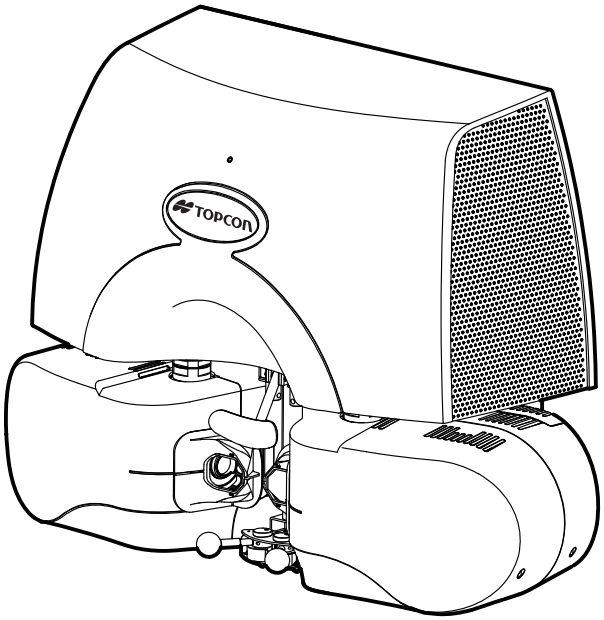
TOPCON



USER MANUAL
REFRACTION SYSTEM

Chronos

INTRODUCTION

Thank you for purchasing the TOPCON REFRACTION SYSTEM Chronos.

INTENDED USE / INDICATIONS FOR USE

The Chronos measures the spherical refractive power, cylindrical refractive power, and astigmatism axis direction of the eyeball. The curvature radius of the corneal surface is measured. In addition, various subjective refraction acuity examinations are performed.

FEATURES

This instrument has the following features:

- It is possible to measure the refractive power and the curvature radius of the corneal surface and perform subjective measurement for both eyes at the same time.
- Simultaneous auto-alignment for both eyes enables the operator to carry out measurement.
- It is possible to perform subjective measurement as keeping the binocular vision.

PURPOSE OF THIS MANUAL

This manual outlines the Chronos, including operating procedures, troubleshooting, maintenance and cleaning.
Before using the instrument, carefully read the "DISPLAYS AND SYMBOLS FOR SAFE USE" and the "GENERAL SAFETY INFORMATION" to familiarize yourself with the features of the Chronos and use it efficiently and safely.
Keep this manual at hand for future reference.
For handling of the adjustable instrument table CGS-1000 exclusively for Chronos (hereinafter referred to as "adjustable instrument table"), please also refer to the instructions in the user manual of the adjustable instrument table.

This manual does not explain how to operate a personal computer (PC), Microsoft Windows and iPad/iOS. It is made on the assumption that the customers have knowledge enough about a personal computer, Microsoft Windows and iPad/iOS.
For operating a personal computer, Microsoft Windows and iPad/iOS, refer to the manual of each equipment.

CAUTION : Federal law restricts this device to sale by or on the order of a physician.

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TRADEMARKS

Chronos is a trademark of TOPCON CORPORATION.

SightPilot™ is a trademark of TOPCON CORPORATION.

Microsoft Windows is a registered trademark or trademark of the U.S. Microsoft Corporation in U.S. and other countries.

QR code is a registered trademark of DENSO WAVE Incorporated.

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iOS is name of OS of Apple Inc. IOS is a registered trademark or trademark of Cisco Systems, Inc. or its related companies in U.S. and other countries, and used under a license.

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1. No part of this manual may be copied or reprinted, in whole or in part, without prior written permission.
2. The contents of this manual are correct to the best of our knowledge. Please inform us of any ambiguous or erroneous descriptions, missing information, etc.
3. This manual is original instructions.

CONTENTS

DISPLAYS AND SYMBOLS FOR SAFE USE

To encourage safe and proper use and to prevent danger to the operator and others or potential damage to properties, warnings and cautions are placed on the instrument body and inserted in the manual.
We suggest that everyone understand the meaning of the following displays, icons and text before reading the "GENERAL SAFETY INFORMATION" and observe all listed instructions.

DISPLAY

Display	Meaning
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or physical damage.
NOTE	Useful functions to know. Paying attention to these will prevent the noted problems.

SYMBOL

Symbol	Description	Description (French)
	Alternating Current	Courant alternatif
	Off (power: disconnection from the mains)	Éteint (courant: coupure avec le secteur)
	On (power: connection to the mains)	Allumé (courant: raccordement sur le secteur)
	Type B applied part	Partie appliquée du Type B
	General warning sign	Symbole d'avertissement général
	Refer to instruction manual/booklet	Voir le manuel/la brochure
	Date of manufacture	Date de fabrication
	Serial number	Numéro de série
	Manufacturer	Fabricant
	Authorised Representative in the European Community	Représentant autorité pour l'Union européenne
	Medical Devices	Équipement médical
	Unique Device Identification (UDI)	Identification unique des dispositifs (IUD)

Symbol	Description	Description (French)
	Humidity limitation	Limite d'humidité
	Atmospheric pressure limitation	Limite de pression atmosphérique
	Temperature limit	Limite de température
	Keep away from sunlight	Tenir à l'abri du soleil
	Fragile, handle with care	Fragile manipuler avec soin
	Keep dry	Garder au sec
	This way up	Vers le haut
	Maximum number of identical packages which may be stacked on one another.	Nombre maximum d'emballages identiques pouvant être empilés les uns sur les autres.
	General symbol for recovery/recyclable. (for the package)	Symbole général de tri sélectif. (pour l'emballage)
 	Recycling symbol for plastic in the package. Low density polyethylene	Symbole de recyclage du plastique dans l'emballage. Polyéthylène basse densité
 	Recycling symbol for plastic in the package. Polystyrene	Symbole de recyclage du plastique dans l'emballage. Polystyrène
	Indicates that the product conforms to the requirements of the Medical Device Regulation(EU)2017/745 and of the other applicable Union legislation	Indique que le produit est conforme aux exigences du Règlement (UE) 2017/745 relatif aux dispositifs médicaux et des autres lois applicables de l'Union Européenne
	CSA listing mark	Marque de certification CSA
	United States Federal law restricts medical devices to sale by or on the order of a licensed healthcare practitioner. (See 21 Code of Federal Regulations (CFR) sec. 801.109(b)(1))	La loi fédérale des États-Unis n'autorise la vente de dispositifs médicaux que par ou sur ordonnance d'un professionnel de la santé autorisé. (Voir 21 Code of Federal Regulations (CFR) sec. 801.109(b)(1))
	WEEE label The symbol indicates that the product should not be discarded as unsorted waste but must be sent to separate collection facilities for recovery and recycling.	Marquage des DEEE Il s'agit d'un symbole indiquant que le produit ne doit pas être éliminé avec les déchets non triés, mais doit être envoyé dans des installations de collecte séparées destinées à la valorisation et au recyclage.
	EU Battery Directive Battery users must not dispose of batteries as unsorted general waste, but treat properly.	Directive européenne sur les batteries Les utilisateurs de batteries ne doivent pas jeter les batteries comme des déchets généraux non triés, mais les traiter correctement.

GENERAL SAFETY INFORMATION

⚠ WARNING

Ensuring the Safety of Patients and Operators
Be careful not to hit the patient's eyes or nose with the main unit during operation. [If the main unit hits the patient's eye or the patient's nose is caught by it, he/she may be injured.]

Preventing Electric Shocks and Fire.
To avoid fire and electric shock, install the instrument in a dry place free of water and other liquids.
Be sure to connect the power plug to an AC 3-pin receptacle equipped with grounding. Connection with receptacle without grounding may cause fire and electric shock in case of short circuiting.
Do not attempt disassembling, rebuilding and/or repairs on your own. [To avoid electric shock and fire] [Your eyes may be exposed to Class 3B invisible laser radiation.] Ask your dealer for repairs.
Do not use the instrument under the condition that there is build-up of dust and liquid on power inlet, power connector and power plug. [If you use the instrument with dust, fire may occur.]
Connect only items that have been specified as part of the ME system or that have been specified as being compatible with the ME system.
Do not connect an additional power strip or an extension cord to the system.

Proposition65 warning sentence
⚠ **WARNING:** This product can expose you to chemicals including Lead, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

⚠ CAUTION

Ensuring the Safety of Patients and Operators
When installing this instrument on the adjustable instrument table, be careful to prevent your fingers from being caught by these units. [Your fingers may be caught between the instrument and the adjustable instrument table to cause injury.]
This instrument must be installed by two workers. [If one worker tries to install the instrument, it may turn over or fall off to cause injury.]
Do not perform any operation and adjustment by other procedures except those described in this manual. Your eyes may be exposed to dangerous ray radiation.
When turning on the power switch of the adjustable instrument table, place the patient's head away from this main unit. If the patient's eye or nose touches the main unit, the patient may be injured.

Ensuring the Safety of Patients and Operators
When turning on the power switch of the adjustable instrument table, make sure that the patient's finger is not put between the measuring head and drive base and between the right and left measuring windows. The patient's finger may be caught by these units to injure the patient.
When operating the main unit, make sure that the patient's finger or nose is not put between the measuring head and drive base and between the right and left measuring windows. [The patient's finger or nose may be caught by these units to injure the patient.]
When starting measurement and when finishing tests, make sure that the patient's finger or nose is not put between the measuring head and drive base and between the right and left measuring windows. The patient's finger or nose may be caught by these units to injure the patient.
Use the instrument in the environment where the operator can check directly the patient's condition and be careful not to hit the patient's eyes or nose with the main unit. [The patient may be injured.]
When adjusting this main unit position manually, check the position of patient’s head. If the eye or nose touches the main unit, he/she may be injured.
When adjusting this main unit position manually, make sure that the patient's nose is not put between the right and left measuring windows. The patient's nose may be caught by these units to injure the patient.
When finishing tests, place the patient's head away from the main unit. If the patient's eye or nose touches the main unit, the patient may be injured.
When pressing the [Abort exam] button, place the patient's head away from this main unit. If the patient's eye or nose touches the main unit, the patient may be injured.
When pressing the [Abort exam] button, make sure that the patient's finger is not put between the measuring head and drive base and between the right and left measuring windows. The patient's finger may be caught by these units to injure the patient.
When operating through wireless communication, use the instrument in the environment without obstacles and wireless interference. [The patient may be injured.]

Preventing Electric Shock and Burn
To avoid electric shock, do not handle the power supply plug with wet hand.
To avoid fire in the event of an instrument malfunction, immediately turn OFF the power switch of the adjustable instrument table and disconnect the power plug from the adjustable instrument table if you see smoke coming from the instrument, etc. Don’t install the adjustable instrument table where it is difficult to pull out its power plug. Ask your dealer for service. [If the instrument is being used without taking remedial measures, electric shock or burn may occur.]
Use the instrument installed into the adjustable instrument table. Do not use the single unit of the main unit or power supply unit respectively. [To avoid electric shock]
To avoid the danger of electric shocks, connect this adjustable instrument table to only the power supply (for commercial use) equipped with a protective earth system. [To avoid electric shocks]
• Do not connect any device which is not recognized as one component of the system. • The personal computer, the Wi-fi router and the operation controller must be installed out of the patient’s environment.

Ensuring Security

- When connecting this instrument to an external device through LAN, apply the security update to the external device, make use of anti-virus software and take other countermeasures against computer virus properly.
- Do not connect any USB storage device that is not checked with the anti-virus software to the USB port of this instrument.
- When connecting this instrument to an external device through LAN, set the ID and password of the user to the external device.
- When outputting data to the shared folder on an external device from this instrument, set a proper user ID and password to the shared folder.
- If the automatic logoff function is disabled, it may cause serious issues in the safety of network connection. Please understand the effects of changing the settings before doing so.

Connected devices

The devices connected to digital or analog interface must comply with the international safety standards such as IEC and ISO standards (for example, IEC62368-1 for information devices and IEC60601-1 for medical devices).
When an external device is additionally connected to the medical electric devices that configure a medical electric system, the whole system (including the connected external device) must comply with the standards of the medical electric system.
If you have any question, consult the dealer from whom you purchased the instrument or the offices listed on the back cover.

When using this instrument, which is combined with an operation controller through wireless connection, you must use a PC (personal computer) or a tablet that meets the specifications and performance recommended for the wireless communication of this instrument as an operation controller.
Using a PC or a tablet that does not meet the recommended specifications and performance will operate this instrument wrongly and injure the patient.
Moreover the above-mentioned improper PC or tablet will emit unnecessary radio waves to affect the peripheral devices adversely.

Electromagnetic Compatibility (EMC)

This instrument and adjustable instrument table have been tested (with 100V/120V/230V) and found to comply with IEC 60601-1-2:2014+AMD1:2020(Ed.4.1). This instrument and adjustable instrument table radiate radio frequency energy within standard and may affect other devices in the vicinity. If you have discovered that turning on/off the instrument and adjustable instrument table affect other devices, we recommend you change its position, keep a proper distance from other devices, or plug it into a different outlet. Please consult the dealer from whom you purchased the instrument if you have any additional questions.

The external devices to be connected must comply with the corresponding EMC standards(e.g. CISPR 32/CISPR 35). The patient may be injured. It may affect other devices in the vicinity.

HOW TO USE THIS MANUAL

- Before using this instrument, be sure to read the cautions on P.1 to P.12.
- When you want to use this instrument first of all, read "BASIC OPERATIONS" on P.44 first.
- The following symbols are used in this manual. Please understand these symbols and their meaning and use the instrument correctly.

 : Describes the convenience functions and the cautions to ensure safe use.

 : Describes the location of supplemental or additional information.

GENERAL MAINTENANCE INFORMATION

USER MAINTENANCE

To ensure the safety and performance of the instrument, all maintenance work, unless specified in this manual, shall only be conducted by trained service engineers.
The following maintenance tasks may be done by the user.
For details, see the relevant part of this manual.

Cleaning the measuring lens/measuring mirror

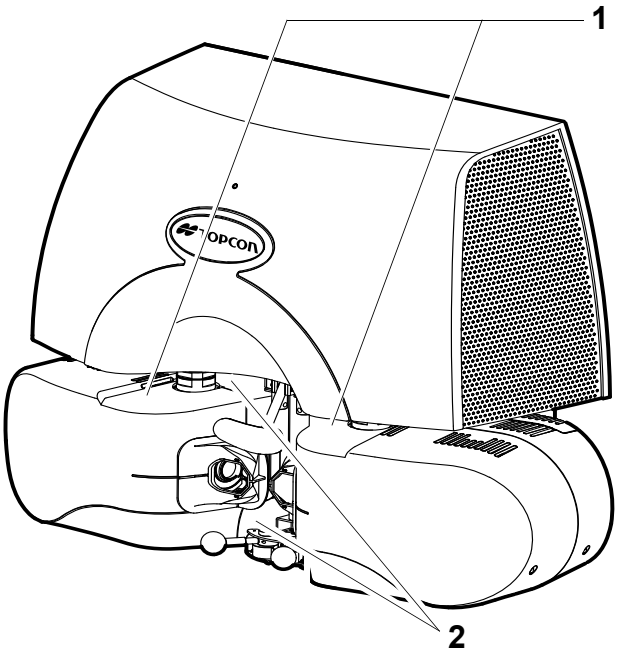
The glass surface of the measuring lens/measuring mirror may be cleaned by the user. For details, see "Cleaning the measuring lens/anterior segment filter" and "Cleaning the measuring mirror" on P.129.

DISCLAIMERS

- TOPCON shall not take any responsibility for damage due to fire, earthquakes, actions by third persons and other accidents, or damage due to negligence and misuse by the user and any use under unusual conditions.
- TOPCON shall not take any responsibility for damage derived from inability to properly use this instrument, such as loss of business profit and suspension of business.
- TOPCON shall not take any responsibility for damage caused from using this instrument in a manner other than that described in this manual.
- TOPCON is not responsible for any damage caused by unauthorized access from outside, malware or viruses.
- Diagnoses made shall be the responsibility of the user and TOPCON shall not take any responsibility for the results of such diagnoses.

POSITIONS OF WARNING AND CAUTION INDICATIONS

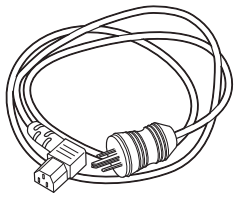
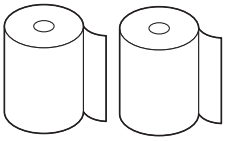
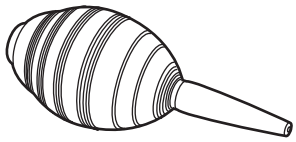
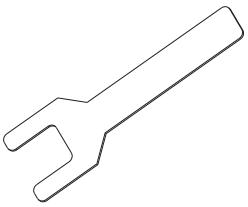
To ensure safety, this machine provides warning displays.
Use the instrument correctly by observing the display instructions. If any of the following display labels are missing, contact your TOPCON dealer at the address listed on the back cover.



No.	Label	Meaning	Signification
1		**CAUTION** When operating the main unit, make sure that the patient's finger or nose is not put between the measuring head and drive base and between the right and left measuring windows. [The patient's finger or nose may be caught by these units to injure the patient.]	**ATTENTION** En utilisant l'instrument, assurez-vous que le doigt ou le nez du patient ne se trouve pas entre la tête de mesure et la base d'entraînement ni entre les fenêtres de mesure droite et gauche. [Le doigt ou le nez du patient pourrait se trouver coincé entre ces unités et blesser le patient.]
2		Degree of protection against electric shock : TYPE B APPLIED PART	Degré de protection contre les chocs électriques : PIÈCE APPLIQUÉE DE TYPE B

STANDARD ACCESSORIES

Upon unpacking, make sure that all the following standard accessories are included.
Figures in ( ) are the quantities.

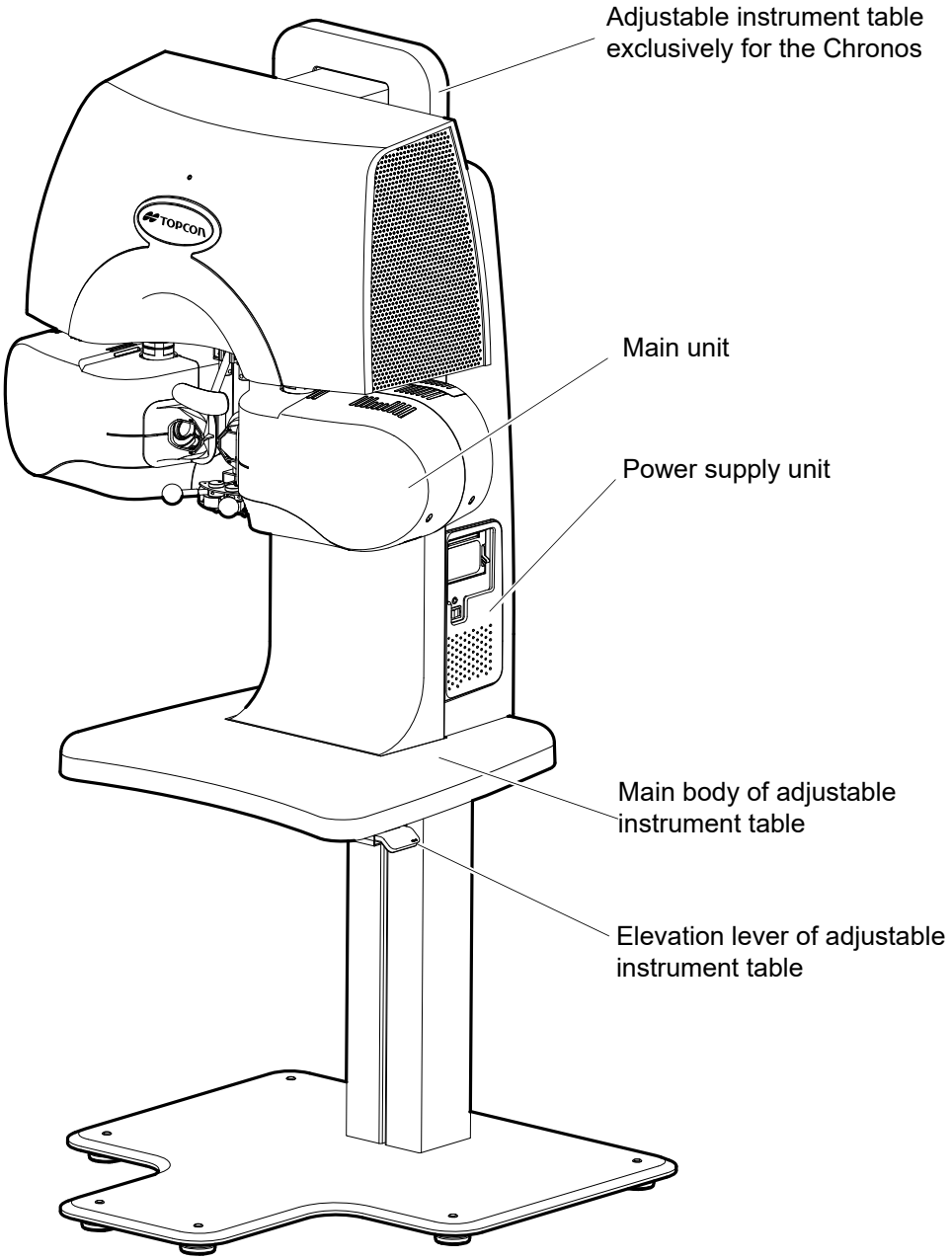
Power cord (1)* 	Printer paper (2) 
Blower (1) 	User Manual Instruction Manual Setup Manual (1 each) 
Nut tightening tool (1) 	Dust cover (1) 

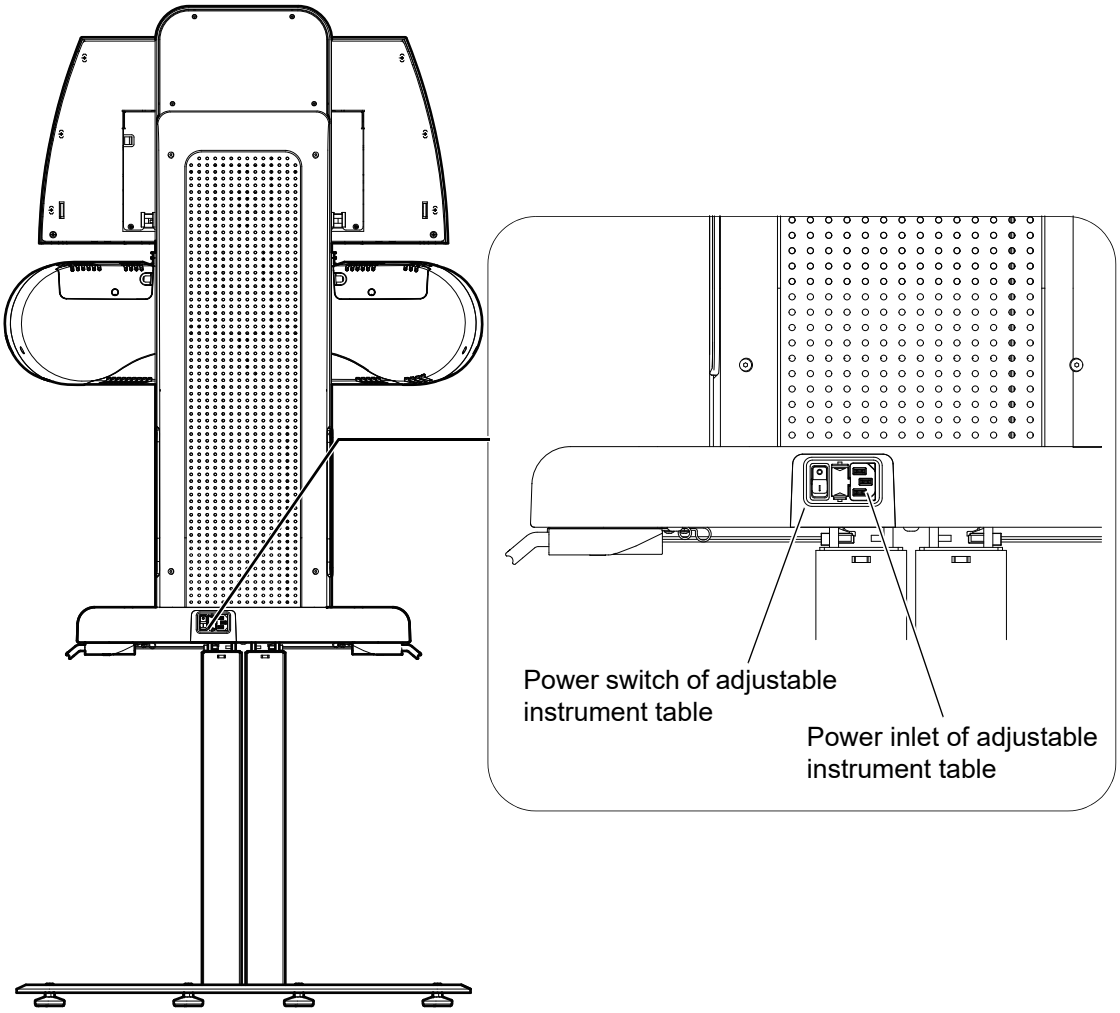
* More than one power cord can be included on certain occasions.

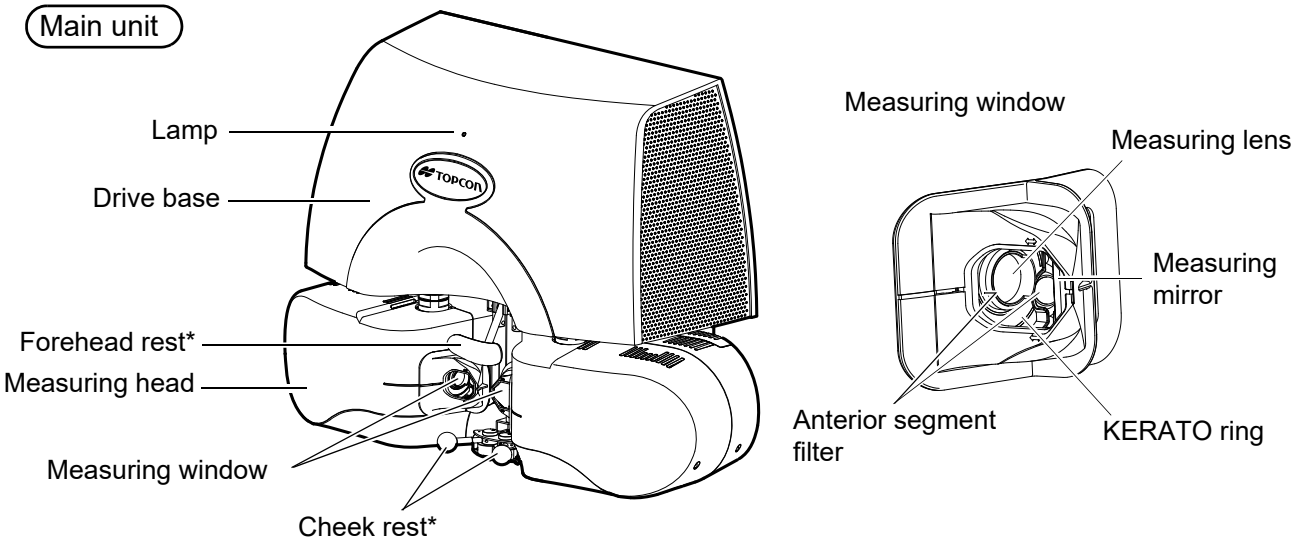
SYSTEM DIAGRAM

Consists of the following components

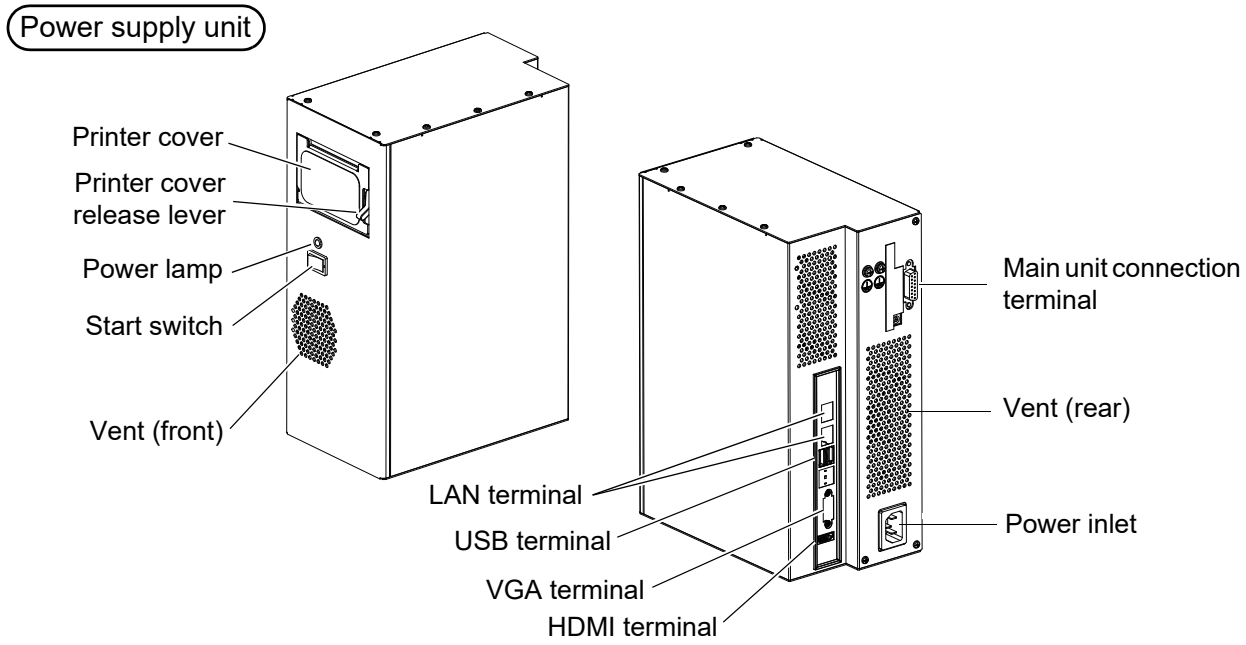
- Chronos (hereinafter referred to as “the instrument” or “this instrument”.)
  Main unit
  Power supply unit
  Power cord
- Adjustable instrument table exclusively for the Chronos
  Main body of adjustable instrument table







* TYPE B APPLIED PART



NOTE

	Lamp status	Status of this instrument
Lamp of main unit	Blinking in green	Preparing for startup
	Lighting in green	Power ON
	Lighting in orange	When an error occurs
Lamp of power supply unit	Lighting	Power ON

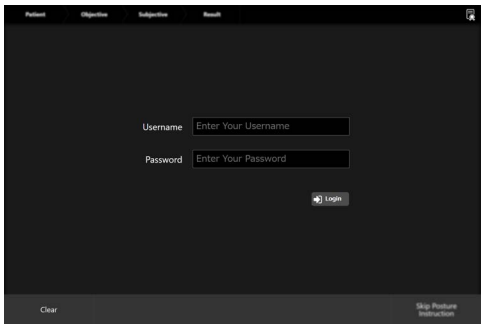
COMPOSITION OF PARTS WHICH CONTACT THE HUMAN BODY

Forehead rest : Polypropylene
Cheek rest : Silicone rubber

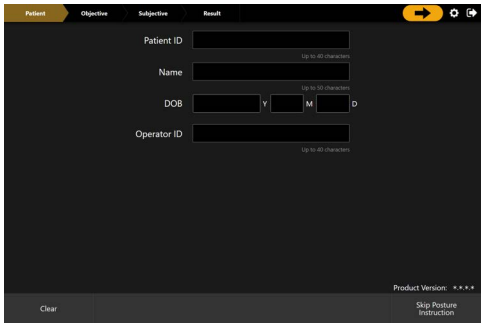
NAME OF SCREEN

Shift of screen

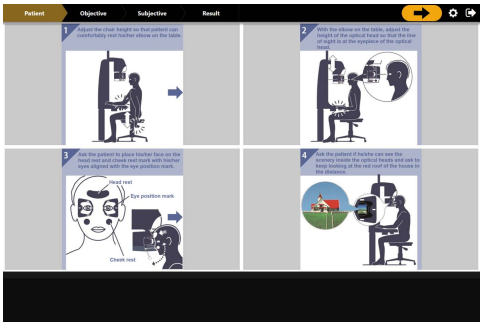
[1] Login screen



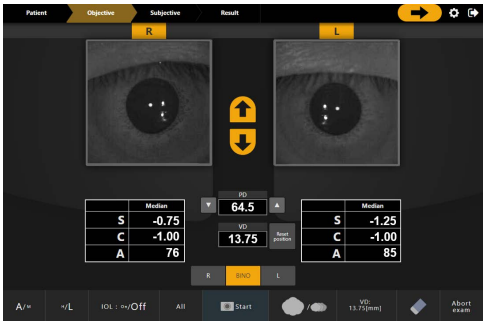
[2] Patient information input screen



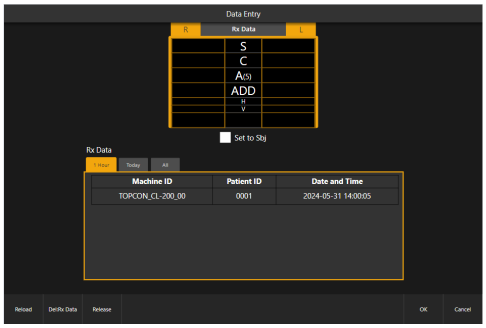
[3] Posture guidance screen



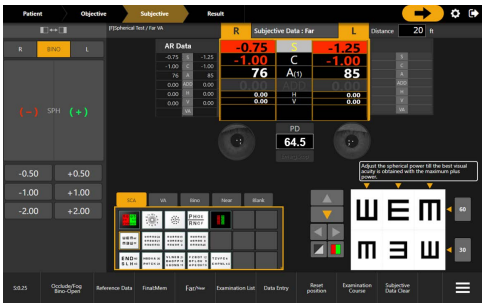
[4] Objective measurement screen



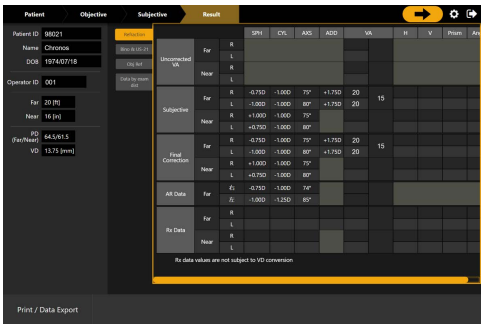
Data entry screen



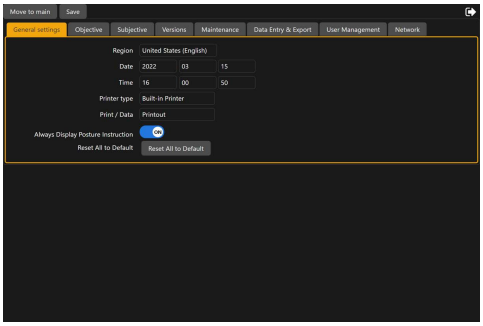
[5] Subjective refraction screen



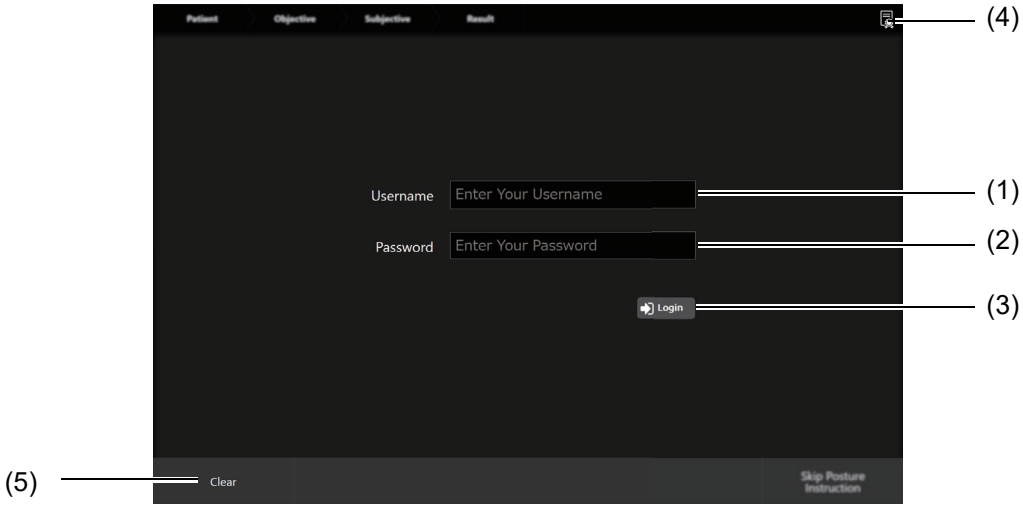
[6] Result screen



[7] Settings screen



[1] Login screen



(1) User name input area

Touch this area and input the user name for login.
"admin" is registered as the user name when shipped.
The user name can be changed on “User Management” of “Settings”.

