIDEK or your authorized distributor.

5.2 Error Messages and Remedy

If one of the following error codes is displayed on the screen or printed out, follow the suggestions in the cause and remedy column.
The error code, detailed indications and serial number of your device are helpful in proper servicing.

Error code	Cause and countermeasure
No.001:EEPROM Error.	• Data error of backup memory (EEPROM) Data loss due to exogenous noise such as static electricity or malfunction of the electric circuit board or EEPROM on the electric circuit board is probable. • If the same error code is displayed again even after the device is turned off and on again, shut off the device and contact NIDEK or your authorized distributor.
No.002:Time error (Firmware error).	• Date and time setting error The built-in battery has been discharged after about one month or longer of nonuse, and the date and time settings went wrong, or malfunction of the electric circuit board or timer IC on the electric circuit board is probable. • If the same error code is displayed again even after the date and time are reset in parameter setting mode, shut off the device and contact NIDEK or your authorized distributor.
No.003:Base temperature is too high.	• If the same error code is displayed again even after the device is turned off and on again, shut off the device and contact NIDEK or your authorized distributor.
No.100:Internal printer is down. No.105:Connection error occurred, or the internal printer is down.	• The internal printer is out of order. • Confirm that the printer cover is securely closed. • If the same error code is displayed again even after the device is turned off and on again, shut off the device and contact NIDEK or your authorized distributor.
No.106:No Paper:Load paper.	• Check the printer paper. Confirm that the printer cover is closed. After that, press the [Execute] button (OPD/CT mode) or [Print] button (AR/KM mode) to continue printing from where the error occurred.
No.107:Printer cover is open.	• Close the printer cover.
No.108:Head temperature is too high.	• The head temperature increased due to continuous printing. Wait for a while.
No.109:The reprint data is invalid or corrupted.	• Data measured with previous software versions, and data edited after the measurement cannot be reprinted with the internal printer.
No.300 Update failed (read error). Would you like to try again? No.301 Update failed (invalid file). Would you like to try again? No.302 Update failed (write error). Would you like to try again?	• Data processing error inside the device • Shut off the device and contact NIDEK or your authorized distributor.

Error code	Cause and countermeasure
No.310 Restoration failed (model error). Would you like to try again? No.311 Restoration failed (serial No. error). Would you like to try again? No.312 Restoration failed (invalid file). Would you like to try again? No.313 Restoration failed (unknown error). Would you like to try again?	• Data processing error inside the device • Shut off the device and contact NIDEK or your authorized distributor.
No.320 Backup failed. The serial No. may have not been entered. Would you like to try again?	• The device serial number is not entered. • Shut off the device and contact NIDEK or your authorized distributor.
No.321 A removable disk cannot be found. Insert a removable disk, and then try again.	• Removable media such as a USB flash drive is not connected. Connect the USB flash drive.
No.380:Internal communication error: Disconnected. No.381:Internal communication error: Cable failure. No.382:No response from SBC. No.383 No response from Measuring Unit. No.384 Network initialization failed. Measurement cannot be taken.	• The Windows application or firmware application may have abended. Execute the OPD3 start icon on the desktop. • If the same error code is displayed again even after the remedy above is performed, shut off the device and contact NIDEK or your authorized distributor.
No.400:Light adjustment failed.	• The patient's eye may have a severe cataract. Perform measurement again. Check the patient's eye with the other refraction devices.
No.401:The pre-measurement result is out of range. No.402:Chart failed. No.403:Pre-measurement failed.	• The patient's eye may be abnormal. Perform measurement again. Check the patient's eye with the other refraction devices.
No.404:Failed to detect data.	• Shut off the device and contact NIDEK or your authorized distributor.
No.405:Eyelid has been detected. No.406:Blinking occurred during measurement. No.407:Blinking occurred during imaging of the eye.	• OPD measurement was not performed properly due to blinking or such. Perform measurement again.
No.408:Right\Left Sensor Error - no signal	• Check the PD window. If it is blocked by any object, remove it. If dust has settled on it, wipe it gently with a cloth dampened with rubbing alcohol. • The cause of the error may be interference light. Place the device where there is little interference light. • Shut off the device and contact NIDEK or your authorized distributor.
No.409:Chopper motor error occurred.	• A device internal error was detected. • Shut off the device and contact NIDEK or your authorized distributor.
No.410:Measurement failed:Time out. No.411:Alignment is off-centered. No.412:Alignment is too off-centered. No.413:Focus alignment is too off-centered.	• Perform measurement again.

Error code	Cause and countermeasure
No.420:Initializing error(Minus Shutter) No.421:Initializing error(Zero Shutter) No.422:Initializing error(Plus Shutter) No.423:Initializing error(Rotator) No.424:Initializing error(Chart) No.425:Initializing error(Chopper) No.426:Initializing error(UD Tracking Motor) No.427:Initializing error(RL Tracking Motor) No.428:Initializing error(FB Tracking Motor) No.429:Initializing error(Chinrest Motor)	• A device internal error was detected. • Shut off the device and contact NIDEK or your authorized distributor.
No.430:Eyelid has been detected. No.431:Blinking occurred during measurement.	• CT measurement was not performed properly due to blinking or such. Perform measurement again.
No.432:Right\Left Sensor Error - no signal	• Check the PD window. If it is blocked by any object, remove it. If dust has settled on it, wipe it gently with a cloth dampened with rubbing alcohol. • The cause of the error may be interference light. Place the device where there is little interference light. • Shut off the device and contact NIDEK or your authorized distributor.
No.433:Error occurred while receiving data.	• The Windows application may have abended. Restart the device.
No.500 The error occurred by LAN connection confirmation. No.501 The error occurred by LAN connection confirmation. No.502 The error occurred by LAN connection confirmation. No.503 The file output to the shared folder cannot be done.	• Communication to the destination PC failed. Check the LAN settings or interface cable connection. • In addition, check that parameters related to communication are set properly.
No.600 Unable to connect to the specified computer. The OPD-Scan lll is shutdown.	• Connection to the database failed at device start-up. Check the destination database condition.
No.601 Communication with the computer to refer to the database has been disrupted. The OPD-Scan lll is shutdown.	• Connection to the database was shut down after device start-up. Check the destination database condition.
No.700 RS232C is not connected.	• Connection to the connected PC via RS-232C is not established. Check the connection to the connected device.
No.701 The RS232C communication end error occurred.	• The connected device did not respond to the OPD-Scan III during RS-232C communication. Check the interface cable connection.
No.800 The file for the update was not found.	• Message during servicing.
No.801 Software for the Touch-Screen Calibration cannot be started.	• The calibration software did not start. • Shut off the device and contact NIDEK or your authorized distributor.
No.802 OPD-Scan lll license key cannot be found.	• Insert the USB license key into the USB port.

5.3 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.

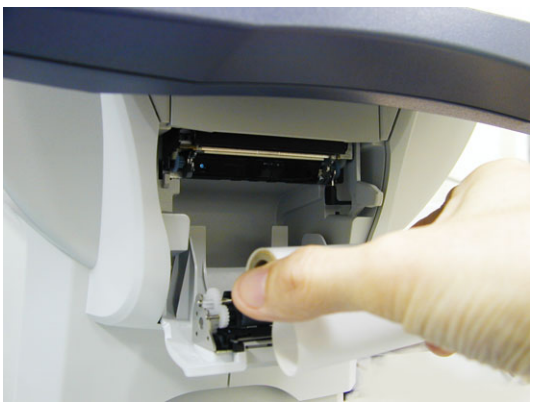
⚠ CAUTION • **Be sure to use only the printer paper (80620-00001) specified by NIDEK.**
Any paper other than the specified one may damage the printer head.

Note

- Do not run the printer when printer paper is not loaded.
  It may ruin the printer head.
- Do not pull the paper in the printer forcefully.
  This may cause malfunction of the printer.

1 Press the cover open button to open the printer cover.

2 Remove the used printer paper.



⚠ CAUTION • **When replacing printer paper, be sure not to touch the printer head on the upper part inside printer cover.**
The printer head is extremely hot immediately after printing. Injury may occur.

3 Set new printer paper.

Set paper as shown in the picture to the right.

Leave the end of paper out from the cover.

Note

- If the roll is set upside down, printing will not occur.
- Make sure that the 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 operate normally. In addition, when the error message is displayed, printing may not be performed.

5.4 Attaching a Stack of Chinrest Paper

Note

- The fixing pins for chinrest paper (two units) are packed together with the spherical model eye at shipment.

1 Pull out the two fixing pins from the chinrest.

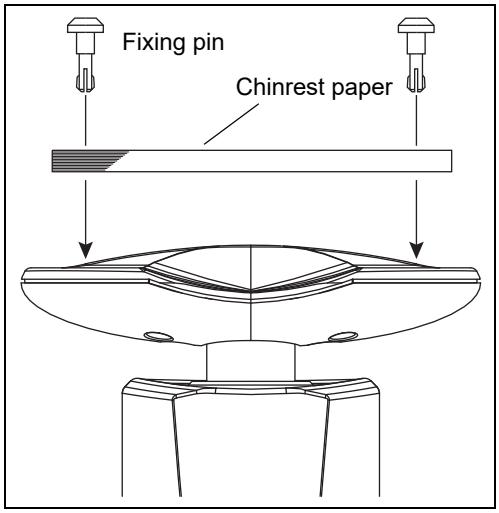
To attach the stack of chinrest paper at first, remove the fixing pins from the spherical model eye.

2 Take out the proper amount of chinrest papers from a whole stack.

It is impossible to fix a whole stack of chinrest paper at a time. Be sure to fix the stack with a thickness of 6 mm or less. Pay attention not to scatter the sheets of chinrest paper.

3 Insert the fixing pins into the holes in the paper

Insert the removed pins into both holes of the stack.



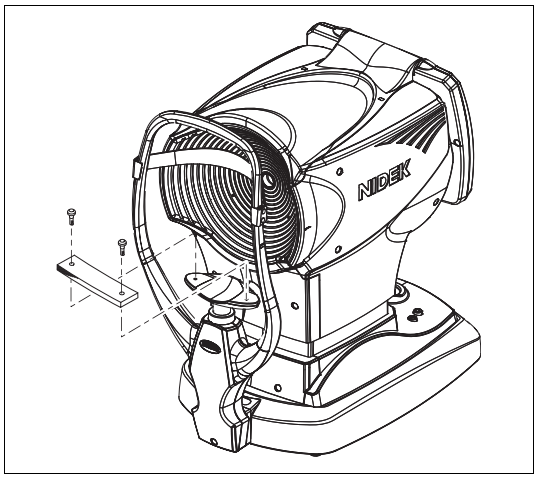
4 Fix the stack of chinrest paper onto the chinrest.

1) Insert a pin into a hole in the chinrest while holding both fixing pins and stack of paper.
2) Push the remaining pin into the other hole of the chinrest with the other hand.

5.5 Checking Measurement Accuracy

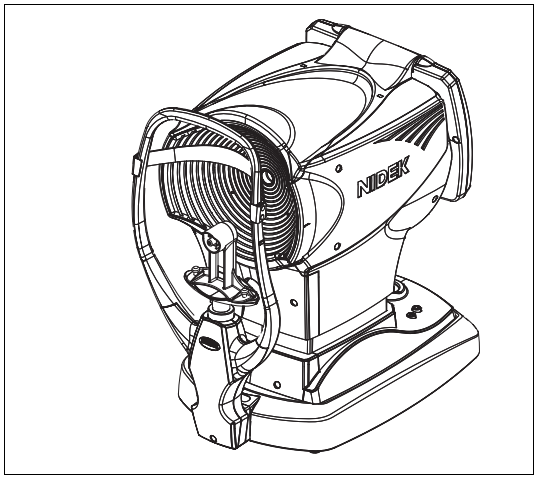
To check the accuracy of measured data, use the provided spherical model eye for AR/KM measurement.

1 Pull out the two fixing pins and remove the stack of chinrest paper from the chinrest.



2 Remove the cap from the spherical model eye and place the model eye on the chinrest with its lens toward the measuring window and then insert the fixing pins.

Check that the lens surface of the model eye is clean.



3 Align the level of the spherical model eye with the eye level marker with the chinrest up/down button ▼ or ▲.

4 Set “Display/Print Format - Step” on the Settings screen (Other tab) to “0.01”.

See “5.8 Changing Device Parameters” (page 323) for the setting method.

5 Perform OPD and CT measurements in the same manner as the normal OPD and CT measurements.

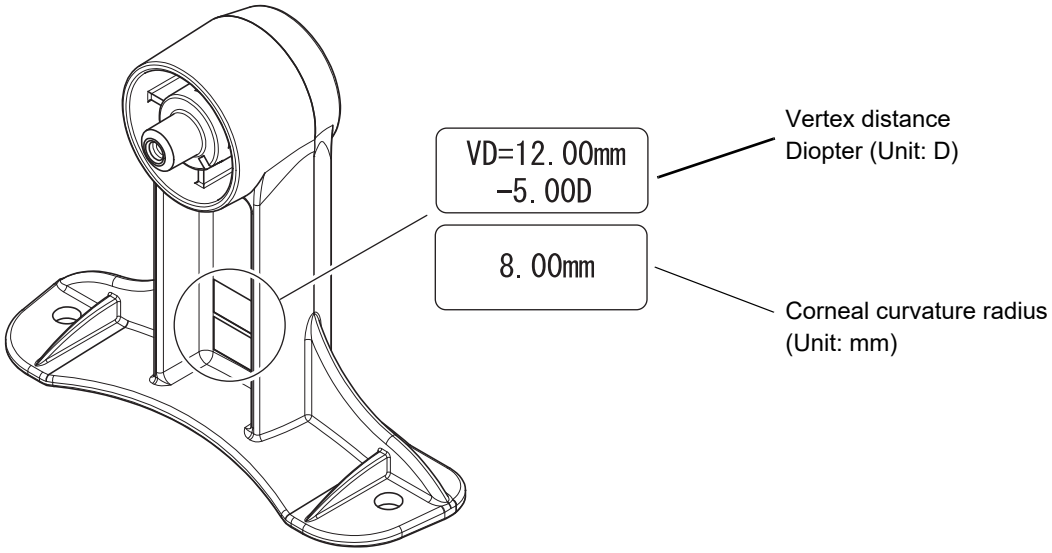
Note

- If there is a disparity between the measurement values and the values marked on the model eye, check that “0.01” is selected for the Display parameter and that the model eye is properly installed, then perform the measurement again.

  If the disparity is greater 0.25 D or greater in the AR measurement, and 0.03 mm or greater in the CT measurement, contact NIDEK or your authorized distributor.
- Always store the model eye with the cap on.

  If the lens surface is soiled or flawed, measurement accuracy cannot be properly checked.

○ Values marked on the labels of the spherical model eye



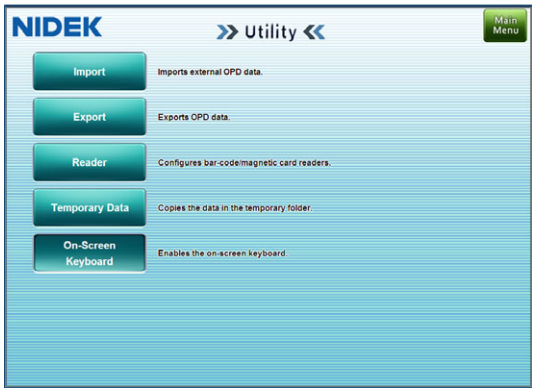
Note

- When the vertex distance is set to a value other than 12 mm, Set the VD value to “12.0” on the Setting screen (Others tab) before performing OPD/CT measurement.
- Do not touch the lens of the model eye with fingers. If the body oil smeared on the lens, clean it with a gauze dampened with a light amount of alcohol.

5.6 Utility Screen Operation

Select the desired menu from the Utility screen for importing/exporting the measured data, copying the temporary data, and setting optional connection.

Pressing the Utility button on the Main Menu screen displays the Utility screen.



Utility menu buttons	Maintenance description
Import	Imports the external OPD measurement data into the database.
Export	Exports the OPD measurement data in the database to the specified folder (or device).
Reader	Sets the parameters for the barcode or magnetic card reader.
Temporary Data	Copies the data temporarily saved in the temporary folder to the USB flash drive (or shared folder). (Available only with the OPD-Scan III)
On-Screen Keyboard	Toggles use of the on-screen keyboard. (Available only with the OPD-Scan III)

5

5.6.1 Importing/exporting measured data

The selected measurement data can be imported or exported to the specified folder. Importing or exporting data is performed in the specified file format.

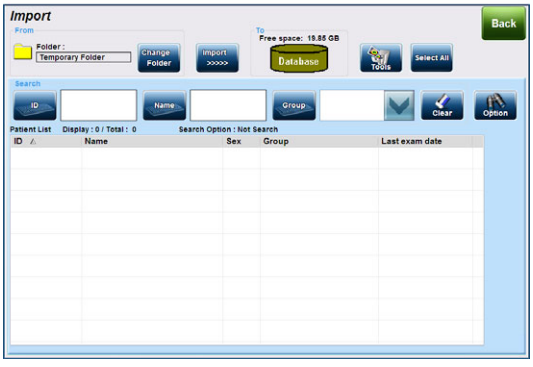
○ Import

The specified external data can be imported to the database.

1 Connect the device where the data to be imported is saved to the OPD-Scan III.

2 Press the Import button.

The Import window appears.

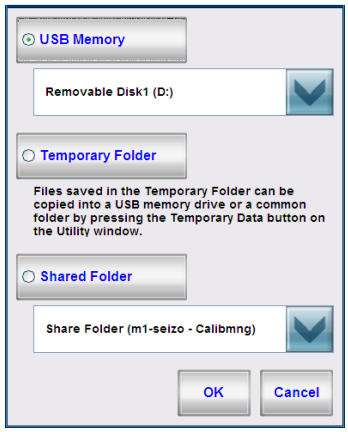


3 Specify the folder where the data to be imported is saved in “Folder:” in the From field.

Specify the desired folder in the Select Folder window that appears by pressing the Change Folder button.

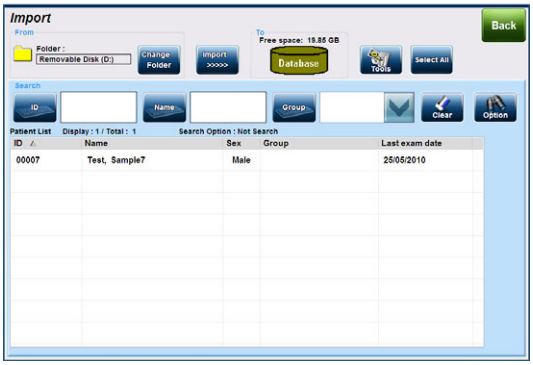
Select the desired folder from USB Memory, Temporary Folder, or Shared Folder. Multiple folders can be selected form the list that appears by pressing the V button.

In case of the OPD software for external PC, specify the desired folder in the Select Folder window.



4 Specify the destination of the data to be imported, and then press the OK button.

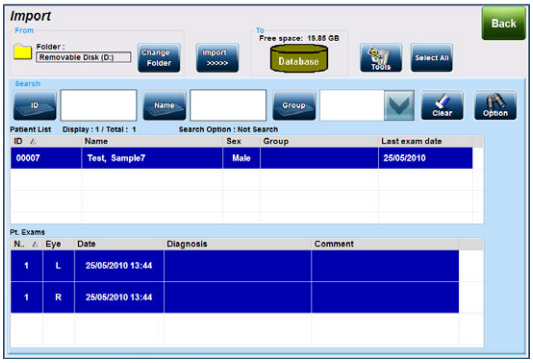
The Select Folder window is closed, and the data in the specified folder is displayed in the Patient List.



5 Select the patient data to be imported from the Patient List.

Easy search, optional search, and selecting/ deselecting all the data can be performed using the same operation as for the Patient List screen.

Selecting the data for a patient displays the exam list in the lower part of the window.



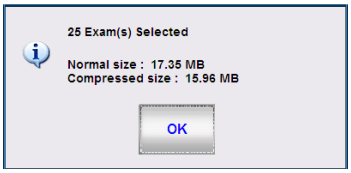
Note

- WIth the Shift and Ctrl keys, multiple patients or exams to be imported or exported can be selected.

Tools button operation

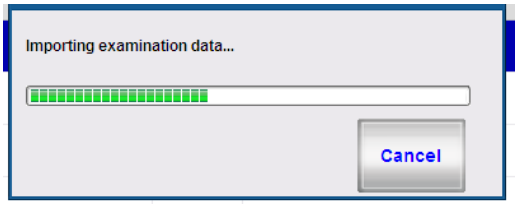
Select the desired function from Edit Patient info, Edit Exam info, and Calculate file size that appear by pressing the Tools button.

Edit Patient info	Displays the Edit Patient Information window to edit the patient information.
Edit Exam info	Displays the Edit Exam Information window to edit the exam information. Select the desired examination data to be edited.
Calculate file size	Calculates the size of the selected examination data.



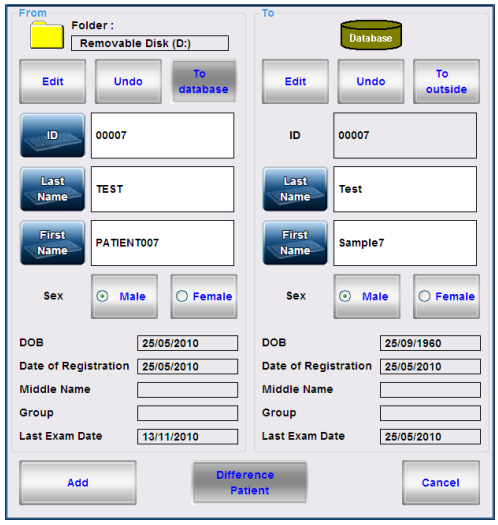
6 Press the Import button.

Data import starts.



If there is other data that has the same patient ID as the patient data to be imported, the Check Patient Information window appears.

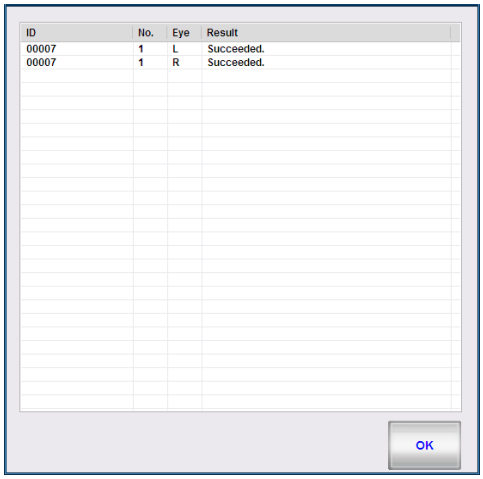
If no patient data is selected, the message, “Please first select a patient!” appears.



Edit	Displays the Edit Patient Information window. The items other than the ID, sex, first name, and last name cannot be edited.
Undo	Undoes the previous editing process.
To database	(This button is always inactive.)
To outside	Copies the patient information of the destination of import to the patient information to be imported.
Add	Imports the data to the same patient ID.
Difference Patient	Imports the data with the different patient ID. The button is active when the patient ID of the data to be imported is changed.
Cancel	Cancels import.

7 After the import is performed, the Import/Export Result window appears.

The imported data is displayed.



8 Press the OK button to close the Import/Export Result window.

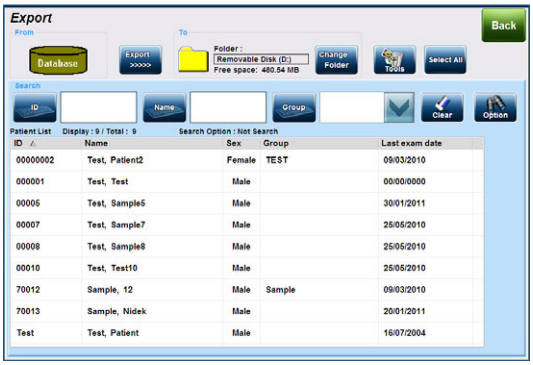
○ Export

The specified data in the database can be exported to the external folder.

1 Press the Export button.

The Export window appears.

The patient data saved in the database is displayed in the Patient List.



2 Specify the folder to save the exported data in the "Folder:" in the To field.

Specify the desired folder in the Select Folder window that appears by pressing the Change Folder button.

Select the desired folder from USB Memory, Temporary Folder, or Shared Folder. Multiple folders can be selected form the list that appears by pressing the V button.

In case of the OPD Software for External PC, specify the desired folder in the Select Folder window.

3 Specify the destination of the data to be exported, and then press the OK button.

The Select Folder window is closed.

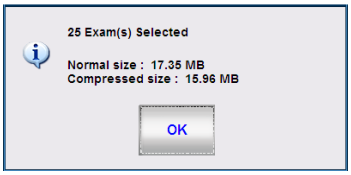
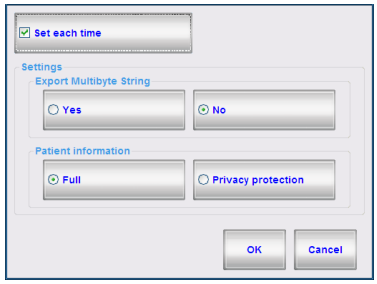
4 Select the patient data to be exported from the Patient List.

Easy search, optional search, and selecting/deselecting all the data can be performed using the same operation as for the Patient List screen.

Selecting the data for a patient displays the exam list in the lower part of the window.

Tools button operation

Select the desired function from Edit Patient info, Edit Exam info, Calculate file size, and Export Setting that appears by pressing the Tools button.

Edit Patient info	Displays the Edit Patient Information window to edit the patient information.
Edit Exam info	Displays the Edit Exam Information window to edit the exam information. Select the desired examination data to be edited.
Calculate file size	Calculates the size of the selected examination data. 
Export Settings	Displays the Export Settings window to set the data to be exported. Select "Yes" or "No" for "Export Multibyte Setting" and "Full" or "Privacy protection" for "Patient information". The Export Settings window is displayed automatically when of export. 

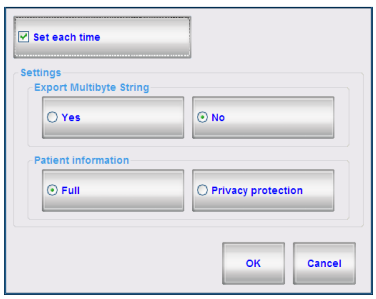
Note

- When the Export Settings window is displayed by pressing the Tools button, data is not exported even if the OK button is pressed.

5 Press the Export button.

The Export Settings window appears.

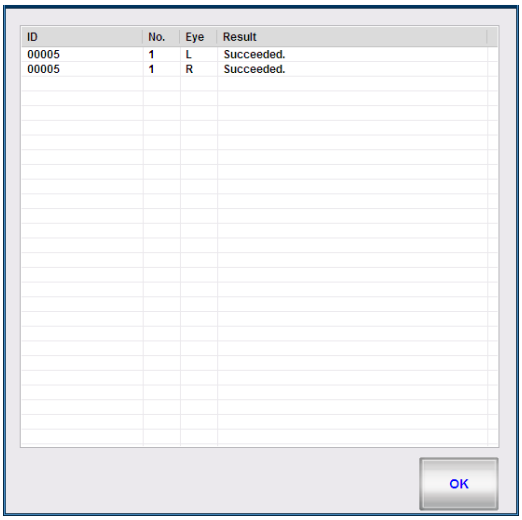
Select "Yes" or "No" for "Export Multibyte String" and "Full" or "Privacy protection" for "Patient Information".



6 Edit the export settings and press the OK button to execute data export.

The Import/Export Result window appears.

Press the OK button to close the Import/Export Result window.



5.6.2 Setting barcode reader and magnetic card reader

The barcode reader and magnetic card reader to be used for inputting the patient ID are set.

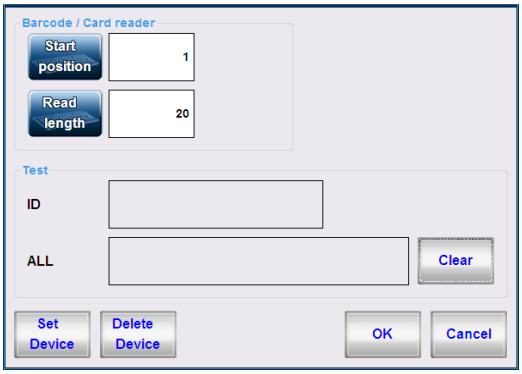
When the barcode reader or magnetic card reader is used, the following function becomes activated.

New patient registration	When reading a new patient ID on the Patient List screen, the Create Patient window is displayed.
Patient selection	When reading a patient ID that has been registered on the Patient List screen, the data is selected on the patient list. When the magnetic card is swiped through the reader, the patient information on the card is displayed on the Patient List screen.

1 Connect the barcode reader or magnetic card reader into the USB port.

2 Press the Reader button.

The Reader Setting window appears.



3 Press the Set Device button.

The “Please input data on barcode or card reader.” message is displayed on the screen.

4 Read the barcode with the barcode reader. Or read the card with the magnetic card reader.

The “Finish changed to input device.” message is displayed on the screen and the screen returns to the previous screen.

The device setting is complete.

5 Read the barcode with the barcode reader again. Or read the card with the magnetic card reader again.

The read data is displayed in the ID and ALL boxes in the Test field.

6 Specify the data number to be imported.

The number of characters set in “Read length” is read as an ID from the position set in “Start position”.

Start position	Specifies the reading start position of the ID.
Read length	Specifies the data length to be read as the ID. The data is read up to the set data length or return code.

Pressing the Clear button makes the ID and ALL boxes blank. After setting change, read the ID again and check that the correct ID is displayed in the ID box.

7 Press the OK button to close the Reader Setting window.

8 Display the Patient List screen and check that the correct ID is displayed in the ID box when the barcode reader or magnetic card reader reads the patient ID.

5.6.3 Copying temporary data (OPD-Scan III)

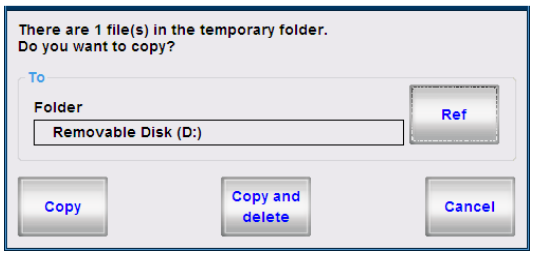
Files saved on the temporary folder of the device is copied to the USB flash drive (or shared folder). This function is not available on the external PC. (The button is not displayed.)

1 Connect the desired storage media such as USB flash drive with the device.

2 Press the Temporary Data button.

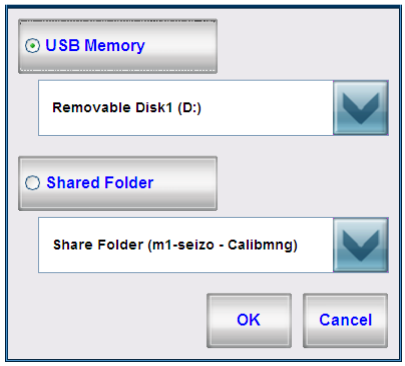
The Temporary Data window appears.

When the output device is not found, the “The Specified folder is invalid.” message is displayed instead of the Temporary Data window.



3 Confirm that the correct path is displayed in the Folder field.

To change the destination folder, press the Ref button to display the Select Folder window.



4 Press the Copy button or Copy and delete button to copy files.

The “Scan3TempData_YYYYMMDD_hhmmss” folder is created in the destination and all files in the temporary folder are copied.

Copy	Copies all files in the temporary folder.
Copy and delete	Copies and deletes all files in the temporary folder.
Cancel	Close the Temporary Data window without copying data.

5.6.4 Using on-screen keyboard (OPD-Scan III)

Whether the on-screen keyboard is used or not is set.When the keyboard is used normally, the setting that on-screen keyboard does not appear by pressing the input button is possible.
This function is not available on the external PC. (The button is not displayed.)

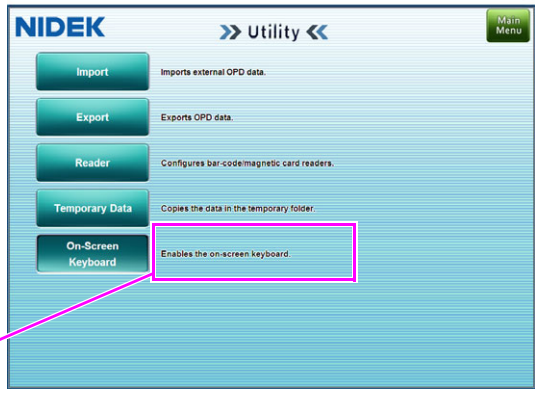
Note

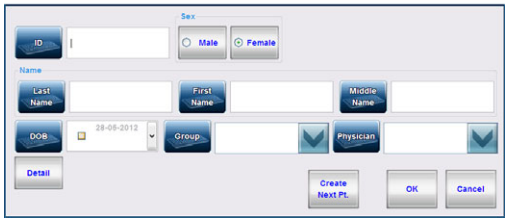
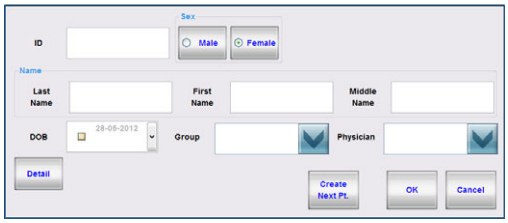
- When the on-screen keyboard is displayed on the screen, data input with the keyboard is impossible.The mouse is available regardless of the keyboard setting.

1 Press the On-Screen Keyboard button to toggle the setting.

The setting status is displayed to the right of the On-Screen Keyboard button and the screen indication does not change.

Check the setting status here.

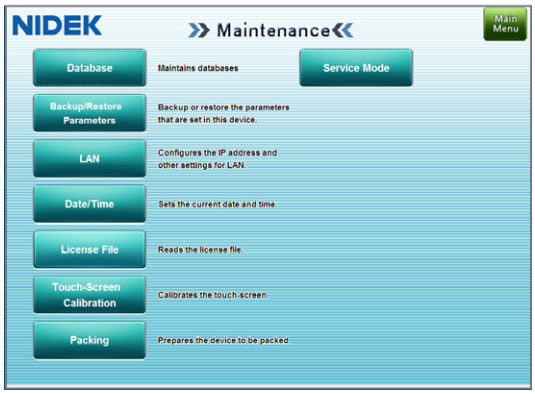


When the on-screen keyboard is used	"Enables the on-screen keyboard." The buttons to display the on-screen keyboard are displayed as blue buttons with a keyboard illustration. 
When the on-screen keyboard is not used	"Disables the on-screen keyboard." Only the names of the boxes are displayed instead of the buttons for displaying the screen. 

5.7 Maintenance Screen Operation

Select the desired maintenance from the menu on the Maintenance screen.

Pressing the Maintenance button on the Main Menu screen displays the Maintenance screen.



Maintenance menu buttons	Maintenance description
Database	Performs the database maintenance.
Backup/Restore Parameters	Backs up or restores the parameters that are set in this device.
LAN	Sets the parameters for LAN connection such as IP address.
Date/Time	Sets the current date and time.
License File	Reads the license file.
Touch-Screen Calibration (For OPD-Scan III device only)	Sets the parameters for the touch screen.
Packing (For OPD-Scan III device only)	Prepares the device to be packed.

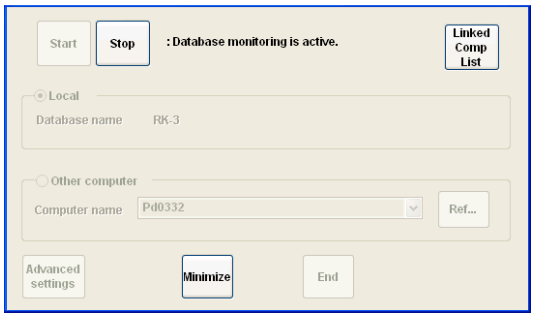
Note

- The Service Mode button cannot be used. If the Input Password window appears by pressing the button, press the Cancel button to close the window.
- Displaying of the Maintenance screen can be protected by password.
  For the setting details, see “5.8.10 Other tab” (page 351).
- For the OPD Software for External PC, “LAN setting” and “Date/Time setting” are in accordance with those of the Windows (OS).
  The IP address and account in the “LAN settings” are of Windows setting and cannot be changed.
  In the “Date/Time setting”, the Windows screen for setting the date and time is displayed.

5.7.1 Database maintenance

Specify the OPD database (device interior / external computer) and toggle the Database Manager between on and off. It is necessary to turn off the Database Manager before changing the database setting.

1 Press the Database button to display the OPD Database Manager screen.



2 Press the Stop button to turn off the Database Manager.

3 To change the database

1) Select the destination to save the database using the Local or Other computer radio button.

   Pressing Linked Comp List button displays the computers in the same network in a list.

2) Press the Start button to restart on the Database Manager.

3) Press the Minimize button to minimize the OPD Database Manager screen.

   The task button of the resident OPD Database Manager cannot be observed in the screen.

Note

- For details of OPD Database Manager, see “2.12.1 Printing measurement data (Internal printer)” (page 133)

5.7.2 Backup/Restoration of parameters

The parameters can be saved/restored as a backup file. This function may be used to restore previously saved parameters, or to use the same parameters for other devices (or the OPD Software for External PC).
The backup setting file is saved to the USB flash drive.

Note

- The backup file is not automatically generated. Perform backup for the parameters as necessary.
- When restoration of a backup file acquired from the device is performed using the OPD Software for External PC, or a backup file acquired from the OPD Software for External PC is restored to the device, the parameter settings for either database backup are not imported.

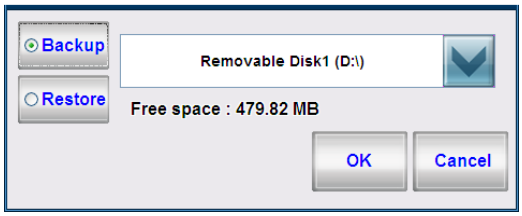
○ Saving setting file

1 Connect the USB flash drive to the USB connector.

2 Press the Backup/Restore Parameters button.

The Backup/Restore Parameters windowappears.

If the USB flash drive is not connected, the message, “A removable disk cannot be found. Insert a removable disk, and then try again.” appears.



3 Press the Backup button to select the backup.

4 Press the OK button to execute the backup.

The progress bar appears to display the progress status.

The Scan3Backup folder is generated in the USB flash drive to save the setting files.

If there is not enough free space in the USB flash drive, the message, “There is not enough disk space on this disk. Insert a different removable disk and then try again.” appears.