(2) Password input area

Touch this area and input the password for login.
"Topcon@123" is registered as the password when shipped.
The password can be changed on “User Management” of “Settings”.

(3) Login button

After inputting the correct user name and password, tap this button. You can log-in Chronos.
After login, when 30 minutes have passed without operating Chronos, the screen is automatically logged out for security and the login screen appears. Once logout has been performed, the data of test being executed are discarded. Be careful.

NOTE	If the automatic logoff setting of the logged in user is set to off, you will not be automatically logged off. If the date changes during login, you will be automatically logged off when displaying the patient information input screen and login screen will be displayed. For automatic logoff setting, refer to "User Management" on P.164.

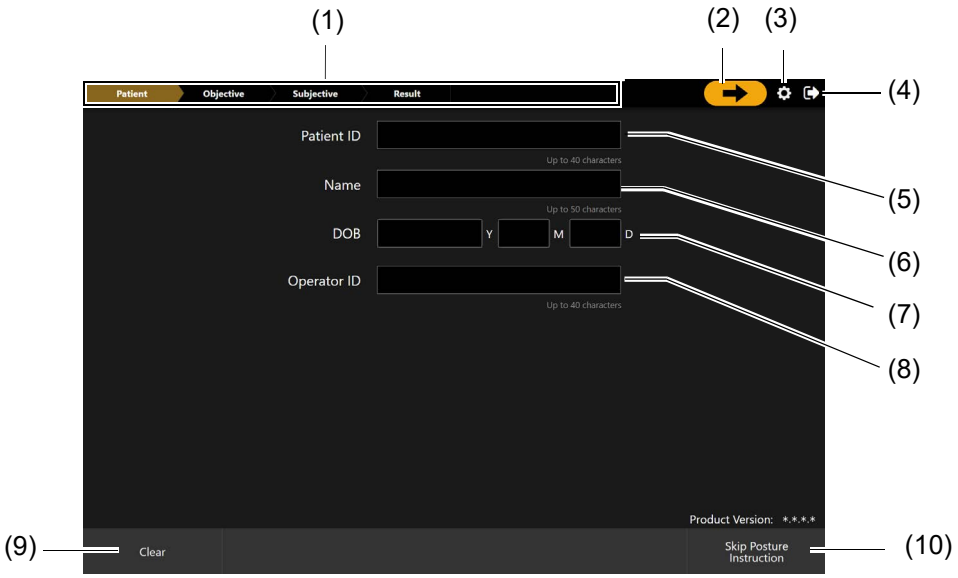
(4) Root certification

Tap this button. You can download the root certificate.

(5) [Clear] button

Tap this button. You can clear the letters input to the user name and password areas.

[2] Patient information input screen



(1) Task display area

This displays the progress of refraction tasks. The current progress is highlighted by one of four refraction tasks, "Patient", "Objective", "Subjective" and "Result". By touching this area, it is possible to go back to the final step of the touched refraction task. For details of this function, refer to "REFRACTION TASK BACK FUNCTION" of "OBJECTIVE OPERATIONS".

(2) Task shift button

Tap this button to proceed to the next refraction task.
This button cannot be tapped in the following cases:
- the device is being initialized;
- objective measurement is being executed;
- the processing to proceed to the next refraction task is not finished.

Even if data is not input on this screen, it is possible to proceed to the next task by tapping the task shift button.

(3) Settings screen display button

Tap this button. The settings screen appears. This button is always displayed during login not only on the patient information input screen but also other screens. Once the settings screen appears, the data of the test being executed are discarded. Be careful.

(4) Logout button

Tap this button. Logout is performed and the login screen appears. This button is always displayed during login not only on the patient information input screen but also other screens. Once logout is done, the data of the test being executed are discarded. Be careful.

(5) [Patient ID] area

Input the patient ID to this area. Patient ID can be input up to forty letters. The data input here is included in the Result screen, printed results and outputdata.
These characters are not allowed because they cause the data to be output incorrectly.
[&], [\], [/], [:], [*], [?], ["], [>], [<], [|]

(6) [Name] area

Input a patient name to this area. Patient name can be input up to fifty letters. The name input here is included in the Result screen, printed results and output data.

These characters are not allowed because they cause the data to be output incorrectly.

[&], ["], [>], [<]

(7) [DOB] area

Input the date of the patient's birthday in the order of "Year", "Month" and "Day". The birthday date input here is converted to the patient's age and is used to decide the ADD initial value in the subjective near-point test. Moreover, the age data is included in the Result screen, printed results and output data.

(8) [Operator ID] area

Input the operator ID to this area. Operator ID can be input up to forty letters. These characters are not allowed because they cause the data to be output incorrectly.

[&], [\], [/], [:], [*], [?], ["], [>], [<], [|]

(9) [Clear] button

Tap this button. The information input in (5) to (8) is cleared and each column is emptied.

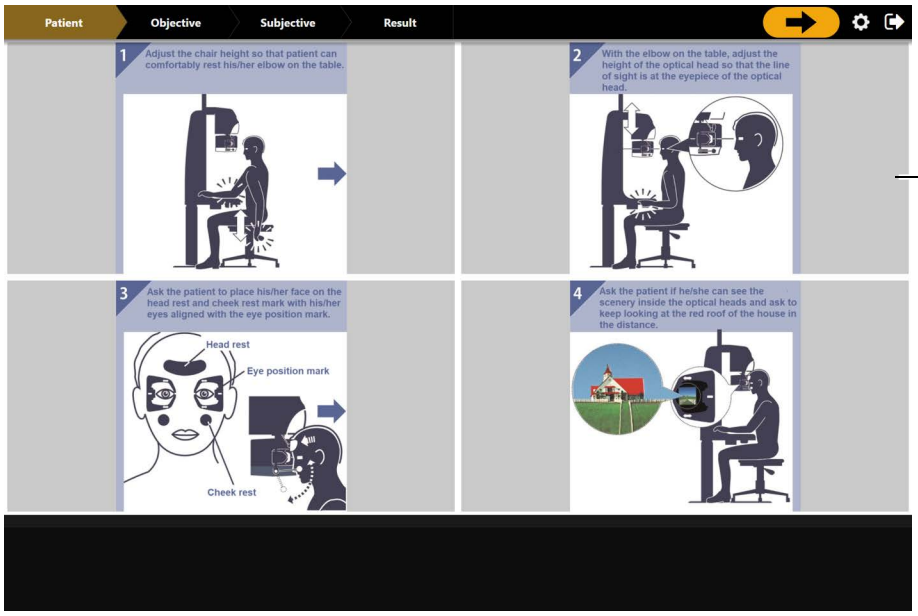
(10) [Skip Posture Instruction/Posture Instruction] button

In this area, one of [Skip Posture Instruction] button and [Posture Instruction] button is displayed.

When "Always Display Posture Instruction" is ON on the general settings screen, the posture guidance screen is displayed by tapping the task shift button. If you tap the [Skip Posture Instruction] button instead of the task shift button, the posture guidance screen is skipped and the objective measurement screen appears.

When "Always Display Posture Instruction" is OFF on the general settings screen, the objective measurement screen appears by tapping the task shift button. If you tap the [Posture Instruction] button instead of the task shift button, the posture guidance screen is displayed before the objective measurement screen.

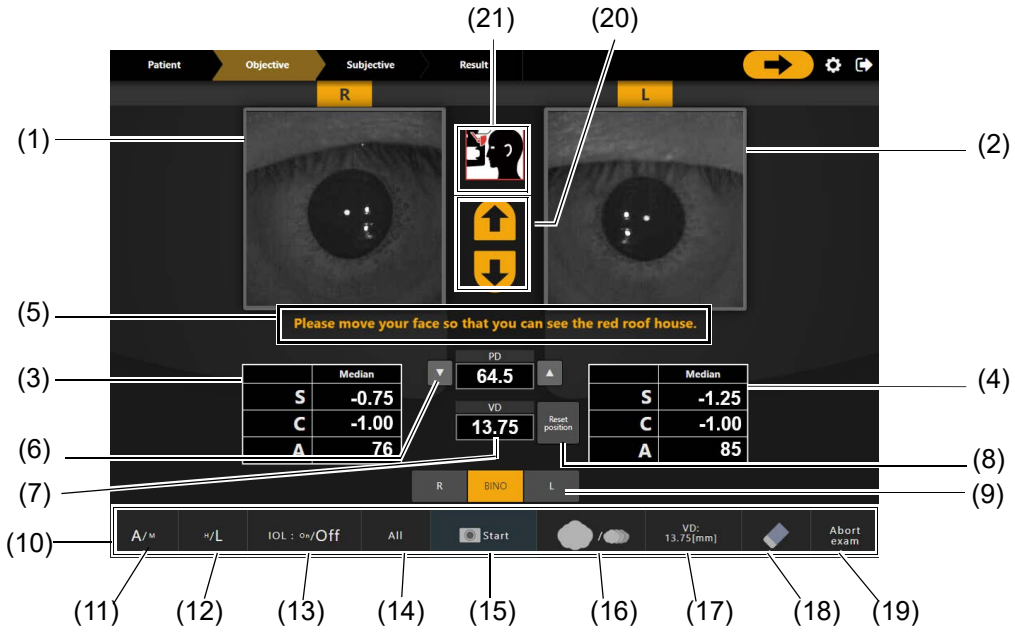
[3] Posture guidance screen



(1) Posture guidance

This displays the procedures to position the instrument and patient's face as keeping the correct posture before starting refraction with Chronos.

[4] Objective measurement screen



(1) Patient's eye display area (Right eye)

(2) Patient's eye display area (Left eye)

These areas display the live image of the patient's eye photographed by Chronos.

(3) Objective refraction measurement result display area (Right eye)

(4) Objective refraction measurement result display area (Left eye)

After the objective refraction measurement is completed, the typical values of the results are displayed.

(5) Alignment guide

When the patient's face is not placed correctly on Chronos, this area displays a message for the operator in order to ask the patient to move his/her face to a proper position.

(6) Pupil distance (PD) change/display area

The pupil distance of the patient, which is calculated by the distance between the right and left measuring heads after alignment has been completed, is displayed by the "0.5mm" or "1.0mm" unit. You can change the distance between the measuring heads by the "0.5mm" or "1.0mm" unit by tapping the [▼] and [▲] buttons at the right and left of this value display area.

(7) Vertex distance (VD) display area

The current vertex distance is displayed.

(8) Drive reset button

The right and left measuring heads are returned to the initial positions by tapping this button. Use this button when you want to return the measuring heads to the initial positions after an alignment error has occurred.

(9) Test eye selection button

Select a patient's eye for objective measurement. Normally tests are performed under the [BINO] selected condition. When the patient's eyes cannot be examined under the binocular condition, select the test eye with the [R] and [L] buttons.

(10) Function button

Each button at the bottom of the screen or this area is called "Function button". The function buttons are displayed on all screens except the alignment guide screen.

(11) Auto-alignment/manual alignment selector button

This changes the alignment method of measuring heads. When the letter "A" is displayed in large size, auto-alignment mode is selected. When the letter "M" is done so, manual alignment mode is selected.

(12) Fixation chart light intensity adjustment button

In objective measurement, the brightness of the fixation chart indicated toward the patient's eye is changed by two steps. When the letter "H" is displayed in large size, the fixation chart is indicated brightly. When the letter "L" is done so, the fixation chart is indicated dark.

(13) IOL eye (Intraocular lens insertion eye) selector button

When an intraocular lens is inserted into the patient's eye and auto-alignment causes an error, tap this button for the patient to change the alignment mode. When the word "Off" is displayed in large size, normal measurement mode is selected. When the word "On" is done so, the alignment mode for the intraocular lens insertion eye is selected.

(14) Objective measurement data display button

After objective measurement is completed, this button is valid. Tap this button to open the screen that displays all the objective refraction measurement data and the measured curvature radius of the corneal surface data.

(15) Measurement start button

Tap this button. Auto-alignment and objective measurement are performed in order.

(16) Fog setting selector button for measurement

When objective refraction measurement is done twice or more, this button decides fogging before measurement for first measurement only or for every measurement. When the "one cloud" icon is displayed largely, fogging is done for first measurement only. When the "three clouds" icon is done so, fogging is done for every measurement.

(17) VD change button

This button changes the VD of the measured patient's eye. Tapping this button enables the operator to select three VDs, "0mm", "12mm" and "13.75mm". The measured value is displayed with the value converted to the selected VD. VD is changed whenever the objective measurement screen is indicated.

(18) [Clear] button

Tap this button. The objective measurement results are discarded.

(19) [Abort Exam] button

Tap this button. The objective measurement results and the current patient information are discarded and the patient information input screen appears again.

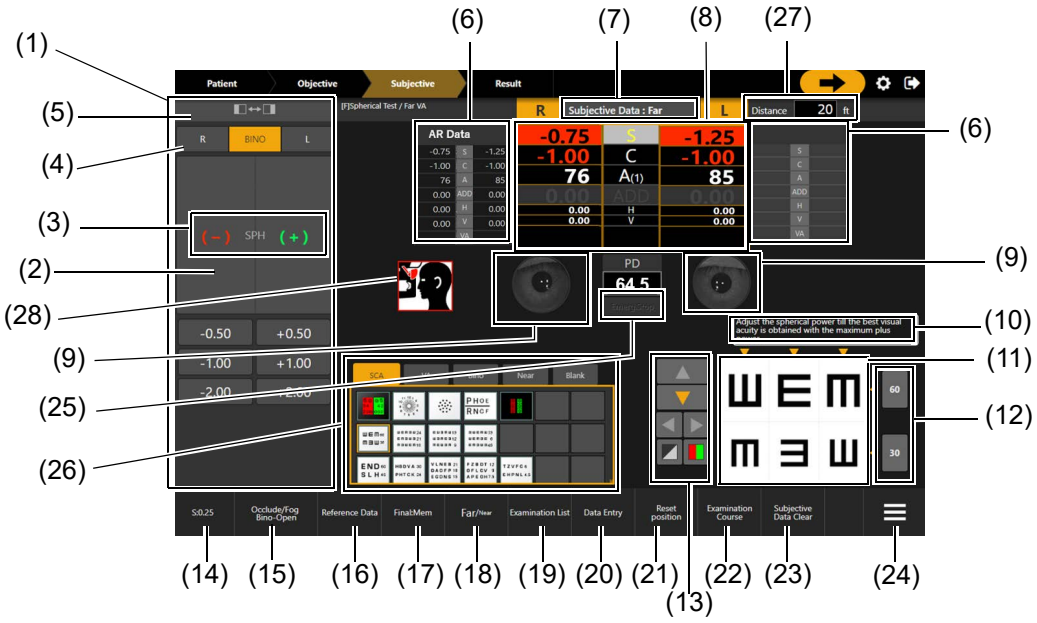
(20) Measuring heads height adjustment buttons

You can adjust the measuring heads height by tapping these buttons. When you tap the upward arrow button, the measuring heads move up. When you tap the downward arrow button, the measuring heads move down. When you want to align the measuring heads height with the patient's eye height before alignment, use these buttons for adjustment.

(21) Forehead rest icon

The icon appears while the patient's forehead is removed from the forehead rest.

[5] Subjective refraction screen



(1) Operation panel

On this area, the buttons to operate the refraction correction values are placed.

(2) Operation buttons

Tap this button. The refraction correction value of the eye selected by "(4) Patient's eye selector button" is changed. The button is divided into the right and left sides. The value can be increased or decreased by the tapped side. The changed correction value is displayed on "(8) Main data".
The value amount to be changed by one button operation can be changed by "(14) Step selector button".

(3) Navigation icon

Tap the right or left operation button. How the correction value is changed is displayed with symbol or an image imitating the chart the patient watches.

(4) Patient's eye selector button

The test eye is set to the right eye by tapping [R], the left eye by tapping [L], and the both eyes by tapping [BINO].

(5) Operation panel position selector button

The operation panel position is changed to the leftmost or the rightmost.

(6) Reference data

The reference data for subjective tests (for example, the objective measurement results or the existing lens power captured by the data entry function) are displayed on this area. The reference data on this area must be recorded in advance. To change the displayed reference data, touch the title above the reference data area to access the data list. Then, select the recorded data to be indicated as reference data.
Touching others of the reference data area except the title enables the operator to exchange the reference data of this area for the data of the main data area and vice versa in a moment. This function is convenient when comparing the view status of the subjective test result with that of the existing lens power.

(7) Title bar

The data set name of the data in the main data area is displayed. "Data set" means the container of the measured values or correction values called "Objective data", "Subjective data" or "Final data". Touch the title bar, and the set name list of the recorded data is displayed. Select one name from the data set name list. The values in the main data are changed to those of the selected data set.

Touch the title bar for about 2 seconds and release it. The data set name list is displayed with the data recording mode. In this mode, the values included in the main data are copied and recorded to the data set selected from the list. Then, the main data is displayed with the selected data set name. After recording data in a data set, you can change the values displayed in the main data.

(8) Main data

The refraction correction values and the measured visual acuity values, which are currently set in Chronos, are displayed.

Touching the refraction correction value and its title enables the operator to increase/decrease the value. Touch the left of the displayed value to decrease the touched refraction value and touch the right to increase the value. Touch the left of the correction value title to decrease the touched correction values at the right and left at the same time and touch the right to increase the values at the right and left at the same time.

(9) Examination window

This window displays the live image of the patient's eye being tested and besides, the status of the lens being set in Chronos. The lens status is overlaid on the patient's eye live image.

Touching the examination window enables the operator to occlude or open the eye at the touched side.

When Chronos detects the incorrect patient's eye position during subjective test, the periphery of the examination window flashes in pink in order to inform the operator of the incorrect position. If this flashing state continues, tap "(24) Hamburger menu button" to select [Auto-alignment].

(10) Mini help

Simple help information about the test being executed is displayed.

(11) Large chart

The chart which the patient sees now is displayed.

When the chart in this area is the visual acuity chart with "two rows and three columns", "three rows and five columns" and "two rows and five columns", the [▼] button is displayed for each column at the top of the large chart and, the [◀] button is displayed for each row at the right. These are called "Mask set buttons". Tapping the [▼] button sets a vertical line mask over the selected column. Tapping the [◀] button sets a lateral line mask over the selected row. Then, only the selected column or row is indicated toward the patient. Touch directly the visual acuity chart in this area, and a character mask is set over the selected visual acuity chart. Then, only the selected one character is indicated toward the patient.

(12) Side button

This area displays the function buttons concerned with the chart in the large chart area or the test being executed.

The side buttons shown at the right are displayed when a visual acuity test chart is indicated in the large chart area.
These buttons display the visual acuity value on each row. Tap the button of one value, and the visual acuity value is recorded as the test result and is displayed on "(8) Main data".

The side buttons shown at the right are displayed when the astigmatism test or the cross cylinder test is executed.
Tap one of the buttons. The cylinder axis value of the patient's eye selected with "(4) Patient's eye selector button" is changed to the value of the tapped button.

The side buttons shown at the right are displayed when the phoria test is executed.
When one of the horizontal or vertical prism values is set in the main data, the [Memory + Clear] button and the [All Clear] button are valid. Tap the [Memory + Clear] button. The horizontal/vertical prism values, which are set in the main data, are stored and the values in the main data are set to zero. When the values are stored, the [Restore] button and the [All Clear] button are valid. Tap the [Restore] button. The stored horizontal/vertical prism values are returned into the main data. Tap the [All Clear] button. The horizontal/vertical prism values, which are currently set in the main data, and the stored horizontal/vertical prism values are deleted. Zero is set to the prism values in the main data.

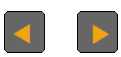
(13) Chart control buttons

When a visual acuity test chart is displayed in the large chart area, these buttons are displayed.

 : Tap this button. The half at the right of the chart is displayed in green and, the half at the left is displayed in red. The operator can perform R/G test.

 : This button is displayed when a visual acuity chart is displayed.
Tap this button. The chart with white background and black letters and the chart with black background and white letters are alternately displayed.

 : These buttons are displayed when the displayed chart is not the inverted-triangular space-between-letters-reduced layout chart.
Tap these buttons when a mask is not set over the chart. The whole chart is changed and displayed in the order of visual acuity values. Tap these buttons when the vertical line mask, lateral line mask or character mask is set. The mask is moved up and down.

 : These buttons are valid when the displayed chart is not the inverted-triangular space-between-letters-reduced layout chart and the vertical line mask or character mask is set. Tap these buttons. The vertical line mask or character mask is moved right and left.

(14) Step selector button

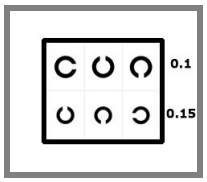
This button changes the amount of the refraction correction value that can be changed when operating "(2) Operation buttons" once.

Tap this button. The list showing the changeable step of the refraction correction value is displayed. Select a desired changed step from the list.

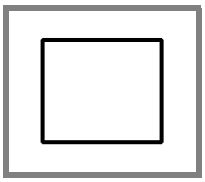
(15) Occlude/fog selector button

Change the occluding method for the fellow eye of the tested patient's eye. The following six types can be selected.

- Bino-Open — When "Bino-Open" is selected, the view of the occluded eye/open eye is shown below. This is the initial action.



View of open eye


View of occluded eye

  The fellow eye can view the displayed status of other section except the test targets. The patient can perform the subjective test as keeping the binocular view.
- Manual Fog (Open) — Select "Manual Fog(Open)" when the operator wants to set/cancel fogging manually. While this button is selected, the fellow eye is not automatically fogged. This method is like the operation when operating the refractor head manually.
- Fog: +0.75 — When "Fog: +0.75" is selected, the fellow eye is fogged with the +0.75D spherical lens. The value in the main data is not changed.
- Fog: +1.50 — When "Fog: +1.50" is selected, the fellow eye is fogged with the +1.50D spherical lens. The value in the main data is not changed.
- Fog: +2.00 — When "Fog: +2.00" is selected, the fellow eye is fogged with the +2.00D spherical lens. The value in the main data is not changed.
- Occlude — When "Occlude" is selected, the chart indicated toward the fellow eye is turned off. The view is the same when the occluding plate is inserted in the normal refractor head.

(16) Reference data display selector button

Tap this button when "(6) Reference data" is displayed. The reference data is hidden. Tap this button when reference data is hidden. Reference data is displayed.

(17) Final data record button

Tap this button. The data in the main data area are recorded as final data values and the main data are changed to the final data.

(18) Far/Near selector button

Tap this button to change far-/near-point tests to each other. The test distance of each test is decided on the subjective general settings screen.

(19) Examination list display button

Tap this button. The list of the tests that can be executed with Chronos is displayed. Select a test from the test name list. The necessary chart, patient's eye, operation data, lens status, etc. are automatically set.

The displayed test name list is the far-point or near-point test list according to the condition selected with "(18) Far/Near selector button".

(20) Data entry screen button

This button indicates the screen to capture the data measured by lens meter.

(21) Reset position button

This button returns the measuring heads to the initial position. When alignment is done again during subjective test, sometimes the measuring heads are moved to the unexpected position due to alignment error. In this case, use this button.

(22) Examination course list display button

The list of the course tests registered on the settings screen is displayed. Select a course on the displayed list, and the tests are executed in the registered order. For the details of the course test, refer to "MEASUREMENT BY USING COURSE TEST FUNCTION" of "OBJECTIVE OPERATIONS".

(23) Subjective Data Clear button

This button can delete the following data in "Subjective data", which is one of the data sets displayed in the main data area, and the data related to it:

- The correction values recorded in "Subjective data";
- The results of US-21 tests and binocular function test that are executed by using the above-mentioned subjective data.

When you want to restart the subjective correction test from the beginning in the midway of the test, you can use this function.

(24) Hamburger menu button

Tap this button, and other function buttons are displayed. The function buttons are changed according to the test being executed. The function buttons that cannot appear on the screen are loaded in the hamburger menu.

The menu to be individually displayed is shown below.

- Trial Frame Mode — Tap this button to access the mode in which the patient wearing the trial frame can watch this instrument's chart.
  For the details of the trial frame mode, refer to "TRIAL FRAME MODE" of "OBJECTIVE OPERATIONS".
- Optional exam dist — Tap this button to open the window which can change temporarily the optional test distance.
  For the optional test distance, refer to "CHECKING THE VISUAL ACUITY WITH OPTIONAL EXAM DISTANCE" of "OBJECTIVE OPERATIONS".
- Auto alignment — Tap this button, and auto-alignment is performed. When the incorrect position of the patient's eye is indicated on "(9) Examination window", perform alignment again by using this function.

- Abort exam — Tap this button. The data being measured and the patient information are deleted and the patient information input screen appears again.
- Fusion support — When switching from far to near testing, the device gradually moves the chart forward to support the patient in achieving fusion.
- Random — This button is displayed when the triangular space-between-letters-reduced layout visual acuity chart is not displayed. Tap this button. The chart is changed at random according to the largest visual acuity value in the chart being indicated. While the chart is being displayed at random, tap the ▲ and ▼ buttons in "(13) Chart control buttons". The visual acuity value size can be changed.
- Transpose cylinder — Tap this button, and the cylinder power is converted.
- Direct prism — Tap this button. Another two buttons, the [10P IN] and [15P IN] buttons, are displayed during horizontal prism test and the [5P UP (R)] button is displayed during vertical prism test.
  When [10P IN] or [15P IN] is selected, the displayed horizontal prism power is set to the eye selected with "(4) Patient's eye selector button".
  When [5P UP (R)] is selected, "2.5 prism" is given to each of right and left and the vertical prism power is set.
- AC/A — This button is displayed while the #13B test is being executed. Tap this button, and the AC/A test can be performed.

(25) Emergency stop button

This button stops the Chronos action forcedly. When the Chronos action is about to endanger the patient for some reason or other, the operator operates this button to stop Chronos.

(26) Chart page

The list of the charts to be used in tests is displayed in this area. The icon displayed in chart page is called "Chart icon" and the tab at the top of chart page is called "Chart page tab".
Select a chart icon. The chart being indicated to the patient is changed and besides, the test registered in the chart icon is executed.
The chart icon with green frame should be used in far-point test. The chart icon with pink frame should be used in near-point test.
Change the chart page tab. The chart icons in the chart page are changed.
The chart icons and chart tab names, which are registered in every chart page, can be changed by settings.

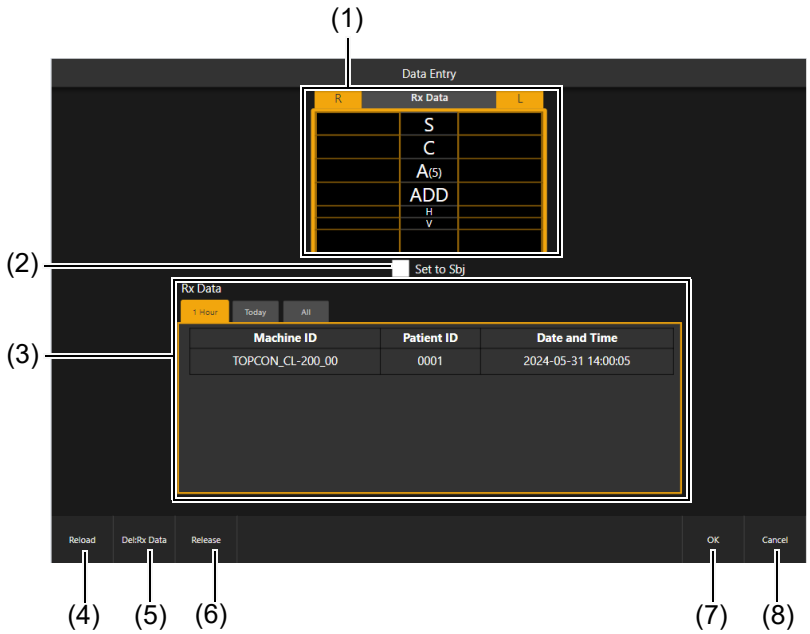
(27) Test distance display/change area

The test distance of the subjective test being executed is displayed in this area. When "Final Data" is set in the main data, you can change the test distance in this area.

(28) Forehead rest icon

The icon appears while the patient's forehead is removed from the forehead rest.

Data entry screen



(1) Data Area

This area displays currently selected data.

(2) Set to sbj

If this checkbox is checked, after pressing the [OK], the selected data will be set into the subjective data.

(3) Data List

The eyeglass data from the lensmeter is imported from the specified "Data Import Folder" and displayed in a list. For details on data import, see "Data Entry & Export" on page 159.

- 1 Hour: displays data from the last hour.
- Today: displays Today's data.
- All: displays all data.

*Touch the tabs for [Machine ID], [Patient ID], and [Date and Time] to sort the data in ascending/descending order for each item.

(4) Reload button

This button reloads the list of lensmeter data. E

(5) Delete: Rx button

The eyeglass data from the lensmeter will be deleted from "Data Import Folder" . For details on deleting data, see "Data Entry & Export" on page 159.

(6) Deselect button

This button cancels the selected data.

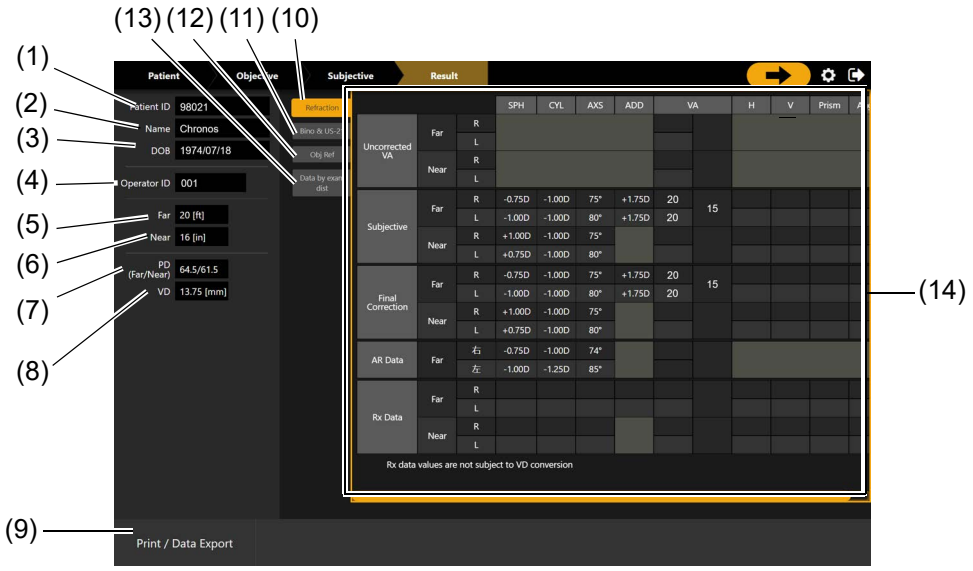
(7) OK button

This button imports the selected data as the lens (eyeglass) data. Then the screen shifts to the subjective test screen.

(8) Cancel button

The screen shifts to the subjective test screen without acquiring any data.

[6] Result screen



(1) Patient ID

This area displays the patient ID input on the patient information input screen.

(2) Name

This area displays the patient name input on the patient information input screen.

(3) DOB

This area displays the patient's birthday date input on the patient information input screen.

(4) Operator ID

This area displays the operator ID input on the patient information input screen.

(5) Far

This area displays the far-point test distance used in the executed test.

(6) Near

This area displays the near-point test distance used in the executed test.

(7) PD (Far/Near)

The patient PD measured by Chronos is displayed in the order of "Far PD" and "Near PD".

(8) VD

This area displays the VD of lens (eyeglass) to be prescribed. The refraction correction values except the lens (eyeglass) data, which are output on results, have been converted by this VD.

(9) Print/Data Export

This button is used to output the test results by print/data output format. The action when tapping this button is specified by general settings on the settings screen.

(10) Refraction correction

Tap this button. The refraction correction value measured by Chronos is displayed.

(11) Bino & US-21

Tap this button. The results of the binocular function test performed by Chronos and those of the US-21 test are displayed.

(12) Objective refraction value

Tap this button. All the objective refraction values and keratometry values, which have been measured by Chronos for the patient, are displayed.

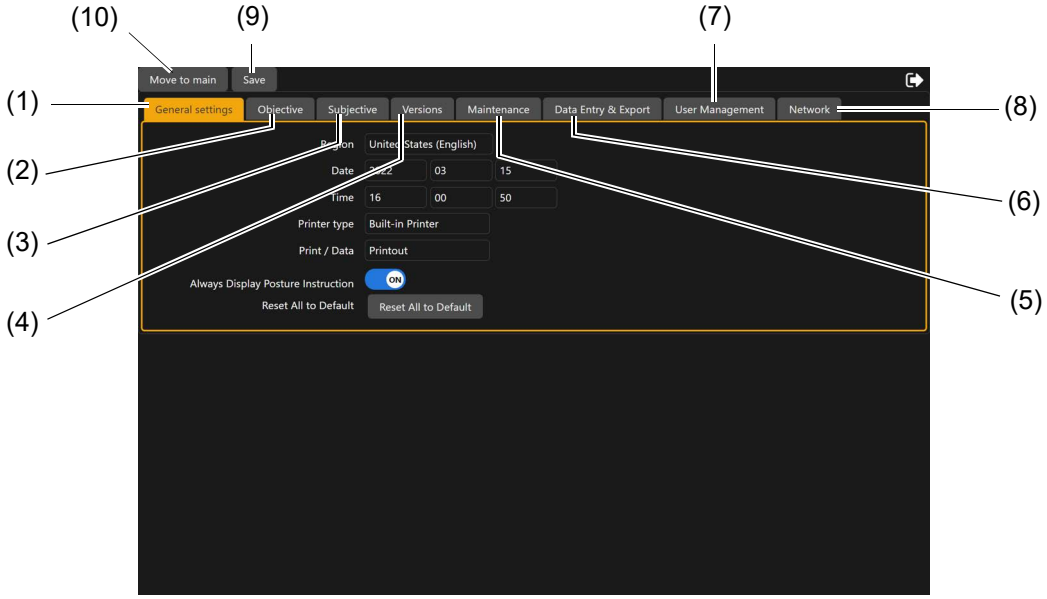
(13) Data by exam distance

This area displays the spherical refractive power values and visual acuity values measured with all test distances including "Optional exam distance".

(14) Test results display area

This area displays the test results.

[7] Settings screen



(1) [General settings] button

This displays the screen to edit general settings of Chronos such as time, printer and others.

(2) [Objective] button

This displays the screen to edit the settings of objective measurement such as the objective measurement mode or the measurement count.

(3) [Subjective] button

This displays the screen to edit the settings of subjective tests such as the subjective test distance or the chart used for subjective tests.

(4) [Versions] button

This displays the version of Chronos.