5 When the message, “Backup completed successfully.” appears, press the OK button.

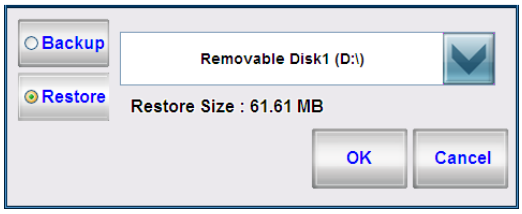
6 Remove the USB flash drive.

○ Restoring setting file

1 Connect the USB flash drive where the setting file is saved to the USB connector.

2 Press the Backup/Restore Parameters button.

The Backup/Restore Parameters window appears.



3 Press the Restore button to select the restore.

If there are no setting files, the message, “Restore files cannot be found.” appears. Check the file saved to the USB flash drive.

4 Press the OK button to execute the restoration.

The progress bar appears to display the progress status.

The setting file is read into the device.

5 Remove the USB flash drive.

6 The device automatically restarts.

5.7.3 LAN setting

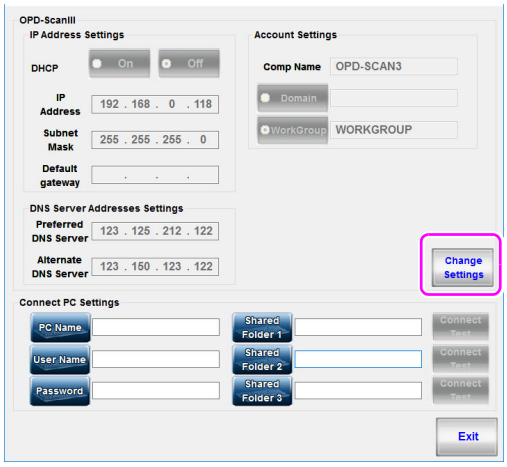
When connecting the device to the external computer using LAN connection, set the IP address, subnet mask, and account.
If the OPD-Scan III and external computer belong to the different domain or workgroup in the network, set the account so that access between each other become possible.
Set the shared folder so that it is accessed from both the OPD-Scan III and external computer.
*Connection to the internal LAN and external network is not covered under warranty by NIDEK.

Note

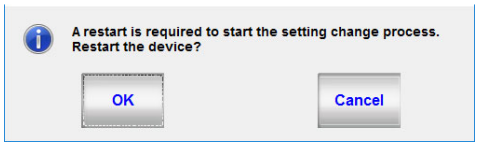
- For the detailed LAN setting, contact the network administrator of the facility.
- Check the computer name, login user name, login password and share the desired folders on the PC to be connected in advance.

1 Press the LAN button to display the LAN Settings window.

In this stage, only fields in “Connect PC Settings” can be entered.

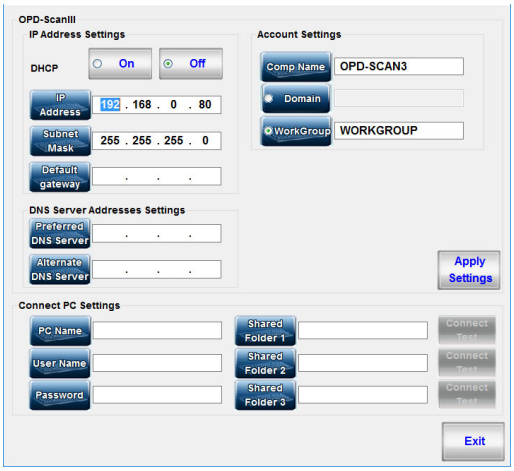


2 To enable setting, press the Change Settings button. When the message as shown to the right is displayed, press the OK button.



The device automatically restarts and the LAN Settings window is displayed again.

All setting fields become enabled.



3 Perform the necessary settings for the device and the computer to be connected.

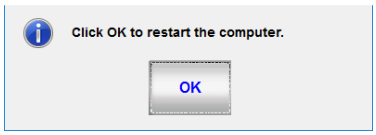
IP Address Settings	DHCP	Sets whether to use the DHCP by selecting “On” or “Off”. Select “On” when connecting to a computer with the DHCP server function. When “On” is selected, the IP Address, Subnet Mask, Default gateway, Preferred DNS Server, and Alternate DNS Server entry fields cannot be entered.
	IP Address	Used to enter the IP address. Change the default “192.168.0.80” as necessary. Do not use “172.30.30.30” and “172.30.30.31” because they have been already used in the device internal communication.
	Subnet Mask	Used to enter the subnet mask. Change the default “255.255.255.0” as necessary.
	Default gateway	Used to enter the default gateway. This setting is unnecessary when outputting data within the network to which the device belongs. This field is blank by default.
Account Settings	Comp Name	Used to enter the computer name of the device. Change the default “OPD-Scan3” as necessary.
	Domain	Used to enter the domain name of the destination network.
	WorkGroup	Used to enter the workgroup name of the destination network. Change the default “WORKGROUP” as necessary.
DNS Server Addresses Settings	Preferred DNS Server	Used to enter the IP address of the preferred DNS (Domain Name System) server. This field is blank by default.
	Alternate DNS Server	Used to enter the IP address of an additional DNS server as the alternative server, in case of the preferred DNS server cannot be used. This field is blank by default.
Connect PC Settings	PC Name	Used to enter the name of the destination computer.
	User Name	Used to enter the user name of the destination computer.
	Password	Used to enter the login password for the user name of the destination computer.
	Shared Folder 1	Used to enter the shared folder name of the destination computer.
	Shared Folder 2	Used to enter the shared folder name of the destination computer.
	Shared Folder 3	Used to enter the shared folder name of the destination computer.

4 After changing the settings, press the Apply Settings button. When the message as shown to the right is displayed, press the OK button.

5 Press the Connect Test button to the right of the shared folders (Shared Folder 1 to 3) to test the connection.

Performing connection test saves the settings of the shared folders.

6 When the LAN setting is complete, press the Exit button. When the message as shown to the right is displayed, press the OK button.



The device automatically restarts and the title screen is displayed.

If an error occurs, check the setting.

Error message	Cause and remedy
No. 500 The error occurred by LAN connection confirmation.	• Connection to the destination PC failed. Check the LAN setting or interface cable connection. In addition, confirm that the parameters related to communication are set properly.
No. 501 The error occurred by LAN connection confirmation.	• Connection to the destination PC is unavailable with the setting contents. Confirm that the parameters related to communication are set properly.
No. 502 The error occurred by LAN connection confirmation.	• An error such as LAN communication error occurred. Check the interface cable connection.
No. 503 The file output to the shared folder cannot be done.	• The destination user account is invalid.

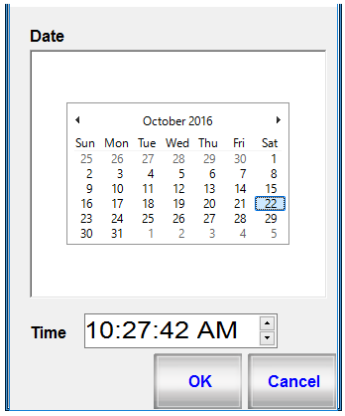
5

5.7.4 Setting date and time

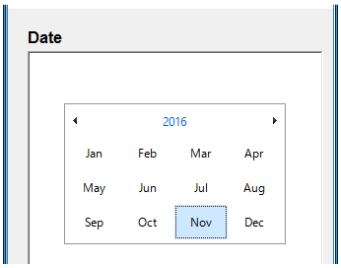
The date and time displayed on the screen and printing can be set.

1 Press the Date/Time button to display the Date and Time Settings window.

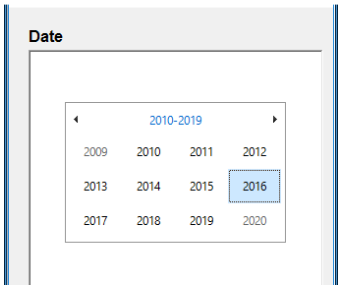
2 Set the date and time by operating the buttons on the Date and Time Settings window.



Select the desired month from the list that appears by pressing the month and year indication. Pressing the (◀) or (▶) buttons displays the previous or following year.



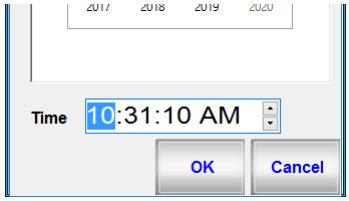
Select the desired year from the list that appears by pressing the year indication while the months are displayed. Pressing the (◀) or (▶) buttons displays the previous or following 12 years.



Select the day by pressing the desired one in the calendar.

Hour, minute, second, or PM/AM is changed using the (▲) and (▼) buttons while the item to be changed is selected in the Time box.

If the hardware keyboard is used, the time can be entered directly.



3 Press the OK button to close the Date and Time Settings window.

The clock is updated to the set time.

Note

- The device is equipped with a rechargeable lithium battery to maintain clock. (The lithium battery is not user-replaceable.)

5.7.5 Reading license file

The optional licenses of software such as the Advance mode and IOL-Station are read. Reading the licenses enables the OPD-Scan III to activate the software.

Note

- Pressing the Advance or IOL-Station button on the Exam List screen to activate the Advance mode or the IOL-Station software.

1 Connect the USB flash drive where the license file is saved to the USB connector.

For OPD Software for External PC, insert the USB license key to the USB port.

2 Press the License File button.

The Reads the license file window appears.

3 Select the USB flash drive where the license file is saved and press the OK button.

4 When the message, “Completed successfully.” appears, the procedure is complete.

5.7.6 Touch screen calibration

If the response to the position touched on the screen does not aligns with the position of the button displayed on the screen when operating the touch screen, perform calibration for the touch screen.

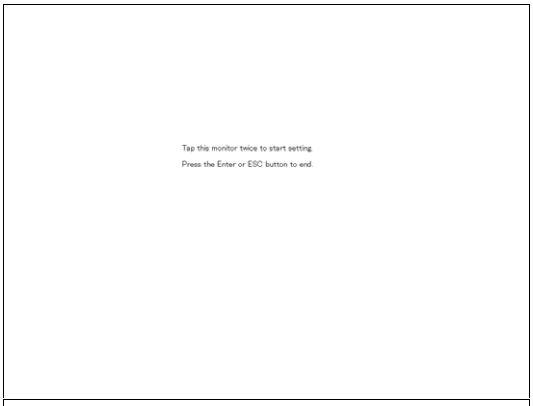
1 Prepare the provided touch pen.

2 Press the Maintenance button on the Main Menu screen to display the Maintenance screen.

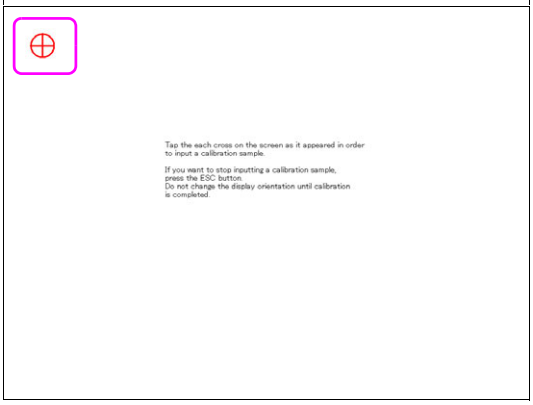
3 Press the Touch-Screen Calibration button to start the calibration.

4 The screen is switched, and the message as shown to the right is displayed in the center of the screen. Press the screen twice.

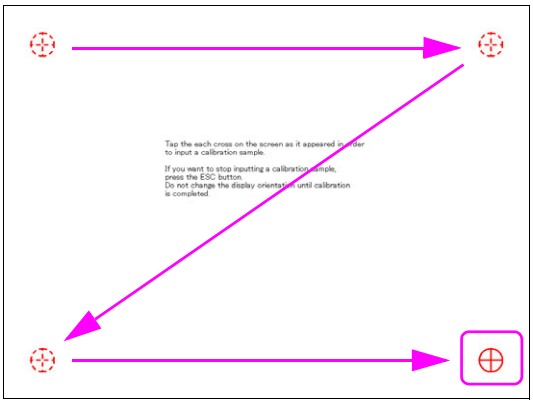
To cancel the calibration, press the Enter or Esc key on the keyboard.



5 The message as shown to the right is displayed in the center of the screen while a cross mark ⊕ is displayed in the upper left corner of the screen. Press the center of the cross mark ⊕ using the touch pen.



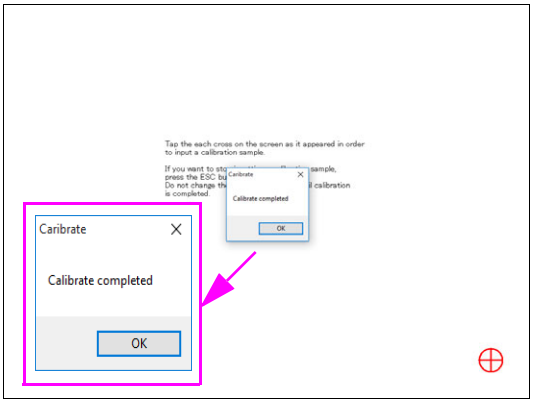
6 The cross mark ⊕ is now displayed in the upper right corner. Press the center of the cross mark using the touch pen.



7 In the same manner, press the center of the cross mark ⊕ using the touch pen as it is displayed in the center, lower left, and lower right of the screen.

Pressing the center of the cross mark ⊕ in the lower right corner of the screen completes the calibration.

The message as shown to the right is displayed. Pressing the OK button returns to the Maintenance screen.



5.7.7 Packing mode

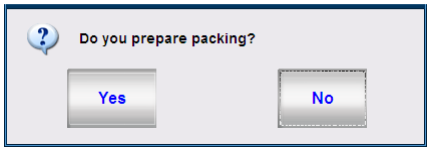
When packing the device to transport, set the internal mechanism to the position suitable for transport.

⚠ **CAUTION** • **When transporting, set the mode to Packing mode and pack the main body in the original packing material with the fixing lever unlocked.**

It may result in failure when excessive vibration and shock are applied.

1 Press the Packing button on the Maintenance screen.

The message, “Do you prepare packing? Yes/ No” appears.



2 Press the Yes button to move to Packing mode.

The device is automatically set to Packing mode, and the main body and chinrest move to the lowest position.

The device is turned off, and the power switch is automatically flipped to the Off side.

Note • To return from Packing mode, flip the power switch to the On side in the same manner as the usual start-up.

5.8 Changing Device Parameters

5.8.1 Changing settings

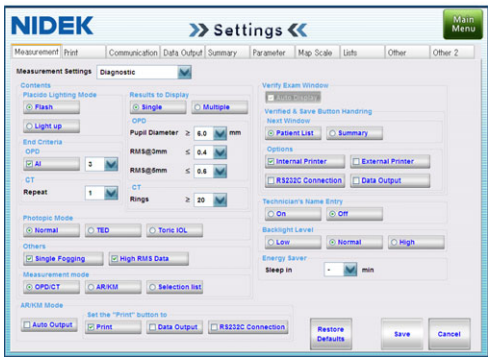
The OPD-Scan III is equipped with the function to change the device parameters in accordance with the needs of the operator. Follow the procedure below to check and change the parameters.

Note

- Displaying of the Settings screen can be protected by password.
  For the setting details, see "5.8.10 Other tab" (page 351).

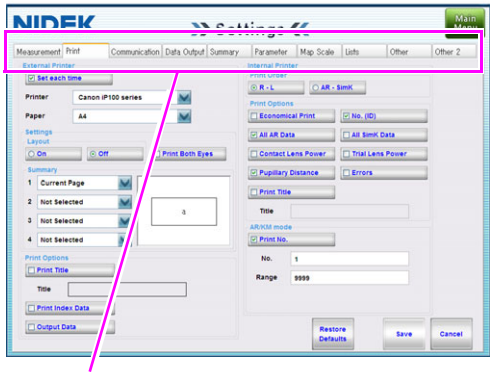
1 Press the Settings button in the Main Menu screen to display the Settings screen.

The selected item is displayed in the check box, radio button, or selection box.



2 Press the tab of the item to be changed.

For the detail of the parameters, see "5.8.2 Measurement tab" (page 325) to "5.8.10 Other tab" (page 351).



Press the desired tab.

Tab	Settings
Measurement	Measurement condition such as measurement mode and the number of measurements
Print	Printing contents of the internal and external printers
Communication	Communication setting for RS-232C communication
Data Output	Settings for the destination to save the output data, file name, and image format
Summary	Settings for the layout and summary to be used when multiple maps are displayed on the screen
Parameter	Round-off condition of the result value and analysis condition
Map Scale	Settings for the color scale when the map is displayed

List	Editing the selected items related to the patient information, measurement data, and common information
Other	Settings for data format, name, measured eye, and date
Other 2	Settings for display of patient's birth date

3 Set the parameter to be changed.

Set the parameter by selecting the desired item from the check box, ratio button, or drop-down list of the selection box, or inputting the desired contents in the text box.

For details of the settings, see "5.8.2 Measurement tab" (page 325) to "5.8.10 Other tab" (page 351).

Note

- For the explanation about the parameters, the condition that the check box is checked is "ON" and the unchecked condition is "OFF".
- The underlined setting are the defaults.

4 After parameter change, press the Save button to save the setting.

The changed setting is saved.

Trying to change the tab or press the Main Menu button while the setting change is not saved displays the "Would you like to save the changes? Yes/No/Cancel" message.

Yes button	Saves the setting and changes the screen.
No button	Changes the screen without saving the setting.
Cancel button	Closes the message window without closing the setting.

5 Press the Main Menu button to return to the Main Menu screen.

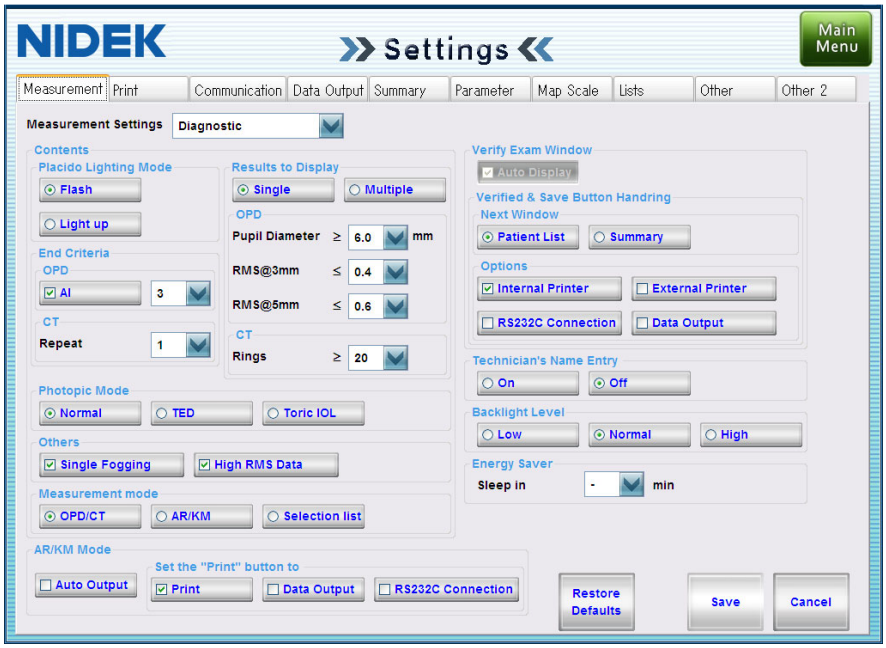
Note

- When the device is turned off, the setting change is remaining.

○ Other button operation on the Settings screen

Restore Defaults button	Resets the parameters on the current tab to the defaults.
Save button	Saves the settings to be displayed on the screen.
Cancel button	Restores the parameter setting to that when the screen is displayed.
Main Menu button	Changes to the Main Menu screen. When any parameter is not saved, the confirmation message is displayed.

5.8.2 Measurement tab



Measurement Settings: Diagnostic, Refractive, Cataract, Custom

A combination of measurement conditions is registered for each Diagnostic, Refractive, or Cataract. When one of the three settings is selected, the measurement conditions are set according to the purpose.

When the registered measurement condition is changed, “Custom” is displayed. The measurement conditions of “Diagnostic”, “Refractive”, and “Cataract” cannot be changed.

Diagnostic	Performs measurement effective for general eye diagnosis.
Refractive	Performs measurement effective for planning the refractive surgery.
Cataract	Performs measurement effective for selecting an IOL in the cataract surgery.
Custom	Indicates the measurement conditions set by the user. When the conditions are changed from the default of each “Diagnostic”, “Refractive”, and “Cataract”, the setting is changed to “Custom” automatically.

The following is the difference among the settings.

Settings	Diagnostic	Refractive	Cataract
Placido Lighting Mode	Flash	Light up	Flash
Photopic Mode	Normal	TED	Toric IOL
Results to Display	Single	Multiple	Single
Option - RS232C Connection	OFF	OFF	OFF
End Criteria - CT	1	3	1

Contents

Placido Lighting Mode: Flash, Light up

Sets the timing when the placido rings light up on the measurement screen.

Flash	The placido rings light up during measurement.
Light up	The placido rings light up continuously after mode change.

End Criteria - OPD: AI, Repeat

OPD Sets the number of times of OPD measurement until it is completed automatically.

AI	When the measurements are performed over the specified times and the data is stable without variation, the measurement finishes automatically. If the obtained data contains the unstable one, the measurement is performed additionally and finishes when the data becomes stable.
Repeat	Performs the specified number of times of measurement. The number of times can be specified from one to ten. (The default is three times.)

End Criteria - CT Repeat: 1 to 10 (The default is 1.)

Sets the number of times of CT measurement until it is completed automatically.

Results to Display: Single, Multiple

Selects the screen for checking measurement results.

Single	Displays the best data selected by the device on the Verify Examination Quality screen. When the measurement for an eye is complete, the Verify Examination Quality screen is displayed.
Multiple	Displays all data on the Verify Multi Measurement screen. When the measurements for both eyes are complete, the Verify Multi Measurement screen is displayed.

OPD - Pupil Diameter: ø3.0 to 9.0mm or more (The default is 6.0 mm or more.)

When the measured pupil diameter in OPD measurement is smaller than the setting, the diameter value is displayed in red on the Verify Examination Quality screen.

OPD - RMS@3mm: 0.2 to 1.5 or less (The default is 0.4 or less.)

When the analysis value of RMS@3mm in OPD measurement is larger than the setting, the value for Multi on the Verify screen is displayed in red.

OPD - RMS@5mm: 0.2 to 1.5 or less (The default is 0.6 or less.)

When the analysis value of RMS@ 5 mm in OPD measurement is larger than the setting, the value for Multi on the Verify screen is displayed in red.

CT - Rings: 1 to 39 rings or more (The default is 20 rings or more.)

When the number of detected placido rings in CT measurement is smaller than the setting, the number of detected rings is displayed in red on the Verify screen.

Photopic Mode: Normal, TED, Toric IOL

Sets the illumination method for the anterior eye capture.

Normal	The four LED lamps within the placido rings light up.
TED	The two LED lamps within the placido rings light up.
Toric IOL	The six LED lamps within the placido rings light up.

Single Fogging (Factory setting: ON)

Sets whether fogging is applied each time of OPD measurement or fogging is kept on from the second time during repeated measurements.

When the measurement time with the OFF setting is longer than that with the ON setting.

High RMS Data (Factory setting: ON)

Sets the data display method when the RMS value of AR measurement is 1.0 or higher.

ON	The S, C, and A values are displayed in orange and “E” is displayed next to the “A” indication on the measurement screen.
OFF	“Low conf.” is displayed in red.

Measurement Mode: OPD/CT, AR/KM, Selection list

Set the measurement mode to be activated by pressing the Measurement button.

OPD/CT	OPD/CT mode starts. Patient list (before measurement) of OPD/CT mode is displayed.
AR/KM	AR/KM mode starts. Measurement screen of AR/KM mode is displayed.
Selection list	Measurement mode selection list is displayed. Either OPD/CT mode or AR/KM mode may be selected to start measurement.

AR/KM Mode

Auto Output (Factory setting: OFF)

Sets whether or not to automatically output data after finishing the measurement.

Set the “Print” button to

Sets the format in which data is output when the Print button is pressed. With the default setting, “Print” is enabled, and others are disabled. (Multiple selection is possible.)

Print	The measurement value is printed with the internal printer. For the setting of the printed parameters, see “5.8.3 Print tab” (page 330).
Data Output	The AR and KM values are output as an XML file using a LAN. The XML file format differs depending on the “Output Settings for NAVIS” setting in the Data Output tab.

Format of the XML file in accordance with the “Output Settings for NAVIS” setting

ON	Outputs an XML file with the NIDEK’s original data specifications that support NAVIS.
OFF	Outputs XML files that comply with the format defined in the opthalmic device standard specifications on the web site of the Japan Ophthalmic Instruments Association (JOIA). For details, see “7.4 JOIA Output Data Format” (page 374).

RS232C Connection	RS232C output to the connected RT is executed.

Note

- For the “Set the “Print” button to” setting, at least one item needs to be selected. If no item is selected, the message “Please select at least one button in “Set the ‘Print’ to”.” appears.
- When the RT is connected with the “RS232C Connection” setting enabled and the Print setting disabled, pressing the Print button in the measurement screen displays the RT No. in the screen.

  This No. is used to read data with the RT.

Verify Exam Window

Auto Display (Factory setting: ON)

Sets whether the measurement screen is automatically changed to the Verify Examination Quality screen after measurement.

Verified&Save Button Handling

Next Window: Patient List, Summary

Sets the screen to be displayed after measurement is complete.

Patient List	The Verify Examination Quality screen (or Verify Multi Measurement screen) is changed to the Patient list screen. This is effective for measuring multiple patients subsequently.
Summary	The Verify Examination Quality screen (or Verify Multi Measurement screen) is changed to the summary screen. This is effective for checking the results after measurement.

Options

Selects the automatic process after measurement.

Internal Printer	Sets whether the measurement results are printed out with the internal printer. (The default is “ON”.)
External Printer	Sets whether the measurement results are printed out with the external printer. (The default is “OFF”.)
RS232C Connection	Sets whether the measurement data (AR, KM, PD values) are export to the device connected to the RS232C port. (The default is “OFF”.)
Data Output	Sets whether map data is exported or not. (The default is “OFF”.)

Note

- To select “Send HD Exam Date” and “Send 30sec Refraction” of “OPD/CT Mode” under the Communication tab, set the RS232C Connection setting to “ON”.
- To output an XML file of the AR and KM values, select “Data Output” of “AR/KM Mode” as well.

Technician's Name Entry: On, Off

Sets whether the Select Technician window is displayed when the Measurement button is pressed. Check the box when the examination data includes the operator’s information because the device is shared by multiple users.

The operator’s information is saved to the exam information for each data.

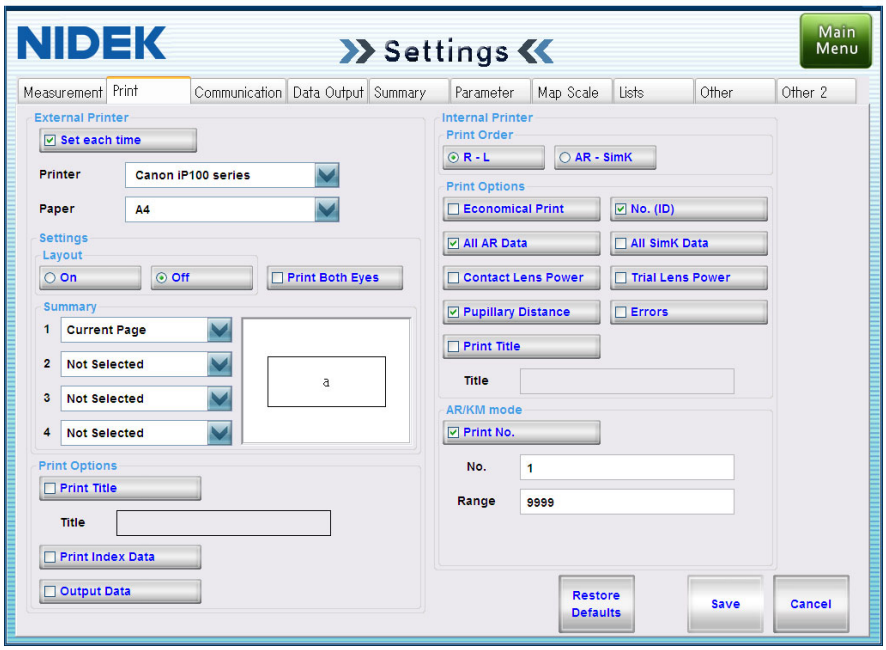
Backlight Level: Low, Normal, High

Sets the backlight brightness of the touch screen. Select from “Low”, “Normal”, and “High”.

Energy Saver: -, 5, 10. 15 (min)

Sets the time until the device enters into power saving mode when the idle status continues. When “-” is selected, the power saving mode is not taken effect.

5.8.3 Print tab



External Printer

Set each time (Factory setting: ON)

Sets whether the Printer Settings screen is displayed when the Print button on the map is pressed. To change the print conditions when of printing, select “ON”.

Printer: Current printer driver name

Select the printer to be normally used.

Paper: Current printer form

Select the print paper size.

The list of the printer paper forms supported by the printer driver set in the Printer parameter is displayed.

Layout: On, Off

This is the setting of the summary print layout. When “On” is selected, the two summaries are printed out on the one page.

Print Both Eyes (Factory setting: OFF)

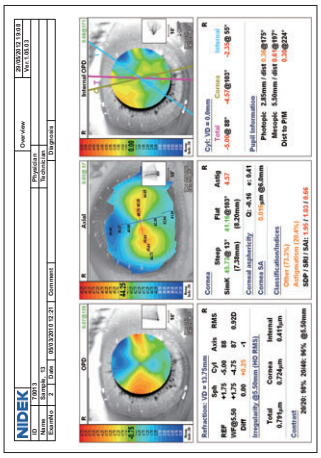
Sets whether the both-eye data is printed out automatically in the summary print. When the single-eye summary is printed out, the other eye side data is printed out automatically with the On setting. With the OFF setting, only the eye data to be displayed (right eye or left eye) is printed out.

Summary

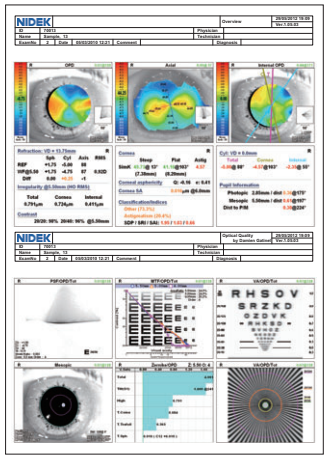
When multiple summaries are printed out at the one time, specify the desired summaries in the Summary 1 to 4 fields. The summary 1 is set to “Current Page” normally. On the summary screen, the displayed summary is printed out. With the setting that the summary printout is after measurement, the Default setting summary is printed out.

The summary indicated by “Not Selected” is not printed out.

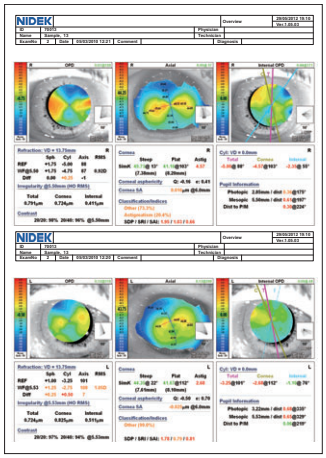
When the set summary does not exist (all fields are “Not Selected”.), the “Select a summary.” message is displayed by pressing the Print button and the summary cannot be printed out. The OK button to start printing becomes unavailable on the Printer Settings screen.



Layout (2-up print:) Off



Layout (2-up print): On
Print Both Eyes: Off



Layout (2-up print:) On
Both-eye print: On

Print Options

The checked function becomes active. The defaults of all items are “OFF”.

Print Title	Sets whether the desired text is printed out as a title when printing the summary on an external printer. When “Print Title” is checked, the desired title can be entered. Enter the title wit the on-screen keyboard displayed by pressing the Title button in the entry filed. If a keyboard is used, the title can be directly input in the entry field.
Print Index Data	Sets whether the various measurement and analysis data are printer out below the summary to be printed.
Output Data	Sets whether the data is output at the same time of printing. The contents of the data to be output is set with the Data Output tab.

Internal Printer

Print Order: R-L, AR-SimK

This is the print order setting of the measurement data.

R-L	The data is printed out in the order of right eye (AR/KM measurement value), left eye (AR/KM measurement value).
AR-SimK	The data is printed out in the order of AR measurement value (right/left), KM measurement value (right/left).

Print Options

The checked function becomes active. As a default, “No. (ID)”, “All AR Data”, “Pupillary Distance” are ON, the other items are OFF.

Economical Print	Lessens the space between lines of printout. This is saving in printer paper.
No. (ID)	Toggle printing of the ID number.
All AR Data	The AR typical value and all measured AR values are printed out. When the box is not checked, only the AR typical values (or the latest AR values if there is no AR typical values) are printed.
All SimK Data	The SimK typical value and all measured SimK data are printed out. When the box is not checked, only the SimK typical value (or the latest SimK value if there is no Simk value) is printed.
Contact Lens Power	The value converting the vertex distance (VD) to 0 mm against the AR typical value (or the latest value if there is no typical value) and its SE value are printed out.
Trial Lens Power	Based on the AR typical value (or the latest value if there is no typical value), the value of the CYL value that is automatically converted so that the trial lens sphere value becomes smaller is printed out.
Pupillary Distance	Toggle printing of the measured PD. The PD (pupillary distance) is measured automatically when measuring the both eyes in OPD and CT measurements.
Errors	Sets whether an error occurred during OPD or CT measurement is printed out when the All AR Data or All SimK Data box is checked.
Print Title	Sets whether the desired text is printed out as a title when printing the data on an internal printer. When the Print Title box is checked, the 24 characters are entered at maximum. Enter the title with the on-screen keyboard displayed by pressing the Title button in the entry filed. If a keyboard is used, the title can be directly input in the entry field.
Print No. (AR/KM mode)	Sets whether the print No. is printed out as an identification number when printing the measurement data in AR/KM mode. An automatically incremented print No. is printed on the measurement data for each print in the range from “0001” to the number input in the Range field. When the print No. reaches the number input in the Range field, the print No. returns to “0001”. To change the current print No., input the desired number in the No. field. Print numbers can be input in the No. and Range fields with the on-screen keyboard displayed by pressing the Title button in the entry field. They can be also directly input in the entry field with a hardware keyboard.

AR/KM Mode

Print No.

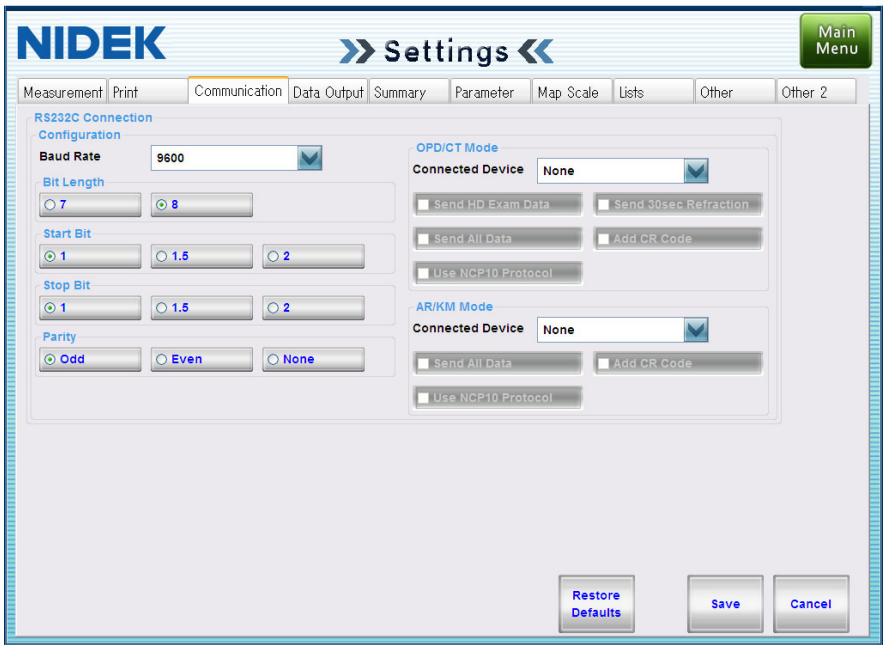
Sets whether the Print No. is printed as an identification number when the measurement results are printed in AR/KM mode. (The default setting is OFF.)

When this setting is enabled, a number is printed in the range between 0001 and the number set in the Range box. Each time printing is executed, the number increases in increments of one. When the number specified in the Range box is reached, the numbering starts from 0001.

To change the current print No., change the setting of the No. box.

Input the number in the No. and Range boxes using the on-screen keyboard that appears by pressing the No. and Range buttons, or a hardware keyboard.

5.8.4 Communication tab



RS232C Connection

Configuration

Baud Rate	Set the baud rate (bit transmission speed) for communication. Select from 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. The default is “9600”.
Bit Length	Set the bit number for a single character used in communication. Select from 7 and 8. The default is “8”.
Start Bit	Set the starting bit in communication. 1 Select from 1, 1.5 and 2. The default is “1”.
Stop Bit	Set the stopping bit in communication. 1 Select from 1, 1.5, and 2. The default is “1”.
Parity	Set the parity check in communication. Select from Odd, Even, and None. The default is “Odd”.

OPD/CT Mode

Connected Device

Select from None, Previous RT Series, RT-5100 Support, Eye Care Card, and Computer. The available options varies depending one the connected device.

	Send HD Exam Data	Send 30sec Refraction	Send All Data	Add CR Code	Use NCP10 Protocol	Use NIDEK2 Protocol
None	Not available	Not available	Not available	Not available	Not available	Not available
Previous RT Series	Not available/ Available	Available	Available	Available	Not available	Available
RT-5100 Support*3	Available*1	Available	Available	Available	Not available	Available

Eye Care Card	Available *1 *2	Available	Available	Available	Not available	Not available
Computer	Not available	Not available	Available	Available	Available (Fixed)	Not available

*1: The CB version is Ver. 1.18 or 1.09 Lite or later.

*2: The EyeCa-RW2 version is Ver. 1.01 or later.

*3: The RT-5100, RT-3100, and MEM-200 (RT-6100) are supported.

These settings are for transferring data to the refractor such as the RT-5100. The checked function become active. The defaults of all items are “OFF”.