(5) [Maintenance] button

This displays the screen to output the log for maintenance.

(6) [Data Entry & Export] button

This displays the screen to edit the settings of the connection with lens meter and the output of the data measured by Chronos.

(7) [User Management] button

This displays the screen to edit the settings of the Chronos user management such as the login password or management password.

(8) [Network] button

This displays the screen to edit the settings of the network for connecting the operation controller and other additional networks.

(9) [Save] button

This saves the edited settings.

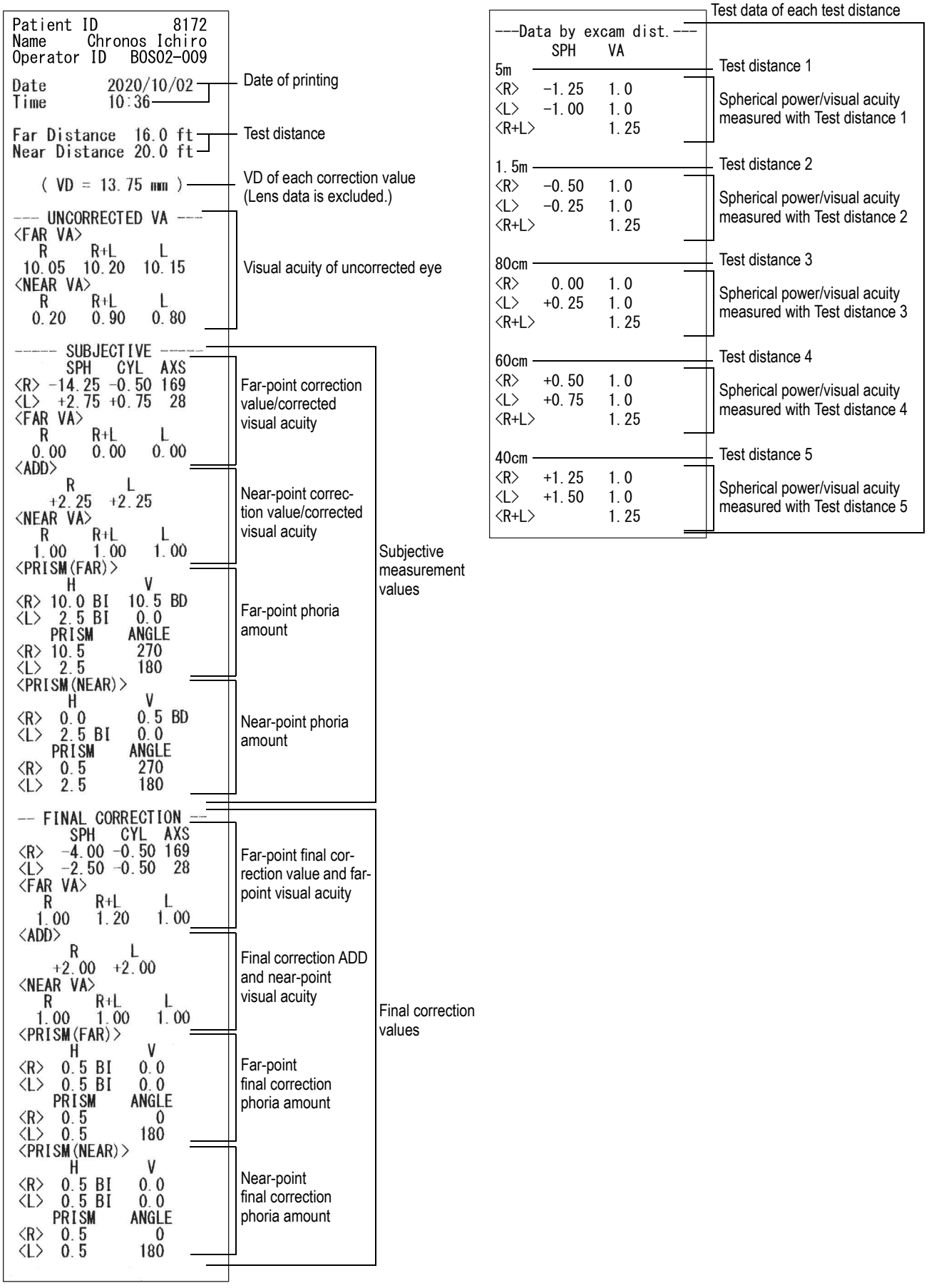
(10) [Move to main] button

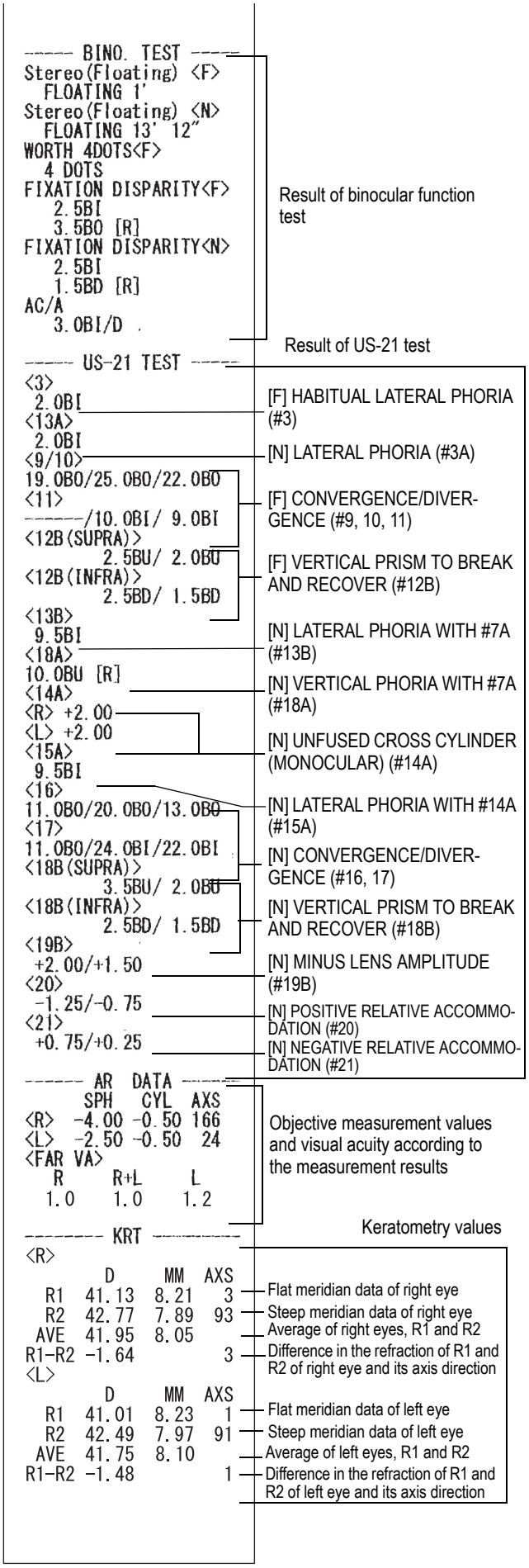
Tap this button. "Settings" is finished and the patient information input screen appears.

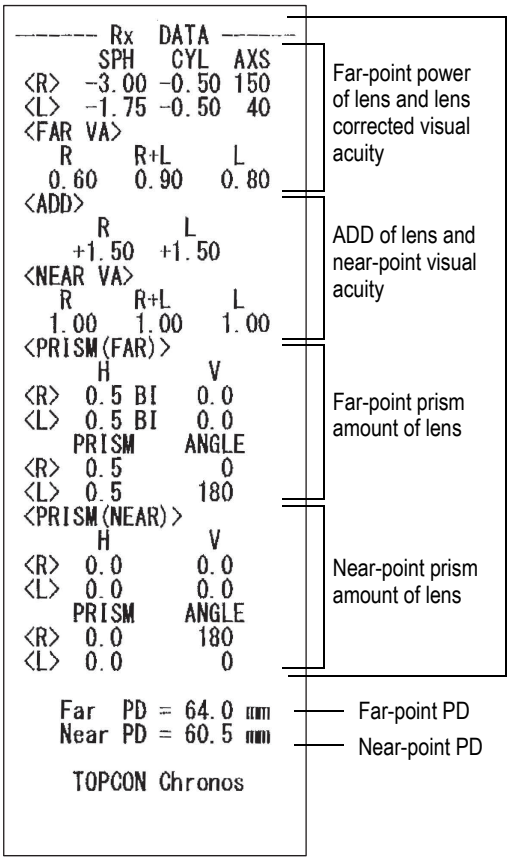
If the [Save] button is not tapped before tapping this button, all of the edited settings are discarded.

NAMES ON PRINTER OUTPUT

Results printed by the printer built in the power supply unit

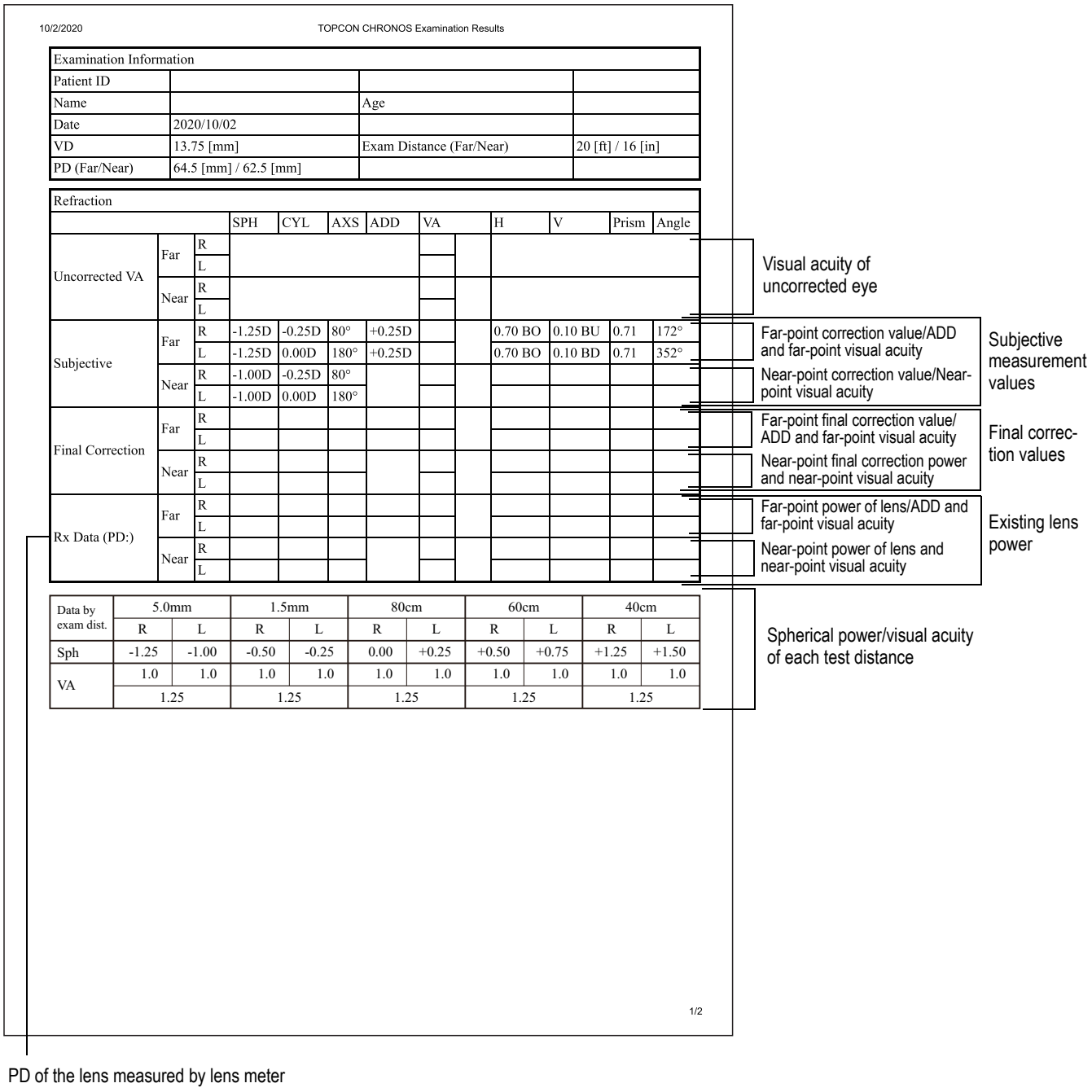






The item in which data is not recorded is not printed.

Results printed by external printer



10/2/2020 TOPCON CHRONOS Examination Results

Examination Information			
Patient ID			
Name		Age	
Date	2020/10/02		
VD	13.75 [mm]	Exam Distance (Far/Near)	20 [ft] / 16 [in]
PD (Far/Near)	64.5 [mm] / 62.5 [mm]		

Refraction												
			SPH	CYL	AXS	ADD	VA		H	V	Prism	Angle
Uncorrected VA	Far	R										
		L										
	Near	R										
		L										
Subjective	Far	R	-1.25D	-0.25D	80°	+0.25D			0.70 BO	0.10 BU	0.71	172°
		L	-1.25D	0.00D	180°	+0.25D			0.70 BO	0.10 BD	0.71	352°
	Near	R	-1.00D	-0.25D	80°							
		L	-1.00D	0.00D	180°							
Final Correction	Far	R										
		L										
	Near	R										
		L										
Rx Data (PD:)	Far	R										
		L										
	Near	R										
		L										

Data by exam dist.	5.0mm		1.5mm		80cm		60cm		40cm	
	R	L	R	L	R	L	R	L	R	L
Sph	-1.25	-1.00	-0.50	-0.25	0.00	+0.25	+0.50	+0.75	+1.25	+1.50
VA	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	1.25		1.25		1.25		1.25		1.25	

1/2

Visual acuity of uncorrected eye

Subjective measurement values

Far-point correction value/ADD and far-point visual acuity

Near-point correction value/Near-point visual acuity

Final correction values

Far-point final correction value/ ADD and far-point visual acuity

Near-point final correction power and near-point visual acuity

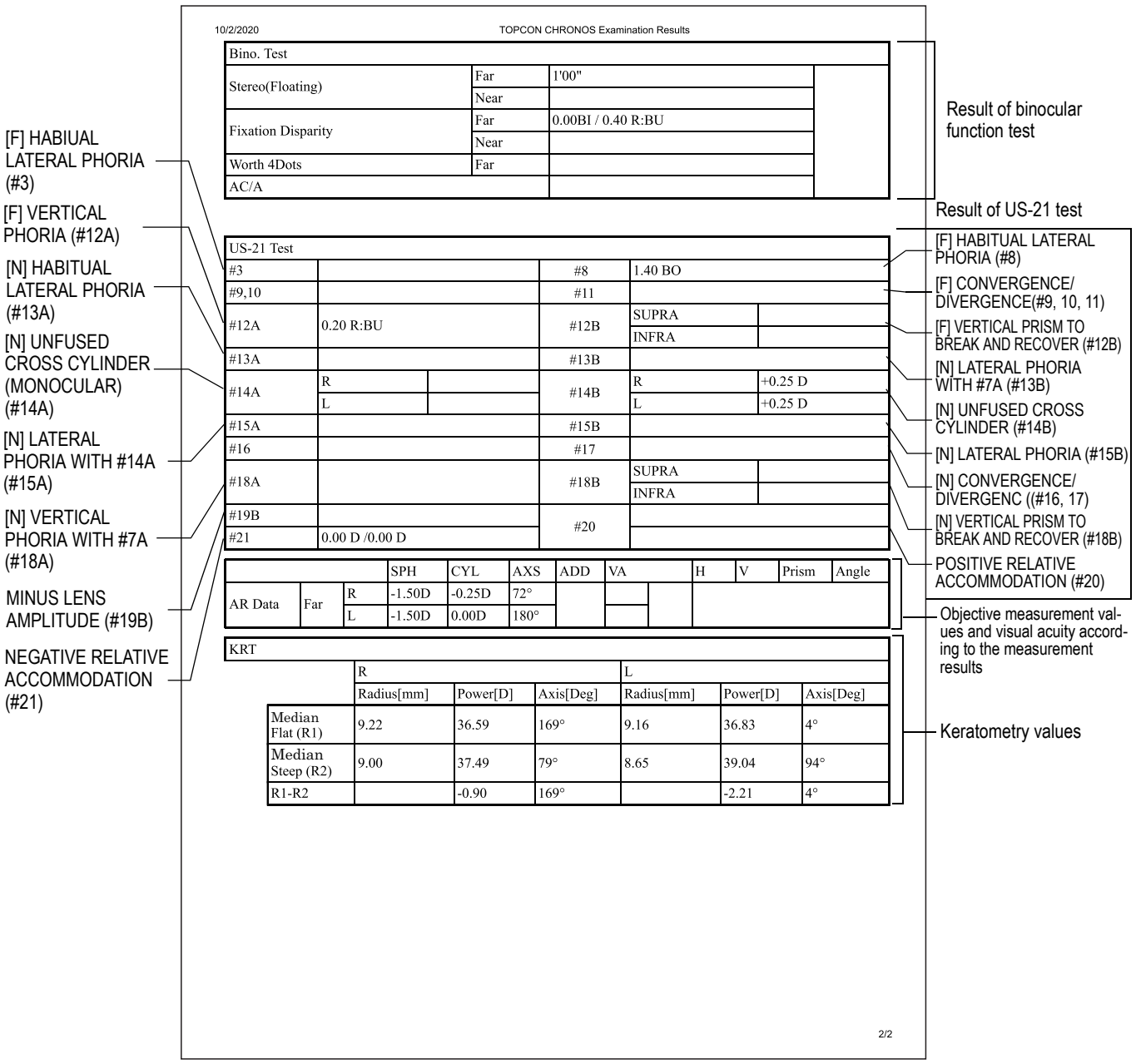
Existing lens power

Far-point power of lens/ADD and far-point visual acuity

Near-point power of lens and near-point visual acuity

Spherical power/visual acuity of each test distance

PD of the lens measured by lens meter


10/2/2020
TOPCON CHRONOS Examination Results
Bino. Test
Stereo(Floating)
Far
1'00"
Near
Fixation Disparity
Far
0.00BI / 0.40 R:BU
Near
Worth 4Dots
Far
AC/A
US-21 Test
#3
#8
1.40 BO
#9,10
#11
#12A
0.20 R:BU
#12B
SUPRA
INFRA
#13A
#13B
#14A
R
L
#14B
R
+0.25 D
L
+0.25 D
#15A
#15B
#16
#17
#18A
#18B
SUPRA
INFRA
#19B
#20
#21
0.00 D /0.00 D
SPH
CYL
AXS
ADD
VA
H
V
Prism
Angle
AR Data
Far
R
-1.50D
-0.25D
72°
L
-1.50D
0.00D
180°
KRT
R
L
Radius[mm]
Power[D]
Axis[Deg]
Radius[mm]
Power[D]
Axis[Deg]
Median Flat (R1)
9.22
36.59
169°
9.16
36.83
4°
Median Steep (R2)
9.00
37.49
79°
8.65
39.04
94°
R1-R2
-0.90
169°
-2.21
4°
2/2
[F] HABIUAL LATERAL PHORIA (#3)
[F] VERTICAL PHORIA (#12A)
[N] HABITUAL LATERAL PHORIA (#13A)
[N] UNFUSED CROSS CYLINDER (MONOCULAR) (#14A)
[N] LATERAL PHORIA WITH #14A (#15A)
[N] VERTICAL PHORIA WITH #7A (#18A)
MINUS LENS AMPLITUDE (#19B)
NEGATIVE RELATIVE ACCOMMODATION (#21)
Result of binocular function test
Result of US-21 test
[F] HABITUAL LATERAL PHORIA (#8)
[F] CONVERGENCE/ DIVERGENCE(#9, 10, 11)
[F] VERTICAL PRISM TO BREAK AND RECOVER (#12B)
[N] LATERAL PHORIA WITH #7A (#13B)
[N] UNFUSED CROSS CYLINDER (#14B)
[N] LATERAL PHORIA (#15B)
[N] CONVERGENCE/ DIVERGENC ((#16, 17)
[N] VERTICAL PRISM TO BREAK AND RECOVER (#18B)
POSITIVE RELATIVE ACCOMMODATION (#20)
Objective measurement values and visual acuity according to the measurement results
Keratometry values

PREPARATIONS

INSTALLING THE INSTRUMENT

⚠CAUTION	• When installing this instrument on the adjustable instrument table, be careful to prevent your fingers from being caught by these units. Your fingers may be caught between the instrument and the adjustable instrument table to cause injury. • This instrument must be installed by two workers. If one worker tries to install the instrument, it may turn over or fall off to cause injury.

- Please consult your dealer for the instrument installation.

CONNECTING THE POWER CORD

⚠WARNING	Be sure to connect the power plug to an AC 3-pin receptacle equipped with grounding. Connection with receptacle without grounding may cause fire and electric shock in case of short circuiting.

⚠CAUTION	To avoid electric shock, do not handle the power supply plug with wet hand.

1 Make sure that the power switch of the adjustable instrument table is OFF.

2 Connect the power cord to the power inlet of the adjustable instrument table.

3 Plug in the power cord at a grounded AC 3-pin receptacle.

PREPARATION OF OPERATION CONTROLLER

As the controller of this instrument, a PC or a tablet is necessary.
For the specifications of the recommended controller, refer to "SPECIFICATIONS OF THE CONNECTED DEVICES" on P.192.

CONNECTING THE OPERATION CONTROLLER TO THE INSTRUMENT

⚠CAUTION	• When connecting this instrument to an external device through LAN, apply the security update to the external device, make use of anti-virus software and take other countermeasures against computer virus properly. • Do not connect any USB storage device that is not checked with the anti-virus software to the USB port of this instrument. • When connecting this instrument to an external device through LAN, set the ID and password of the user to the external device. • When outputting data to the shared folder on an external device from this instrument, set a proper user ID and password to the shared folder.

Cable connection

1 Connect the USB-LAN adapter to the USB terminal on the rear side of the power supply unit.

2 Using the LAN cable, connect the LAN connector of the USB-LAN adapter to the LAN connector of the operation controller.

3 Set the network parameters of the operation controller in the range shown below.

IP address	10.1.2.5 - 10.1.2.253
Subnet mask	255.255.255.0

Wireless connection

1 Connect the USB-LAN adapter to the USB terminal on the rear side of the power supply unit.

2 Using the LAN cable, connect the LAN connector of the USB-LAN adapter to the LAN connector of the Wi-Fi router.

3 Turn on the power of the connected Wi-Fi router and carry out settings shown below. (For the Wi-Fi router setting method, refer to the instruction manual of your Wi-Fi router.)
- Set the bridge mode as the action mode.
- Set [10.1.2.4] as IP address of the Wi-Fi router.
- Activate the DHCP server function.

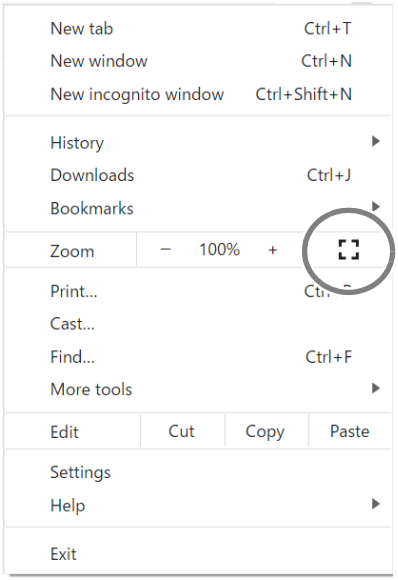
4 Activate the Wi-Fi communication function of the operation controller and connect the operation controller to the Wi-Fi router being used.

START, CONNECTION AND SETTING OF BROWSER SOFTWARE

1 Start the browser software(*) and enter the following address to the browser's address bar.
Address: http://10.1.2.3/topcon/sub/login.php
*Recommended browser software: Google Chrome

NOTE	• Do not use two or more pieces of browser software or tabs and display them at the same time. The operation and performance of the software may be adversely affected. • By registering the IP address and subnet mask to the custom folder, etc. of browser software, you can access the browser software more easily on the next use time and later.

2 When using Windows PC/tablet, display the browser on the full screen. Tap the ⋮ button, which is displayed at the upper right of the browser screen. On the displayed menu, tap the icon circled in the figure below to indicate the browser on the full screen.



NOTE	• Unless the browser is displayed on the full screen while Windows PC/tablet is being used, the layout on the screen may be destroyed. • To cancel the full-screen status with the Windows tablet, tap the blank area on the browser screen for about 1 second. The "×" mark is displayed at the upper middle of the screen. Tap this mark to cancel the full-screen status.

3 When the login screen appears, input the user name and password and tap the [Login] button. The initial data of user name and password are shown below.

User name	admin
Password	Topcon@123

4 When logging in Chronos for the first time, the following screens are automatically displayed. On and after the next login, these screens are not displayed after logging in.

- **Region setting screen**
  Set the language to be used. After selecting the language, tap the [Start] button to access the next screen.

- **Settings screen**
  Perform settings of Chronos in detail. For settings, refer to " SETTING OF FUNCTIONS BY SETTINGS SCREEN" on P.131.
  After setting, tap the [Save] button at the top of the screen and then tap the [Move to main] button.

5 When the above procedures are completed, the patient information input screen appears.

SETTING PRINTER PAPER

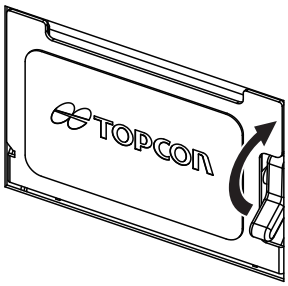
NOTE	Front and back sides of paper are specified. If paper is set reversely, data are not printed.

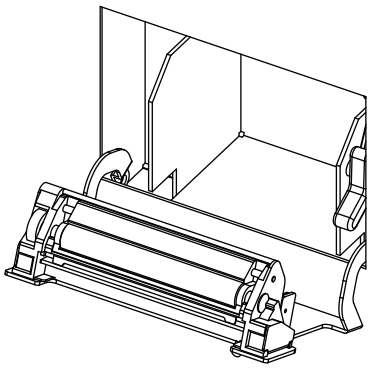
- For printing paper, use the following paper specified by TOPCON.
  If any other paper except the specified one is used, the printing noise is louder or the faded letters are printed.

Item name	Item Code
Printer Paper	44800 4001

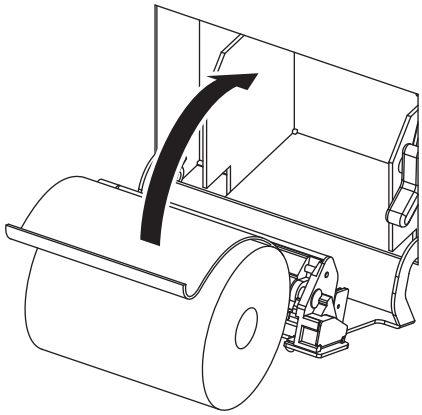
Product No.: TP-50K-J-R (manufactured by Nippon Paper Industries Co., Ltd.)
(Paper Width: 58mm, Roll Outer Diameter: ϕ48mm or less)
When ordering any consumable, contact our agent where you purchased the product, or our particular department as indicated in this Instruction Manual with the Item Name, Item Code and Quantity.

1 Push the printer cover release lever to open the cover.

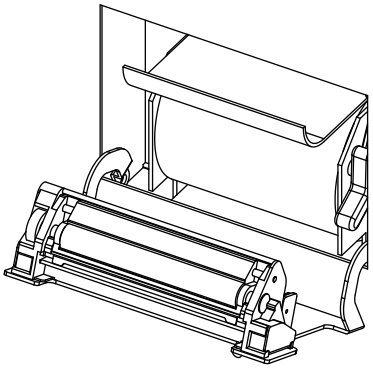




2 Set the printer paper to the printer with the paper rolling direction as shown in the figure.
Be careful not to set the paper in a wrong direction.

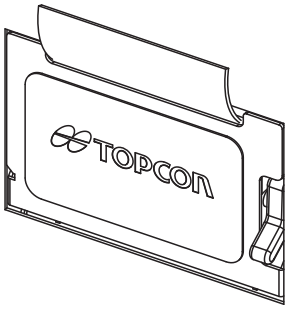


3 Pull the end of the paper out of the ejector.



4 Close the cover.
Make sure that the cover is locked by a click sound.

NOTE	Be careful not to catch the pulled paper with the cover.

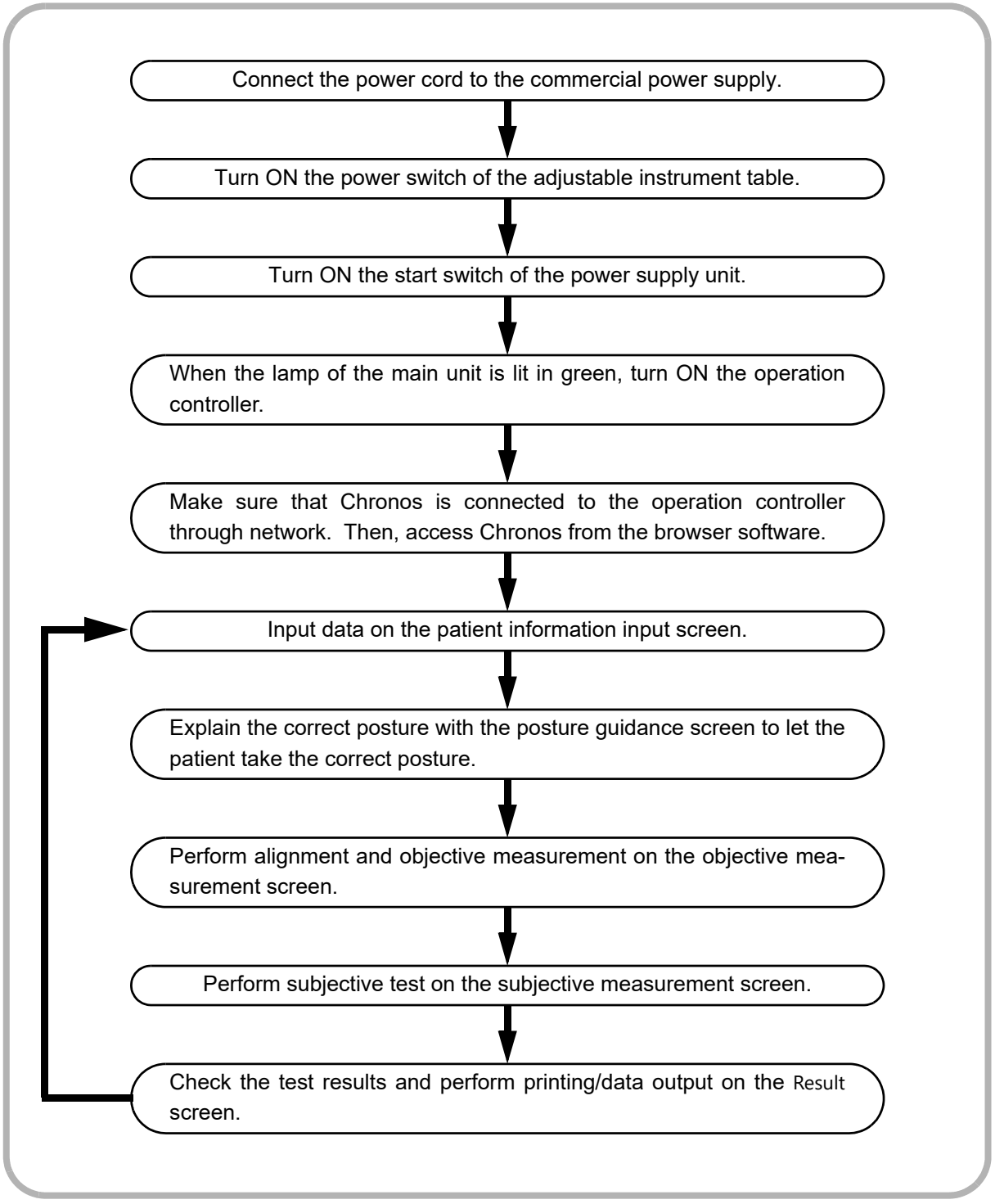


NOTE	• Unless the printer cover is closed securely, printing cannot be done. • If paper jamming has occurred, open the lower section and reset the paper. (For details, refer to "Printer paper jamming" on P.177.)

BASIC OPERATIONS

FLOW OF OPERATION

Basic operation flow of this instrument is mentioned below.



* If the operator inspects at a remote location separate from the patient and the main unit, refer to P.190 "For remote operation".

PREPARATION BEFORE MEASUREMENT

Turn on the power

⚠CAUTION	• When turning on the power switch of the adjustable instrument table, place the patient's head away from this main unit. If the patient's eye or nose touches the main unit, the patient may be injured. • When turning on the power switch of the adjustable instrument table, make sure that the patient's finger is not put between the measuring head and drive base and between the right and left measuring windows. The patient's finger may be caught by these units to injure the patient.

1 Connect the power cord plug, which is connected to the power inlet of the adjustable instrument table, to the commercial power supply (grounded AC-3-pin receptacle). For connection, refer to "CONNECTING THE POWER CORD" on P.38.

2 Turn ON POWER SWITCH of adjustable instrument table.

3 Turn ON the start switch of the power supply unit and make sure that the lamp of the main unit is lit in green. While the lamp is blinking, the instrument is preparing for start. Please wait for a while.

4 Turn ON the operation controller.

5 Make sure that the instrument is connected to the operation controller through network. Then, start the browser software.

Login

1 Access the following address from the browser software.
http://10.1.2.3/topcon/sub/login.php

2 When the login screen appears, input the user name and password.
The initial data of user name and password are shown below.

User name	admin
Password	Topcon@123

3 Tap the [Login] button.

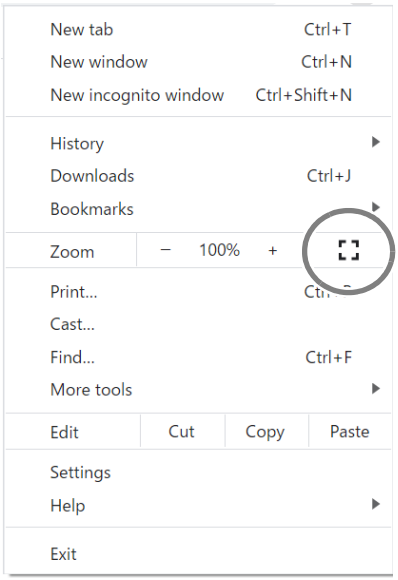
NOTE	For changing the user name and password, refer to "User Management" on P.164.

Displaying the browser on the full screen

When using Windows PC/tablet, display the browser on the full screen by the following procedures.

1 Tap the ⋮ button, which is displayed at the upper right of the browser screen.

2 On the displayed menu, tap the icon circled in the figure below to indicate the browser on the full screen.



NOTE	• Unless the browser is displayed on the full screen while Windows PC/tablet is being used, the layout on the screen may be destroyed. • To cancel the full-screen status with the Windows PC/tablet, tap the blank area on the browser screen for about 1 second. The "×" mark is displayed at the upper middle of the screen. Tap this mark to cancel the full-screen status.

Input of patient information

1 On "Patient information input screen", enter the patient ID/name/birth date/operator ID.

2 Tap the task shift button to shift to the next task.

NOTE	• The operator can start a test without inputting the patient information. We recommend the operator to input the patient information because the operator can judge the data easily when outputting or printing the test results data. • The birthday date is used to decide the initial ADD when the near-point test is performed. We recommend the operator to input the birthday date when the near-point test is performed. • For the screen shift on the operation controller, be sure to use the screen shift button. If the "forward"/"backward" function of the browser is used for shifting the screen, Chronos does not operate correctly.

Adjustment of the patient's face position

NOTE	• Adjust the height of the adjustable instrument table to prevent the patient from being uncomfortable. Unless it is adjusted properly, correct measured values cannot be obtained from time to time.

1 Wipe away dust from the forehead rest and cheek rest.

2 Let the patient take a seat in front of the instrument.

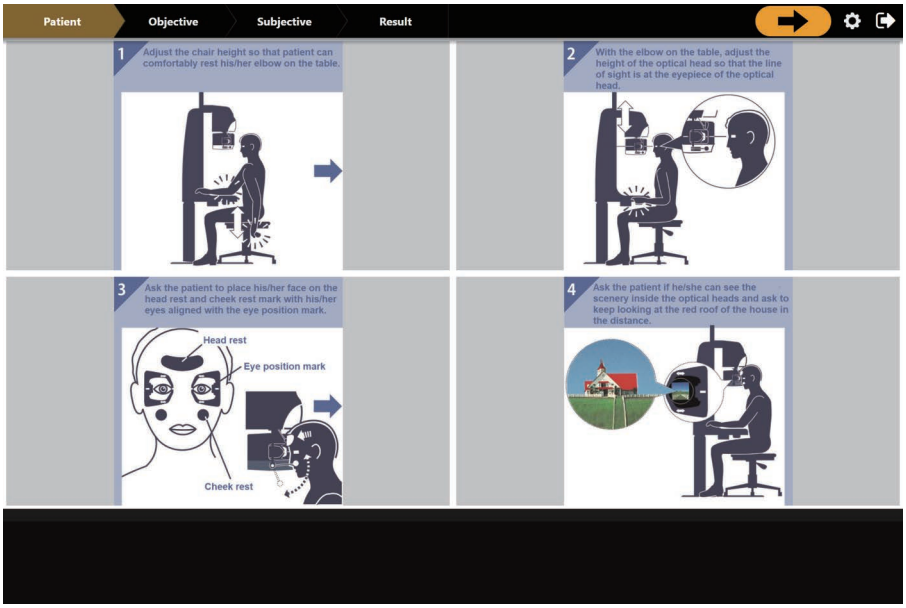
3 Adjust the patient's posture for refraction test according to the posture guidance screen.

[1] Adjust the chair height so that the patient can comfortably rest his/her elbow on the adjustable instrument table.

[2] With the elbow on the table, adjust the height of the main unit with the elevation lever of the adjustable instrument table so that the line of sight is at the measuring window height of the main unit.

[3] Ask the patient to place his/her forehead and cheek on the forehead rest and cheek rest with his/her forehead aligned with the mark of the measuring window.

[4] Ask the patient if he/she can see the scenery inside the main unit and ask to keep looking at the red roof of the house in the distance.



4 When the patient's posture has been adjusted correctly, tap the task shift button to shift to the next task.

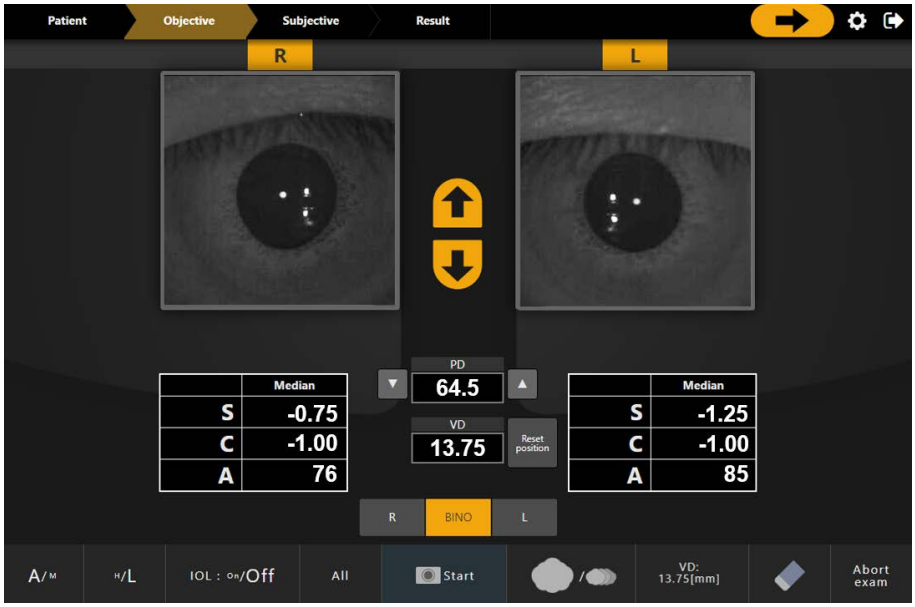
NOTE	If you tap not the task shift button on the patient information input screen but the [Skip Posture Instruction] button, which is one of the function buttons, you can shift to the objective measurement screen without indicating the posture guidance screen.

TEST

⚠CAUTION	• When finishing tests, place the patient's head away from the main unit. If the patient's eye or nose touches the main unit, the patient may be injured. • When starting measurement and when finishing tests, make sure that the patient's finger or nose is not put between the measuring head and drive base and between the right and left measuring windows. The patient's finger or nose may be caught by these units to injure the patient.

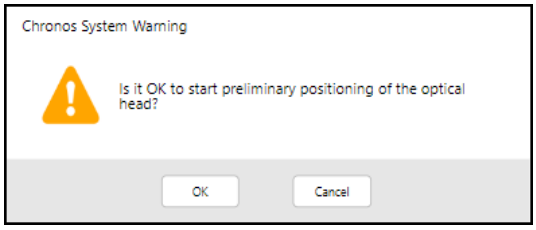
Objective measurement

NOTE	• If the eyelid or eyelash covers the pupil, auto-alignment is not completed from time to time. In this case, ask the patient to open his/her eye widely. • If the patient blinks frequently or if the cornea surface is not normal because of blepharoptosis, IOL eye or corneal diseases, auto-alignment is not completed from time to time. In this case, perform alignment in manual mode. • Even if you do not execute the objective measurement, you can shift to the subjective test by tapping the task shift button. Before shifting to the subjective test screen, alignment must be completed. If auto-alignment fails, complete alignment manually and then shift to the subjective test screen.



1 Confirm that the patient's eye is displayed on the patient's eye display area.
While the patient's forehead is not contacting the forehead rest, an icon like the one below is displayed and blinks.
The measurement cannot be performed correctly in this state, so instruct the patient to place their forehead firmly against the forehead rest so that the forehead rest icon is not displayed.

2 When the preliminary positioning is enabled in the settings, the preliminary positioning is performed to adjust the measurement head position.
The following message is displayed, so press the [OK] button to start.
When the preliminary positioning is completed, PD value is displayed in the PD display area.

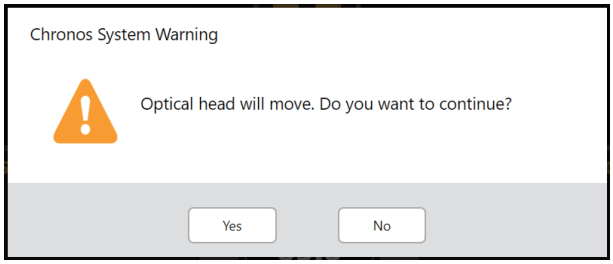


NOTE	• The preliminary positioning feature is for smoothly progressing the objective measurement, but even if [Cancel] is selected on the preliminary positioning start message, it is possible to progress with the following procedure. • When the preliminary positioning fails, an error message is displayed. Improve the patient's posture, the line of sight, and the forehead rest state according to the error message. When the error message is closed, the preliminary positioning start message is displayed again.

3 When a message is also displayed in the alignment guide after the preliminary positioning is completed, ask the patient to move his/her face finely so that his/her face may be adjusted correctly.

4 If the pupil cannot be within the patient's eye display area by adjusting the face position only, tap the [▼] and [▲] buttons at the right and left of the pupil distance (PD) change/display area so that his/her pupil may be within the above-mentioned area.

5 Tap the [Measurement Start] button, and the following message appears. Select [Yes]. Auto-alignment starts.

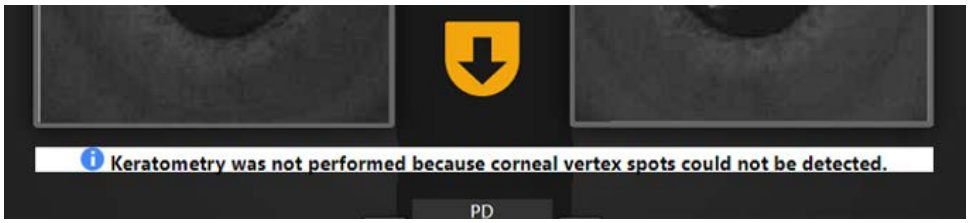


6 When alignment is successful, the instrument performs refractometry and keratometry automatically.

7 When measurement is completed, the results of refractometry are displayed on the objective refractometry result display area. Tap the [Start] button again. Refractometry/keratometry can be performed again.

8 If there is no problem in the results, tap the task shift button.

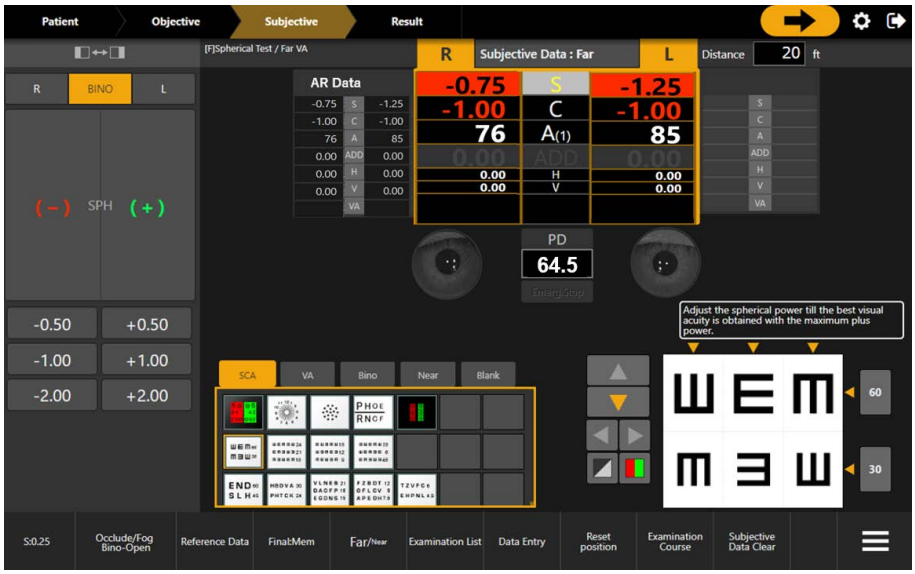
NOTE	When the "Automatic switching of alignment mode" is set to ON in the settings, if the corneal apex alignment was not successful, the device will automatically switch to pupil-centered alignment. In the case of a pupil-centered alignment, a kerato measurement is not performed.



Subjective test

NOTE	• Measurement cannot be done from time to time because the measuring heads reach their moving limit according to the combination of the following conditions. - The PD of the patient is too small; - The set test distance is too small; - The horizontal prism amount (BO) is too large. • Check whether the fusion can be done correctly by the patient during the test and perform the test. If fusion cannot be done correctly, the correct measurement values cannot be obtained from time to time. • If fusion cannot be done by the patient, use the occlude/fog selector button, which is among the function buttons, to select "Occlude". It is possible to perform the test under the condition that one eye is occluded.

- For details of the subjective tests and operations that can be performed with this instrument, refer to " OPERATION FOR TESTS" on P.55.



1 Make sure that the refractometry values obtained by objective measurement are copied on the subjective data and are set on the main data area.

2 Select a chart icon on the chart page for the test to be performed.
The test parameters are related to the chart icons. The following operations are executed by selecting a chart icon only.

- Far-point/near-point tests are changed to each other. (*)
- The chart indicated to the patient is changed.
- The test to be executed is changed.
- The auxiliary lens required for the test is inserted.
- Data set is changed.
- The patient's eye is changed.
- The lens type to be changed by the operation panel is changed.
- The occluding method for the fellow eye of the test eye is changed.

* The chart icon with green frame should be used for far-point test and the chart icon with pink frame, for near-point test.

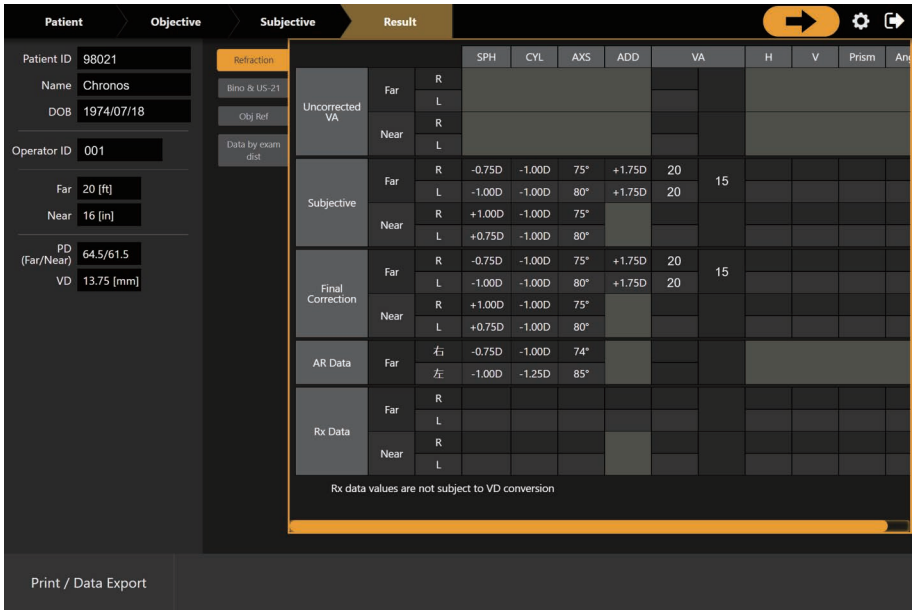
3 If necessary, change the patient's eye with the patient's eye selector button on the operation panel.

4 As referring to the navigation icon displayed on the operation buttons, execute the test as changing the correction values by tapping the operation buttons.

5 Sometimes the frame of the examination window flashes in pink during the test. This means that the patient's eye is deviated from the correct position. If flashing continues, select "Auto-alignment" from the hamburger menu at the lower right of the screen to perform alignment again.

6 When the subjective tests have been completed, tap the task shift button.

Result



1 The Result screen appears with the refraction correction button selected status. On this screen, you can check the results of the refraction correction test.

2 Tap the [Bino & US-21] button. You can check the results of the binocular function test and the US-21 test.

3 Tap the [Obj Ref] button. You can check all the measurement values of refractometry and keratometry.

4 Tap the [Print/Data Export] button. The printer built in the power supply unit or the external printer prints and outputs data according to settings.

NOTE	• To use an external printer, you must set up a printer in your tablet/PC in advance. For setup of printer, refer to the instruction manual of your printer. • When using an external printer has been set in the instrument, tap the [Print/Data Export] button. The print dialog is displayed. Select a proper printer and print data.

5 Tap the task shift button. The measurement data are cleared, the main unit is reset and the patient information input screen appears again.

HOW TO FINISH

1 Finish the browser.

2 Turn OFF the operation controller and the start switch of the power supply unit.

NOTE	When an external connection device is connected to the external input/output terminal, turn OFF the external connection device (when equipped with the power switch).

3 Turn OFF the POWER SWITCH on the adjustable instrument table.

NOTE	Turn OFF the start switch of the power supply unit first and then the power switch of the adjustable instrument table. If not, the instrument may malfunction.

OPERATION FOR TESTS

This chapter will explain the tests and operations that can be performed with the Chronos.

VISUAL ACUITY TEST/SPHERICAL POWER/CYLINDER POWER CORRECTION

VISUAL ACUITY MEASUREMENT

Measure the patient's visual acuity.

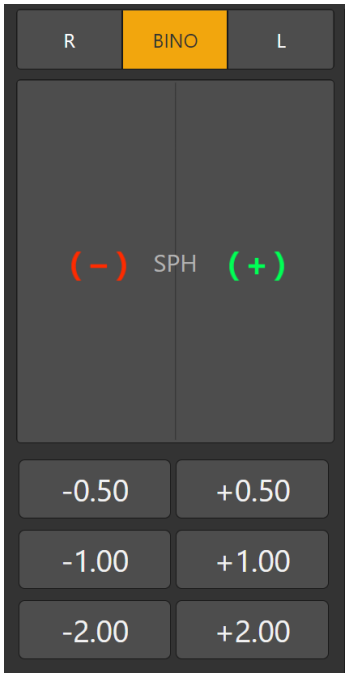
1 Select a visual acuity chart.
To perform the visual acuity measurement, select the visual acuity chart icon from the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	The test is performed with right eye, left eye and both eyes. When the test chart is set, the previous state is retained.
Auxiliary lens	Not set.
Operation mode	In far-point test, the mode to operate the spherical power is set. In near-point test, the mode to operate ADD is set.

Item	Description
Operation panel	

2 Select a patient's eye.
Select an eye to be tested with the patient's eye selector button.

3 Adjust the spherical power.
If necessary, adjust the spherical power. Tap the operation buttons, (-) (+). The spherical power is decreased/increased by the step determined by the step change button. The spherical power can also be changed by tapping the six buttons having numbers, which are under the operation buttons. In this case, the spherical power is changed according to the numbers written on the six buttons.

4 Measure the visual acuity.
Measure the patient's visual acuity.
To display the visual acuity test chart having the different visual acuity values in far-point test, select a test chart again on the chart page or press the [▲]/[▼] buttons on the test screen to change the chart.

5 Record the visual acuity value.
Touch the button applicable to the patient's visual acuity among the side buttons. The value is recorded as the patient's visual acuity.
Each time you touch the visual acuity button, the recorded value is overwritten.

R/G TEST

Measure the spherical refraction for the patient.

1 Fog the patient's eye.
Use the operation panel to shift the spherical power of the patient's eye to the plus side.

NOTE	It is possible to preset the fogging quantity when the R/G test chart is selected. Set the fogging quantity on the parameter setting screen. To access the parameter setting screen, select [Settings], [Sub], [Chart page] and touch the [Modify] button.

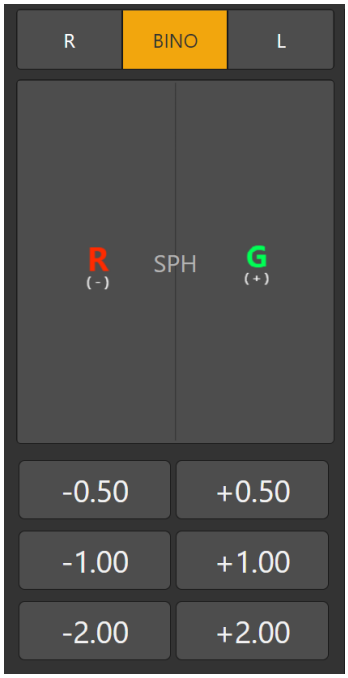
2 Select the R/G test chart.
To perform the R/G test, select the R/G test chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	The test is performed with right eye, left eye and both eyes. When the test chart is set, the previous state is retained.
Auxiliary lens	Not set.
Operation mode	In far-point test, the mode to operate the spherical power is set. In near-point test, the mode to operate ADD is set.

Item	Description
Operation panel	

3 Select a patient's eye.
Select an eye to be tested with the patient's eye selector button.

4 Correct the spherical power.
Ask the patient which side the characters are seen better, on the red or green side.
When the characters on the red side are seen better, press the "R" button, which is one of the operation buttons. When those on the green side are seen better, press the "G" button. When using the operation buttons, the spherical power is changed by the step determined by the step change button.
Adjust until the characters on both sides are seen equally.

The spherical power can also be changed by tapping the six buttons having numbers, which are under the operation buttons. In this case, the spherical power is increased/decreased according to the numbers written on the buttons.

ASTIGMATISM TEST

Search for the approximate astigmatic correction value of the patient.

1 Prepare for the test.

Before beginning this test, carry out the following operation:

Set the cylinder power to "0.00D" and the cylinder axis to "180°". Even if the objective measurement value has already been copied in the main data (subjective value), carry out this procedure. Shift the spherical power by about 1.00D in the plus direction. Then, ask the patient to watch the visual acuity chart of 0.5 - 0.6. While the patient is watching the chart, return the spherical power in the minus direction until the patient can see the characters barely on the visual acuity chart.

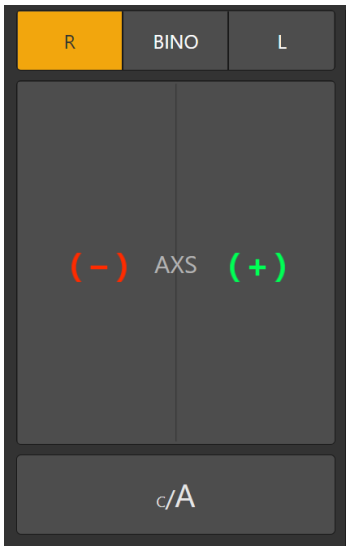
2 Select the astigmatism test chart.

To perform the astigmatism test, select the astigmatism test chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	When any other item except "binocular" is the last test object, the previous state is retained. When "binocular" is the last test object, the right eye of the patient is set.
Auxiliary lens	Not set.
Operation mode	The mode to operate the cylinder axis is set.
Operation panel	

3 Select a patient's eye.
Select an eye to be tested with the patient's eye selector button.

4 Correct the cylinder axis.
If the operation mode is not set for "Cylinder axis", press the [Power/Axis] button on the operation panel to change the mode.
Ask the patient whether he/she sees a darker bolder line than others. If there is no such line, the patient does not have astigmatism. If he/she sees a darker bolder line, have him/her answer with the numerals between 1 and 6. Set "The numeral of the answer × 30°" to the cylinder axis. The cylinder axis is changed in the positive direction by pressing the [+] button on the operation panel and, to the negative direction by pressing the [-] button.

5 Correct the cylinder power.
Press the [Power/Axis] button on the operation panel to change the operation mode to the cylinder power.
Change the cylinder power until all the lines are seen with equal clarity. The cylinder power is changed to the positive direction by pressing the [+] button on the operation panel and, to the negative direction by pressing the [-] button.

CROSS CYLINDER TEST (JACKSON CROSS)

Measure the patient's astigmatism accurately by using the Jackson cross cylinder lens.

1 Prepare for the test.

Before beginning this test, adjust the spherical power so that the characters on the red and green sides are seen equally in the R/G test. Additionally, set the cylinder power/axis measured objectively or execute the astigmatism test to set the approximate cylinder power/axis.

For the R/G test, refer to "R/G TEST".
For the astigmatism test, refer to "ASTIGMATISM TEST".

2 Select the cross cylinder test chart.

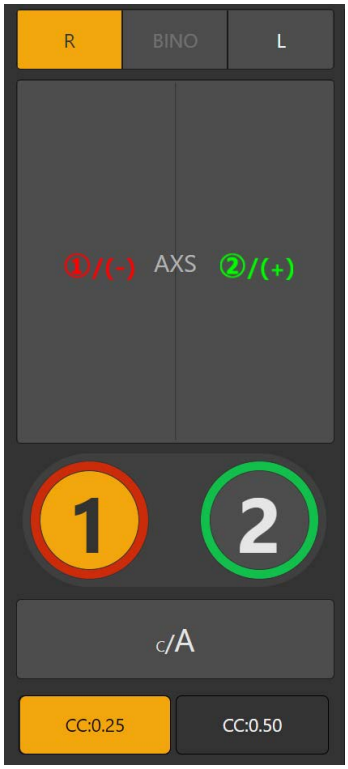
To perform the cross cylinder test (Jackson cross), select the cross cylinder test chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	When any other item except "binocular" is the last test object, the previous state is retained. When "binocular" is the last test object, the right eye of the patient is set.
Auxiliary lens	  The Jackson cross cylinder lens is set for the eye being tested. The green and red frames around the lens indicate the front and rear of the cross cylinder.
Operation mode	The mode to operate the cylinder axis is set.

Item	Description
Operation panel	

3 Select a patient's eye.
Select an eye to be tested with the patient's eye selector button.

4 Measure the cylinder axis.
Press the ① and ② buttons on the operation panel alternately and repeatedly. Have the patient answer which button he/she can see the chart better, ① or ②.
When the chart is seen better when pressing the ① button, press the "①/(-)" button on the operation panel. When the chart is seen better when pressing the ② button, press the "②/(+)" button on the operation panel.
Make adjustments until the patient sees the chart almost equally for both the ① and ② buttons.

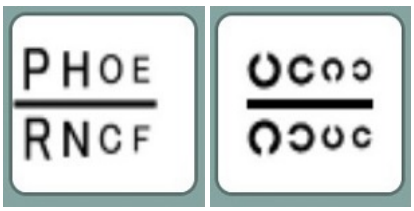
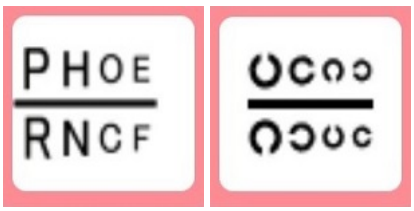
5 Measure the cylinder power.
After measuring the cylinder axis, proceed to the cylinder power measurement.
To proceed to the cylinder power measurement, press the [Power/Axis] button on the operation panel.
The procedure is the same as the cylinder axis measurement. Make adjustments until the patient sees the chart almost equally for both the ① and ② buttons.
Press the [Power/Axis] button on the operation panel. The system returns to the cylinder axis measurement.

BINOCULAR BALANCE TEST (POLARIZATION)

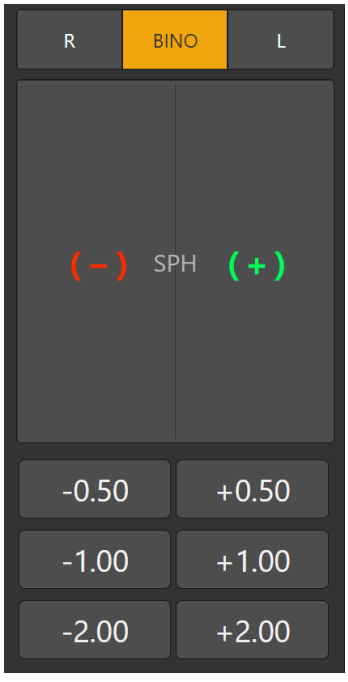
To make the patient's binocular vision clear, adjust the spherical power according to the visual acuity balance of each eye.

1 Select the binocular balance test (polarization) chart.
To perform the binocular balance test (polarization), select the binocular balance test (polarization) chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate the spherical power is set.
Operation panel	

2 Adjust the balance.
Adjust the visual acuity balance between the right and left eyes.

The patient sees the upper row of letters with the right eye and the lower row of letters with the left eye. Have the patient compare the upper and lower rows of letters and answer which row of letters is seen better, upper or lower.

When he/she sees better with the right eye, press the [R] button. When he/she sees better with the left eye, press the [L] button. Then, press the [+] button on the operation panel to add "+0.25D" to the spherical power.

In this state, have the patient compare the upper and lower rows of letters again.

Finish the test in one of the following situations:

- When the upper and lower rows of letters are seen equally;
- The status just before the eye that sees better has been changed.

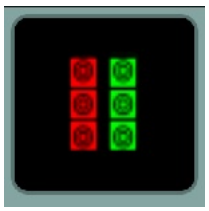
The spherical power can also be changed by tapping the six buttons having numbers, which are under the operation buttons. In this case, the spherical power is increased/decreased according to the numbers written on the buttons.

BINOCULAR BALANCE TEST (POLARIZATION: 2-COLOR)

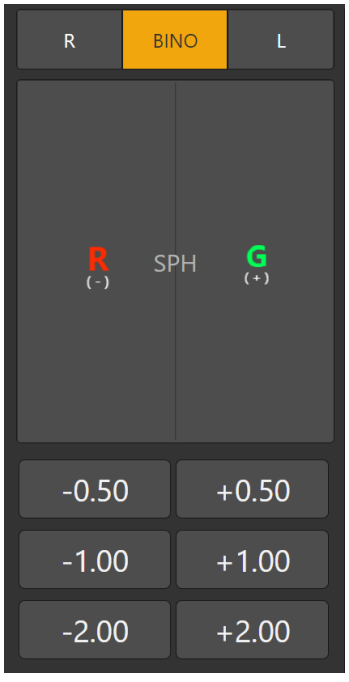
To make the patient's binocular vision clear, adjust the spherical power so that the refine end point of each eye will be equal when the patient sees an object with both eyes.

1 Select the binocular balance test (polarization: 2-color) chart.
To perform the binocular balance test (polarization: 2-color), select the binocular balance test (polarization: 2-color) chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate the spherical power is set.
Operation panel	

2 Check the refined status of the right eye.
Adjust the refined status of the right eye on condition that the patient sees the chart binocularly.
Press the [R] button.

The patient sees the upper row with the right eye, the lower row with the left eye and the middle row with both eyes.
First, have the patient compare the mark ◎ in the red and green squares on the upper row and answer which square the mark is seen better, in the red or green square. When the mark in the red square is seen better, press the [R] button once on the operation panel. When the mark in the green square is seen better, press the [G] button once.
In this state, have the patient compare and answer again.
When the marks at the right and left sides on the upper row are seen equally, the adjustment of the right eye is finished.
The spherical power can also be changed by tapping the six buttons having numbers, which are under the operation buttons. In this case, the spherical power is increased/decreased according to the numbers written on the buttons.

3 Check the refined status of the left eye.
Press the [L] button.
Following the same procedure as the right eye, have the patient compare the mark ◎ in the red and green squares on the lower row to check the refined status of the left eye.
When the marks at the right and left sides on the lower row are seen almost equally, the adjustment of the left eye is finished.

4 Check the adjusted status of both eyes.
Press the [BINO] button.
Following the same procedure as mentioned above, have the patient compare the mark ◎ in the red and green squares on the middle row to check the adjusted status of both eyes.
When the marks at the right and left sides on the middle row are seen almost equally, the test is finished.

PHORIA TEST

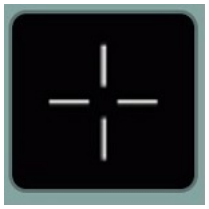
PHORIA TEST (POL. CROSS)

Measure heterophoria of the patient by using the "Pol. Cross" chart.

1 Select the "Phoria Test (Pol. Cross)" chart.
To perform "Phoria Test (Pol. Cross)", select the "Phoria Test (Pol. Cross)" chart icon on the chart page.

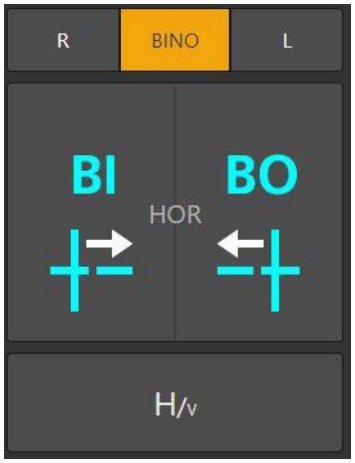
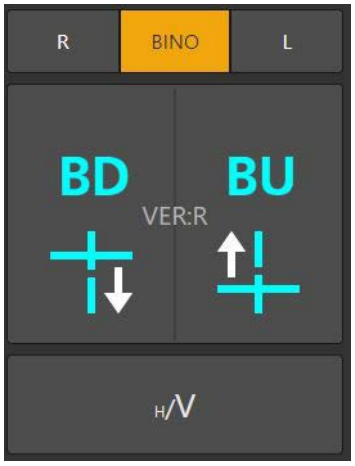
2 Select the astigmatism test chart.
To perform the astigmatism test, select the astigmatism test chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	In initial status, the mode to operate "Horizontal prism" is set.

Item	Description
Operation panel	 When the operation mode is set to "Horizontal prism"  When the operation mode is set to "Vertical prism"

3 Check if the patient has heterophoria.

When the patient sees the test chart, only the vertical line is seen with the right eye and only the horizontal line, with the left eye.

If the patient does not have heterophoria, he/she sees the vertical line crossing the horizontal line at the center.

If the patient has horizontal phoria, the vertical and horizontal lines are disassociated from the center in the horizontal direction in his/her vision.

If the patient has vertical phoria, the vertical and horizontal lines are disassociated from the center in the vertical direction in his/her vision.

4 Measure the horizontal phoria value.

If the patient has horizontal phoria, measure its value.

If the operation mode is not set to "Horizontal prism", press the [H/V] button on the operation panel to change the mode.

Ask the patient which direction the vertical line is in relation to the horizontal line, right or left.

When the vertical line is disassociated to the left, press the [BI] button until the vertical line reaches the center. When the vertical line is disassociated to the right, press the [BO] button until the vertical line reaches the center.

5 Measure the vertical phoria value.

If the patient has vertical phoria, measure its value.

Press the [H/V] button on the operation panel to change the operation mode to "Vertical prism".

Ask the patient which direction the horizontal line is in relation to the vertical line, upward or downward.

When the horizontal line is disassociated upward, press the [BD] button until the horizontal line reaches the center. When the horizontal line is disassociated downward, press the [BU] button until the horizontal line reaches the center.

PHORIA TEST (CROSS RING)

Measure heterophoira of the patient by using the "Cross Ring" chart.

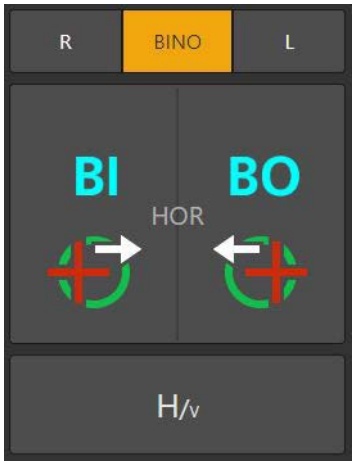
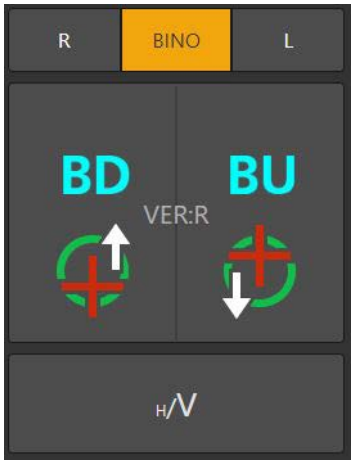
1 Select the "Phoria Test (Cross Ring)" chart.
To perform the "Phoria Test (Cross Ring)", select the "Phoria Test (Cross Ring)" chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	In initial status, the mode to operate "Horizontal prism" is set.

Item	Description
Operation panel	 When the operation mode is set to "Horizontal prism"  When the operation mode is set to "Vertical prism"

2 Check if the patient has heterophoria.

When the patient sees the test chart, only the cross is seen with the right eye and only the ring, with the left eye.

If the patient does not have heterophoria, the cross center overlaps the ring center in his/her vision.

If the patient has horizontal phoria, the centers of cross and ring are disassociated in the horizontal direction in his/her vision.

If the patient has vertical phoria, the centers of cross and ring are disassociated in the vertical direction in his/her vision.

3 Measure the horizontal phoria value.

If the patient has horizontal phoria, measure its value.

If the operation mode is not set to "Horizontal prism", press the [H/V] button on the operation panel to change the mode.

Ask the patient which direction the cross is in relation to the ring, right or left.

When the cross is disassociated to the left against the ring, press the [BI] button until the vertical center lines of the cross and the ring overlap each other. When the cross is disassociated to the right against the ring, press the [BO] button until the vertical center lines of the cross and the ring overlap each other.

4 Measure the vertical phoria value.

If the patient has vertical phoria, measure its value.

Press the [H/V] button on the operation panel to change the operation mode to "Vertical prism".

Ask the patient which direction the cross is in relation to the ring, upward or downward.