Send HD Exam Data	Check this box to compare the night and day measurement data sets and choose one to transmit to other systems such as the RT-5100. When this box is not checked, only the day measurement data is transmitted. The day measurement data indicates the AR measurement data (typical value) or the SPH, CYL, and AXIS (ZS, ZC, and ZA) values obtained by Zernike polynomials within the 4 mm-diameter analysis area (depending on the setting of “Send 30sec Refraction”). The night measurement data indicates the SPH, CYL, and AXIS (ZS, ZC, and ZA) values obtained by Zernike polynomials within the pupil in mesopic vision (maximum 6 mm in diameter). This setting is disabled when “Use NCP10 Protocol” is checked.
Send 30sec Refraction	Check this box to transmit more appropriate data for subjective optometry between ZS, ZC and ZA data (SPH, CYL and AXIS data obtained by Zernike polynomials within the set Zernike analysis area) and AR-measured data. When this box is not checked, the AR-measured data is transmitted. When the Zernike analysis area diameter is less than 4.0 mm, the AR measurement value is always transferred. The ZS, ZC and ZA data is calculated from the average map data and AR-measured data to be transmitted is the typical value. Whether the ZS, ZC, and ZA data or AR-measured data was transmitted is indicated in the Printout of a internal printer. See “2.12.1 Printing measurement data (Internal printer)” (page 133).
Send All Data	Set the method to transmit the measurement values via communication channels. If this parameter is checked, all the measurement data sets are transmitted. If the parameter is not checked, only the typical values (or latest values if there is no typical value) is transmitted.
Add CR Code	Toggle putting the CR code at the end of the data to be transmitted.
Use NCP10 Protocol	Use the NCP10 communication protocol to output data to devices that support NCP10 protocol. This item is displayed and automatically activated (cannot be canceled) when “Connected Device” is computer.
Use NIDEK2 Protocol	The NIDEK2 communication protocol is displayed when “Connected Device” is not computer. It can be selected when “Connected Device” is either “Previous RT Series” or “RT5100 Support”. In a communication environment where a time-out occurs without checking this protocol, use this protocol.

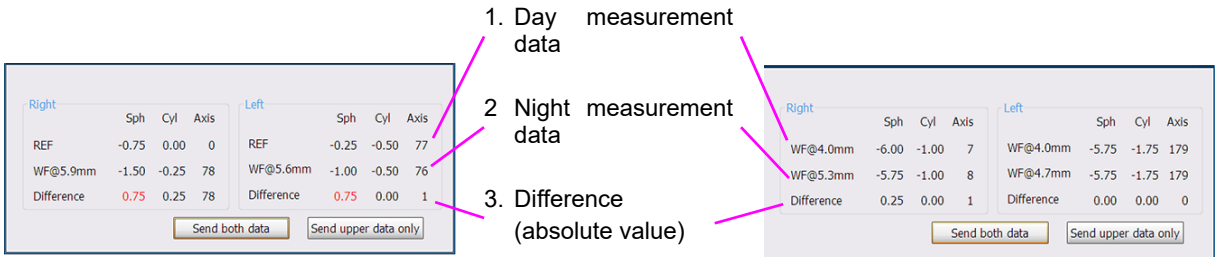
Note

- To enable “Send HD Exam Data” and “Send 30sec Refraction”, select “RS232C Connection” in “Options” of “Verified & Save Button Handling” under the Measurement tab.
- When data is transferred with the connected device set to “RT-5100 Support”, the patient ID needs to consist of four digits or more. If the patient ID consists of less than four digits, the message “The data cannot be sent because the ID has less than 4 digits.” appears.

  To prevent patient IDs consisting of less than four digits from being created or edited, select “4 or more” in the Other tab. (See “5.8.10 Other tab” (page 351).)

○ Transferring HD Exam data

When “Send HD Exam” is checked, the HD EYE EXAM screen appears when examination data is saved after completion of measurement.



AR (refraction) value is transferred as day measurement data

ZS, ZC, and ZA (WF@4.0 mm) are transferred as day measurement data

Select data to be transferred by pressing the “Send both data” or “Send upper data only” button.

Pressing either button starts printing of measurement data with the internal printer (when “Internal Printer” is checked in the Settings screen (Measurement tab)), and data is transferred to the specified refractor.

Send both data	Both “1. Day measurement data” and “2. Night measurement data” are transferred to the specified refractor.
Send upper data only	Only “1. Day measurement data” is transferred to the specified refractor. “2. Night measurement data” is not transferred.

If the difference between “1. Day measurement data” and “2. Night measurement data” is large, “3. Difference (absolute value)” is shown in red. In such a case, it is recommended to press “Send both data” to transfer the night measurement data as well.

OPD data transferred after Multi measurement

When transferring OPD data (AR value or ZS, ZC, and ZA values) after Multi measurement, data is transferred depending on the OPD data selected to be saved in the Verify Multi Measurement screen as shown in the table below.

Only an OPD data set is selected.	The selected OPD data is transferred.
Multiple OPD data sets are selected.	Out of the OPD data sets selected in the Verify Multi Measurement screen, the topmost data (best data selected by the device) in the screen is transferred.
No OPD data is selected.	The last OPD data is transferred.

AR/KM Mode

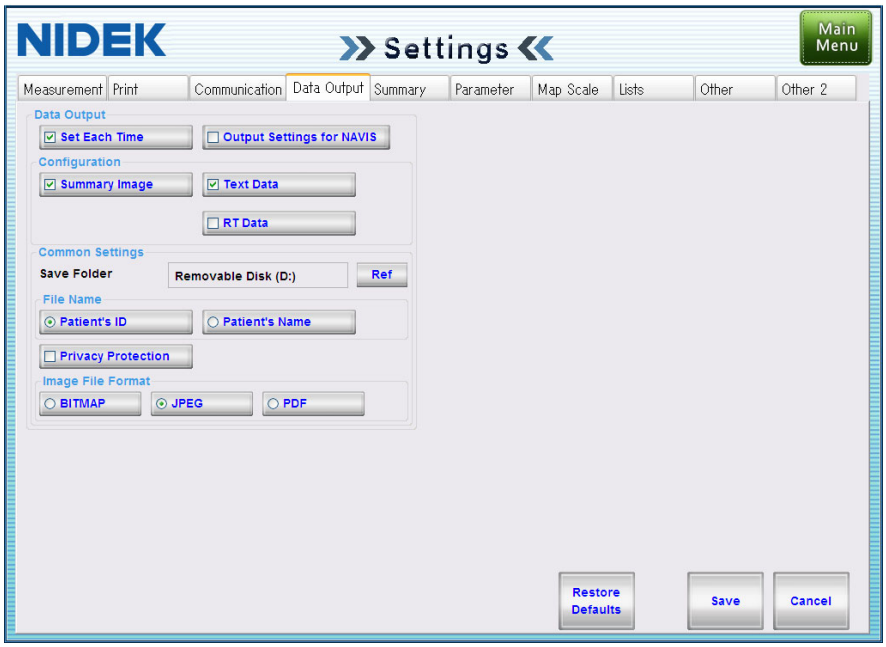
Connected Device

Select from None, Previous RT Series, RT-5100 Support, Eye Care Card, and Computer. The available options varies depending one the connected device.

	Send All Data	Add CR Code	Use NCP10 Protocol	Use NIDEK2 Protocol
None	Not available	Not available	Not available	Not available
Previous RT Series	Available	Available	Not available	Available
RT-5100 Support	Available	Available	Not available	Available
Eye Care Card	Available	Available	Not available	Not available
Computer	Available	Available	Available (Fixed)	Not available

Send All Data	Set the method to transmit the measurement values via communication channels. If this parameter is checked, all the measurement data sets are transmitted. If the parameter is not checked, only the typical values (or latest values if there is no typical value) is transmitted.
Add CR Code	Toggle putting the CR code at the end of the data to be transmitted.
Use NCP10 Protocol	Use the NCP10 communication protocol to output data to devices that support NCP10 protocol. This item is displayed and automatically activated (cannot be canceled) when “Connected Device” is computer.
Use NIDEK2 Protocol	NIDEK2 is a communication protocol with an extended time-out limit for when an RS-232C communication device other than computer is connected. It is for a communication environment where a time-out occurs without checking this protocol. It can be selected when “Connected Device” is either “Previous RT Series” or “RT5100 Support”.

5.8.5 Data Output tab



Set Each Time (Factory setting: ON)

Sets whether the Saving map window is displayed before data output. Check the box when the destination, file name, data format are needed to be changed for each output.

Output Settings for NAVIS (Factory setting: OFF)

Check this item to output data to NAVIS.

When this item is checked, the file name becomes unchangeable, the privacy protection is disabled, and images are saved as Jpeg files (unchangeable).

Configuration

Select the output data type.

Summary Image	Outputs the contents of a summary as an image (JPEG or BITMAP). (The default is “ON”.)
Text Data	Outputs numeric data being displayed in the map in the CSV format. The text data can be used with various spreadsheet software or for other various purposes. (The default is “OFF”.)
RT Data	The data received from the RT is added to the numeric data (CSV format) on the map and output. (The default is “OFF”.)

Common Settings

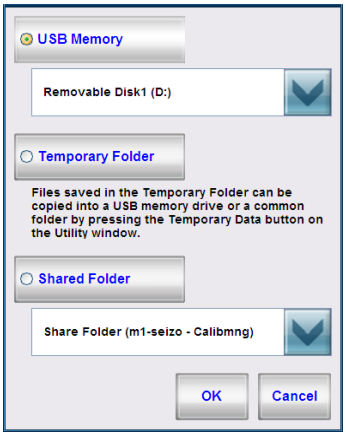
Save Folder

Select the location to output data. Press the Ref button to specify the device and folder.

Press the Ref button to display the Select Folder window and select the location from USB Memory, Temporary Folder, and Shared Folder.

Pressing the V button displays the available locations. When the device or shared folder is not recognized, the selection button becomes disabled and any item cannot be selected.

After selecting the location, press the OK button to close the Select Folder window.



File Name: Patient's ID/Patient's Name

Select the patient information to be attached to the output data file name.

Patient's ID	Attaches the patient ID in front of the file name. ID_ Summary name _ Year Month Day _ Hour Minute Second.(Extension) If “Privacy Protection” is selected, this additional information is not attached to the file name.
Patient's Name	Attaches the first and last names of the patient in front of the file name. Fist and last name _ Summary name _ Year Month Day _ Hour Minute Second.(Extension) If “Privacy Protection” is selected, the initials of the patient name are attached to the file name.

Privacy Protection (Factory setting: OFF)

When the box is checked, the data that does not include privacy information is output

Image File Format: BITMAP/JPEG/PDF

Select the image data format.

BITMAP	Saves image data as a BMP (extension “.bmp”) image. Images are saved without being compressed.
JPEG	Saves image data as a Jpeg (extension “.jpg”) image. Images are saved after being compressed. Compared to the BMP file, the Jpeg file becomes smaller, however the image quality may become lower.
PDF	Saves image data as a PDF (extension “.pdf”) file. With commercially available PDF editing software, multiple PDF files can be combined into a single file.

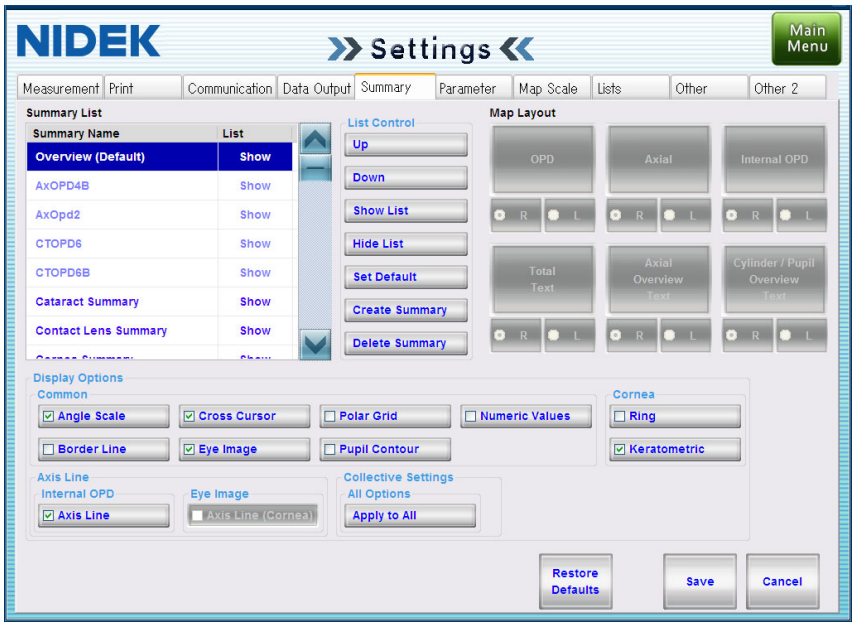
COM Port settings (only for OPD Software for External PC)

COM Port number: COM1—

Select the COM port to which the external device is connected for data output.

The COM port to which the external device is currently connected or was connected before is displayed.

5.8.6 Summary tab



Summary List

Select the desired summary to display the map layout. In addition, select the summaries to be displayed at first on the summary screen, the contents of the summary list, and its order.

List Control

Change the summary to be displayed in the summary list.

Up	Moves up the selected summary by a row.
Down	Moves down the selected summary by a row.
Show List	"Show" is indicated in the List column for the selected summary. The selected summary is listed in the summary screen.
Hide List	"Hide" is indicated in the List column for the selected summary. The selected summary is not listed in the summary screen. "Hide" cannot be selected for default summaries.
Set Default	"Default" is indicated on the side of the summary name in the summary list. The default summary is initially displayed in the summary screen.
Create Summary	Displays the Create Summary screen.
Delete Summary	Deletes the summary selected in the list. Pressing the Delete Summary button display the "Are you sure you want to delete this summary? Yes/No" message. Pressing the Yes button deletes the summary from the list. The default display summary and default summay cannot be deleted. Only the summaries registered by the user can be deleted.

Map Layout

Displays the map layout of the summary selected in the summary list.

When the summary is registered by the user, these buttons become active so as to display the map type selection or select the right or left eye.

Display Options

Select the desired overlay items to be displayed on the map. This is set by the summary.

Common	Select the item to be displayed from Angle Scale, Cross Cursor, Polar Grid, Numeric Values, Border Line, Eye Image, and Pupil Contour.
Cornea	Select the desired item from Ring and Keratometic.
Axis Line	Select the desired item from Internal OPD Axis Line and Eye Image Axis Line (Cornea).

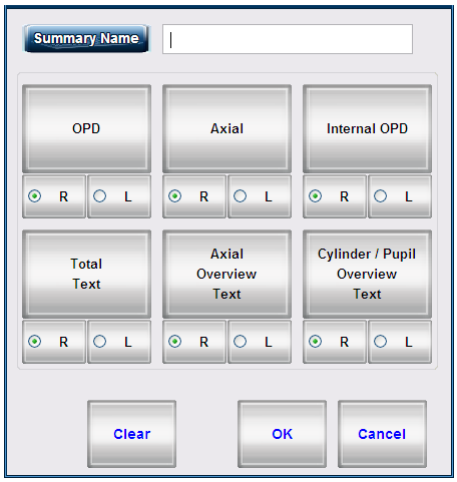
Pressing the Apply to All button applies the currently displayed options to the all map types of other summaries.

Newly creating summary

Register the new summary on the Create Summary window by pressing the Create Summary button.

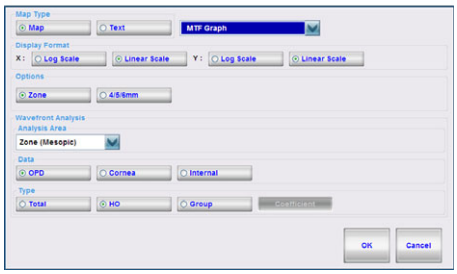
Use the on-screen keyboard that appears by pressing the Summary Name button in the summary name entry filed. If a keyboard is used, the title can be directly input in the entry field.

When the summary name is not entered or the same summary name has been already existing, the name cannot be registered.



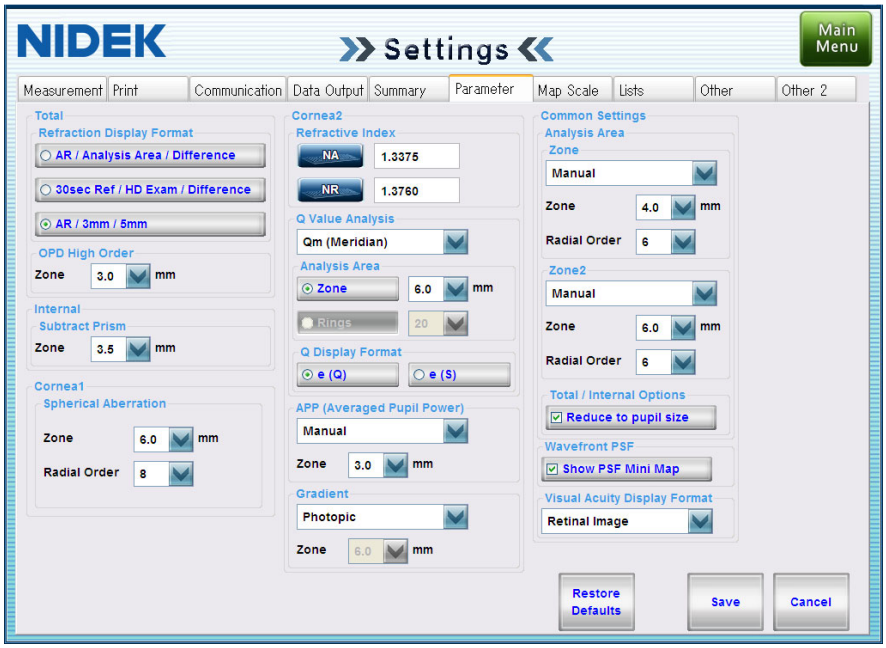
Pressing the map type button displays the Select Map Type window.

Select the right or left eye with the radio button.



Map Type	Select the map or text with the radio button and the desired item from the list displayed by pressing the V button in the selection filed. The options corresponding to the selected map are displayed. In the Map (image map) setting, the following options are available. Axial, Instantaneous, Gradient, “Refractive”, Elevation, Topo Classifire, OPD, Internal OPD, EyeImage, Wavefront, Zernike Graph, PSF, MTF Graph, Visual Acuity, No Map In the Text (text map) setting, the following options are available. Axial - Overview, Axial - Cataract, Instantaneous, Cylinder/Pupil - Overview, Cylinder/Pupil - Cataract, Total, Wavefront Cornea HO/Ref, Wavefront Cornea HO, Wavefront Internal HO, No Map

5.8.7 Parameter tab

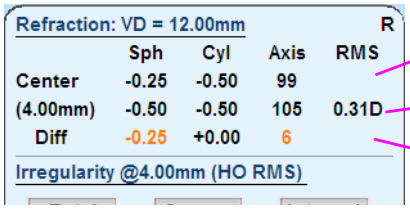


Total

Refraction Display Format: AR/Analysis Area/Difference, 30sec Ref/HD Exam/Difference, AR/3mm/5mm

Select the AR value type to be displayed on the summary text.

AR/Analysis Area/Difference

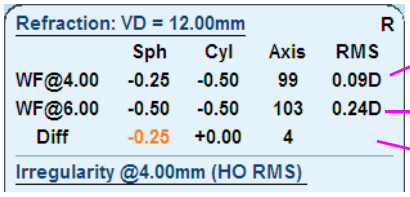


Standard AR values

AR values within the analysis area specified for "Zone" in the summary

Difference between the above values

30sec Ref/HD Exam/Difference

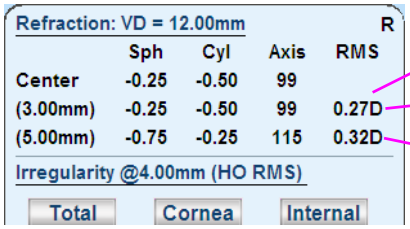


30 AR values selected as the result of 30 sec refraction

AR values to be used as HD Exam

Difference between the above values

AR/3mm/5mm



Standard AR values

AR values within 3 mm-diameter analysis area

AR values within 5 mm-diameter analysis area

OPD High Order/Zone: 3.0 to 9.5mm (Factory setting: 3.0mm)

The area for obtaining the SPH and CYL values is input to be used for calculation when the optional “OPD HO” is selected in the OPD map.

Internal

Removal Prism/Zone: (Factory setting: 3.5mm)

Within the diameter specified here, the direction of the prism to be subtracted from the Internal OPD map is calculated.

Cornea1

Specify the calculation conditions for the corneal spherical aberration which is to be overlaid on the Axial map.
Spherical Aberration—Zone: 3.0 to 9.5 mm (Factory setting: 6.0 mm)
Spherical Aberration—Radial Order: 3 to 8 (Factory setting: 6)

Cornea2

Refractive Index NA: 1.0001 to 2.0000 (Factory setting: 1.3375)

Corneal refractive index to be used for calculating the Axial and Instantaneous maps

Refractive Index NR: 1.0001 to 2.0000 (Factory setting: 1.3760)

Corneal refractive index to be used for calculating the “Refractive” and Internal OPD maps

Q Value Analysis: [Factory setting: Qm (Meridian)]

This is for setting the method and area with which the Q value is obtained.

<table>
<tr><td>Qm (Meridian)</td><td>Q value that is calculated from the data on the meridian that passes through the corneal vertex. This Q value is in accordance with the definition in “Corneal Topography” by ISO.
The area used to calculate the Q value is set in diameter (Zone).</td></tr>
<tr><td>Qe (Ellipsoid)</td><td>Q value that is calculated by fitting the specified area of the cornea to an ellipsoid.
The area used to calculate the Q value is set by the number of rings from the center or by the diameter (Zone).
The table below shows the correspondence between the number of rings and area diameter for general eyes
<table>
<tr><td>Number of rings</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr>
<tr><td>Approximate area diameter (mm)</td><td>ø3.23</td><td>ø3.42</td><td>ø3.76</td><td>ø3.93</td><td>ø4.28</td><td>ø4.46</td><td>ø4.81</td><td>ø4.99</td><td>ø5.34</td><td>ø5.51</td></tr>
<tr><td>Number of rings</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td></tr>
<tr><td>Approximate area diameter (mm)</td><td>ø5.93</td><td>ø6.11</td><td>ø6.46</td><td>ø6.64</td><td>ø6.99</td><td>ø7.16</td><td>ø7.51</td><td>ø7.69</td><td>ø8.04</td><td>ø8.21</td></tr>
<tr><td>Number of rings</td><td>30</td><td>31</td><td>32</td></tr>
<tr><td>Approximate area diameter (mm)</td><td>ø8.57</td><td>ø8.74</td><td>ø9.09</td></tr>
</table></td></tr>
</table>

Q Value Analysis/Analysis Area

Specifies the analysis area corresponding to the Q value calculation method (Qm/Qe).

Zone	Specifies the area within the 3.0 to 9.0 mm in diameter when of Qm/Qe.
Rings	Specifies the range within the range from 10 to 31 ring edges when of Qe.

Q Value Analysis/Q Display Format

Sets the value indicating the asphericity on the cornea displayed in the table at the bottom of the main screen.

e (Q)	Eccentricity and Q value
e (S)	Eccentricity and shape factor

APP (Averaged Pupil Power)

Specifies the pupil area to be used in calculating the Averaged Pupil Power (APP) displayed on the Axial map.

Photopic	Area within the pupil contour in photopic vision
Mesopic	Area within the pupil contour in mesopic vision
Manual	Used to specify the desired area (Zone) in diameter. Specify in the range from 3.0 to 9.5 mm. The center of the area is the pupil center position when the specified value is the pupil diameter under the assumption based on the middle of the pupil centers in photopic and mesopic visions.

Gradient

Specifies the position for calculating the gradient when the gradient of the optical axis in CT measurement is corrected. It is used in calculation of the Curvature Gradient map.

Photopic	Diameter of the pupil contour in photopic vision
Mesopic	Diameter of the pupil contour in mesopic vision
Manual	Used to specify the diameter by number. Specify in the range from 3.0 to 10.5 mm. The center of the area is the pupil center position when the specified value is the pupil diameter under the assumption based on the middle of the pupil centers in photopic and mesopic visions.

Common Settings

Analysis Area

Specifies the analysis area and order of Zone and Zone2 displayed in the wavefront analysis area list when selecting the Wavefront, Zernike Graph, PSF, MTF Graph, or Visual Acuity map on the Select Map Type screen.

Zone/Zone2

Photopic	Area of the pupil contour in photopic vision Specifies the order in the range of 3 to 8.
Mesopic	Area of the pupil contour in mesopic vision Specifies the order in the range of 3 to 8.
Manual	Used to specify the desired area in diameter. Specify in the range from 3.0 to 9.5 mm. The center of the area is the pupil center position when the specified value is the pupil diameter under the assumption based on the middle of the pupil centers in photopic and mesopic visions. Specifies the order in the range of 3 to 8.

“Total / Internal Options” / “Reduce to pupil size” (Factory setting: ON)

Sets whether to reduce the analysis area diameter to the pupil size or to use the specified analysis area (Zone) as it is for the Total and Internal aberration calculation if the mesopic pupil diameter is smaller than the specified analysis area.

Wavefront PSF / Show PSF Mini Map (Factory setting: ON)

Sets whether Show PSF Mini Map is performed when displaying the Wavefront map or Overview.

Visual Acuity Display Format (Factory setting: Retinal Image)

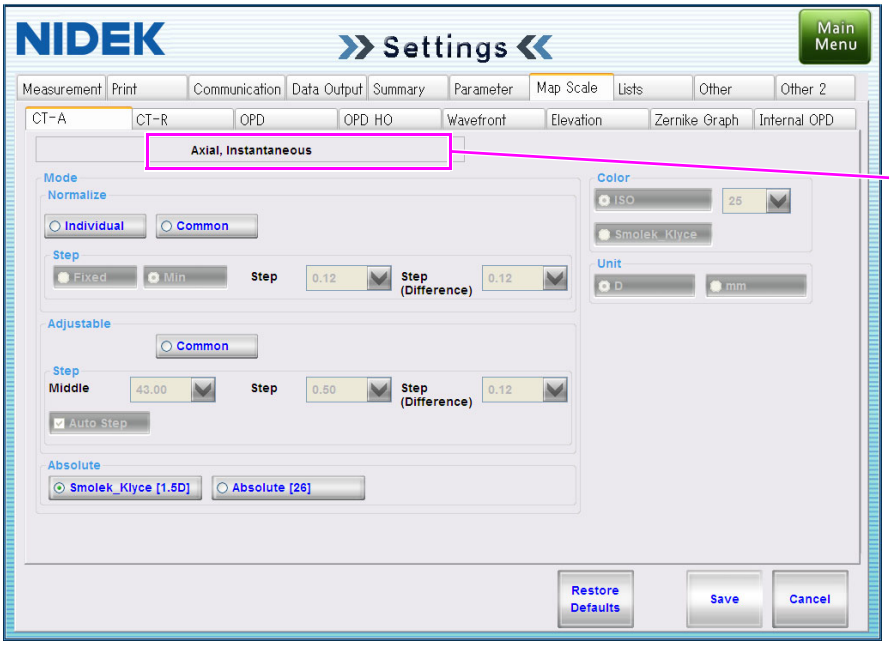
Selects the Visual Acuity map displayed in the patient view simulation from “Retinal Image” and “Patient View Image”.

When “Retinal Image” is selected, the map shows how the chart is projected on the retina.

When “Patient View Image” is selected, the map shows how the chart appears to the patient. It should be noted that this simulation does not take into account how a point image on the retina is processed by the brain through the optic nerve. Therefore, the simulated image may differ from the actual patient view.

5.8.8 Map Scale tab

Edit the color scale for each map.
The Map Scale tab is divided into the tabs for each map. Select the desired map tab to change the color scale.



The map corresponding of the displayed tab is displayed.

Tab	Target map
CT_A	Axial and Instantaneous maps
CT_R	“Refractive” map
OPD	OPD map
OPD HO	OPD High Order map
Wavefront	Wavefront Total, Wavefront High Order, and Wavefront Group maps
Elevation	Elevation map
Zernike Graph	Zernike Graph map
Internal OPD	Internal OPD map

The scale mode, typical value, increments, color, and unit are selected on each tab.

Note

- Change of the color scale applies to the color scale of the same type map.
- The unchangeable setting items on the tab are grayed out.

Color scale type

The color scale is broadly divided into the relative and absolute scales.

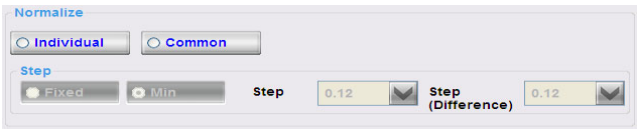
Normalize

In the relative color scale, the map histogram is calculated and the appropriate increments and middle scale are automatically selected so that the color scale can be used effectively.

Select the scale unit (D or mm) in the Unit field and color scheme (ISO or Smolek_Klyce) and color number in the Color field.

Color scale mode		Explanation
Normalize	Individual	The increments and middle value are calculated so that the color scale is be used at the most effectively based on the maximum and minimum value on each map. The middle value cannot be changed.
	Common	The increments and middle value of the color scale are calculated based on the maximum and minimum values on each map. The middle value cannot be changed.
Adjustable	Common	This is the one of the relative scales, the difference from Norm. (Com.) is that the calculated middle value and increments can be changed. Checking the Auto Step box automatically selects the increments appropriate for the specified middle value.

Settings of Normalize (Individual/Common)



Select whether to fix the increments or set the minimum increments.

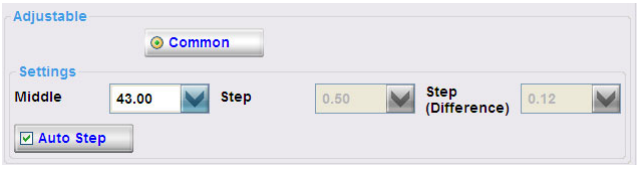
Fix	The scale is always displayed in the specified increments.
Minimum	The minimum increments automatically calculated is selected. The automatically calculated increments do not become smaller than the one specified here.

Select the Step and Step (Difference) parameter from the drop-down list. The options in the list varies depending on the selected unit (D or mm).

The calculated increments do not become smaller than the value specified here.

D	0.12, 0.25, 0.50, 0.75, 1.00, 1.50, 2.00, 5.00 Step (Difference) is up to 2.00.
mm	0.02, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 1.00 Step (Difference) is up to 0.40.
µm (Zernike Graph)	0.05, 0.10, 0.20, 0.50, 1.00, 2.00, 5.00
µm (Elevation)	0.50, 1.00, 2.00, 5.00, 10.00, 20.00

Settings of Adjustable (Common)



Select the Step and Step (Difference) parameters from the drop-down list. The options in the list varies depending on the selected unit (D or mm).

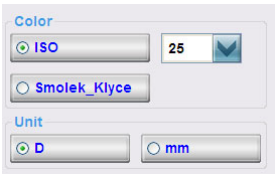
D	0.12, 0.25, 0.50, 0.75, 1.00, 1.50, 2.00, 5.00 The minimum step (difference) is up to 2.00.
mm	0.02, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 1.00
µm	0.05, 0.10, 0.20, 0.50, 1.00, 2.00, 5.00
µm (Elevation)	0.50, 1.00, 2.00, 5.00, 10.00, 20.00

Select the middle value from the drop-down list. The options in the list varies depending on the selected unit (D or mm).

D	10.00 to 100.00 (in 0.25 D increments)
D (OPD, OPD_HO)	-20.00 to 20.00 (in 0.25 D increments)
mm	3.0 to 39.95 (in 0.05 mm increments)
µm	-50.00 to 50.00 (in 0.5 µm increments)

When the Auto Step box is checked, the Step and Step (Difference) entry fields are filled automatically and become unchangeable.

Color: Set the color scheme and number.



ISO	Colors conforming to the color scale recommended by ISO standards Specify the color number in the color number field. (The options are 15 to 25 colors and the scheme is in the order of red, green, and blue.)
Smolek_Klyce	Color scheme as the same as the absolute color scale (pink, red, yellow, green, blue, and dark blue) The color number is 26 and cannot be changed.

Color: Set the color scale unit. Select from D (diopter) and mm (curvature radius).

The unit can be changed on the Axial and Instantaneous maps. The unit is fixed as follows on the other maps.

D	“Refractive” map, Internal OPD map, OPD map, and OPD_HO map
μm	Elevation map, Wavefront map, and Zernike map

When the unit setting is changed, the middle value and increments are changed also.

Absolute

The absolute color scale has the fixed increments and range. Regardless of the patient’s eye conditions, the same diopter is with the same color. Therefore, this is effective for comparing several maps. The absolute color scale can be selected from the following three types.

Color scale mode		Explanation
Absolute	Smolek Klyce [1.5D]	Smolek Klyce scale This is a fixed color scale of 26 colors and displayed in 1.5 D increments within the range of 30 to 67.5 D.
	Absolute [26]	The color scheme is as the same as the Smolek Klyce. The increments are enlarged in the periphery part and displayed with the fixed color scale of 26 colors within the range of 9 to 101.5 D.
	Smolek Klyce2 [0.5]	Smolek Klyce2 scale This is a fixed color scale of 27 colors and displayed in 0.5 μm increments within the range of -6.5 to 6.5 μm.

Note

- In the absolute color scale, the color cannot be changed.

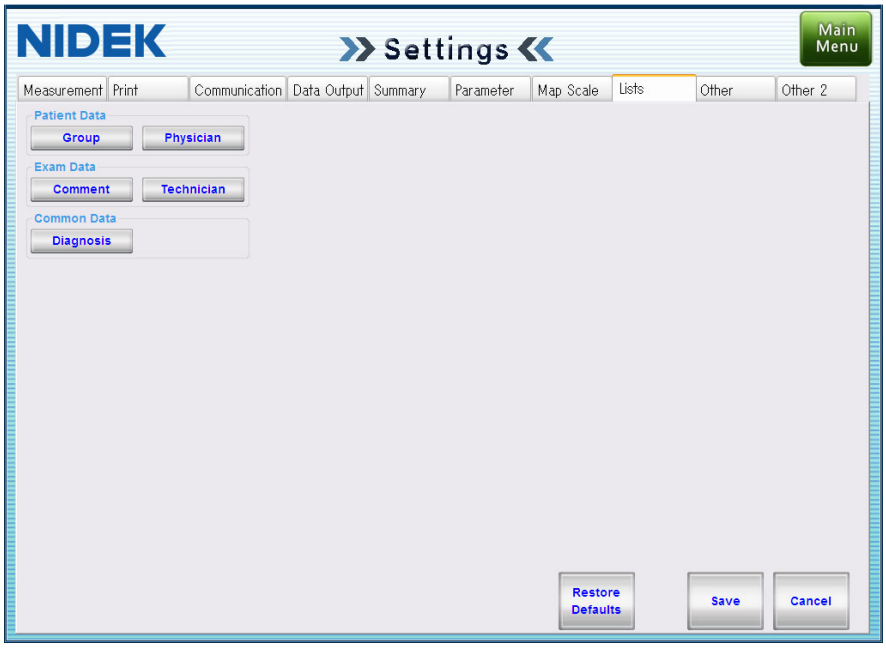
Maps for which absolute color scale is available

Color scale mode	Available maps
Smolek Klyce [1.5D]	Axial map, Instantaneous map, “Refractive” map
Absolute [26]	
Smolek Klyce2 [0.5]	Wavefront map

The absolute color scales are not available for the OPD map.

5.8.9 Lists tab

Edit the list to be displayed in the drop-down list.
Pressing each item button displays the list edit window. Operation on the window changes and deletes the items.



Patient Data	Croup	Registers the groups to be entered in the easy search, Create Patient window, and Edit Patient Information window.
	Physician	Registers the physician to be entered in the Create Patient window and Edit Patient Information window.
Exam Data	Comment	Registers the comments to be entered on the Edit Exam Information window.
	Technician	Registers the operator to be entered on the Operator entry window and Edit Exam Information window.
Common Data	Diagnosis	Registers the diagnosis and cases to be entered in the patient information and examination data. The several items are entered at defaults.

CAUTION • **Pressing the Restore Defaults button clears all the list data registered by the user.**
When the Restore Defaults button is pressed wrongly, press the Cancel button and then the Save button.

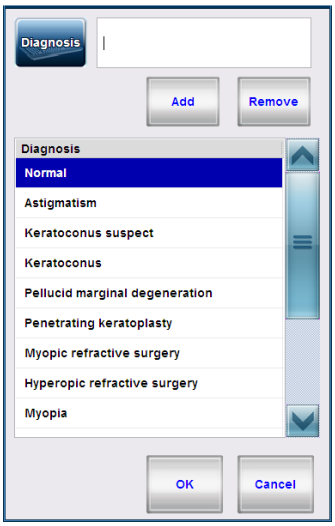
List edit procedure

1) Press the button of the list to be edited.

   The Edit List window appears.

2) Enter the contents to be added in the text box.

   The on-screen keyboard appears by pressing the buttons on the side of each box. If a keyboard is used, the name can be directly input.



Note

- To change the contents of the items, deleted the previous item and add the new item.
  The already-entered item cannot be rewritten.

3) Press the Add button to add the entered item in the list.

   The added item is listed at the bottom.

4) To delete the item, select it in the list and press the Remove button.

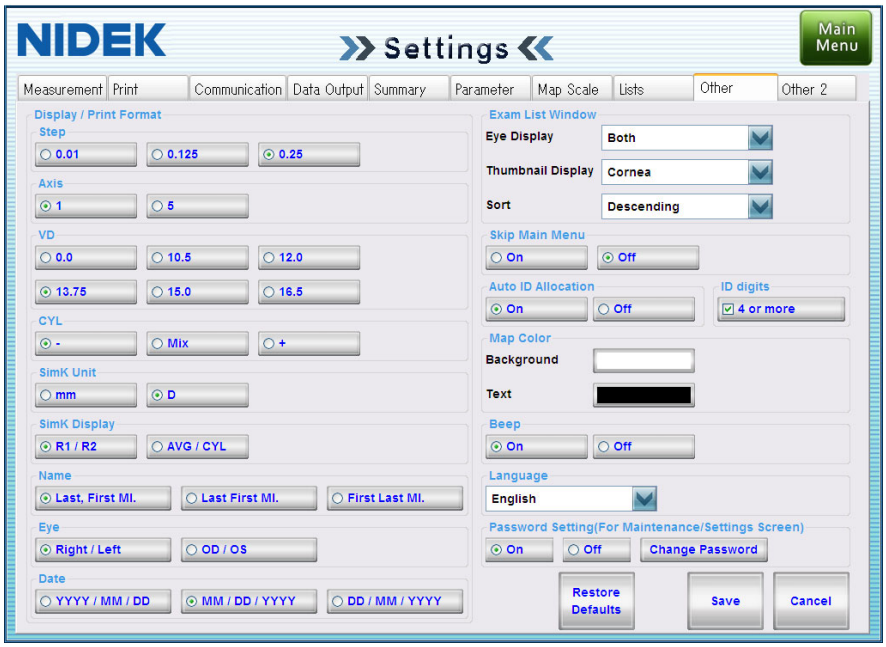
5) Press the OK button to close the Edit List window.

   Press the Cancel button to close the Edit List window without saving the change.

Note

- When the item deleted from the list have been already in the data, it is not deleted from each data.