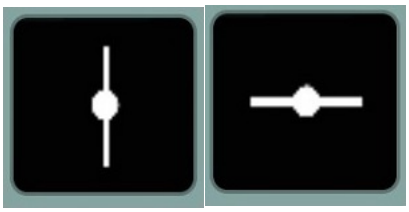
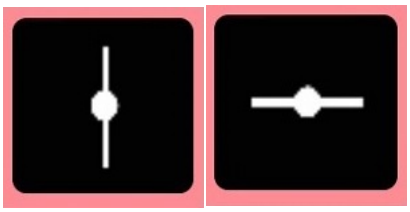
When the cross is disassociated downward in relation to the ring, press the [BU] button until the horizontal center lines of the cross and the ring overlap each other. When the cross is disassociated upward in relation to the ring, press the [BD] button until the horizontal center lines of the cross and the ring overlap each other.

PHORIA TEST (MADDOX)

Measure heterophoria of the patient by using the fixation target and Maddox rod.

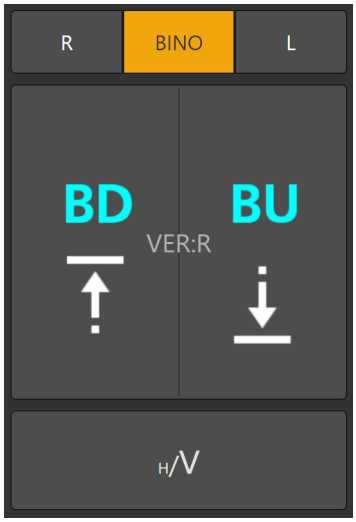
1 Select the "Phoria Test (Maddox)" chart.
To perform "Phoria Test (Maddox)", select the "Phoria Test (Maddox)" chart icon on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	In initial status, the mode to operate "Horizontal prism" is set.

Item	Description
Operation panel	 When the operation mode is set to "Horizontal prism"  When the operation mode is set to "Vertical prism"

2 Check if the patient has heterophoria.

Press the [H/V] button on the operation panel, and you can check if the patient has horizontal phoria. Press the [H/V] button once more, and you can check if the patient has vertical phoria.

When checking horizontal phoria, a vertical line is seen with the right eye and a dot, with the left eye.

If the patient does not have horizontal phoria, the dot seen with the left eye is on the vertical line seen with the right eye. If the patient has horizontal phoria, the dot seen with the left eye is separated from the vertical line seen with the right eye.

If the patient does not have vertical phoria, the dot seen with the right eye is on the horizontal line seen with the left eye. If the patient has vertical phoria, the dot seen with the right eye is separated from the horizontal line seen with the left eye. When checking vertical phoria, a dot is seen with the right eye and a horizontal line, with the left eye.

3 Measure the horizontal phoria value.

If the patient has horizontal phoria, measure its value.

If the operation mode is not set to "Horizontal prism", press the [H/V] button on the operation panel to change the mode.

Ask the patient which side the dot exists against the vertical line, the right or left.

When the dot is at the right side of the vertical line, press the [BI] button until the dot and line overlap each other. When the dot is at the left side of the vertical line, press the [BO] button until the dot and line overlap each other.

4 Measure the vertical phoria value.

If the patient has vertical phoria, measure its value.

Press the [H/V] button on the operation panel to change the operation mode to "Vertical prism".

Ask the patient which side the dot exists against the horizontal line, above or under the line.

When the dot exists under the horizontal line, press the [BD] button until the dot and line overlap each other. When the dot exists above the horizontal line, press the [BU] button until the dot and line overlap each other.

HORIZONTAL PHORIA MEASUREMENT (PRISM SEPARATION)

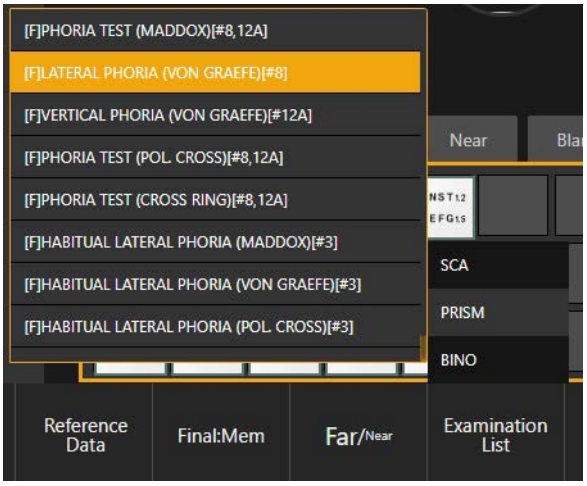
Measure horizontal phoria of the patient by using the chart where characters are arranged on one vertical line.

1 Select the chart where four numerals are arranged at upper and lower sections on one vertical line.

To perform the horizontal phoria measurement (prism separation), select the icon of the chart where four numerals are arranged at upper and lower sections on one vertical line on the chart page.

If this icon does not exist on the chart page, specify the test name from "Examination List".

Touch [Prism] on the [Examination List] tab and select "LATERAL PHORIA (VON GRAEFE) [#8]" from the displayed list.



Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate "Horizontal prism" is set.

Item	Description
Operation panel	

2 Check if the patient has heterophoria.

The patient sees the lower section of four numerals arranged vertically with the right eye and, the upper section with the left eye.

If the patient does not have heterophoria, the numerals at the upper and lower sections are on one line in his/her vision.

If the patient has horizontal phoria, the numerals at the upper and lower sections are disassociated in the horizontal direction.

3 Measure the horizontal phoria value.

If the patient has horizontal phoria, measure its value.

Ask the patient which direction the upper character line is disassociated against the lower character line, right or left.

When the upper character line is disassociated to the right, press the [BI] button until the upper and lower character lines are arranged on one line.

When the upper character line is disassociated to the left, press the [BO] button until the upper and lower character lines are arranged on one line.

VERTICAL PHORIA MEASUREMENT (PRISM SEPARATION)

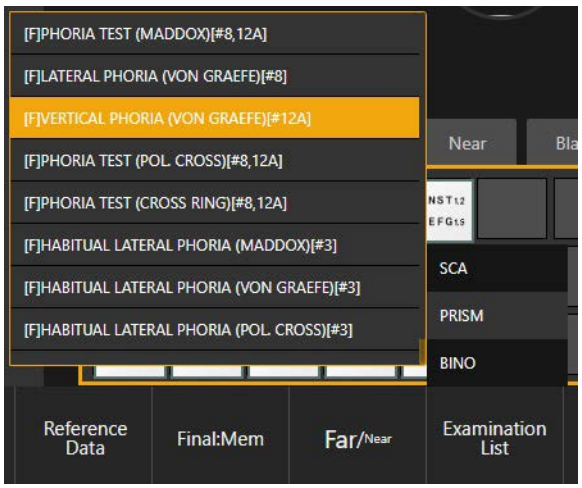
Measure vertical phoria of the patient by using the chart where characters are arranged on one horizontal line.

1 Select the chart where four numerals are arranged at right and left sections on one horizontal line.

To perform the vertical phoria measurement (prism separation), select the icon of the chart where four numerals are arranged at right and left sections on one horizontal line.

If this icon does not exist on the chart page, specify the test name from "Examination List".

Touch [PRISM] on the [Examination List] tab and select "VERTICAL PHORIA (VON GRAEFE)[#12A]" from the displayed list.

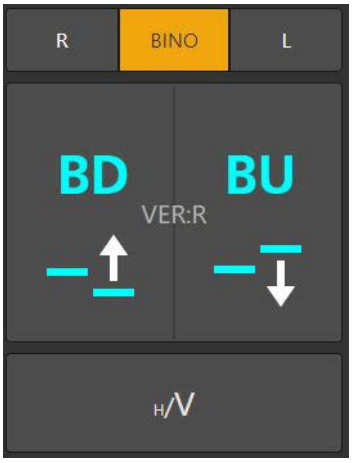


Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate "Vertical prism" is set.

Item	Description
Operation panel	

2 Check if the patient has heterophoria.

The image the patient sees is separated horizontally because of the prism inserted over the left eye. The patient sees the right section of the four numerals arranged horizontally with the right eye and, the left section with the left eye.

If the patient does not have heterophoria, the numerals at the right and left sections are on one line in his/her vision.

If the patient has vertical phoria, the numerals at the right and left sections are disassociated in the vertical direction.

3 Measure the vertical phoria value.

If the patient has vertical phoria, measure its value.

Ask the patient which direction the right character line is disassociated against the left character line, upward or downward.

When the right character line is disassociated downward, press the [BD] button until the right and left character lines are arranged on one line.

When the right character line is disassociated upward, press the [BU] button until the right and left character lines are arranged on one line.

OTHER BINOCULAR FUNCTION TESTS

FIXATION DISPARITY TEST (POL. CROSS WITH FIXATION TARGET)

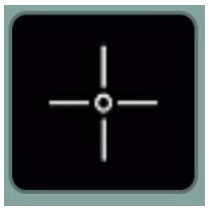
Measure fixation disparity of the patient by using the cross chart with fixation target.

1 Prepare for the test.
This test must be executed without any disassociation of the eyes. Before this test, correct any disassociation of the eyes by conducting "Phoria test".

: For phoria test, refer to "PHORIA TEST (POL.CROSS)".

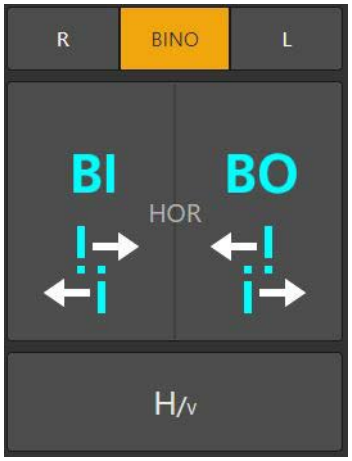
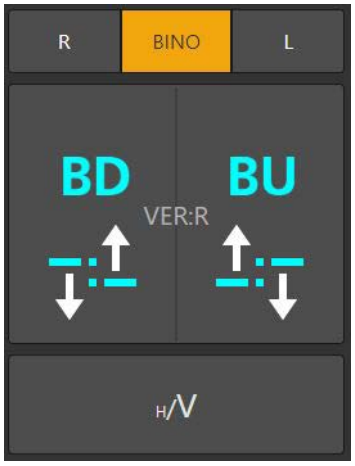
2 Select the cross chart with fixation target.
To perform the fixation disparity test (cross with fixation target), select the icon for the cross chart with fixation target on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	In initial status, the mode to operate "Horizontal prism" is set.

Item	Description
Operation panel	 When the operation mode is set to "Horizontal prism"  When the operation mode is set to "Vertical prism"

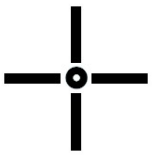
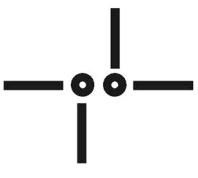
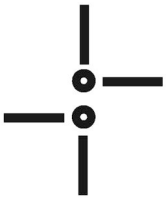
3 Check if the patient has fixation disparity.

When the patient sees the test chart, the following status is his/her vision: The fixation target at the cross center is seen by both eyes. In addition, the reversed "L" shape made by the vertical and horizontal lines is seen by the left eye. The "L" shape made by the vertical and horizontal lines is seen by the right eye.

If the patient does not have fixation disparity, he/she sees a cross made by the straight vertical and horizontal lines.

If the patient has fixation disparity in the horizontal direction, the vertical lines are deviated in the horizontal direction in his/her vision.

If the patient has fixation disparity in the vertical direction, the horizontal lines are deviated in the vertical direction in his/her vision.

				
Chart seen by left eye	Chart seen by right eye	Chart seen by both eyes without fixation disparity	Example for the eye having fixation disparity in horizontal direction	Example for the eye having fixation disparity in vertical direction

4 Measure the fixation disparity degree in horizontal direction.

If the patient has fixation disparity in the horizontal direction, measure its value.

If the operation mode is not set to "Horizontal prism", press the [H/V] button on the operation panel to change the mode.

Have the patient watch the vertical lines. Ask the patient which direction the upper vertical line is positioned against the lower vertical line, right or left.

When the upper vertical line is at the left against the lower vertical line, press the [BI] button until the upper and lower vertical lines are on one line.

When the upper vertical line is at the right against the lower vertical line, press the [BO] button until the upper and lower vertical lines are on one line.

5 Measure the fixation disparity in the vertical direction.

If the patient has fixation disparity in the vertical direction, measure its value.

If the operation mode is not set to "Vertical prism", press the [H/V] button on the operation panel to change the mode.

Have the patient watch the horizontal lines. Ask the patient which direction the right horizontal line is positioned against the left horizontal line, under or above the left line.

When the right horizontal line is under the left horizontal line, press the [BD] button until the right and left horizontal lines are on one line.

When the right horizontal line is above the left horizontal line, press the [BU] button until the right and left horizontal lines are on one line.

FIXATION DISPARITY TEST (POL. SCALE CROSS WITH FIXATION TARGET)

Measure fixation disparity of the patient by using the polarization scale cross chart with fixation target.

1 Prepare for the test.

This test must be executed without any disassociation of the eyes. Before this test, correct any disassociation of the eyes by conducting "Phoria test".

: For phoria test, refer to "PHORIA TEST (POL.CROSS)".

2 Select the polarization scale cross chart with fixation target.

To perform the fixation disparity test (pol. scale cross with fixation target), select the icon for the polarization scale cross chart with fixation target on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
 The frame of the far-point chart is green.	Near-point test cannot be executed.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	In initial status, the mode to operate "Horizontal prism" is set.

Item	Description
Operation panel	 When the operation mode is set to "Horizontal prism"  When the operation mode is set to "Vertical prism"

3 Check if the patient has fixation disparity.

When the patient sees the test chart, the following status is his/her vision: The fixation target at the cross center is seen by both eyes. In addition, the peripheral scales are seen by the left eye and the cross at the center is seen by the right eye.

If the patient does not have fixation disparity, each end of the center cross indicates the center of each section of the peripheral scales.

If the patient has fixation disparity in the horizontal direction, the vertical lines of the cross do not indicate the scale centers and are deviated in the horizontal direction.

If the patient has fixation disparity in the vertical direction, the horizontal lines of the cross do not indicate the scale centers and are deviated in the vertical direction.

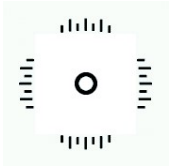
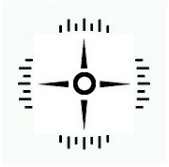
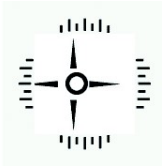
			

Chart seen by left eye	Chart seen by right eye	Chart seen by both eyes without fixation disparity	Example for the eye having fixation disparity in horizontal direction	Example for the eye having fixation disparity in vertical direction

4 Measure the fixation disparity degree in horizontal direction.

If the patient has fixation disparity in the horizontal direction, measure its value.

If the operation mode is not set to "Horizontal prism", press the [H/V] button on the operation panel to change the mode.

Have the patient watch the vertical line and scale at the upper side. Ask the patient which side the vertical line indicates against the scale, right or left.

When the vertical line indicates the left of the scale, press the [BI] button until the vertical line indicates the scale center. When the vertical line indicates the right of the scale, press the [BO] button until the vertical line indicates the scale center.

5 Measure the fixation disparity degree in the vertical direction.

If the patient has the fixation disparity in the vertical direction, measure its value.

If the operation mode is not set to "Vertical prism", press the [H/V] button on the operation panel to change the mode.

Have the patient watch the horizontal line and scale at the left side. Ask the patient which side the horizontal line indicates against the scale, upper or lower side.

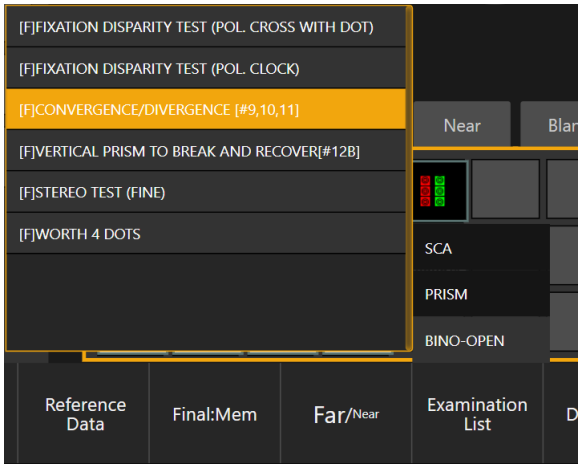
When the horizontal line indicates the lower side of the scale, press the [BD] button until the horizontal line indicates the scale center. When the horizontal line indicates the upper side of the scale, press the [BU] button until the horizontal line indicates the scale center.

CONVERGENCE/DIVERGENCE

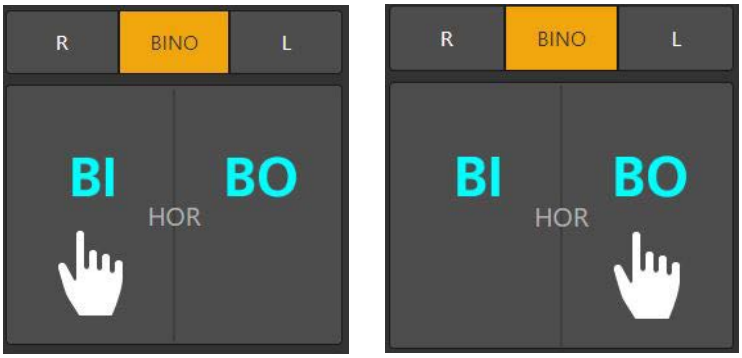
Measure the convergence and divergence of the patient. The result is used as a reference value when the heterophoria of the patient is corrected.
The result of the test is recorded by touching the [Record] button.

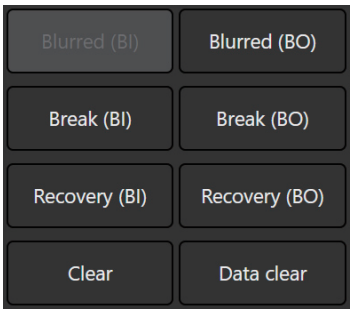
1 Prepare for the test.
This test must be executed in the condition that abnormal refraction has been completely corrected. If abnormal refraction is not corrected yet, correct it before this test.

2 To perform this test, specify the test name from "Examination List".
Tap the [Far/Near] function button to display the test list that is applicable to the desired test distance.
Touch [BINO-OPEN] on the [Examination List] tab and select "[F] CONVERGENCE/DIVERGENCE [#9, 10, 11]" on the displayed list.



The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate "Horizontal prism" is set.
Operation panel	According to the progress of the test, the following two types are alternately displayed. 

Item	Description
Result entry button	 Use [Blurred (BI)], [Break (BI)] and [Recovery (BI)] at the left to record the divergence test results. Use [Blurred (BO)], [Break (BO)] and [Recovery (BO)] at the right to record the convergence test results. In far-point test, blur is not generated in the case of divergence. So, the [Blurred (BI)] button at the leftmost of the function buttons is displayed in the invalid status.

3 Measure divergence.

First, measure the divergence of the patient.

Have the patient view the chart where characters are arranged on one vertical line.

[Checking the blur point] (Only for near point)

Instruct the patient to respond whenever he/she sees the blurred characters on the chart. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the blurred characters", stop the operation. Check if the patient still sees the blurred characters though you try to adjust the focus correctly. When the patient says positively "I see the blurred characters", touch the [Blurred (BI)] button to record the measured value.

[Checking the break point]

Instruct the patient to respond whenever he/she sees the characters on two lines, which are, in fact, arranged vertically on one line in the chart. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the characters on two lines", touch the [Break (BI)] button to record the measured value.

[Checking the recovery point]

Instruct the patient to respond whenever he/she sees the characters on one line again. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the characters on one line again", touch the [Recovery (BI)] button to record the measured value.

4 Measure convergence.

Measure the convergence of the patient.

Before proceeding to the convergence measurement, touch the [Clear] button to cancel the prism set currently.

[Checking the blur point]

Instruct the patient to respond whenever he/she sees the blurred characters on the chart. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the blurred characters", stop the operation. Check if the patient still sees the blurred characters though you try to adjust the focus correctly. When the patient says

positively "I see the blurred characters", touch the [Blurred (BO)] button to record the measured value.

[Checking the break point]

Instruct the patient to respond whenever he/she sees the characters on two lines, which are, in fact, arranged horizontally on one line in the chart. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the characters on two lines", touch the [Break (BO)] button to record the measured value.

[Checking the recovery point]

Instruct the patient to respond whenever he/she sees the characters on one line again. Press the button indicated by the navigation icon on the operation panel.

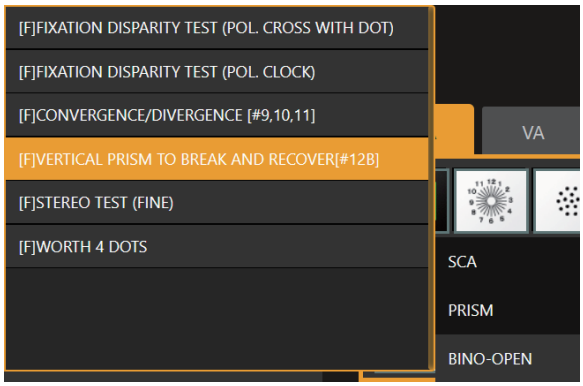
When the patient says "I see the characters on one line again", touch the [Recovery (BO)] button to record the measured value.

VERTICAL VERGENCE

Measure the vertical vergence of the patient. The result of the test is recorded by touching the record entry button.

1 Prepare for the test.
This test must be executed in the condition that abnormal refraction has been completely corrected. If abnormal refraction is not corrected yet, correct it before this test.

2 To perform this test, specify the test name from "Examination List".
Tap the [Far/Near] function button to display the test list that is applicable to the desired test distance.
Touch [BINO-OPEN] on the [Examination List] tab and select "[F] VERTICAL PRISM TO BREAK AND RECOVER [#12B]" on the displayed list.



The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode. The right eye is the object of the operation.
Auxiliary lens	Not set.
Operation mode	The mode to operate "Vertical prism" is set.
Operation panel	According to the progress of the test, the following two types are alternately displayed. 

Item	Description
Result entry button	 Use [Break (BU)] and [Recovery (BU)] at the left to record the results of the test for the lower divergence of right eye and upper divergence of left eye. Use [Break (BD)] and [Recovery (BD)] at the right to record the results of the test for the upper divergence of right eye and the lower divergence of left eye.

3 Measure the lower divergence of right eye and the upper divergence of left eye.

First, measure the lower divergence of right eye and the upper divergence of left eye for the patient.

Have the patient watch the chart where characters are arranged on one horizontal line.

[Checking the break point]

Instruct the patient to respond whenever he/she sees the characters on two lines, which are, in fact, arranged horizontally on one line in the chart. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the characters on two lines", touch the [Break (BU)] button to record the measured value.

[Checking the recovery point]

Instruct the patient to respond whenever he/she sees the characters on one line again. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the characters on one line again", touch the [Recovery (BU)] button to record the measured value.

4 Measure the upper divergence of right eye and the lower divergence of left eye.

Measure the upper divergence of right eye and the lower divergence of left eye for the patient.

Before proceeding to this measurement, touch the [Clear] button to cancel the prism set currently.

[Checking the break point]

Instruct the patient to respond whenever he/she sees the characters on two lines, which are, in fact, arranged horizontally on one line in the chart. Press the button indicated by the navigation icon on the operation panel.

When the patient says "I see the characters on two lines", touch the [Break (BD)] button to record the measured value.

[Checking the recovery point]

Instruct the patient to respond whenever he/she sees the characters on one line again. Press the button indicated by the navigation icon on the operation panel.

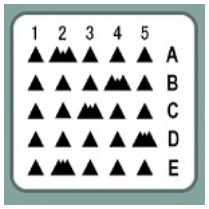
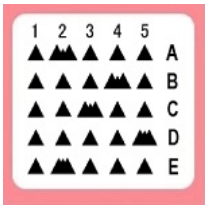
When the patient says "I see the characters on one line again", touch the [Recovery (BD)] button to record the measured value.

PRECISE STEREOSCOPIC VISION TEST

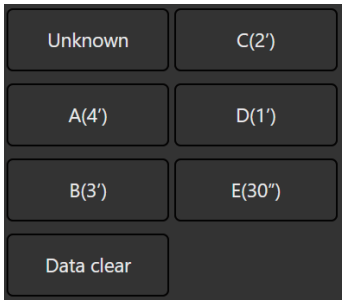
Check if the patient has the stereoscopic vision.

1 Select the precise stereoscopic vision chart.
To perform the precise stereoscopic vision test, select the icon for the precise stereoscopic vision test on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
	
The frame of the far-point chart is green.	The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The previous state is retained.
Operation panel	The previous state is retained.
Result entry button	

2 Check the stereoscopic vision.
Each line has one triangle which is in relief status. If the patient recognizes this relief, he/she has the stereoscopic vision of 4 minutes, 3 minutes, 2 minutes, 1 minute and 30 seconds in order from the top line.
Record the test results by touching the button of the smallest parallax that can be checked among the result entry buttons.
The triangle in relief is the doubled triangle on the chart patterns.

WORTH 4 DOTS TEST

Check if the patient has strabismus and suppression.

1 Select the Worth 4 dots test chart.
To perform the Worth 4 dots test, select the icon for the Worth 4 dots test on the chart page.

Example of the test chart icons on chart page

Far-point test chart icon	Near-point test chart icon
 The frame of the far-point chart is green.	Near-point test cannot be executed.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The previous state is retained.
Operation panel	The previous state is retained.

2 Check how the chart is seen.
When the patient sees the test chart, as shown in the figures below, three green dots are seen by the left eye and, red two dots by the right eye.

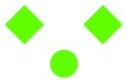
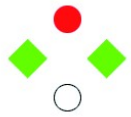
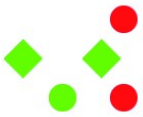
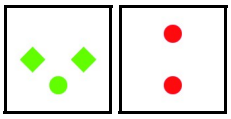


Chart seen by left eye	Chart seen by right eye

When the patient sees the chart with both eyes at the same time, there are five types of the visual condition as shown in the figures below.

[4 Dots]
When the patient sees four dots, he/she does not have strabismus or he/she has abnormal concordance.
When the patients are changed one after another, the vision of the chart is changed as follows depending on the patient: The lowest white shape dot is seen in red, green or a mix of red and green. When the lowest dot is seen in red, the right eye is superior. When it is seen in green, the left eye is superior. When it is seen in the mixed color, the right and left eyes are balanced.
[2 Red]
When the patient sees two red dots, the left eye is suppressed if he/she sees an object with both eyes.
[3 Green]
When the patient sees three green dots, the right eye is suppressed if he/she sees an object with both eyes.
[5 Dots]
When the patient sees two red dots and three green dots, he/she has strabismus.
[2R 3G Alter]
When the patient sees red and green dots alternately, he/she has alternating suppression.

				
4 Dots (Normal/Abnormal concordance)	2 Red (Suppression on left eye)	3 Green (Suppression on right eye)	5 Dots (Strabismus)	2R 3G Alter (Alternating suppression)

3 Record the result.

The function buttons contain a button named [Result]. Tap this button, and the buttons that have the description about the above-mentioned five types of the visual condition are displayed. Select the button applied to the patient's visual condition.

NEAR-POINT TEST

ADD TEST

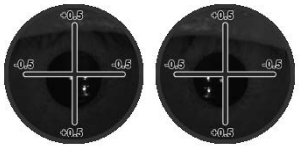
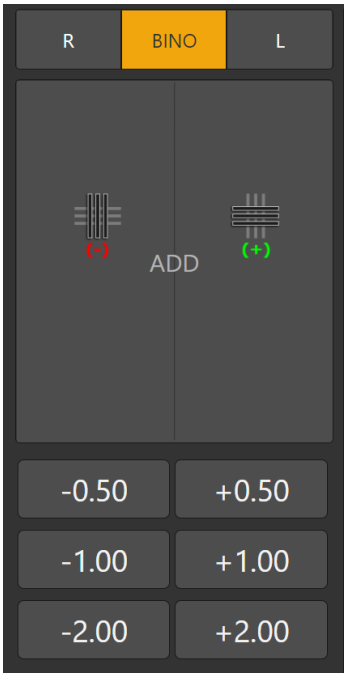
NOTE	When switching to a closer test distance, the fusion support is performed. For details, see "FUSION SUPPORT" on page 107.

Search for the ADD power required for near vision by using the cross cylinder lens and grid chart.

1 Select the grid chart.
To perform the ADD test, select the grid test chart icon on the chart page.

The frame of the near-point chart is pink.

The following items are automatically changed as shown below.

Item	Description
Test eye	Changed to the binocular mode.
Auxiliary lens	 The cross cylinder lens of ±0.5D is set.
Operation mode	The mode to operate "ADD" is set.
Operation panel	

2 Search for the necessary ADD power.

Have the patient compare the vertical lines with the horizontal ones and answer which are seen more clearly, vertical or horizontal lines.

When the patient answers "The horizontal lines are seen more clearly", press the [R] button on the operation panel.

When the patient answers "The vertical lines are seen more clearly", press the [L] button on the operation panel.

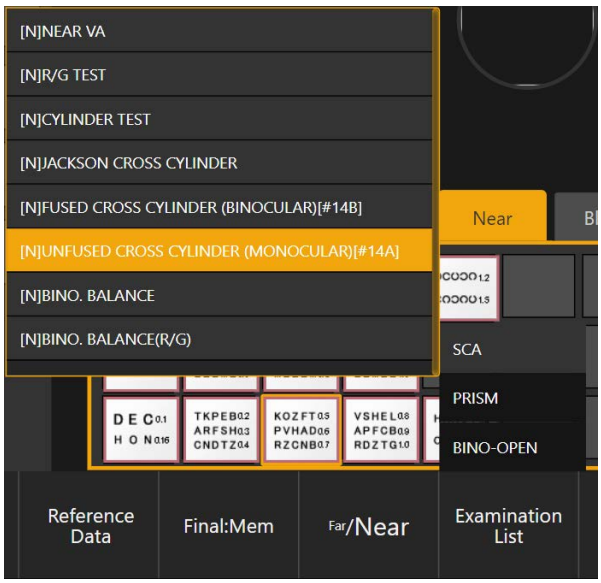
Adjust the ADD power until the vertical lines are seen as clearly as the horizontal ones or until the horizontal lines are seen a little more clearly.

The ADD power can also be changed by tapping the six buttons having numbers, which are under the operation buttons. In this case, the ADD power is increased/decreased according to the numbers written on the buttons.

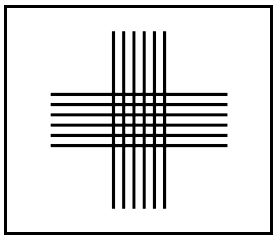
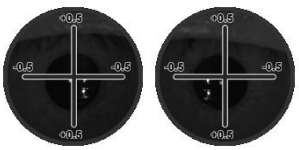
MONOCULAR ADD TEST

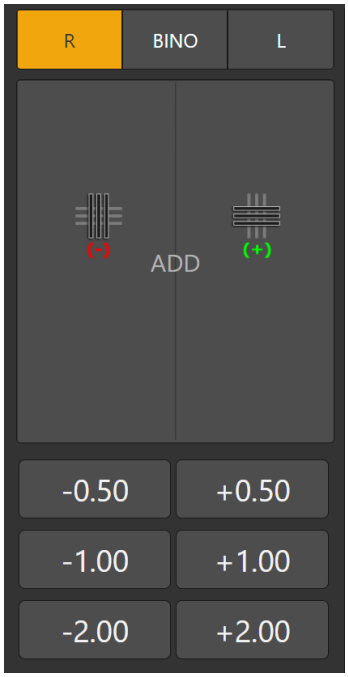
Search for the ADD power required for near vision of each eye by using the cross cylinder lens and grid chart.

1 To perform this test, specify the test name from "Examination List".
Press the [Far/Near] button to display the near-point test list.
Touch [SCA] after selecting the [Examination List] button and select "[N] UNFUSED CROSS CYLINDER (MONOCULAR) [#14A]" from the displayed list.



The following items are automatically changed as shown below.

Item	Description
Chart	
Test eye	When any other item except "binocular" is the last test object, the previous state is retained. When "binocular" is the last test object, the right eye of the patient is set.
Auxiliary lens	 The cross cylinder lens of ±0.5D is set.
Operation mode	The mode to operate "ADD" is set.

Item	Description
Operation panel	

2 Select a patient's eye.
Select an eye to be tested with the patient's eye selector button.

3 Search for the necessary ADD power.
Have the patient compare the vertical lines with the horizontal ones and answer which are seen more clearly, vertical or horizontal lines.
When the patient answers "The horizontal lines are seen more clearly", press the [R] button on the operation panel.
When the patient answers "The vertical lines are seen more clearly", press the [L] button on the operation panel.
Adjust the ADD power until the vertical lines are seen as clearly as the horizontal ones or until the horizontal lines are seen a little more clearly.
The ADD power can also be changed by tapping the six buttons having numbers, which are under the operation buttons. In this case, the ADD power is increased/decreased according to the numbers written on the buttons.

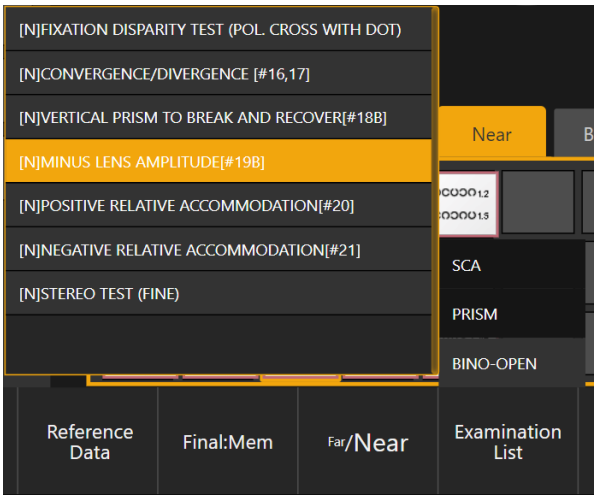
MINUS LENS AMPLITUDE MEASUREMENT

Place the near-point visual acuity target that meets the maximum near-point visual acuity of the patient at 33cm in front of his/her eyes. Have the patient view this target. When adding the concave spherical lenses, check to what degree the patient can see the target clearly. In this way, measure the accommodation power for the patient.

1 Prepare for the test.
This test must be done by using the visual acuity target that meets the maximum near-point visual acuity of the patient. Before this test, perform the near-point visual acuity test.

: For the visual acuity test, refer to "VISUAL ACUITY MEASUREMENT".

2 To perform this test, specify the test name from "Examination List".
Press the [Far/Near] button to display the near-point test list.
Touch [BINO-OPEN] on the [Examination List] tab and select "[N] MINUS LENS AMPLITUDE [#19B]" from the displayed list.



The following items are automatically changed as shown below.

Item	Description
Chart	The near-point visual acuity chart including the visual acuity 1.0 is displayed. F Z B D T O F L C V A P E O H
Test distance	Changed to 33cm during this test. When this test is finished and any other test is performed, the original test distance is set again.
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate "ADD" is set.

Item	Description
Operation panel	According to the progress of the test, the following two types are alternately displayed. 
Result entry button	

3 Measure the "Blurred" point.

Have the patient view the target. Instruct the patient to respond whenever he/she sees the blurred target once the test is started. Then, press the button indicated by the operation panel.

When the patient says "I see the blurred target", stop operating the button.

4 Record the result for the "Blurred" point.

Touch the [Blurred (-)] button to record the result.

The value displayed in "ADD" shows the adjustment needed to compensate for the "Blurred" degree.

When the patient sees the target at 33cm, the adjustment of 3.00D is required. The value to be recorded is the value obtained by adding 3.00D to the value, which is displayed in "ADD", with the reversed sign.

5 Measure the "Recovery" point.

Instruct the patient to respond whenever he/she sees the target clearly again. Press the button indicated by the operation panel.

When the patient says "I see the target clearly", stop operating the button.