5.8.10 Other tab



Display/Print Format

Step: 0.01, 0.125, 0.25 (D)

The indication increments of SPH and CYL data for AR measurement.

Printed keratometry data is also based on the increment indicated.

Axis: 1, 5 (°)

The indication increments of AXIS data for AR measurement.

VD: 0.0, 10.5, 12.0, 13.75, 15.0, 16.5 (mm)

The corneal vertex distance (distance from the corneal vertex point to the posterior surface of a lens) is selected.

CYL: -, Mix, +

The reading mode for the CYL values is selected from -, MIX and +.

For keratometry data, the data is shown with "+" when the "+" radio button is selected. When the Mix or "-" radio button is selected, the data is shown with "-" mode.

SimK Unit: mm, D

Sets the display unit on the measurement screen of the keratometer value simulated from CT measurement.

SimK Display: R1/R2, AVG/CYL (OPD-Scan III only)

Sets the display format on the measurement screen of the keratometer value simulated from CT measurement.

R1/R2	The flattest meridian value (R1), the steepest meridian value (R2), and R1 axis angle
AVG/CYL	The average between R1 and R2 (AVG), corneal astigmatism amount (CYL), and R1 axis angle

Name: Last, First MI., Last First MI., First Last MI.

Last, First MI.	Displayed in the order of the last name, first name middle name.
Last First MI.	Displayed in the order of the last name first name middle name.
First Last MI.	Displayed in the order of the first name last name middle name.

Eye: Right/Left, OD/OS

Select the right and left eye indication format of the patient's eye from "Right/Left" and "OD/OS".

Date: YYYY/MM/DD, MM/DD/YYYY, DD/MM/YYYY

Print date format.

YYYY/MM/DD	Year. Month. Day
MM/DD/YYYY	Year / Month / Day
DD/MM/YYYY	Day / Month /Year

Exam List Window

Eye Display: Right, Left, Both

Select the data to be displayed first from Right, Left, and Both on the Exam List screen.

Thumbnail Display: Cornea, Total, Internal, Total/Cornea, Cornea/Internal, Total/Internal, All

Select the map to be overlaid on the thumbnail when displaying the Exam List screen.

Sort: Ascending, Descending

Sets whether the thumbnails is displayed on the Exam List screen in the ascending or descending order.

Skip Main Menu: On, Off

When "On" is selected, the Patient List screen is displayed without displaying the Main Menu screen at start-up.

Auto ID Allocation: On, Off

Selects whether the patient ID is numbered automatically when registering a new patient. When "Off" is selected, the initial display in the ID field is blank.

ID digits: 4 or more

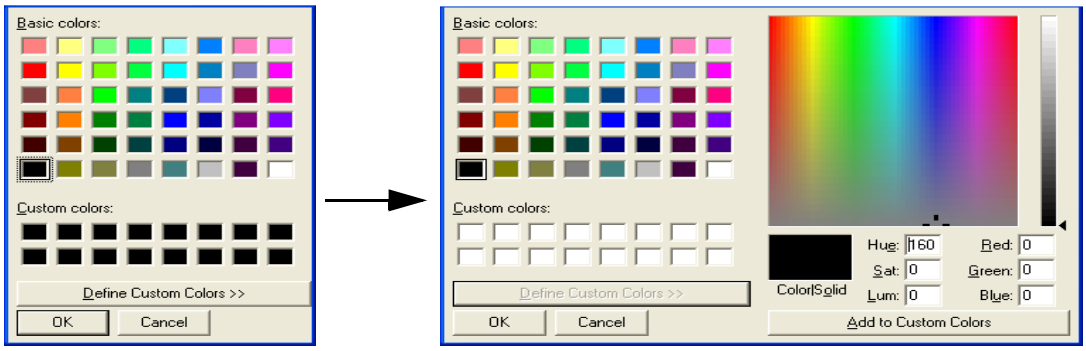
Selects whether to set restrictions to patient IDs consisting of less than four digits. (Check mark is placed by default.)

When data is transferred with "RT-5100 Support" selected for "Connected Device", , data transfer cannot be executed with the patient ID consisting of less than four digits. To prevent patient IDs consisting of less than four digits from being registered, selecting this check box is recommended.

Selected	Registration of new patient information is not allowed with a patient ID consisting of less than four digits. If any patient ID consisting of less than four digits is edited, the confirmation message "The ID you entered has less than 4 digits. Are you sure you want to proceed with this ID?" appears.
Cleared	No restrictions are set for the number of digits comprising patient IDs.

Map Color

Background	Sets the map background color. Pressing the Background button displays the color setting window. Select the desired color and press the OK button.
Text	Set the character color on maps. However, the characters of the item changeable by clicking are green. Pressing the Text button displays the setting window. Select the desired color and press the OK button.



Pressing the Create Color button display the new window and select the custom color.

5

Beep: On, Off

Sets whether beeps are sound when of operation.

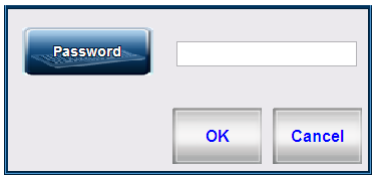
Language: English, German

Sets the display language.

Password setting (for the Maintenance/Settings screen): On, Off

Sets whether to display the Input Password window before the Maintenance or Settings screen when the Maintenance or Settings button is pressed in the Main Menu screen.

To protect the contents of the Maintenance or Settings screen, select “On”.

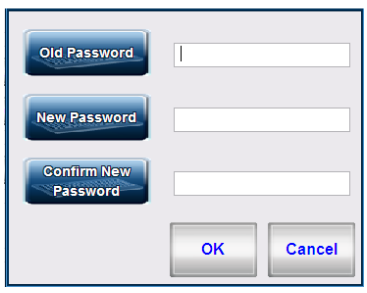


Change Password

1) Press the Change Password button to display the Change Password window.
2) Fill in the Old Password, New Password, and Confirm New Password boxes.

   A maximum of 20 characters can be specified for the password.

   The following characters are not allowed in the password: `~!@#$^&*()=+[]{}\\|;:'\",<>/? .



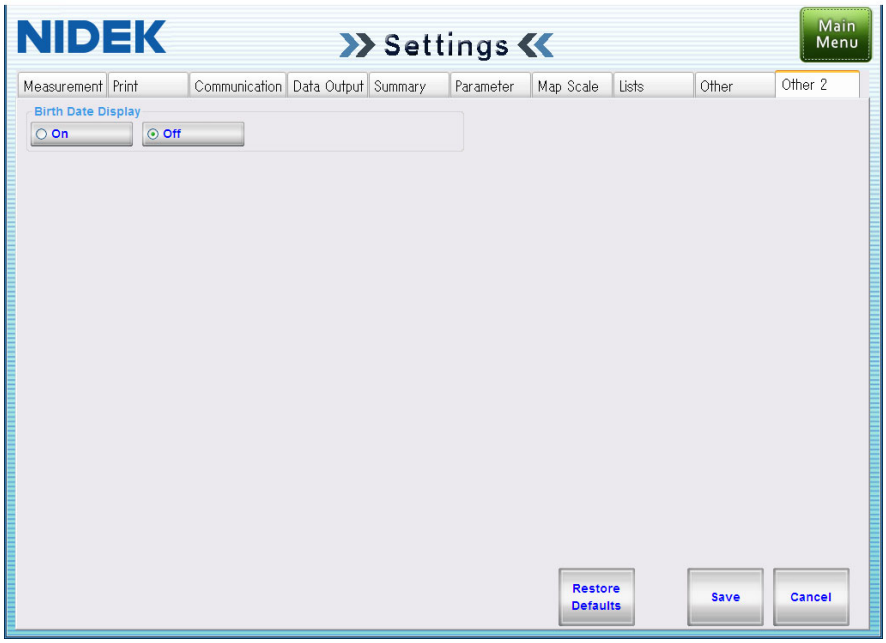
3) Pressing the OK button displays the message indicating completion of the password change, and closes the Change Password window.

If there is any problem with the input information, a message appears.

Note

- When “On” is selected for the Password Setting for the first time, the default password is “opd3svc2”.

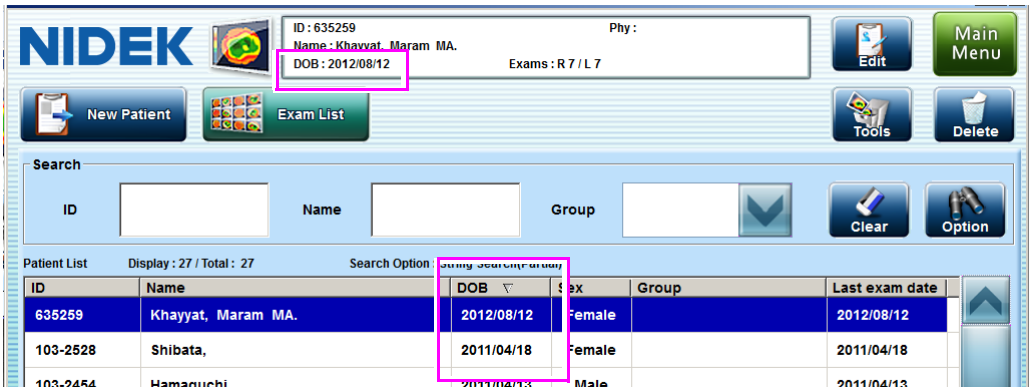
5.8.11 Other 2 tab



Date of Birth Display: On, Off

When “On” is selected, date of birth of the selected patient is displayed in the patient data brief information box (or the patient data button) in the screens such as the Measurement screen, Patient List screen, and Summary screen. In the Patient List screen, the date of birth is indicated between the name and sex. (When the date of birth has not been input, “00/00/0000” is indicated.)

The date of birth is also added to the patient information printed or output.



5.9 Cleaning

When the cover or panel of the device becomes dirty, clean it with a soft cloth. For persistent stains, soak the cloth in a neutral detergent, wiring well, and wipe. Finally dry with a soft, dry cloth.

⚠ CAUTION

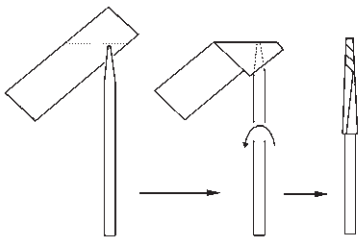
- **Never use an organic solvent such as paint thinner.**
  This could damage the surface of the device.
- **Lightly wipe the exterior of the LCD. Do not press the LCD using an object with a hard tip. In addition, keep magnetic objects away from the LCD.**
  Scratches or failure of the LCD may result.
- **Never use a sponge or cloth soaked in water.**
  The water may leak into the inside of the device and cause device failure.

5.9.1 Cleaning the measuring window

When the measuring window gets fingerprints or dust on it, the reliability of the measured value is impaired substantially. Check for smudge on the measuring window before use, and then clean it if it is soiled.
The measuring window lens does not usually get soiled through normal use because it is recessed.

1 Blow off dust on the measuring window with a blower.

2 Wrap lens cleaning paper around a thin stick such as a chopstick (or cotton swab) and wipe the lens of the measuring window with a material moistened with alcohol.



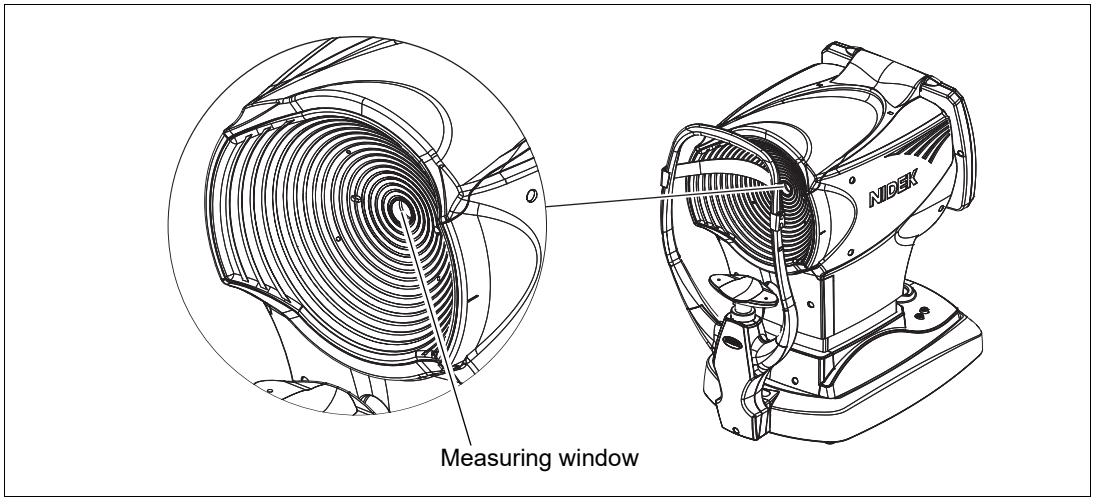
Wrap cleaning paper around the tip.

Note

- Use a thin stick which does not damage glass lenses.
- Wipe lightly from the center of the measuring window to the outside in a circular motion.

3 Check if the window is cleaned using a penlight. If not, clean it again with new cleaning paper.

Apply light with a penlight and change the view angle to check the clearness.



5.9.2 Cleaning the printer

After repeated usage, the paper slot of the auto cutter of the printer may become soiled with paper residue. If the residue accumulates, malfunction of the auto cutter may result. Check the auto cutter before using the device. Clean it if it is soiled.

1 Open the printer cover and remove the printer paper roll.

See “5.3 Replacing Printer Paper” (page 300).

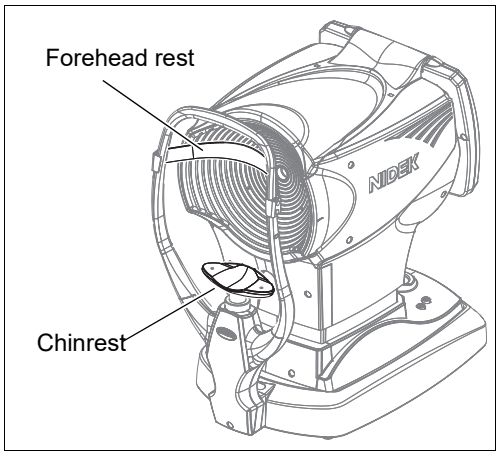
2 Apply the nozzle of a vacuum cleaner to the auto cutter to remove paper residue.

Never blow off paper residue with a blower. If residue settles on the internal working structure, malfunction may result.

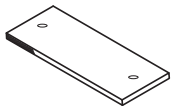
3 Supply the printer paper as it was.

5.9.3 Cleaning the forehead rest and chinrest

Before measurement, clean the patient's contact area (chinrest and forehead rest).
Gently wipe the surface of the device with clean gauze or absorbent cotton dampened with rubbing alcohol.
After each use of the chinrest paper, remove one sheet of paper.
If residue is found or dirt cannot be removed, repeatedly wipe the surface with new gauze or absorbent cotton.



5.10 List of Replacement Parts

Part name	Part number	Note	
Printer paper	80620-00001	Width 58 mm, Length 25 m	
Chinrest paper	32903-M047	Pack of chinrest paper	

* After replacing consumables, restock them.

6. SPECIFICATIONS AND ACCESSORIES

6.1 Classifications

[Protection against electrical shock]

Class I ME equipment

Applied part: Type B applied part

[Protection against harmful ingress of water or particulate matter]

IPX0

[Suitability for use in an oxygen rich environment]

ME equipment that is not intended for use in an oxygen rich environment

[Method(s) of sterilization]

ME equipment that does not contain any part that needs sterilization

[Mode of operation]

Continuous operation

6.2 Specifications

○ Measurement of refractive error (AR measurement)

- Spherical power (S)
  -20.00 to +22.00 D (VD = 12 mm)
  0.01/ 0.12/ 0.25 D increments
- Cylindrical power (C)
  0 to ±12.00 D
  0.01/ 0.12/ 0.25 D increments
- Cylinder axis (A) 0 to 180°
  1°/ 5° increments
- Vertex distance 0/10.5/12/13.75/15/16.5 mm
- Minimum measurable pupil diameter
  ø2.6 mm
- Measurable range on the eye
  ø2.0 to 9.5 mm
- Relaxation of accommodating eye
  Auto fogging system
- Chart Scenery chart
- Accuracy The accuracy specifications are based on the results of eye model testing performed in accordance with ISO10342, Ophthalmic Instruments - Eye Refractometers.

Criterion	Measurement range	Test device[a]	Tolerance
Spherical vertex power	-15 to +15 D (Maximum meridional vertex power)	0 D, ±5 D, ±10 D	±0.25 D
		±15 D	±0.50 D
Cylindrical vertex power	0 to 6 D	Sph: approx. 0 D Cyl: -3 D Axis: 0°, 90°	±0.25 D
Cylinder axis[b] for cylinder power	0 to 180°		±5°

a The refractive error of the test device shall not differ by more than 1.0D from the nominal value above.
b Cylinder axis shall be indicated as specified in ISO8429.

○ Measurement of corneal curvature radius (KM measurement)

- Corneal curvature radius (R1, R2, AVE)
  5.00 to 10.00 mm
  0.01 mm increments
  Accuracy: ±0.05 mm
- Corneal refractive power (R1, R2, AVE)
  33.75 to 67.50 D (n = 1.3375)
  0.01/ 0.12/ 0.25 D increments
- Corneal cylindrical power (C)
  0 D to ±12.00 D
  0.01/0.12/0.25 D increments

- Cylinder axis (A)
  0 to 180°
  1°/ 5° increments
- KM measurable area
  ø3.3 mm (when the corneal curvature radius is 7.7 mm)

The measuring range is in accordance with Type A, ISO 10343 and the measuring accuracy is in accordance with Type 2, ISO 10343.

○ Corneal shape measurement (CT measurement)

- Corneal refractive power
  33.75 to 67.50 D (n = 1.3375)
  * Indication range: 10 to 100 D (n = 1.3375)
  0.01 D increments
- Corneal diameter to be measured
  Maximum diameter of 11 mm (Corneal curvature radius, r = 7.9 mm)
  Minimum diameter of 0.5 mm (Corneal curvature radius, r = 7.9 mm)
- Number of placido rings (edges)
  33 edges (16 rings × 2 and center circle) or more
- Data point 11,880 (33 × 360) points or more
- Accuracy
  The accuracy specifications are based on the results of eye model testing performed in accordance with ISO 19980.