6 Record the result for the "Recovery" point.

Touch the [Recovery (-)] button to record the result.

As the "Blurred" point, the value to be recorded is the value obtained by adding 3.00D to the value, which is displayed in "ADD", with the reversed sign.

POSITIVE RELATIVE ACCOMMODATION MEASUREMENT

Place the near-point visual acuity target that meets the visual acuity of 0.8 at the preset near-point test distance. Have the patient view the target. As adding the concave spherical lenses, check to what degree the patient can see the target clearly. By conducting this test, measure the positive accommodation power for the patient.

1 Prepare for the test.

This test must be started in the condition that the patient can see a target clearly at the preset near-point test distance.

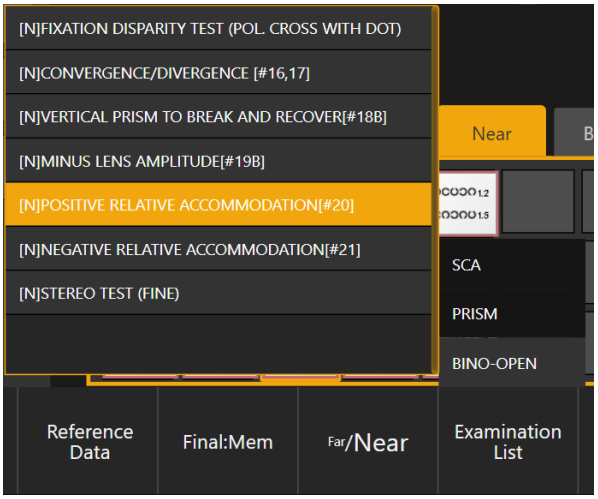
Before this test, perform the ADD test.

: For the ADD test, refer to "ADD TEST".

2 To perform this test, specify the test name from "Examination List".

Press the [Far/Near] button to display the near-point test list.

Touch [BINO-OPEN] on the [Examination List] tab and select "[N] POSITIVE RELATIVE ACCOMMODATION [#20]" from the displayed list.



The following items are automatically changed as shown below.

Item	Description
Chart	The near-point visual acuity chart including the visual acuity value 0.8 is displayed. F Z B D T O F L C V A P E O H
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate "ADD" is set.

Item	Description
Operation panel	According to the progress of the test, the following two types are alternately displayed. 
Result entry button	

3 Measure the "Blurred" point.

Have the patient view the target. Instruct the patient to respond whenever he/she sees the blurred target. Press the button indicated by the operation panel.

When the patient says "I see the blurred target", stop operating the button.

4 Record the result for the "Blurred" point.

Touch the [Blurred (-)] button to record the result.

The value displayed in "ADD" shows the adjustment required to compensate for the "Blurred" degree.

In the "Positive Relative Accommodation" test, the object is to measure the degree to which the patient's eye can be adjusted from the status where he/she sees a target clearly at the preset near-point test distance. The value to be recorded is obtained by subtracting the value measured in the ADD test from the value displayed in "ADD".

5 Measure the "Recovery" point.

Have the patient to respond whenever he/she sees the target clearly again. Press the button indicated by the operation panel.

When the patient says "I see the target clearly", stop operating the button.

6 Record the result for the "Recovery" point.

Touch the [Recovery (-)] button to record the result.

As the "Blurred" point, the value to be recorded is obtained by subtracting the value measured by the ADD test from the value displayed in "ADD".

NEGATIVE RELATIVE ACCOMMODATION MEASUREMENT

Place the near-point visual acuity target that meets the visual acuity of 0.8 at the preset near-point test distance. Have the patient view the target. As adding the convex spherical lenses, check to what degree the patient can see the target clearly. By conducting this test, measure the accommodation power that is really used by the patient to view a target at the preset near-point test distance.

1 Prepare for the test.

This test must be started in the condition that the patient can see a target clearly at the preset near-point test distance.

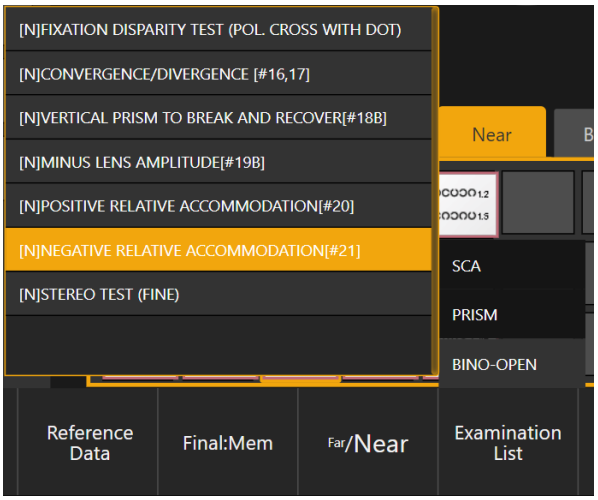
Before this test, perform the ADD test.

: For the ADD test, refer to "ADD TEST".

2 To perform this test, specify the test name from "Examination List".

Press the [Far/Near] button to display the near-point test list.

Touch [BINO-OPEN] on the [Examination List] tab and select "[N] NEGATIVE RELATIVE ACCOMMODATION [#21]" from the displayed list.



The following items are automatically changed as shown below.

Item	Description
Chart	The near-point visual acuity chart including the visual acuity value 0.8 is displayed. F Z B D T O F L C V A P E O H
Test eye	Changed to the binocular mode.
Auxiliary lens	Not set.
Operation mode	The mode to operate "ADD" is set.

Item	Description
Operation panel	According to the progress of the test, the following two types are alternately displayed.  
Result entry button	

3 Measure the "Blurred" point.

Have the patient view the target. Instruct the patient to respond whenever he/she sees the blurred target. Press the button indicated by the operation panel.

When the patient says "I see the blurred target", stop operating the button.

4 Record the result for the "Blurred" point.

Touch the [Blurred (+)] button to record the result.

The value displayed in "ADD" shows that the patient has cancelled the adjustment equal to this value.

In the "Negative Relative Accommodation" test, the object is to measure the degree to which the patient has used his/her adjusting power to watch a target at the preset near-point test distance.

The value to be recorded is the value obtained by subtracting the ADD power of the patient from the value displayed in "ADD".

5 Measure the "Recovery" point.

Instruct the patient to respond whenever he/she sees the target clearly again. Press the button indicated by the operation panel.

When the patient says "I see the target clearly", stop operating the button.

6 Record the result for the "Recovery" point.

Touch the [Recovery (+)] button to record the result.

As the "Blurred" point, the value to be recorded is the value obtained by subtracting the ADD power of the patient from the value displayed in "ADD".

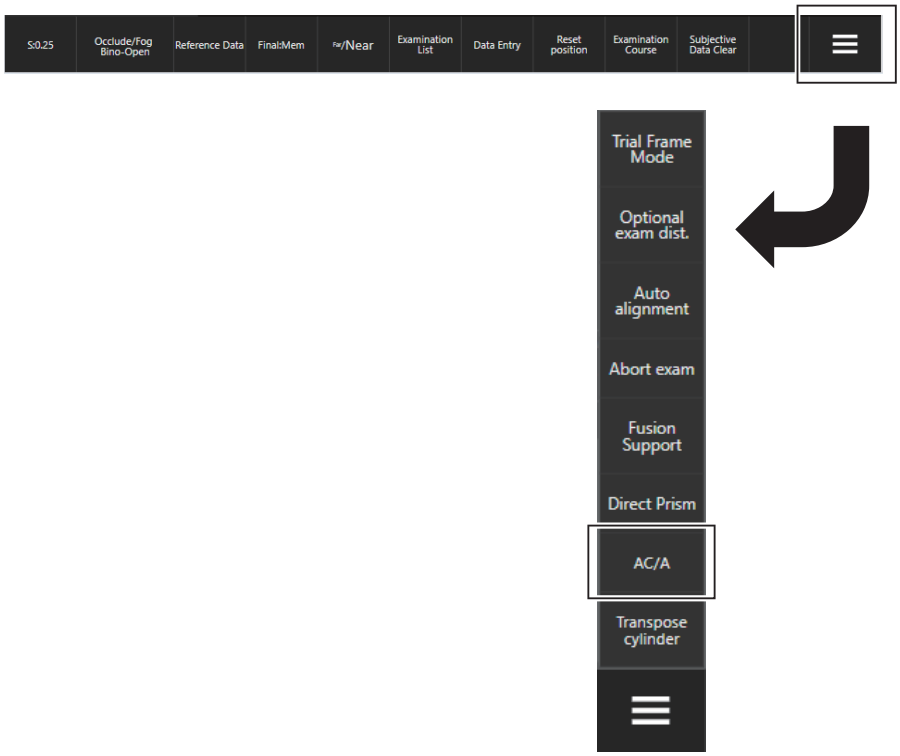
AC/A

For human eyes, the adjustment and convergence work at the same time under the correlated status. The AC/A ratio is the value to indicate how much convergence will occur when the adjustment of 1.00D has occurred.
In this test, measure the AC/A ratio by gradient.

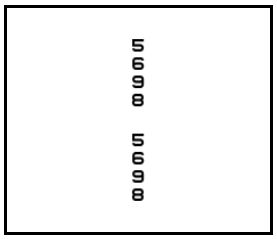
1 Prepare for the test.
This test must be conducted just after "[N] LATERAL PHORIA WITH #7A (#13B)". Before this test, perform "[N] LATERAL PHORIA WITH #7A (VON GRAEFE)[13B]".

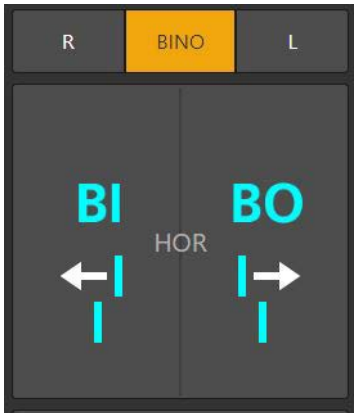
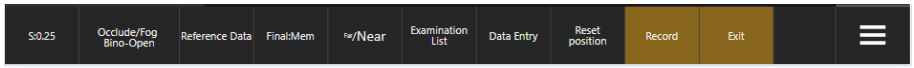
For "[N] LATERAL PHORIA WITH #7A (VON GRAEFE)[13B]", refer to "HORIZONTAL PHORIA MEASUREMENT (PRISM SEPARATION)".

2 Touch the [AC/A] button.
While the near-point horizontal phoria test is being executed, the [AC/A] button is displayed in the hamburger menu button.
The [AC/A] button is functional after the near-point horizontal phoria has been measured. When the horizontal phoria has been measured, touch this button.



The following items are automatically changed as shown below.

Item	Description
Chart	
ADD	"+1.00D" is set to both eyes.
Test eye	Changed to the binocular mode.

Item	Description
Auxiliary lens	Not set.
Operation mode	The mode to operate "Horizontal prism" is set.
Operation panel	
Function button	

3 Measure the changed convergence.

When the ADD power is shifted by "+1.00D", the adjustment equal to 1.00D is cancelled in the patient's eye and the convergence is changed.

Measure the changed convergence in the same way as the horizontal phoria measurement.

The patient sees the numerals at the lower section with the right eye and, those at the upper section with the left eye.

Because the adjustment of 1.00D is cancelled, possibly divergence will occur in the patient's eye. Therefore, as the illustration at the left side of operation panel, the upper character line is disassociated rightward and lower character line, leftward in the patient's vision initially. Ask the patient how the upper and lower character lines are positioned in his/her vision. Then, operate the [BI] and [BO] buttons according to the operation panel until the upper and lower character lines are aligned straight.

At the same time, as the above example, the AC/A ratio is calculated and displayed in "Mini Help".

4 Record the result.

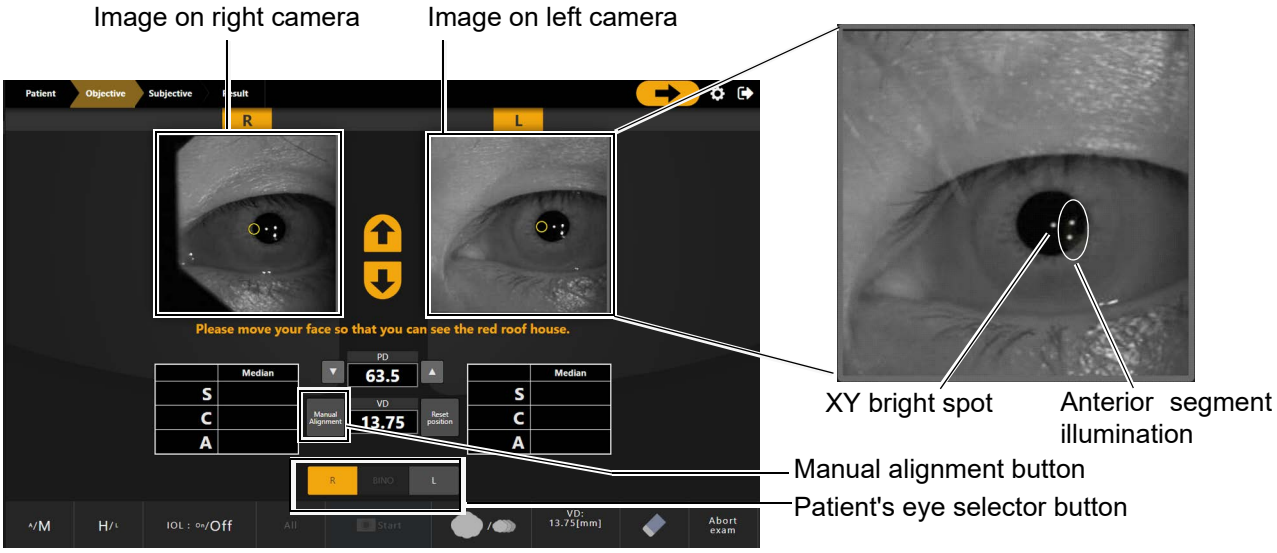
After the measurement, touch the [Record] button to record the result.

The AC/A ratio measurement is finished.

OBJECTIVE OPERATIONS

POSITION ADJUSTMENT BY MANUAL OPERATION

⚠CAUTION	• When adjusting this main unit position manually, check the position of patient's head. If the eye or nose touches the main unit, he/she may be injured. • When adjusting this main unit position manually, make sure that the patient's nose is not put between the right and left measuring windows. The patient's nose may be caught by these units to injure the patient.



1. On the objective measurement screen, press the [A/M button]. The "M" character is enlarged and the manual alignment mode starts.
2. In the manual alignment mode, alignment is performed for each eye. Using the patient's eye selector button displayed near the bottom of the screen, select an eye for alignment.
3. Tap each XY bright spot on the patient's eye images of the right and left cameras. The "×" mark appears at the tapped place.
4. Make sure that the "×" mark is displayed on the XY bright spot position. Then, tap the [Manual alignment] button. Alignment is executed.
5. Repeat the operations of Step 3 to Step 4 until the XY bright spot is put into the orange "○" mark that is displayed on each of the images of right and left cameras.
6. Using the patient's eye selector button, select the fellow eye and repeat the operations of Step 3 to Step 5.
7. After the alignment of both eyes has been completed, select an eye for objective measurement with the patient's eye selector button. When [R] or [L] is selected, the selected eye only is measured and the fellow eye is not measured. When [BINO] is selected, objective measurement is performed for both eyes.
8. The test result is displayed.
9. Tap the task shift button to shift to subjective test.

FUSION SUPPORT

When the test distance becomes shorter, such as when switching from far-point test to near-point test, the patient may not be able to achieve fusion and to continue the test. Therefore, before switching to a closer test distance, an image is displayed that seems the object is approaching, to support the smooth fusion. At the same time, the measurement head moves to the test position.

NOTE	Fusion support may not work if the change in distance is small.

THE DEFAULT SETTING OF FUSION SUPPORT

The default fusion support enable/disable setting can be set on the settings screen. For setting instructions, see "(13) Fusion Support" on page 141.

CHANGING FUSION SUPPORT SETTING ON THE SUBJECTIVE REFRACTION SCREEN

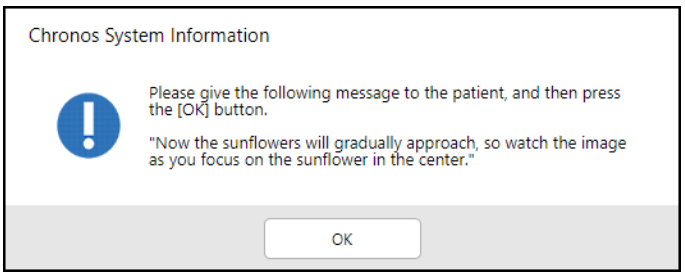
The default fusion support determined on the settings screen can be changed for each patient during the subjective test. The fusion support changed here will be applied until the next time you return to the Patient information input screen.

1. Press the hamburger menu on the subjective refraction screen.
2. Press the [Fusion Support] button. The [Fusion Support] button is enabled when it turns yellow.

FUSION SUPPORT OPERATION

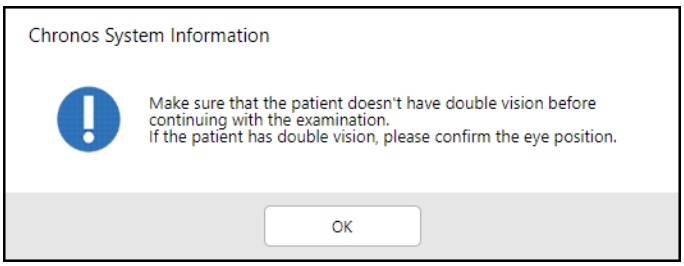
When fusion support is enabled, fusion support is performed when switching to a closer test distance.

1. Switch from the distance test to the near test by one of the following actions:
   - Select the near-point test chart from the chart page during the far-point test.
   - Switch the near-point test with the [Far/Near] function button.
   - Switch to a closer test distance by changing the optional test distance
2. The following message appears and a still image of a sunflower is shown to the patient.



3 Ask the patient to keep looking at the sunflower and press [OK]. An image of a sunflower approaching is displayed, and at the same time the position of the measurement head moves to the appropriate position.

4 The following message will be displayed, so ask the patient if they can see the target image fused. If they can see the target fused without any diplopia, proceed with the test. If they can't see the target fused, check the alignment of the eyes.



CHECKING THE VISUAL ACUITY WITH "OPTIONAL EXAM DISTANCE"

When you use Chronos, you can set the test distance within 6m to 25cm (20ft to 10in).
By making use of this feature, in addition to the basic tests with "Exam Distance (Far Point)" and "Exam Distance (Near Point)", you can adjust the spherical power values and record the visual acuity values with three "Optional exam distances".

SETTING THE DEFAULT "OPTIONAL EXAM DISTANCE"

You can set the default "Optional exam distance" on the settings screen. For the setting method, refer to "(3) Optional exam distance 1 - 3" of P.138.

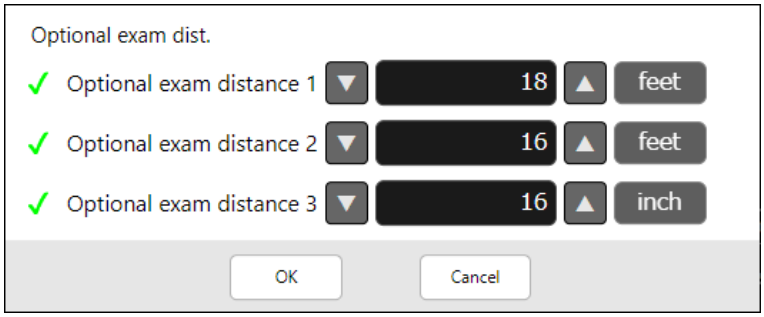
CHANGING "OPTIONAL EXAM DISTANCE" ON THE SUBJECTIVE TEST SCREEN

It is possible to change the default "Optional exam distance" determined on the settings screen for each patient while a subjective test is being executed.
The "Optional exam distance" changed here is applied until the patient information input screen is accessed again.

1 Tap the hamburger menu button on the subjective test screen.

2 Tap the [Optional exam dist.] button on the displayed menu.

3 The window to set "Optional exam distance" is displayed. Change the desired "Optional exam distance".



4 After changing "Optional exam distance", tap the [OK] button to close the window.

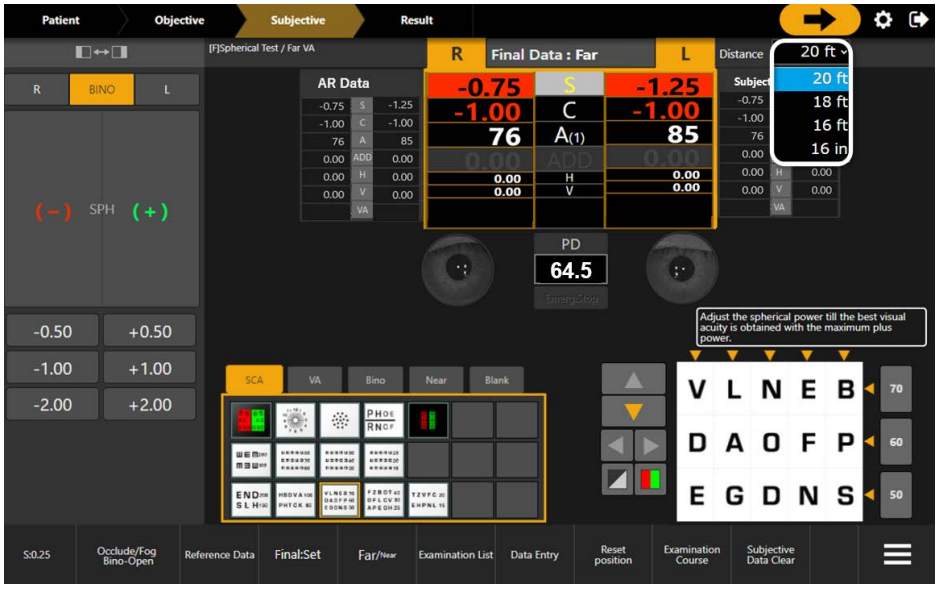
NOTE	If you change "Optional exam distance" under the condition that the measurement result with the "Optional exam distance" is recorded, the measurement result with the value before changing will be discarded.

SHIFTING TO THE PROCEDURE FOR CHANGING "OPTIONAL EXAM DISTANCE"

NOTE	• Only when "Final Data" is set as the main data, you can shift to the procedure for changing "Optional exam distance". • When switching to a closer test distance, fusion support is performed. For details, see "FUSION SUPPORT" on page 107.

1 Tap the [Final: Mem] button or [Final: Set] button among the function buttons to change the main data to "Final Data".

2 Tap "Test distance display/change area" at the top of the screen to display the changeable test distances list.



3 Select a desired test distance on the displayed list. The test distance is changed to the selected one.

MEASUREMENT THAT CAN BE EXECUTED WITH "OPTIONAL EXAM DISTANCE"

After the refractive power has been corrected with the basic "Exam Distance (Far Point)"/"Exam Distance (Near Point)", measurement with "Optional exam distance" can be used for checking the items mentioned below:

- whether the sufficient visual acuity is obtained when the patient watches a target at other test distances;
- the spherical power needed to obtain the sufficient visual acuity.

While "Optional exam distance" is being set, it is possible to adjust the spherical power and record the visual acuity.
While "Optional exam distance" is being set, it is possible to change the cylinder power/cylinder axis. Because these values are common to the cases of other test distances, the cylinder power/axis values that have been changed are not changed even if the test distance is changed.
While "Optional exam distance" is being set, it is not possible to execute the phoria test/binocular function test. Moreover, it is not possible to select the charts for which these tests are registered on the chart page.

You can set "Optional exam distance" within 6m to 25cm (20ft to 10in). The distance of 1m or more is regarded as the distance for far-point test. The distance of less than 1m is regarded as the distance for the near-point test.
When one far-point/near-point test distance is changed to another far-point/near-point test distance, the test being executed and the chart are used successively. When changing the test distance to the value exceeding the threshold of far-point and neat-point distance values, the visual acuity test is automatically executed.

REFRACTIVE POWER DISPLAYED ON THE MAIN DATA DURING THE MEASUREMENT WITH "OPTIONAL EXAM DISTANCE"

The value displayed in "ADD" of the main data while "Optional exam distance" for far-point test is being set is obtained as follows:
"Near-point spherical power measured with "Exam Distance (Near Point)" (= Spherical power of "Exam Distance (Far Point)" + ADD of "Exam Distance (Near Point)") – Current spherical power set on the measuring head.
While "Optional exam distance" for near-point test is being set, the value displayed on "SPH" of the main data is the far-point spherical power measured with "Exam Distance (Far Point)". The value displayed on "ADD" of the main data is the value obtained by subtracting the spherical power displayed on "SPH" from the current spherical power set on the measuring head.

MEASUREMENT BY USING COURSE TEST FUNCTION

In Chronos, when you register the execution order of tests, you can save the time to change the charts and the patient's eye manually. Eleven courses (including "Standard course" which is preset) can be registered. After you have registered these courses on the settings screen, you can access and execute the tests of the registered procedure on the subjective test screen.

STANDARD COURSE

In the standard course, the test procedures are already registered at the beginning and they can be edited.

To reset the edited standard course to the initial registered condition, perform one of the following two operations:

- Tap the [Reset to Default] button on the "General settings" screen of "Subjective".
- Delete all procedures on the registering/editing screen of the standard course and tap the [OK] button to return to the course list screen.

Standard course registered initially

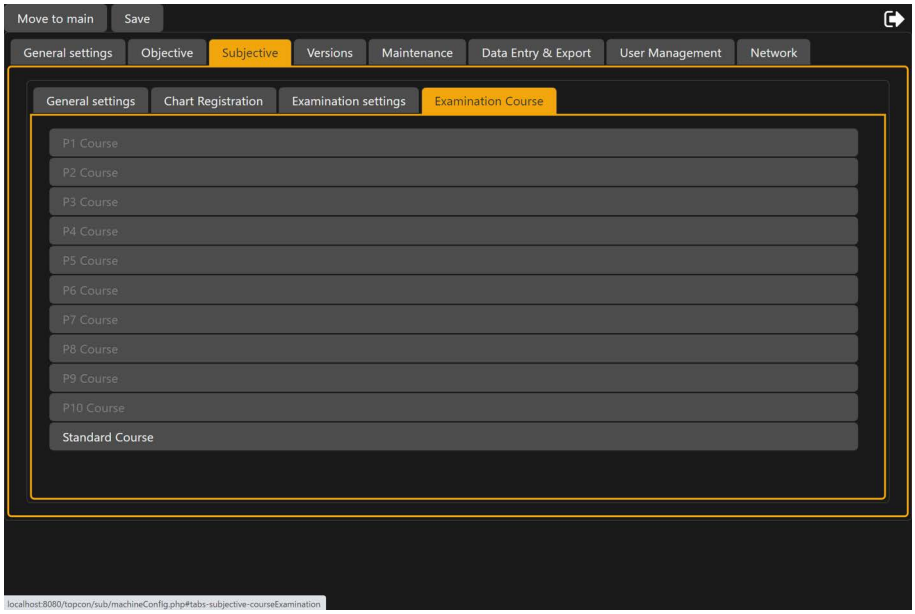
Procedure	Chart	Test	Patient's eye
1		[F] R/G test	Mono (Follow prev.)
2		[F] Jackson cross cylinder (axis)	Mono (Follow prev.)
3		[F] Jackson cross cylinder (power)	Mono (Follow prev.)
4		[F] R/G test	Mono (Follow prev.)
5		[F] Spherical test / Far VA	Mono (Follow prev.)
6		[F] Spherical test / Far VA	Bino
7		[N] Fused cross cylinder (Binocular) [#14B]	Bino
8		[N] Near VA	Bino

REGISTERING/EDITING OF COURSE

NOTE	For the setting screen of course registration, refer to the description of "Course test-Course list screen", "Course test-Course registration screen" and "Course test-parameters change screen" in "SETTING ITEMS LIST" of "SETTING OF FUNCTIONS BY SETTINGS SCREEN".

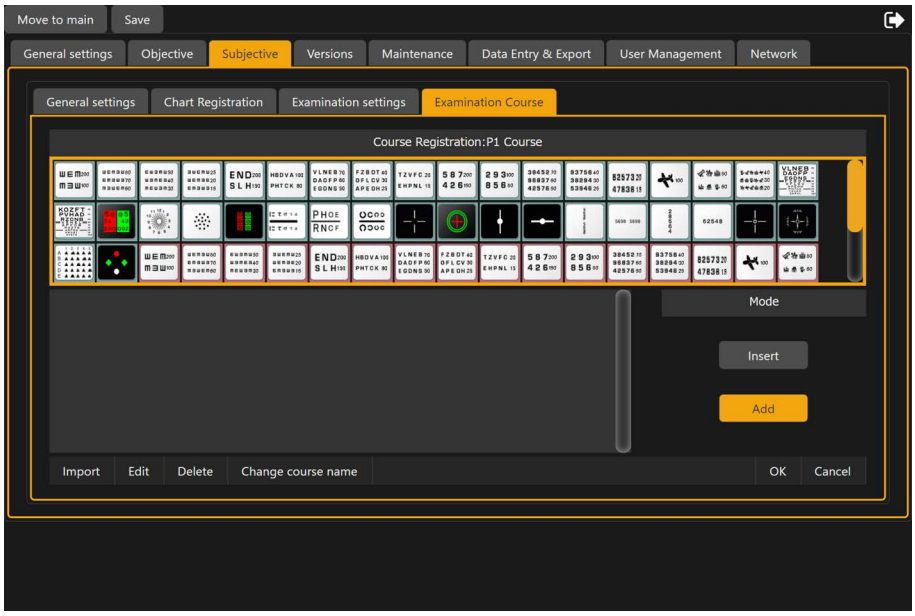
1 From the "Subjective" tab on the settings screen, select the [Examination Course] tab.

2 The buttons of [P1 Course] - [P10 Course] and [Standard Course] are displayed.



The already registered course is displayed with white letters on the button and the unregistered course, with gray letters.
Select a registered course, and you can edit the course. Select an unregistered course, and you can register the course.
Select the button of a course to be registered. Now, for example, select the [P1 Course] button and edit it.

3 The P1 course registration screen appears.



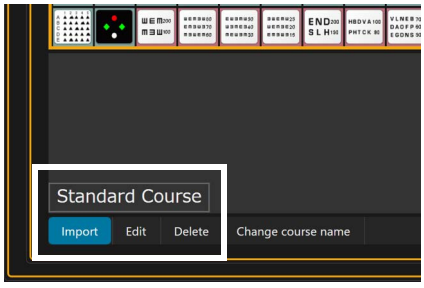
From the test chart icons list at the top of the screen, select the icons of the charts to be used according to the test procedure that you want to register. On the course registration list at the bottom of the screen, the initial values of the selected charts and test names are added. You can register up to 50 test procedures on the course registration list.

For the test in which each eye must be examined, it is not necessary to register the test procedures for each of right/left eyes.
For example, when registering as shown below, Procedure 1/3 and 2/3 are executed for right eye and next, the same procedures are executed for left eye. Then, Procedure 3/3 is executed.

1/3	R/G test (Mono)
2/3	Astigmatism test (Mono)
3/3	Binocular balance test (Bino)

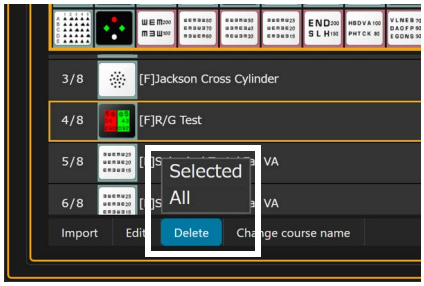
When the mode is set to "Add", the selected chart icon is added to the end of the course registration list.
When you want to insert a test in the middle of the course registration list, change the mode to "Insert". Select the position to be inserted on the list and then select a chart icon.

4 When you want to create a new course based on the already registered course, use the "Import" function.



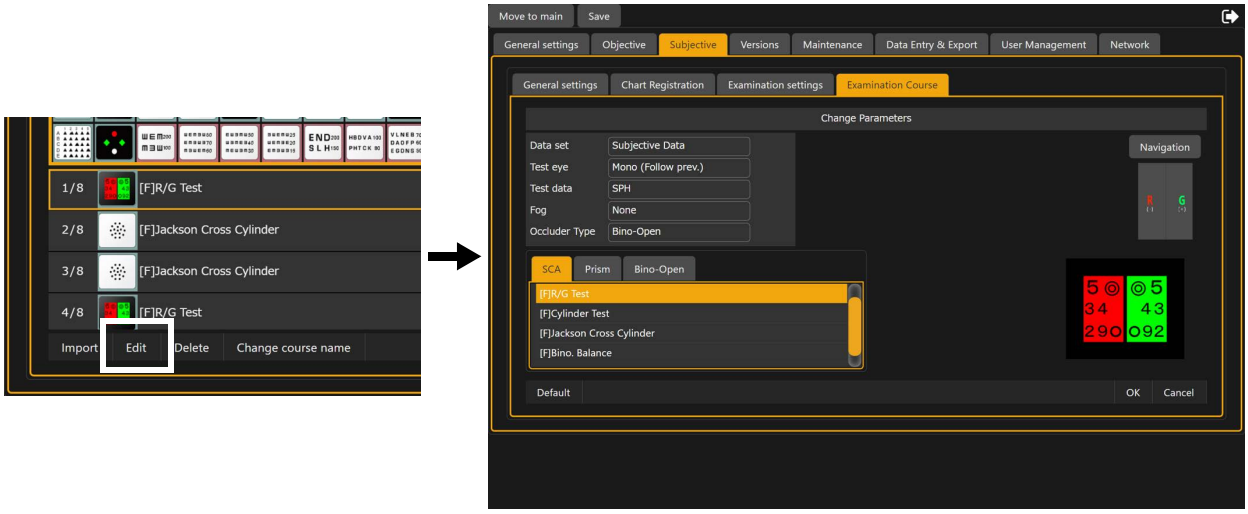
Tap the [Import] button, and the registered course names are displayed. Select a course that will be the base of a new course. Then, the procedure registered in the selected course is read into the course registration list.

5 When you want to delete a test in the course registration list, select the desired procedure in the list. Select the [Delete] button, and the sub menus, [Selected] and [All], appear.



Select [Selected], and the procedure which has already been selected in the course registration list is deleted. Select [All], and all the procedures in the course registration list are deleted, regardless of the selected status.

6 After registering test procedures, adjust the test parameters if necessary. Select a procedure for which the test parameters should be changed on the course registration list. Then, select the [Edit] button. The parameters change screen appears.

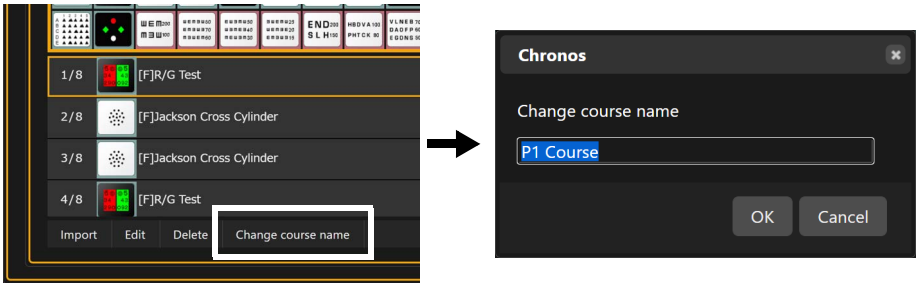


On this screen, set the following details:

- Test to be executed
- Data set for executing the test
- The target of test, "Monocular test" or "Binocular test"
- The data (correction value) to be measured
- Fogging of the patient's eye at the start of test
- Occluder type of the eye, which is not the test target
- Others

When the parameters have been set, tap the [OK] button to close the parameters change screen. Perform these operations for all the tests in the course registration list that need the parameters adjustment.