Corneal curvature radius	Corneal refractive power	Measurement range	Tolerance/ mean deviation	Tolerance/ standard deviation
5.00 mm	67.50 D	Diameter ≤ 6 mm	±0.25 D	0.30 D
6.50 mm	51.92 D	Diameter ≤ 6 mm Diameter ≤ 3 mm 3 mm < Diameter ≤ 6 mm Diameter > 6 mm	±0.16 D	0.25 D
8.00 mm	42.19 D	Diameter ≤ 6 mm Diameter ≤ 3 mm 3 mm < Diameter ≤ 6 mm Diameter > 6 mm	±0.11 D	0.13 D
9.40 mm	35.90 D	Diameter ≤ 6 mm Diameter ≤ 3 mm 3 mm < Diameter ≤ 6 mm Diameter > 6 mm	±0.10 D	0.14 D
10.00 mm	33.75 D	Diameter ≤ 6 mm Diameter ≤ 3 mm 3 mm < Diameter ≤ 6 mm Diameter > 6 mm	±0.09 D	0.15 D

○ Other measurements

- Pupillary distance measurement (PD measurement)
  30 to 85mm
  1 mm increments
- Corneal diameter measurement (WTW measurement)
  13.0 mm or less
  0.02 mm increments
- Pupil diameter measurement (PS measurement)
  1.0 to 10.0 mm
  0.02 mm increments

○ Working range of auto tracking

- Up and down 32 mm or more
- Right and left ±5 mm
- Forward and backward ±2 mm

○ Movable range

- Measuring unit Forward and backward: 33mm
  Right and left: 85mm
- Motorized chin rest Up and down: 62mm or more

○ Other functions

- Display 10.4-inch Color LCD (XGA)
- Printer Thermal line printer with auto cutter
- Storage Solid State Drive (Built into the main body)
- Interface connectors
  RS-232C (Output)
  USB (USB2.0)
  LAN (Ethernet)

○ Electrical rating

- Power source AC 100 to 240 V ±10% 50/60 Hz
- Power consumption 110 VA

○ Dimensions and mass

- Dimensions 284 mm (W) × 525 mm (D) × 533 mm (H)
- Mass 23 kg

○ Environmental conditions (during use)

- Temperature 10 to 35ºC (50 to 95ºF)
- Humidity 30 to 90%
- Atmospheric pressure
  800 to 1060 hPa
- Temperature Indoor, no harmful dust or smoke

○ Environmental conditions (during transport and storage, packed condition)

- Temperature –10 to 55ºC (14 to 131ºF)
- Humidity 10 to 95%
- Atmospheric pressure
  700 to 1060 hPa

○ Others

- Expected service life (defined by manufacturer)
  8 years from the date of initial operation
  * Proper maintenance is necessary.
- Packing unit 1 unit

6.3 Standard Configuration

6.3.1 Standard accessories

• Printer paper	3 rolls
• Power cord	1 unit
• Dust cover	1 unit
• Pack of chinrest paper	1 unit
• Fixing pins for chinrest paper	2 units
• Spherical model eye	1 set
• Operator’s manual	1 volume
• Touch-screen pen	1 unit
• Touch-screen pen holder	1 unit
• Ferrite core	1 unit
• OPD Software for External PC installation CD	1 unit
• OPD Software for External PC USB license key	1 unit
• OPD Software for External PC operator’s manual	1 volume

6.3.2 Optional accessories

- Interface cable
- Eye Care card system
- Barcode reader (USB)
- Magnetic card reader (USB)
- Color printer (USB)
- External hard disk drive (USB)
- Advance (for license setting)
- IOL-Station (cataract surgery support software)
- Corneal Score

Note

- For the operating procedures for IOL-Station, refer to the operator's manual for IOL-Station.
- When the OPD-Scan III measurement data is used for IOL-Station, IOL-Station must be V1.03 or later.
- Advance and Corneal Score are the optional functions to be added to OPD Software for External PC.

7. APPENDIX

7.1 Glossary

●AR Measurement

Fundus is scanned with slit-shaped ray bundles and measured in increments of 1º in the 2.6 mm area. AR-measured data is obtained.

●AR typical values

The typical values of the first 3 usable values taken during AR-measured values and put in order in a computer.

●AR values

One of the measured values (SPH, CYL, AXIS) obtained during OPD measurement which is equal to values obtained by an auto refractometer. This represents the refractive status of an approximate center of the eye.

●Auto shot

A function with which the device automatically starts a serial measurement as soon as the device is best aligned and in ideal focus.

●Auto tracking

A function with which the device automatically controls the up, down, right, and left movements and focusing of the measuring unit.

●Chart

The picture of balloon that can be seen by looking into the measuring window.

●Contact lens conversion value

The value that the AR typical values (or the latest values when the typical values have not been obtained) are converted into CL values, letting the vertex distance (VD) be 0mm.

●CT measurement

The projected placido rings on the cornea are captured, analyzed, and a map is obtained which represents the corneal curvature and distribution of refractive powers.

●Expected service life

A period of time beyond which the reliability and safety of the system cannot be guaranteed even with normal use and regular maintenance that involves proper exchange of maintenance and consumable parts, repair, and overhaul.

●KM measurement

A placido ring image projected over the cornea is captured. The captured image is analyzed and corneal curvature radius in the 3 mm in diameter area on cornea, the direction of the steepest meridian and corneal astigmatism are obtained.

●Limit Mark

When the main body moves out of the working range of auto tracking, the limit indicator (arrows) is displayed on the screen.

●OPD measurement

Fundus is scanned with slit-shaped ray bundles and measured in increments of 1º in the area from 2 to 9.5 mm in diameter. AR-measured data and OPD maps are obtained.

●PD

Abbreviation of “Pupil Distance” which is the width between the right and left pupils.

●Power saving mode

If there is no operation for more than a set number of minutes of latent operation, a dimmed title screen appears, which is the power-saving status of the device. Touch the touch-screen panel or the keyboard to exit the power saving mode and return to normal mode.

●PSF

Abbreviation of Point Spread Function. This function simulates what kind of image is formed on the retina when the patent looks at a point source of light like a star.

●Q value

A value which is referred to when selecting a contact lens. This represents asphericity of the cornea.

●Trial Lens Data

Data where the AR typical values (or the latest values when the typical values have not been obtained) are examined and indicated by a cylindrical value (cylinder reading direction) which would make a spherical trial lens have a lower power for convenience.

●Vertex Distance

The distance between a corneal vertex to the posterior surface of the spectacle lens.

7.2 List of Abbreviations

This device and operator's manual use the abbreviations below.

General

OPD	Optical Path Difference
CT	Corneal Topography
TED	Torsion Error Detection TED function (correction of eye ball movement) in the refractive surgery with the Excimer Laser Corneal Surgery System, EC-5000
PSF	Point Spread Function
RMS	Root Mean Squared fit error
MTF	Modulation transfer function
SimK S	Simulated keratometry Steep
SimK F	Simulated keratometry Flat
HO	High Order
Q value	Asphericity
EMR	Electroric Medical Record

Case

NRM	Normal eye with astigmatism within 0.5 D
AST	Eye with astigmatism over 0.5 D
KCS	Kratoconus suspect
KC	Clinical Keratoconus
PMD	Pellucid Marginal Degeneration
PKP	Penetrating keratoplasty
MRS	Eye after Myopic Refractive Surgery
HRS	Eye after Hyperopic Refractive Surgery
OTH	Others (Unclassified variations)

Corneal Index

SimK	Simulated keratometry
MinK	Minimum Keratometry Value
ACP	Average Corneal Power
CYL	Simulated keratometric cylinder
CVP	Coefficient of Variation of corneal Power
SDP	Standard Deviation of corneal Power
AA	Analyzed Area

CEI	Corneal Eccentricity Index
PVA	Potential Visual Acuity
LogMAR	Log minimum Angle of Resolution
DSI	Differential Sector Index
SRI	Surface Regularity Index
SRC	Area compensated Surface Regularity Index
SAI	Surface Asymmetry Index
IAI	Irregular Astigmatism Index
OSI	Opposite Sector Index
CSI	Center-Surrounded Index
KPI	Keratoconus Prediction Index
EDP	Elevation/Depression Power
EDD	Elevation/Depression Diameter

Color scale

Norm	Relative scale in color scale display (Normalize)
Adj	Adjustable scale in color scale display (Adjustable)
Abs26	26-color fixed color scale (Absolute [26])
Indv	Scale applied to each map data (Individual)
Com	Scale applied to each map type (Common)
S-K 1.5	Smolek Klyce scale in 1.5 D increments (Smolek-Klyce [1.5D])

7.3 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

O Specified cable

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

O Essential performance

Refractive error measurement function

Corneal topography 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

7.4 JOIA Output Data Format

The information shown below are for those who are in charge of or related to designing of the electronic medical record. Refer to it as necessary.

7.4.1 XML data format

When the “Output settings for NAVIS” parameter is off, data is output with the format commonly used for ophthalmic test equipment specified by the Japan Ophthalmic Instruments Association.

“Compulsory” column	Example
None	Neither the tag nor the value is compulsory.
Tag	The tag is compulsory, but the value can be blank.
Tag + value	Both the tag and the value are compulsory.

* The “compulsory” column is applied to the lower tags only when their upper tags exist.
* The XML data format is independent of the print format or communication format. All the data that can be output are output.

Ophthalmology tag

Tag name	Explanation	Data type	Compulsory	Example
<Ophthalmogy>	Ophthalmic data	-	Tag + value	

Common data

Tag name	Explanation	Data type	Compulsory	Example
<Common>	Common tag	-	Tag + value	
<Company>	Company name	string (64 characters)	Tag + value	NIDEK
<ModelName>	Model name	string (64 characters)	Tag + value	OPD-Scan3
<MachineNo>	No. for distinction among the devices of the same model	string (64 characters)	Tag	44011
<ROMVersion>	No. for distinction among the models with the same ROM version	string (64 characters)	Tag	1.04.02/1.01
<Version>	XML specifications version (fixed)	string (64 characters)	Tag + value	1.2
<Date>	Date (year, month, day)	date	Tag + value	2011-08-30
<Time>	Time (hour, minute, second)	time	Tag + value	14:32:22
<Patient>	Patient	-	Tag + value	
<No.>	Patient No.	string (64 characters)	Tag + value	
<ID>	Patient ID	string (64 characters)	Tag	000001
<FirstName>	Patient’s first name	string (64 characters)	Tag	John
<MiddleName>	Patient’s middle name	string (64 characters)	Tag	mi
<LastName>	Patient’s last name	string (64 characters)	Tag	Smith
<Sex>	Patient’s sex	string (M, F, O only)	Tag	M
<Age>	Patient’s age	int	Tag	None

Tag name	Explanation	Data type	Compulsory	Example
<DOB>	Patient's date of birth	date	Tag	None
<NameJ1>	Patient's name in other languages	string (64 characters)	Tag	None
<NameJ2>	Patient's name in other languages	string (64 characters)	Tag	None

Refractometry (AR) data

Tag name	Explanation	Data type	Compulsory	Example
<Measure type="REF">	Measurement type tag	-	Tag + value	
<VD unit="mm">	Corneal vertex distance	double	Tag + value	12.00
<DiopterStep unit="D">	Diopter increment	double	Tag	0.01
<AxisStep unit="deg">	Angle increment	int	Tag	1
<CylinderMode>	Cylinder mode (-,+,mix)	string (-,+,mix only)	Tag	-
<REF>	Refractometry data	-		
<R>	Right eye measurement value	-		
<List No="1 to n">	Measurement value (1 to n times)	-		
<Sphere unit="D">	Spherical refractive power (D)	double	Tag + value	-1.55
<Cylinder unit="D">	Cylindrical refractive power (D)	double	Tag + value	-2.78
<Axis unit="deg">	Cylinder axis (°)	int	Tag + value	43
<SE unit="D">	Spherical equivalent refraction (D)	double	Tag	-2.94
<CataractMode>	CAT mode	string (64 characters)	Tag	off
<IOLMode>	IOL mode	string (64 characters)	Tag	None
<ConfidenceIndex>	Confidence index	string (64 characters)	Tag	None
<Median>	Median value	-		
<Sphere unit="D">	Spherical refractive power (D)	double	Tag + value	
<Cylinder unit="D">	Cylindrical refractive power (D)	double	Tag + value	
<Axis unit="deg">	Cylinder axis (°)	int	Tag + value	
<SE unit="D">	Spherical equivalent refraction (D)	double	Tag	
<L>	Left eye measurement value	-		
<List No="1 to n">	Measurement value (1 to n times)	-		
<Sphere unit="D">	Spherical refractive power (D)	double	Tag + value	
<Cylinder unit="D">	Cylindrical refractive power (D)	double	Tag + value	
<Axis unit="deg">	Cylinder axis (°)	int	Tag + value	
<SE unit="D">	Spherical equivalent refraction (D)	double	Tag	
<CataractMode>	CAT mode	string (64 characters)	Tag	
<IOLMode>	IOL mode	string (64 characters)	Tag	
<ConfidenceIndex>	Confidence index	string (64 characters)	Tag	
<Median>	Median value	-		
<Sphere unit="D">	Spherical refractive power (D)	double	Tag + value	
<Cylinder unit="D">	Cylindrical refractive power (D)	double	Tag + value	
<Axis unit="deg">	Cylinder axis (°)	int	Tag + value	
<SE unit="D">	Spherical equivalent refraction (D)	double	Tag	
<Nidek>	NIDEK data		Tag	
<ThirtySecRefraction>	30 second refraction data		Tag	

Tag name	Explanation	Data type	Compulsory	Example
<R>	Transfered right eye measurement value		Tag	
<RT>	RT transfer data (WFsent, ARsent)		Tag	
<L>	Transfered left eye measurement value		Tag	
<RT>	RT transfer (WFsent, ARsent)		Tag	
<HD_Exam>	HD Exam data		Tag	
<R>	Right eye measurement value		Tag	
<Sphere unit="D">	Spherical refractive power (D)	double	Tag	
<Cylinder unit="D">	Cylindrical refractive power (D)	double	Tag	
<Axis unit="deg">	Cylinder axis (°)	int	Tag	
<SE unit="D">	Spherical equivalent refraction (D)	double	Tag	
<RT>	RT transfer (SentToRT NotSend)		Tag	
<L>	Left eye measurement value		Tag	
<Sphere unit="D">	Spherical refractive power (D)	double	Tag	
<Cylinder unit="D">	Cylindrical refractive power (D)	double	Tag	
<Axis unit="deg">	Cylinder axis (°)	int	Tag	
<SE unit="D">	Spherical equivalent refraction (D)	double	Tag	
<RT>	RT transfer (SentToRT NotSend)		Tag	

Keratometry (KM) data

Tag name	Explanation	Data type	Compulsory	Example
<Measure type="KM">	Measurement type tag	-	Tag + value	
<DiopterStep unit="D">	Corneal refractive power increment	double	Tag + value	0.01
<AxisStep unit="deg">	Angle increment	int	Tag	1
<CylinderMode>	Cylinder mode (-,+,mix)	string (-,+,mix only)	Tag	-
<RefractiveIndex >	Corneal refractive index	double	Tag + value	1.3375
<KM>	Keratometry data	-		
<R>	Right eye measurement value	-		
<List No="1?n">	Measurement value (1 to n times)	-		
<R1>	R1 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	7.78
<Power unit="D">	Corneal refractive power	double	Tag + value	42.88
<Axis unit="deg">	Axis angle	int	Tag + value	46
<R2>	R2 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<Average>	Average value	-	Tag + value	
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag	
<Cylinder>	Cylindrical power	-	Tag + value	
<Power unit="D">	Cylindrical refractive power	double	Tag + value	
<Axis unit="deg">	Cylinder axis angle	int	Tag + value	
<Median>	Median value	-		

Tag name	Explanation	Data type	Compulsory	Example
<R1>	R1 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<R2>	R2 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<Average>	Average value	-	Tag + value	
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag	
<Cylinder>	Cylindrical power	-	Tag + value	
<Power unit="D">	Cylindrical refractive power	double	Tag + value	
<Axis unit="deg">	Cylinder axis angle	int	Tag + value	
<L>	Left eye measurement value	-		
<List No="1 to n">	Measurement value (1 to n times)	-		
<R1>	R1 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<R2>	R2 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<Average>	Average value	-	Tag + value	
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag	
<Cylinder>	Cylindrical power	-	Tag + value	
<Power unit="D">	Cylindrical refractive power	double	Tag + value	
<Axis unit="deg">	Cylinder axis angle	int	Tag + value	
<Median>	Median value	-		
<R1>	R1 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<R2>	R2 data			
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag + value	
<Axis unit="deg">	Axis angle	int	Tag + value	
<Average>	Average value	-	Tag + value	
<Radius unit="mm">	Curvature radius	double	Tag + value	
<Power unit="D">	Corneal refractive power	double	Tag	
<Cylinder>	Cylindrical power	-	Tag + value	
<Power unit="D">	Cylindrical refractive power	double	Tag + value	
<Axis unit="deg">	Cylinder axis angle	int	Tag + value	

7.4.2 XML file sample

This is a sample used to explain the data, and does not comprise the actual measurement data.
For details, see the opthalmic device standard specifications on the web site of the Japan Ophthalmic Instruments Association (JOIA).

When the “Output settings for NAVIS” parameter is off, data is output with the format commonly used for ophthalmic test equipment specified by the Japan Ophthalmic Instruments Association.

```
<?xml version="1.0" encoding="UTF-16"?>

<Ophthalmology xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:nsCommon="http://www.joia.or.jp/standardized/namespaces/Common"
xmlns:nsREF="http://www.joia.or.jp/standardized/namespaces/REF"
xmlns:nsKM="http://www.joia.or.jp/standardized/namespaces/KM"
xsi:schemaLocation="http://www.joia.or.jp/standardized/namespaces/Common Common_schema.xsd
                    http://www.joia.or.jp/standardized/namespaces/REF REF_schema.xsd
                    http://www.joia.or.jp/standardized/namespaces/KM KM_schema.xsd">

    <nsCommon:Common>
        <nsCommon:Company>NIDEK</nsCommon:Company>
        <nsCommon:ModelName>OPD-ScanIII</nsCommon:ModelName>
        <nsCommon:MachineNo>440011</nsCommon:MachineNo>
        <nsCommon:ROMVersion>1.04.02/1.01</nsCommon:ROMVersion>
        <nsCommon:Version>1.2</nsCommon:Version>
        <nsCommon:Date>2011-08-30</nsCommon:Date>
        <nsCommon:Time>14:32:22</nsCommon:Time>
        <nsCommon:Patient>
            <nsCommon:No.></nsCommon:No.>
            <nsCommon:ID>000001</nsCommon:ID>
            <nsCommon:FirstName>John</nsCommon:FirstName>
            <nsCommon:MiddleName>mi</nsCommon:MiddleName>
            <nsCommon:LastName>Smith</nsCommon:LastName>
            <nsCommon:Sex>M</nsCommon:Sex>
            <nsCommon:Age></nsCommon:Age>
            <nsCommon:DOB></nsCommon:DOB>
            <nsCommon:NameJ1></nsCommon:NameJ1>
            <nsCommon:NameJ2></nsCommon:NameJ2>
        </nsCommon:Patient>
        <nsCommon:Operator>
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        </nsCommon:Operator>
    </nsCommon:Common>

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```

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                <nsREF:SE unit="D">-2.22</nsREF:SE>
                <nsREF:CataractMode>off</nsREF:CataractMode>
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                <nsREF:ConfidenceIndex></nsREF:ConfidenceIndex>
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            <nsREF:List No="3">
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            </nsREF:List>
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                <nsREF:Cylinder unit="D">-2.78</nsREF:Cylinder>
                <nsREF:Axis unit="deg">43</nsREF:Axis>
                <nsREF:SE unit="D">-2.94</nsREF:SE>
            </nsREF:Median>
        </nsREF:L>
    </nsREF:REF>

    <Nidek>
        <ThirtySecRefraction>
            <L>
                <RT>ARsent</RT>
            </L>
        </ThirtySecRefraction>
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            <L>
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```

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            <nsKM:Power unit="D">43.10</nsKM:Power>
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        <nsKM:R1>
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            <nsKM:Power unit="D">42.78</nsKM:Power>
```

```
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                <nsKM:R2>
                    <nsKM:Radius unit="mm">7.83</nsKM:Radius>
                    <nsKM:Power unit="D">43.10</nsKM:Power>
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                </nsKM:R2>
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                    <nsKM:Radius unit="mm">7.86</nsKM:Radius>
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</nsKM:Measure>

</Ophthalmology>
```

8. INDEX

T

U

V

W

Z