7 To customize the course name, select the [Change course name] button. Tap this button, and the pop-up window to enter a course name appears. On this window, enter a new course name and tap the [OK] button.

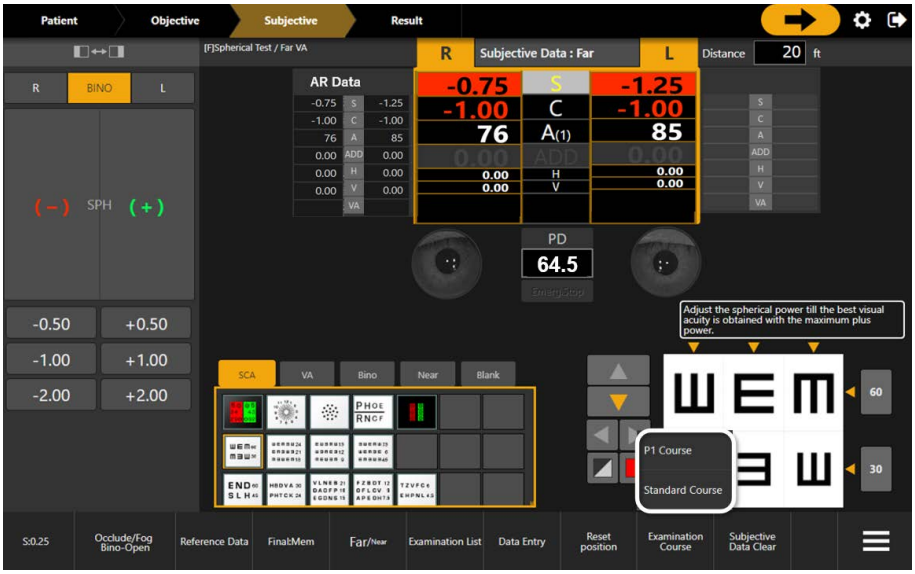


8 When the course registration has been finished, tap the [OK] button and then tap [Save] at the top of the screen to save the settings.

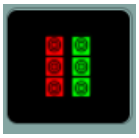
EXECUTION OF COURSE TEST

NOTE	Even while a course test is being executed, you can perform an optional test manually. In this case, when tapping the [Back to course] button displayed in the operation panel, you can return to the course sequence when you started optional test manually.

1 Select the [Examination Course] button among the function buttons on the subjective test screen. The registered course names are displayed. Select a desired course name.

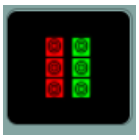


2 The first test of the procedure registered in the selected course starts.
The registered procedure is executed as follows.
[Registered procedure (example)]

Procedure	Chart	Test	Patient's eye
1		[F] R/G test	Mono
2		[F] Astigmatism test	Mono
3		[F] Binocular balance test (polarization)	Bino
4		[F] Spherical test / Far VA	Mono
5		[N] Fused cross cylinder (Binocular) [#14B]	Bino
6		[N] Near VA	Mono

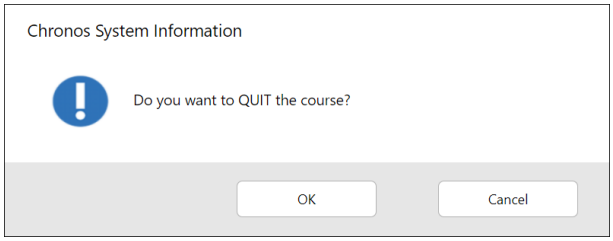
[Tests to be executed]

Procedure	Chart	Test	Patient's eye
1		[F] R/G test	Right eye
2		[F] Astigmatism test	Right eye
3		[F] R/G test	Left eye
4		[F] Astigmatism test	Left eye

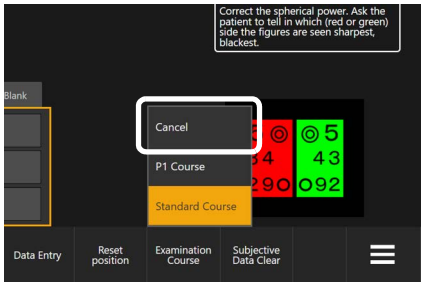
Procedure	Chart	Test	Patient's eye
5		[F] Binocular balance (polarization)	Bino
6		[F] Spherical test / Far VA	Right eye
7		[F] Spherical test / Far VA	Left eye
8		[N] Fused cross cylinder (Binocular) [#14B]	Bino
9		[N] Near VA	Right eye
10		[N] Near VA	Left eye

3 During the course test, the [Prev] and [Next] buttons are displayed on the operation panel. Tap the [Next] button. The Chronos shifts to the next test sequence according to the procedure registered in the current course. Tap the [Prev] button. The Chronos returns to the test sequence before the current one and at the same time the test data is returned to the status just before shifting to the current test sequence.

4 When tapping the [Next] button at the last test in the course or when tapping the [Prev] button at the first test, the message "Do you want to QUIT the course?" is displayed. Tap the [OK] button, and the course is ended.



5 When you want to finish the course test in the middle of the course, select the [Examination Course] button among the function buttons. The [Cancel] menu is displayed. Select this, and the message "Do you want to QUIT the course?" is displayed. Tap the [OK] button, and the course is ended.



TRIAL FRAME MODE

NOTE	• In the trial frame mode, you cannot shift from the subjective test screen to the Result screen. You cannot return to the objective measurement screen, either. When you want to shift to any other screen, finish the trial frame mode and then shift to other screens. • In the trial frame mode, you cannot execute a test from the examination list. When it is necessary to change a chart, select a desired one from the chart page. • In the trial frame mode, the correction lens on the main unit always keeps the unaided status. You cannot change the power. When you want to change the correction value, change the trial lens which is set in the trial frame into another one.

After executing the correction test with Chronos, when a patient wears a trial frame having the correction lens and his/her visual power level is checked, use this function to check how the patient sees the chart of the instrument.

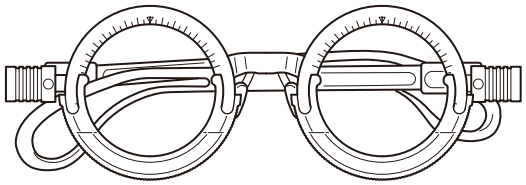
Cautions when using the trial frame mode

Before using the trial frame mode, pay attention to the following points.

● Usable trial frame

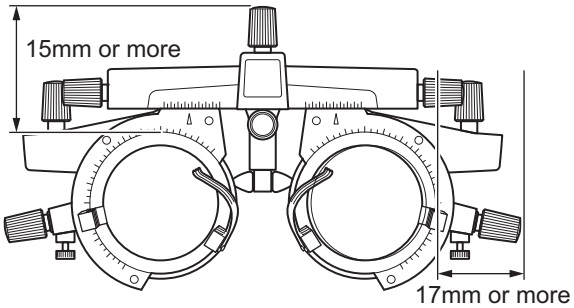
To prevent a trial frame from interfering with the forehead rest or measuring head of the instrument, select a simple frame which does not have the knob to adjust the size or position.
In addition, use a proper trial frame having PD applicable to the patient.

Example of the recommended trial frame for the instrument



- PD is fixed.
- The part protruding from the lens holder is the smallest.

Example of a trial frame which cannot be used for the instrument



- The part protruding from the top of the inserted trial lens is 15mm or more:
  It will interfere with the forehead rest.
- The part protruding from the right/left of the inserted trial lens is 17mm:
  It will interfere with the measuring head.

● Use of cheek rest is recommended.

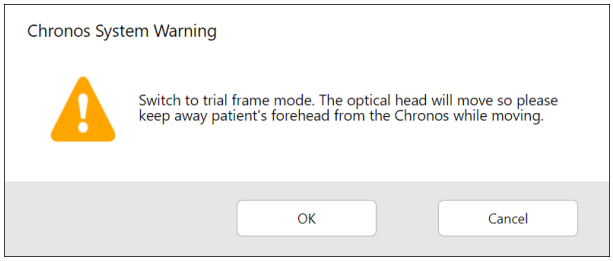
When using the trial frame mode, always use the cheek rest to keep the space between the trial frame and the instrument properly. If the cheek rest is not used, the trial frame interferes with the instrument while the trial frame mode is being used.

Start of trial frame mode

1 Tell the patient to put away his/her forehead from Chronos.

2 On the subjective test screen, select the hamburger menu of the function button. Select the [Trial Frame Mode] button from the displayed sub menu.

3 When the following message is displayed, make sure that the patient's forehead is separated from the forehead rest. Then, tap the [OK] button.



4 The measuring head moves backward by 25mm and at the same time it is set at the infinity far-point vision status. In this status, the convergence of the measuring head is canceled and the parallel vision is set. The correction lens in the measuring head is set at the unaided status. The main data on the screen is not changed.

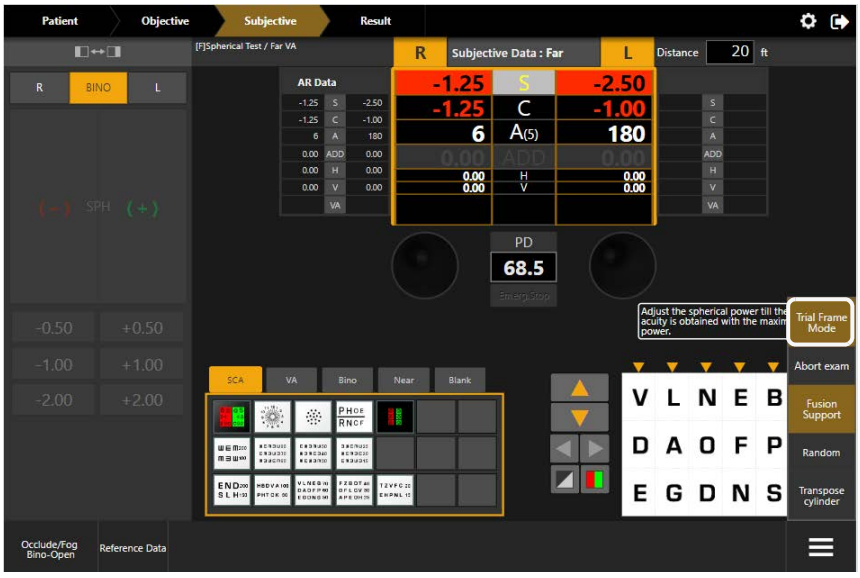
5 Let the patient wear the trial frame. Tell the patient to put his/her forehead on the forehead rest of Chronos and see the chart in the measuring head.

Limit of operation in trial frame mode

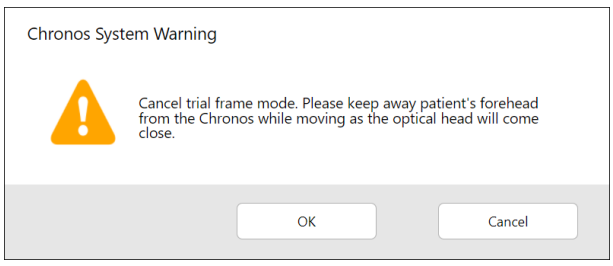
While the trial frame mode is being used, it is possible to perform only the usable operation in the area within the white frame in the following figure.
When selecting a chart from the chart page, the parameters of Chart mask/Occluder type are applied but other parameters registered for the chart are not applied.

Finish of trial frame mode

1 To finish the trial frame mode, tell the patient to put away his/her forehead from Chronos and select the [Trial Frame Mode] button from the hamburger menu of the function button.



2 When the following message is displayed, make sure that the patient's forehead is separated from the forehead rest and tap the [OK] button.



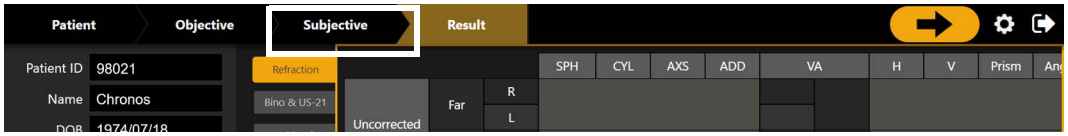
REFRACTION TASK BACK FUNCTION

NOTE	When tapping the task name on the task display area, you can go back to the previous task from the current one. When you want to go to the next task from the current one, use the task shift button.

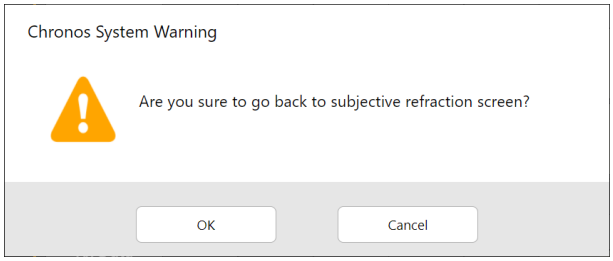
Tap the task name on the task display area. You can return the test to the tapped task.

Going back to the subjective measurement screen

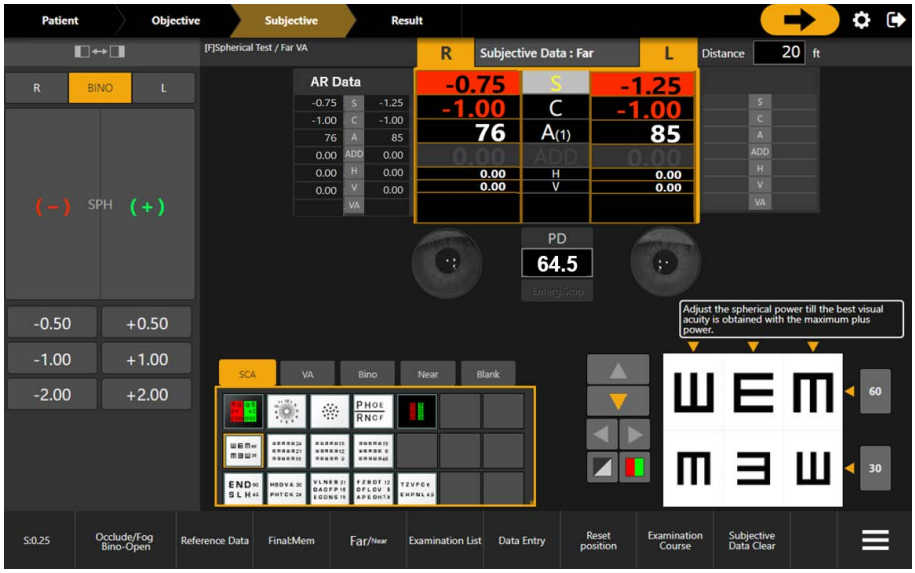
1 On the Result screen, tap [Subjective] on the task display area.



2 The following message is displayed. Tap the [OK] button.



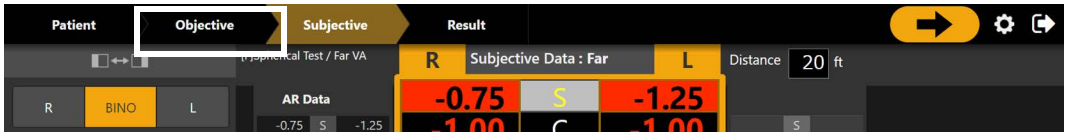
3 The screen shifts to the subjective test screen. At this time, all the test results are kept. The chart, which has been registered as an initial chart is set and the tests registered for the chart are executed.



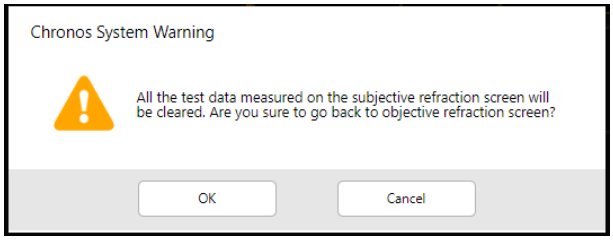
Going back to the objective measurement screen

NOTE	If you go back to the objective measurement screen by using this function, all the results of the tests performed after the objective measurement screen are deleted. Be careful.

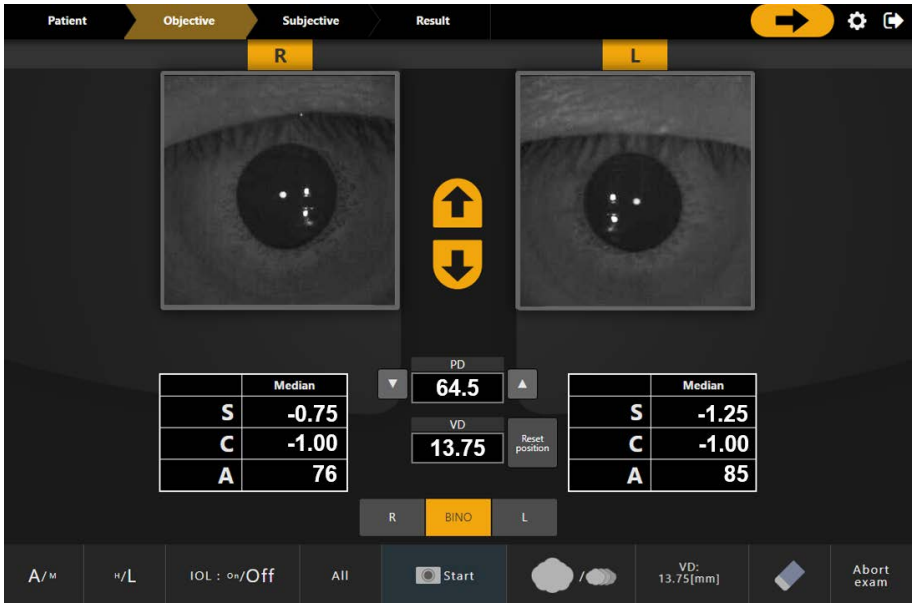
1 On the subjective test screen or the Result screen, tap [Objective] on the task display area.



2 The following message is displayed. Tap the [OK] button.



3 The screen shifts to the objective measurement screen. At this time, all the values measured on the objective measurement screen are kept.

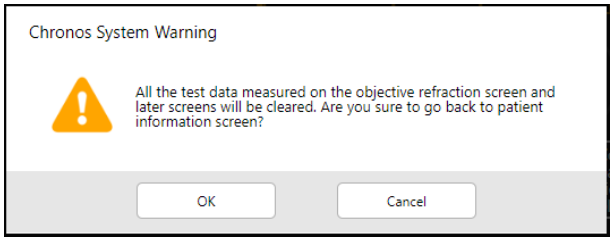


Going back to the patient information input screen

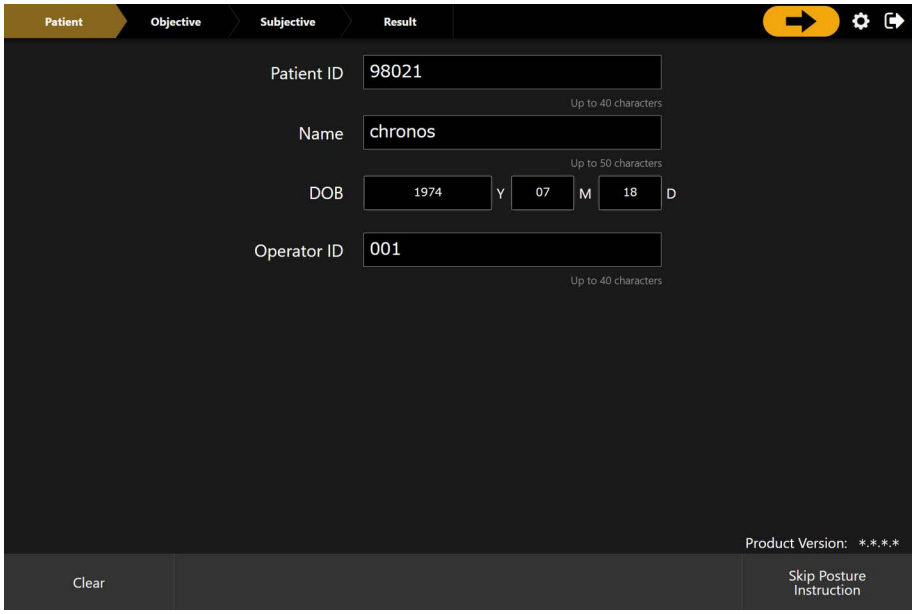
NOTE	If you go back to the patient information input screen by using this function, all the results of the tests performed after the patient information input screen are deleted. Be careful.

1 On the objective measurement screen, the subjective test screen or the Result screen, tap [Patient] on the task display area.

2 The following message is displayed. Tap the [OK] button.



3 The screen shifts to the patient information input screen. At this time, all pieces of the patient information that were input on the patient information input screen are kept.



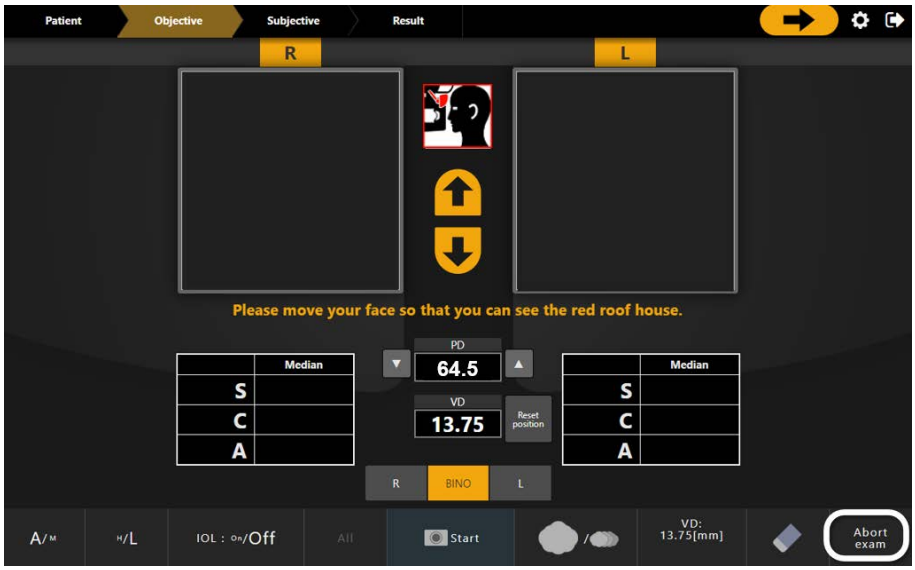
ABORT OF EXAMINATION

⚠CAUTION	• When pressing the [Abort exam] button, place the patient's head away from this main unit. If the patient's eye or nose touches the main unit, the patient may be injured. • When pressing the [Abort exam] button, make sure that the patient's finger is not put between the measuring head and drive base and between the right and left measuring windows. The patient's finger may be caught by these units to injure the patient.

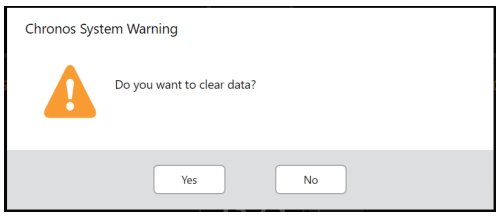
When aborting an examination during the objective test

1 Ask the patient to put his/her face away from the Chronos.

2 Make sure that the patient's face is away from the Chronos. Then, tap the [Abort exam] button.



3 "Chronos System Warning" is displayed. Tap "Yes".



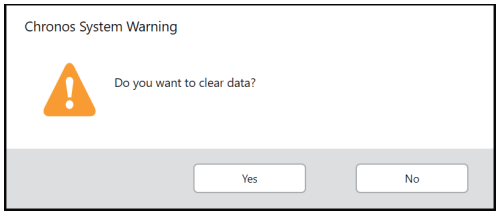
4 The Chronos main unit is reset and the patient information input screen appears again.

When aborting an examination during the subjective test

1 Ask the patient to put his/her face away from the Chronos.

2 Make sure that the patient's face is away from the Chronos. Then, tap the [Hamburger menu] button. When the sub menu is displayed, tap the [Abort exam] button.

3 "Chronos System Warning" is displayed. Tap "Yes".



4 The Chronos main unit is reset and the patient information input screen appears again.

MAINTENANCE

NOTE	During the service/maintenance work, turn off the start switch of the power supply unit and the power switch of the adjustable instrument table and do not use this instrument for the patient.

DAILY CHECKUPS

User maintenance items

Item	Inspection time	Contents
Inspection	Before using	• The instrument must operate correctly. • Measuring window (measuring lens, measuring mirror, KERATO ring and anterior segment filter) must be free of dirt or flow. • The power inlet, power connector and power plug must be free of dirt.
Cleaning	When the part is stained	• Measuring window • Anterior segment filter • Cover, etc.
Replacement	As required	• Printer paper

Manufacturer maintenance items

Item	Inspection time	Contents
Cleaning each part	At least every 12 months	• Cleaning the external parts • Cleaning the optical system • Cleaning the power supply unit
Safety check	At least every 12 months	• Checking the looseness of the nut fixing the measuring heads on the drive base (right and left) • Checking the looseness of the six screws fixing the main unit on the adjustable instrument table
Operation check	At least every 12 months	• Operation of the instrument • Operation of switches
Accuracy check	At least every 12 months	• Checking the measuring function (by special tool)

Management after using

- After using, clean the instrument according to "CLEANING" on and after P.129.
- Dust is a formidable foe to the instrument. When not in use, cover the instrument with the dust cover.
- When not in use, turn off the power switch of the adjustable instrument table.

CLEANING

Cleaning the parts which come into contact with the patient

When the forehead rest is stained, prepare a tepid solution of neutral detergent for kitchenware. Moisten a cloth with the aforementioned solution and wring it thoroughly. Then, wipe the forehead rest with the cloth.

Cleaning KERATO ring and external cover

NOTE	To prevent the plastic parts of the instrument body from discoloring and deteriorating, do not use volatile solvents for cleaning, including benzine, thinner, ether, gasoline, chemical dust cloth, etc.

1 When the KERATO ring and external cover become stained, clean with a dry soft cloth.

2 If the KERATO ring and external cover are badly stained, prepare a tepid solution of neutral detergent for kitchenware. Moisten a cloth with the aforementioned solution and wring it thoroughly. Then, wipe the ring and cover with the cloth.

Cleaning the measuring lens/anterior segment filter

- When the measuring lens/anterior segment filter is stained with dust and dirt:
  Blow away dust/dirt with a blower.
- When the measuring lens/anterior segment filter is stained with fingerprint or oil:
  Blow away dust/dirt with a blower. Apply camera lens cleaner a little to a clean gauze and wipe the lens with it lightly.

Cleaning the measuring mirror

To check stain, darken the room. Illuminate the measuring mirror with a flashlight, etc. and watch it from the diagonally front position to check stain easily.

- Dust and dirt adhered to the surface
  Blow them off using a blower.
  Be careful to prevent the blower end from touching the measuring mirror.

- When the stain is dust, tears, saliva and when the stain is persistent:

1 Moisten a lens cleaning paper with reagent ethanol properly. Wipe the measuring mirror with the lens cleaning paper by rubbing lightly.

2 If your lens cleaning paper is dirty, replace it with clean one and repeat step ***1***.

3 Repeat steps ***1*** and ***2*** until no stain is seen on the measuring mirror.

4 After stain is not seen, moisten a lens cleaning paper with the specified fluorine-based solvent* properly and wipe the measuring mirror with it in order to finish cleaning.

* Please consult the dealer from whom you purchased the instrument or the address listed on the back cover.

Cleaning of external input/output instrument and adjustable instrument table exlusively for Chronos

Clean according to each instruction manual.

NOTE	• Don't use the following methods because the measuring mirror can be damaged.
	  • Wiping the mirror by grasping with fingernails
	  • Using a lens cleaning paper wound around a hard tool (for example, a metallic tool)
	• Use a soft lens cleaning paper without fiber.
	  • For example, BEMCOT (Asahikasei)
	• Don't let any strong-alkaline liquid adhere to the measuring mirror.
	If such liquid adheres to the mirror, immediately wipe it off.
	• If it is difficult to remove a stain from the measuring mirror, contact your dealer or TOPCON (see the back cover).
	• If it is difficult to wipe away the stain from the measuring mirror, wind a cleaning paper around a rod-shaped thing with soft tip and use the wound cleaning paper for wiping.
	  • If you use something with hard tip, the measuring lens/anterior segment filter may be damaged.

SETTING OF FUNCTIONS BY SETTINGS SCREEN

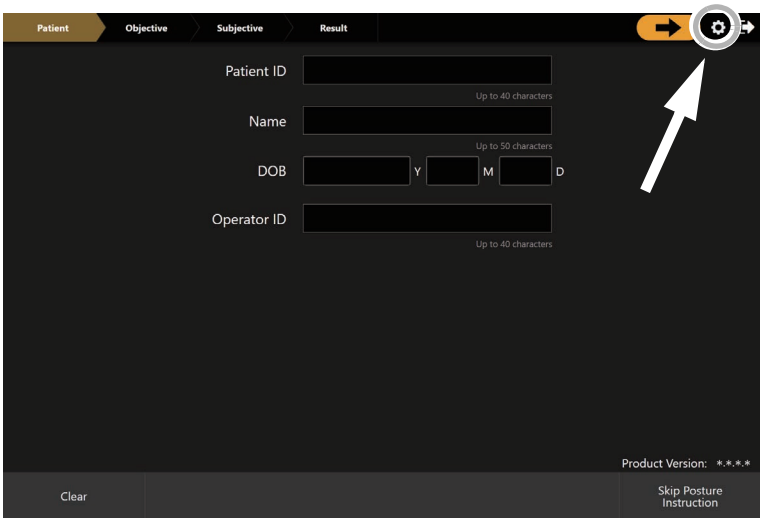
HOW TO OPERATE THE SETTINGS SCREEN

You can set a variety of functions on the settings screen.

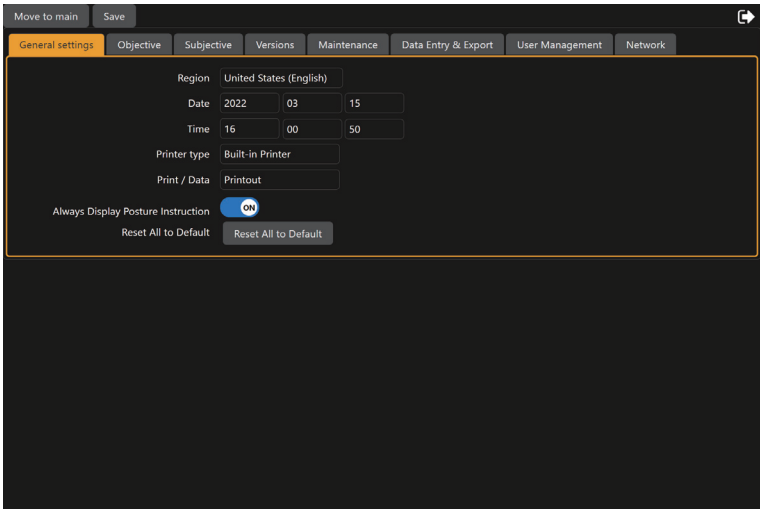
Preparation for setting

1 Connect Chronos to the operation controller. For the connecting method, refer to " PREPARATION BEFORE MEASUREMENT" - " Turn on the power" on P.45.

2 Tap the [Settings] button on the patient information input screen.



The settings screen appears.



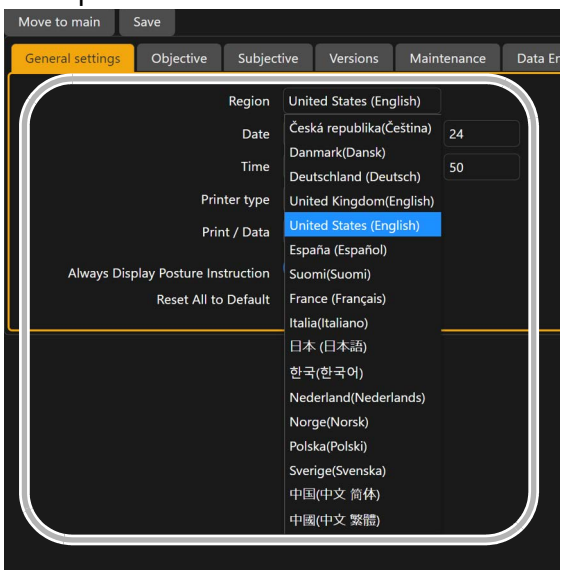
OUTLINE OF OPERATION ON SETTINGS SCREEN

1 Select one category on the tabs at the top.

2 Check and change the settings items.

- **When items are displayed with pull-down menu**

  Tap a desired item place, and the pull-down menu is displayed.
  Select one item from the pull-down menu.



- **When items are displayed with switches**

  Tap a desired item switch to set ON/OFF.

  For example, in the above figure, the eyelid detection function is ON.
  To change to OFF, tap the switch to change ON to OFF.

- **When items are displayed with spin button**

  Tap the [▼] button at the selected item place, and the value is decreased.
  Tap the [▲] button, and the value is increased.

- **When items are displayed with input item window**

  Input an optional value or letters in the input item window at the selected item place.

3 Tap the [Save] button at the upper left of the screen to save the settings.

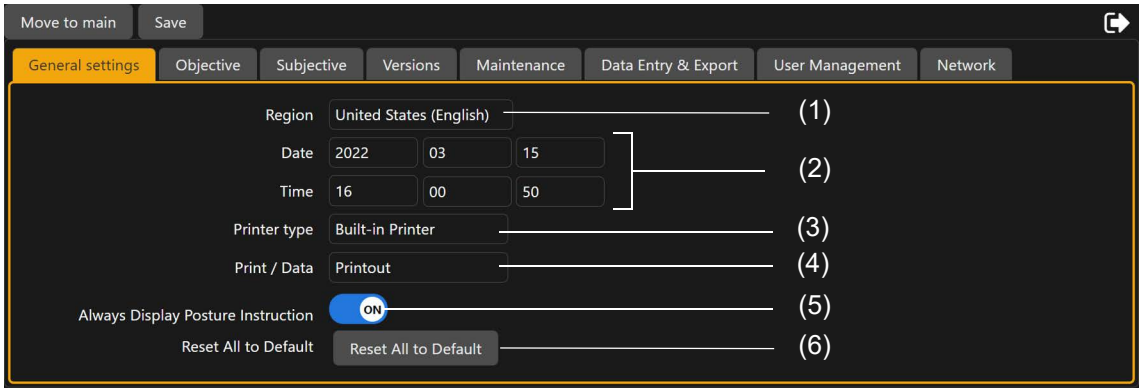
4 Tap the [Move to main] button at the upper left of the screen to return to the patient information input screen.

SETTING ITEMS LIST

The settings screen consists of eight tabs. These tabs are classified according to the types of the objective setting items.

- General settings:
  This tab displays a screen where the settings about the whole of the instrument should be performed.
- Objective:
  This tab displays a screen where the settings about objective test should be performed.
- Subjective:
  This tab displays a screen where the settings about subjective test should be done.
- Versions:
  This tab displays a screen where the version of this instrument's software should be checked.
- Maintenance:
  This tab displays a screen where the settings about log and packing mode should be done.
- Data Entry & Export:
  This tab displays a screen where the settings about data import/export should be done.
- User Management:
  This tab displays a screen where registering/editing/deleting of the user who will use this instrument should be done.
- Network:
  This tab displays a screen where the setting for the network about the power supply unit on Chronos should be done.

General settings



(1) Region

Set a language for this instrument.

Set value

- Česká republika (Čeština) : Set Czech as the language to be displayed on the screens.
- Denmark (Dansk) : Set Danish as the language to be displayed on the screens.
- Deutschland (Deutsch) : Set German as the language to be displayed on the screens.
- United Kingdom (UK) : Set English (UK) as the language to be displayed on the screens.
- United States (English) : Set English (US) as the language to be displayed on the screens.
- España (Español) : Set Spanish as the language to be displayed on the screens.
- Suomi (Suomi) : Set Finnish as the language to be displayed on the screens.
- France (Français) : Set French as the language to be displayed on the screens.
- Italia (Italiano) : Set Italian as the language to be displayed on the screens.
- 日本（日本語） : Set Japanese as the language to be displayed on the screens.

- 한국어 (한국) : Set Korean as the language to be displayed on the screens.
- Nederland (Nederlands) : Set Dutch as the language to be displayed on the screens.
- Norge (Norsk) : Set Norwegian as the language to be displayed on the screens.
- Polska (Polski) : Set Polish as the language to be displayed on the screen.
- Sverige (Svenska) : Set Swedish as the language to be displayed on the screens.
- China (中文 簡体) : Set Chinese (simplified Chinese character) as the language to be displayed on the screens.
- China (中文 繁體) : Set Chinese (traditional Chinese Character) as the language to be displayed on the screens.

(2) Date/Time

Set the date (year/month/day) and time (hour/minute/second) for this instrument. Tap the [Save] button, and the date and time are set.

Set value

Values of each item of "year/month/day" and "hour/minute/second"

Default

"year/month/day" and "hour/minute/second" obtained at startup

(3) Printer type

Set a printer type.

Set value

- Built-in Printer : The built-in printer is used.
- External Printer : An external printer is used.

Default

Built-in Printer

(4) Print/Data

Set the data output method.

Set value

- Printout : Data is output to the printer only.
- Data export : Data is output to the external connected device.
- Printout & data export : Data is output to printer/external connected device.

Default

Printout

(5) Always Display Posture Instruction

Set whether the posture guidance is to be displayed or not.

Set value

- ON : Posture guidance is displayed.
- OFF : Posture guidance is not displayed.

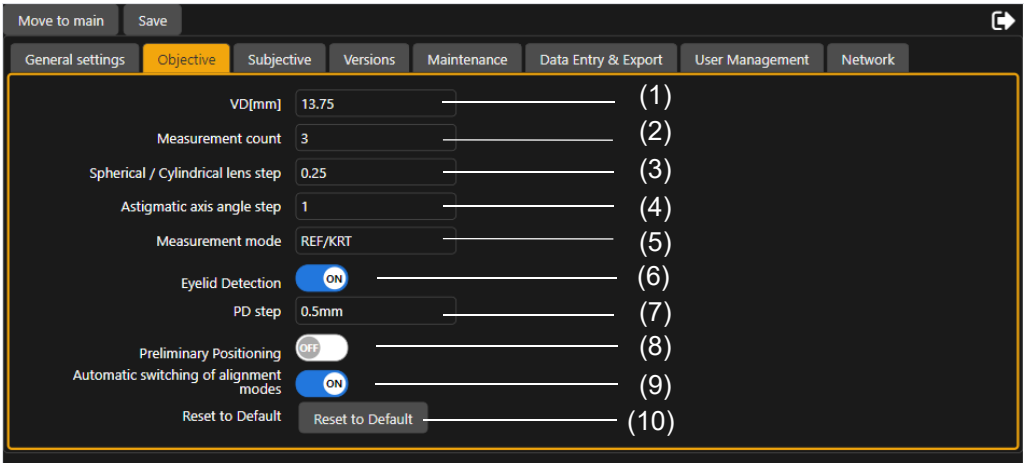
Default

ON

(6) Reset All to Default

Reset all settings to default.

Objective



(1) VD [mm]

Set the VD value (mm) to be used for default.

Set value

- 0.00
- 12.00
- 13.75

Default

13.75

(2) Measurement count

Set the continuous measurement count.

Set value

1 - 10

Default

3

(3) Spherical/Cylindrical lens step

Set the step (D) of spherical/cylinder refraction.

Set value

- 0.125
- 0.25

Default

0.25

(4) Astigmetic axis angle step

Set the step (°) of cylinder axis angle.

Set value

- 1
- 5

Default

1

(5) Measurement mode

Set the measurement mode.

Set value

- REF : Only refractometry is performed.
- REF/KRT : Refractometry and keratometry are performed.

Default

REF/KRT

(6) Eyelid Detection

Set whether the eyelid detection function should be used or not.

Set value

- ON : The eyelid detection function is valid.
- OFF : The eyelid detection function is not valid.

Default

ON

(7) PD step

Set the PD change step (mm).

Set value

- 0.5mm : PD is displayed with the "0.5mm" unit.
- 1.0mm : PD is displayed with the "1.0mm" unit.

Default

0.5mm

(8) Preliminary Positioning

Set whether to perform preliminary positioning.

Set value

- ON : Preliminary Positioning is performed.
- OFF : Preliminary Positioning is not performed.

Default

OFF

(9) Automatic switching of alignment mode

If corneal apex alignment is unsuccessful, it automatically switches to pupil center alignment.

Set value

- ON : Automatically switches the alignment mode.
- OFF : Alignment mode switching is not performed automatically.

Default

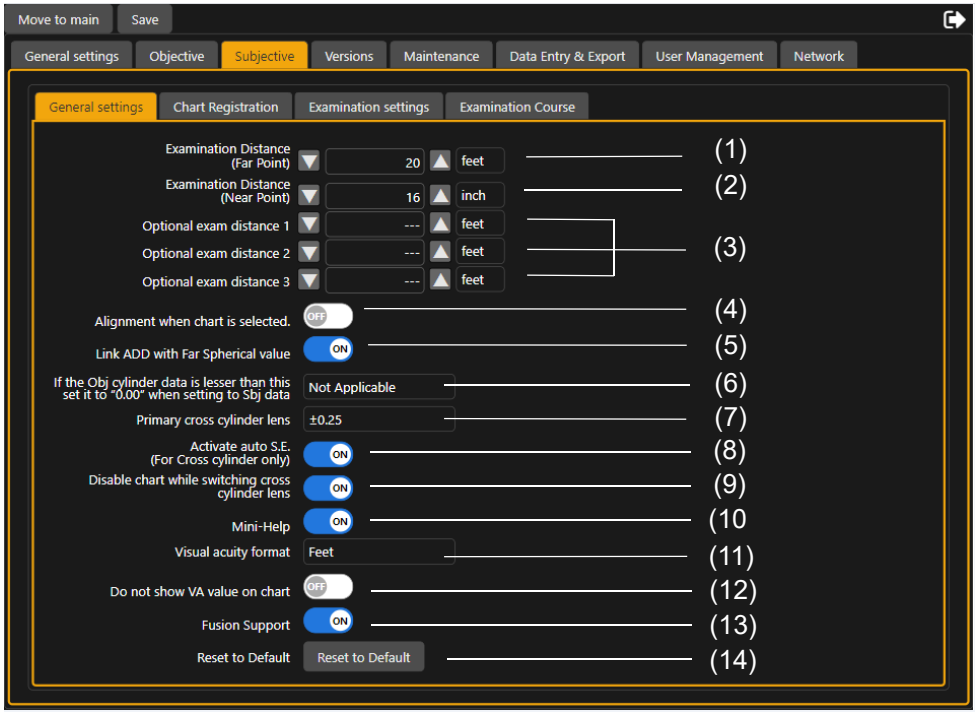
ON

(10) Reset to Default

Reset the set values of the [Objective] tab to default.

Subjective

General settings



(1) Examination Distance (Far Point)

Set the test distance for far-point test with the "meter" or "feet" unit.

Set value

- meter : 6.0, 5.5, 5.0, 4.5, 4.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0
- feet : 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3

Default

Differs based on regional settings.

(2) Examination Distance (Near Point)

Set the test distance for near-point test with the "centimeter" or "inch" unit.

Set value

- cm : 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 33, 30, 25
- inch : 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 13, 12, 10

Default

Differs based on regional settings.

(3) Optional exam distance 1 - 3

In addition to "Exam Distance (Far Point)" and "Exam Distance (Near Point)", "Optional exam distance" can be registered up to three.

Set value

- When the unit is (feet) : —, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3
- When the unit is (meter) : —, 6.0, 5.5, 5.0, 4.5, 4.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0
- When the unit is (inch) —, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 13, 12, 10
- When the unit is (cm) : —, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 33, 30, 25

Default

— (Unset)

(4) Alignment when chart is selected

Set value

- ON : Alignment is automatically done when selecting a chart.
- OFF : Alignment is not automatically done when selecting a chart.

Default

OFF

(5) Link ADD with Far Spherical value

Set value

- ON : When the near ADD is decided and then the far spherical power is changed, ADD is changed to keep the near ADD.
- OFF : Even if the near ADD is decided and then the far spherical power is changed, ADD is kept as it is.

Default

ON

(6) If the Obj cylinder data is lesser than this set it to "0.00" when setting to Sbj data

Set the standard to adjust the cylinder power in objective test.

Set value

- Not Applicable : The cylinder power obtained by refractometry is set to the subjective cylinder power.
- 0.25 : When the cylinder power obtained by refractometry is less than 0.25D, "0.00" is set to the subjective cylinder power.
- 0.50 : When the cylinder power obtained by refractometry is less than 0.50D, "0.00" is set to the subjective cylinder power.
- 0.75 : When the cylinder power obtained by refractometyr is less than 0.75D, "0.00" is set to the subjective cylinder power.
- 1.00 : When the cylinder power obtained by refractometry is less than 1.00D, "0.00" is set to the subjective cylinder power.

Default

Not Applicable

(7) Primary cross cylinder lens

Select a cross cylinder lens to be normally used.

Set value

- ±0.25 : "±0.25D" is set for the cross cylinder lens to be normally used.
- ±0.50 : "±0.50D" is set for the cross cylinder lens to be normally used.

Default

±0.25

(8) Active auto S.E. (For Cross cylinder only)

Set value

- ON : When the cylinder power is changed during the cross cylinder test, the spherical power is automatically changed to keep the equivalent spherical power. Even if this setting is ON, the equivalent spherical power is not kept in other test except the cross cylinder test.
- OFF : The equivalent spherical power is not kept in any case.

Default

ON

(9) Disable chart while switching the cross cylinder lens

Set value

- ON : While the front and rear of the cross cylinder lens are being changed during the test, the chart is hidden.
- OFF : While the front and rear of the cross cylinder lens are being changed during the test, the chart is not hidden.

Default

ON

(10) Mini-Help

Set value

- ON : "Mini-Help" showing the test outline is displayed on the test screen.
- OFF : "Mini-Help" showing the test outline is not displayed on the test screen.

Default

ON

(11) Visual acuity format

Set value

- Decimal : Visual acuity is displayed with the decimal format. According to this setting, the visual acuity charts on the test chart icon list, which can be selected on the chart registration screen, are changed to those of the decimal visual acuity only.
- Meter : Visual acuity is displayed with the meter format. According to this setting, the visual acuity charts on the test chart icon list, which can be selected on the chart registration screen, are changed to those of the meter visual acuity only.
- Feet : Visual acuity is displayed with the feet format. According to this setting, the visual acuity charts on the test chart icon list, which can be selected on the chart registration screen, are changed to those of the feet visual acuity only.

Default

Feet

(12) Hide visual acuity in the chart

Set value

- ON : Visual acuity is not displayed on the chart of the main unit when visual acuity chart is selected.
- OFF : Visual acuity is displayed on the chart of the main unit when visual acuity chart is selected.

Default

OFF

(13) Fusion Support

Set value

- ON : Fusion support is enabled. When the test distance shortens, such as when switching from a far-point to a near-point test, the chart moves gradually closer to support the patient in achieving fusion. However, this may not work if the change in distance is small.
- OFF : Fusion support is disabled.

Default

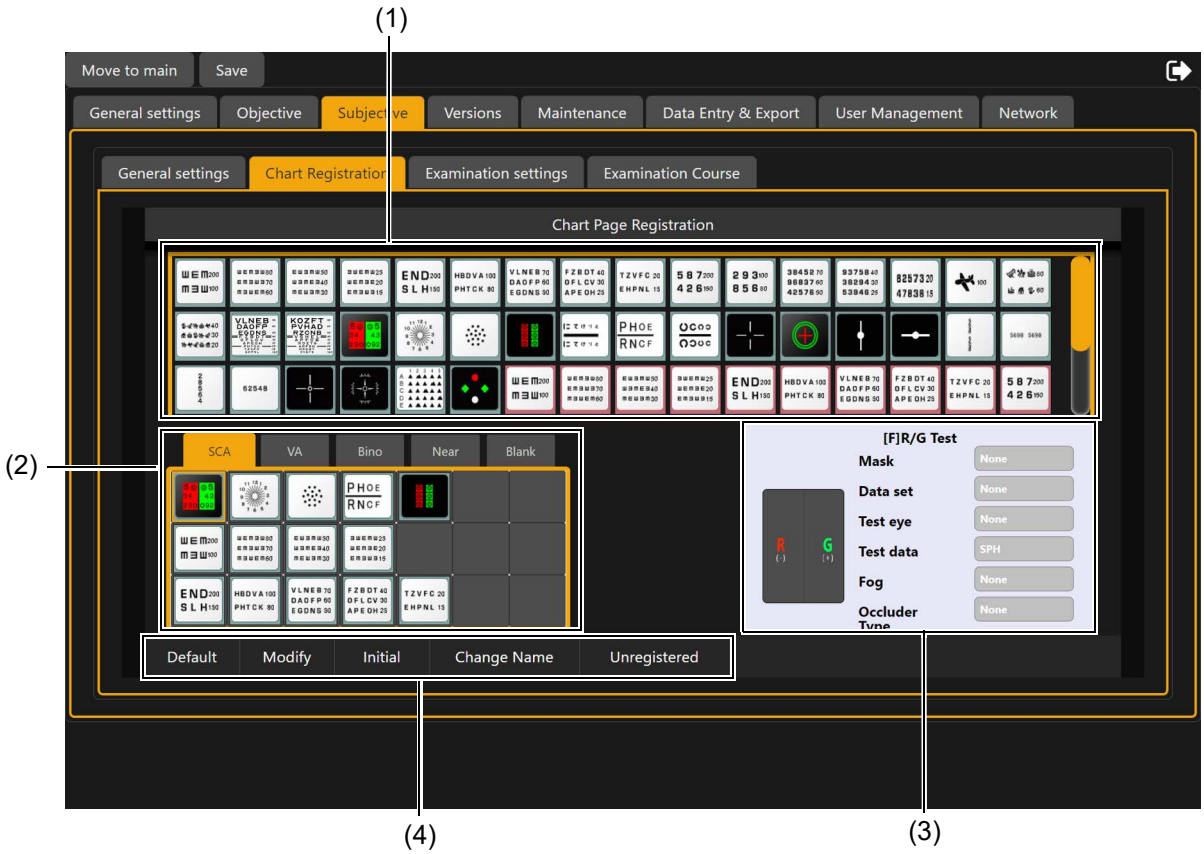
ON

(14) Reset to Default

The settings on this page are reset to default.

Chart registration

You can change the chart icons displayed on the chart page and the settings of the tests related to the chart icons.



(1) Test chart icon list

This area displays the list of the test charts that can be used in Chronos.

(2) Chart page

The test charts registered on the chart page can be used in tests.

- Select the test chart icon to be registered in the test chart icon list mentioned in (1).
- Drag & drop the selected icon to a desired position in the chart page. The chart related to the icon is registered.
- When you drag & drop a test chart icon from the chart page to the outside of the page, the icon is deleted from the chart page.

(3) Registered parameters information

This area displays the parameters of the tests related to the test chart icons of the chart page.

- Test name
  The test name related to the chart icon is displayed.
- Mask
  The status of the mask, which is automatically set at the start of test, is displayed.
- Data set
  The data type, which is set at the start of test, is displayed.
- Test eye
  The test eye is displayed.

- Test data
  Select the data, which will be operated in the test performed when a test chart icon is selected.
- Fog
  The fog amount, which is automatically set to the test eye at the start of test, is displayed.
- Occluder Type
  The lens, which is used to occlude (cover) the untested eye during test, is displayed.

(4) Chart page registration menu function

This area displays the command buttons, which are used for registration about chart page.

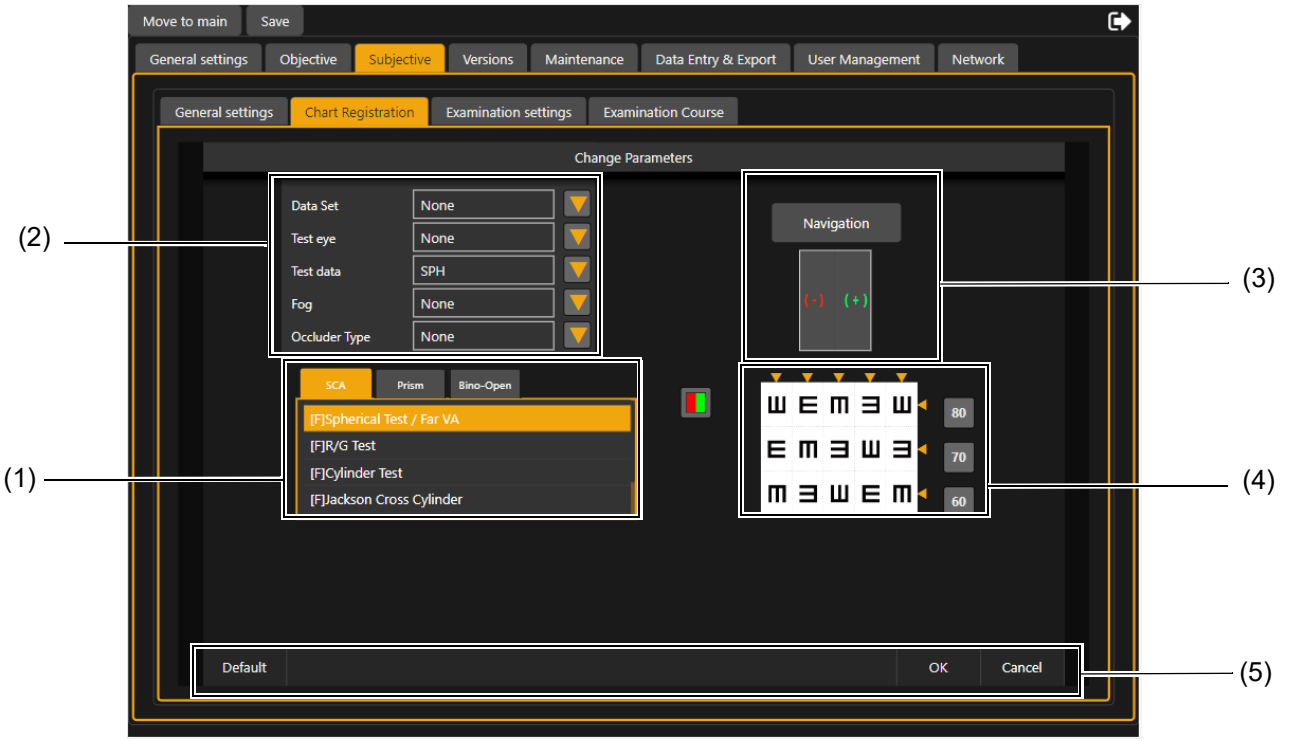
- Default
  The whole of chart page is returned to default.
- Modify
  It is possible to edit the tests, which are related to the chart icons selected from the chart page, and the relevant functions.


: For editing, refer to " Chart registration - Parameter change screen" on P.144.

- Initial
  Specify one chart as the initial chart. When the subjective test screen appears, it is possible to specify the test chart and test that will be displayed first.
- Change Name
  It is possible to edit the chart page names.
- Unregistered
  It is possible to see the unregistered charts in the chart list.
  The registered chart is displayed with shade.

Chart registration - Parameter change screen

It is possible to relate a variety of conditions when executing tests to the charts.



(1) Test name list

This area displays the test name list.

When selecting the chart for far-point test from the chart page, the far-point test names are displayed on the list. When selecting the chart for near-point test, the near-point test names are displayed.

As changing the tab, specify the test to be executed when tapping the selected chart icon.

(2) Test information setting

It is possible to edit the parameters of the test, which will be executed when selecting the relevant chart from the chart page. The displayed values are the initial values of the parameters related to the test, which is selected on the test name list of (1).

Edit the desired parameters.

- **Data Set**

  Set the main data which will be set when selecting the relevant chart from the chart page.

  Set value

  - Unaided : "Unaided data" is set as main data.
  - AR Data : "Objective data" is set as main data. When refractometry is not done, there is nothing in objective data and the correction lens is not inserted.
  - Rx Data : "Current spectacles lens data" is set as main data. When the lens data is not registered, a message is displayed. This message asks whether the data, which were displayed last in the main data area, should be registered as lens data is displayed.
  - Old Data : "Last prescription data" is set as main data. When the last prescription data is not registered, there is no data and the correction lens is not inserted.

- Subjective data : "Subjective data" is set as main data.
- Final data : "Final data" is set as main data. When the final data is not registered, there is no data and the correction lens is not inserted.
- None : The last main data status is succeeded.

- **Test eye**

  Set the patient’s eye when selecting the relevant chart from the chart page.

  Set value

  - Mono (R) : Monocular test is executed and the right eye is the patient's eye to be tested.
    In monocular test, the eye whose data can be changed with the operation buttons meets the patient's eye.
  - Mono (L) : Monocular test is executed and the left eye is the patient's eye to be tested.
  - Mono (Follow prev.) : Monocular test is executed. When the last patient's eye is set to both eyes, the right eye is the patient's eye to be tested. In other cases, the previous state is retained.
  - Bino-Open : Binocular test is executed and both eyes are tested.
    The both eyes' data can be changed with the operation buttons.
  - Bino (R) : Binocular test is executed and both eyes are tested.
    The right eye's data can be changed with the operation buttons.
  - Bino (L) : Binocular test is executed and both eyes are tested.
    The left eye's data can be changed with the operation buttons.
  - None : The last patient's eye status is succeeded.

- **Test data**

  Set the data which can be changed with the operation buttons when selecting the relevant chart from the chart page.

  Set value

  - SPH : "Spherical power" is set as measurement data.
  - CYL : "Cylinder power" is set as measurement data.
  - AXS : "Cylinder axis" is set as measurement data.
  - Prism(H) : "Horizontal prism" is set as measurement data.
  - Prism(V) : "Vertical prism" is set as measurement data.
  - None : The last measurement data status is succeeded.

- **Fog**

  When you select the relevant chart from the chart page and you want to fog the patient's eye automatically at the same time, change the value here. The fog amount is valid in the main data.

  Set value

  - 0.25 D : The "+0.25D" spherical lens is set on the patient's eye when selecting a chart.
  - 0.50 D : The "+0.50D" spherical lens is set on the patient's eye when selecting a chart.
  - 0.75 D : The "+0.75D" spherical lens is set on the patient's eye when selecting a chart.
  - 1.00 D : The "+1.00D" spherical lens is set on the patient's eye when selecting a chart.
  - 1.25 D : The "+1.25D" spherical lens is set on the patient's eye when selecting a chart.
  - 1.50 D : The "+1.50D" spherical lens is set on the patient's eye when selecting a chart.
  - 1.75 D : The "+1.75D" spherical lens is set on the patient's eye when selecting a chart.
  - 2.00 D : The "+2.00D" spherical lens is set on the patient's eye when selecting a chart.
  - None : Fogging is not done.

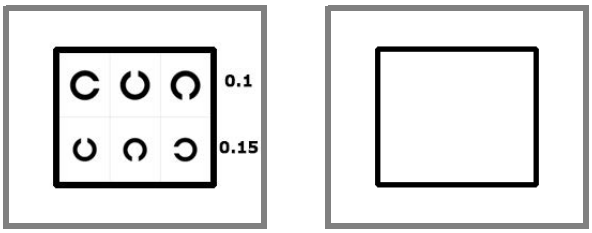
- **Occluder Type**

  When the relevant chart is selected from the chart page and so a monocular test is to be executed, the untested eye will be controlled by occluding. Set the control here. The setting here is also used for occluding in both of monocular and binocular tests.

  Set value

  - Occlude : Select "Occlude". The chart displayed to the occluded eye is turned off. The patient's view is the same as when the occluding plate is inserted in the normal refractor head.
  - Fog: +0.75 : Select "Fog: +0.75". The occluded eye is fogged with the "+0.75D" spherical lens.
  - Fog: +1.50 : Select "Fog: +1.50". The occluded eye is fogged with the "+1.50D" spherical lens.
  - Fog: +2.00 : Select "Fog: +2.00". The occluded eye is fogged with the "+2.00D" spherical lens.
  - Manual Fog (Open) : Select "Manual Fog (Open)". The untested eye is not automatically occluded or fogged and is always open. The operator must set and cancel fogging manually. This operation is almost the same as the manual operation of refractor head.

• Bino-Open : When "Bino-Open" is selected, the view of the occluded eye/open eye is shown below.



View of open eye　　View of occluded eye

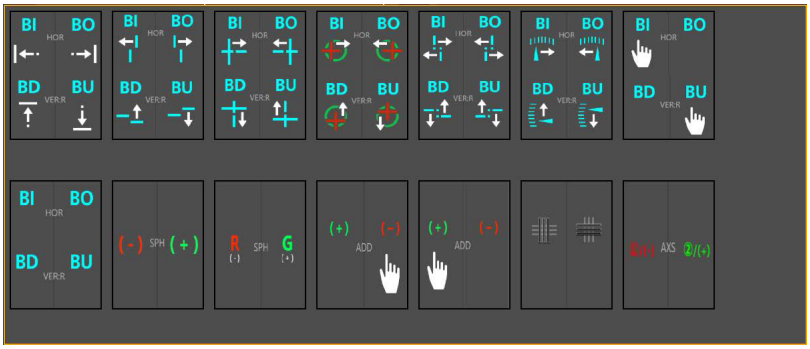
The occluded eye can see the displayed status of other section except the test targets. Subjective test can be performed as the patient keeps the binocular view.

• None : The last occluder type is succeeded.

(3) Navigation icon setting

Set the navigation icon to be displayed on the operation buttons when selecting the relevant chart from the chart page.

Tap the [Navigation icon] button to display the navigation icon list. Select the navigation icons to be displayed on the operation buttons.



(4) Test chart checking display/mask setting

Set a mask which will be automatically set when selecting the relevant chart from the chart page. This setting can be done for only the test chart where a mask can be applied. The mask setting buttons are displayed at the top and at the right side of large chart. The  button is displayed at the left side of large chart. Use these buttons to select a mask which is to be automatically set.

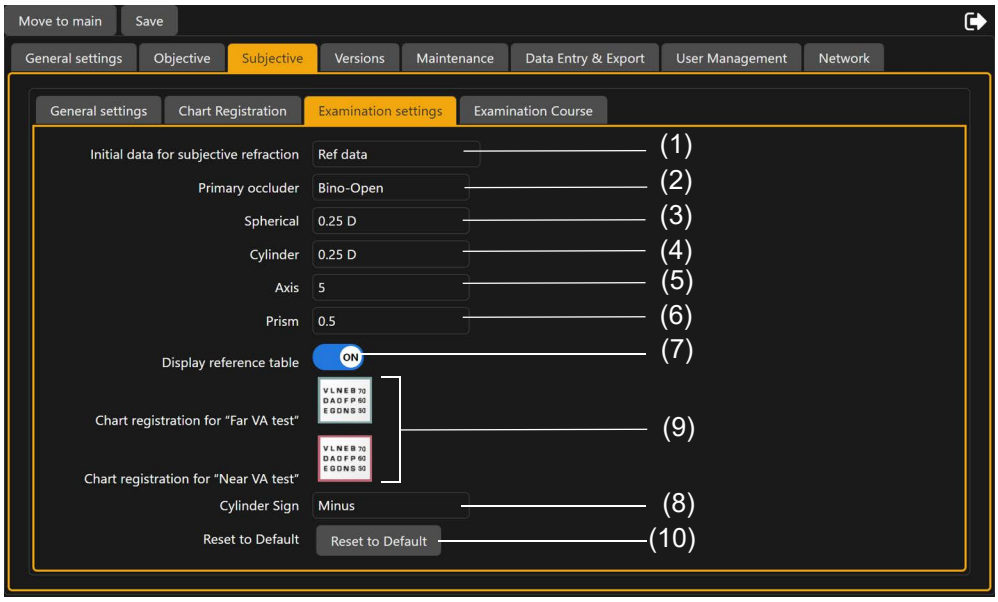
(5) Parameter change page menu function

• Default
Register the default parameters to the selected test charts.

• OK
Save the changed contents and finish setting.

• Cancel
Discard the changed contents and finish setting.

Examination settings



(1) Data at test start

Set the start data when starting the subjective test.

Set value

- Do not set anything : Starts the subjective test without setting anything into the data set "Subjective data".
- Ref data : Sets the Ref value obtained by the objective measurement into the data set "Subjective data" and then starts the subjective test.
- Ref data + Sph 0.50D shift : Sets the +0.50D added value to the far-point spherical power of the Ref correction value, which has been obtained by the objective measurement. This value is set to the data set "Subjective data" and then the subjective test starts.
- Ref data + Sph 1.00D shift : Sets the +1.00D added value to the far-point spherical power of the Ref correction value, which has been obtained by the objective measurement. This value is set to the data set "Subjective data" and then the subjective test starts.
- Ref data + Sph 1.50D shift : Sets the +1.50D added value to the far-point spherical power of the Ref correction value, which has been obtained by the objective measurement. This value is set to the data set "Subjective data" and then the subjective test starts.
- Ref data + Sph 2.00D shift : Sets the +2.00D added value to the far-point spherical power of the Ref correction value, which has been obtained by the objective measurement. This value is set to the data set "Subjective data" and then the subjective test starts.

Default

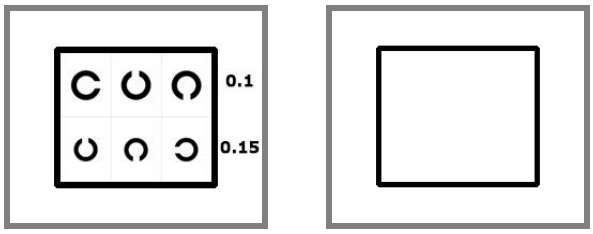
Ref data

(2) Primary occluder

Set the initial control for the untested eye when a monocular test is being executed. The setting here is also used for the initial control when occluding is done in both monocular and binocular tests.

Set value

- Bino-Open : When "Bino-Open" is selected, the view of the occluded eye/open eye is shown below. This is the initial action.



View of open eye View of occluded eye

The occluded eye can see the displayed status of other section except the test targets. Subjective test can be performed as the patient keeps the binocular view.

- Occluder : Select "Occluder". The initial action is to turn off the chart displayed to the occluded eye. The view is the same as when the occluding plate is inserted in the normal refractor head.
- Fog: +0.75 : Select "Fog: +0.75". The initial action is to fog the occluded eye with the "+0.75D" spherical lens.
- Fog: +1.50 : Select "Fog: +1.50". The initial action is to fog the occluded eye with the "1.50D" spherical lens.
- Fog: +2.00 : Select "Fog: +2.00". The initial action is to fog the occluded eye with the "+2.00D" spherical lens.
- Manual Fog (Open) : Select "Manual Fog (Open)". The initial action is as follows: The untested eye is not automatically occluded or fogged and is always open. The operator must set and cancel fogging manually. This operation is almost the same as the manual operation of refractor head.

Default

Bino-Open

(3) Spherical

Set the changing step (D) of the spherical refraction power.

Set value

- 0.25 D
- 0.50 D
- 1.00 D
- 2.00 D
- 3.00 D

Default

0.25 D

(4) Cylinder

Set the changing step (D) of the cylinder refraction power.

Set value

- 0.25 D
- 0.50 D
- 1.00 D

Default

0.25 D

(5) Axis

Set the changing step (°) of the cylinder axis.

Set value

- 1
- 5
- 15

Default

5

(6) Prism

Set the changing step (prism diopter) of the prism refraction power.

Set value

- 0.1
- 0.2
- 0.5
- 1.0

Default

0.5

(7) Display reference table

Set value

- ON : Reference data is displayed on the subjective test screen.
- OFF : Reference data is not displayed on the subjective test screen.

Default

ON

(8) Cylinder Sign

Set value

- Plus : "+" is used as the cylinder power sign in the test results.
- Minus : "-" is used as the cylinder power sign in the test results.

Default

Minus

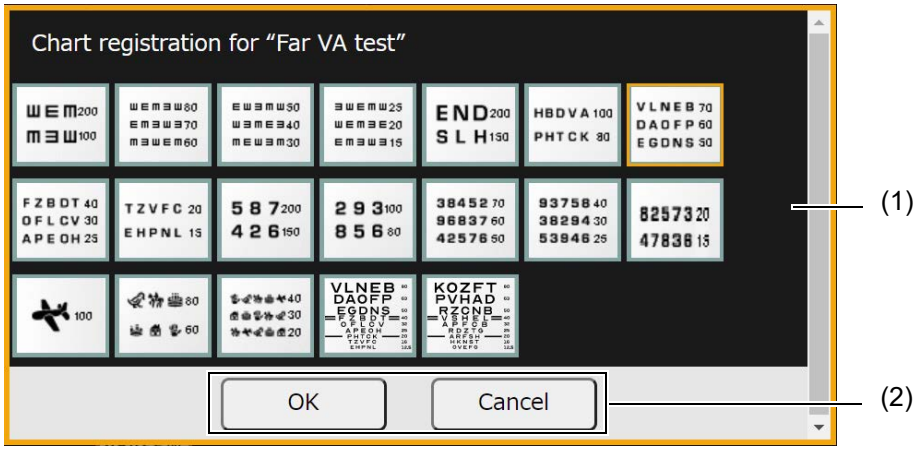
(9) Chart registration for "Far VA test"/Chart registration for "Near VA test"

Open the visual acuity chart registration screen and select the visual acuity chart that is automatically set when "[F] Spherical test/Far VA test" and "[N] Near VA test" are executed.

(10) Reset to Default

Reset the settings on this page to default.

Screens for Chart registration for "Far VA test"/Chart registration for "Near VA test"



(1) Visual acuity test chart list

On the far visual acuity test chart registration screen, the list of the charts usable for the far visual acuity test is displayed. On the near visual acuity test chart registration screen, the list of the charts usable for the near visual acuity test is displayed.

(2) Function buttons for the visual acuity test chart registration screen

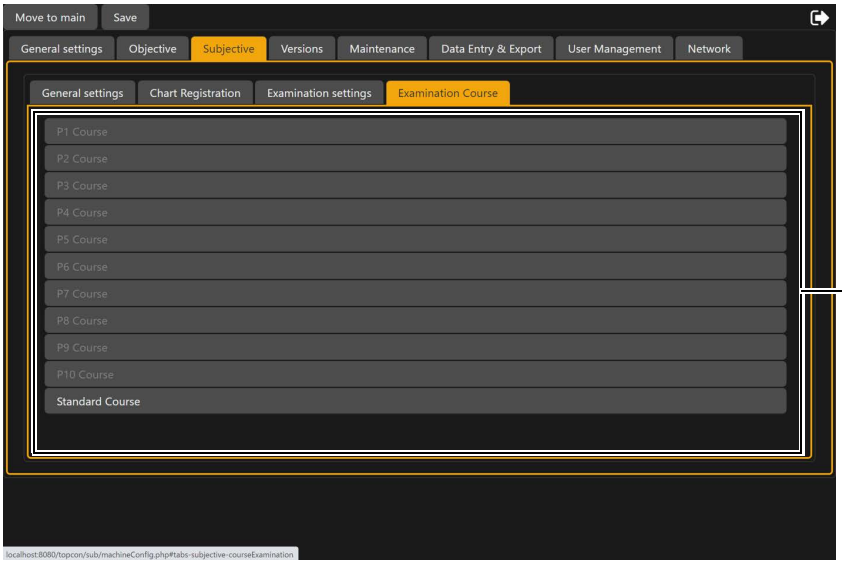
- **OK**

  Decides the visual acuity chart selected on this screen and returns to the test setting screen. At this time, the settings are not saved. To save the settings, tap the [Save] button at the top of the screen.

- **Cancel**

  Discards the selection on this screen and returns to the test setting screen.

Course test - Course list screen

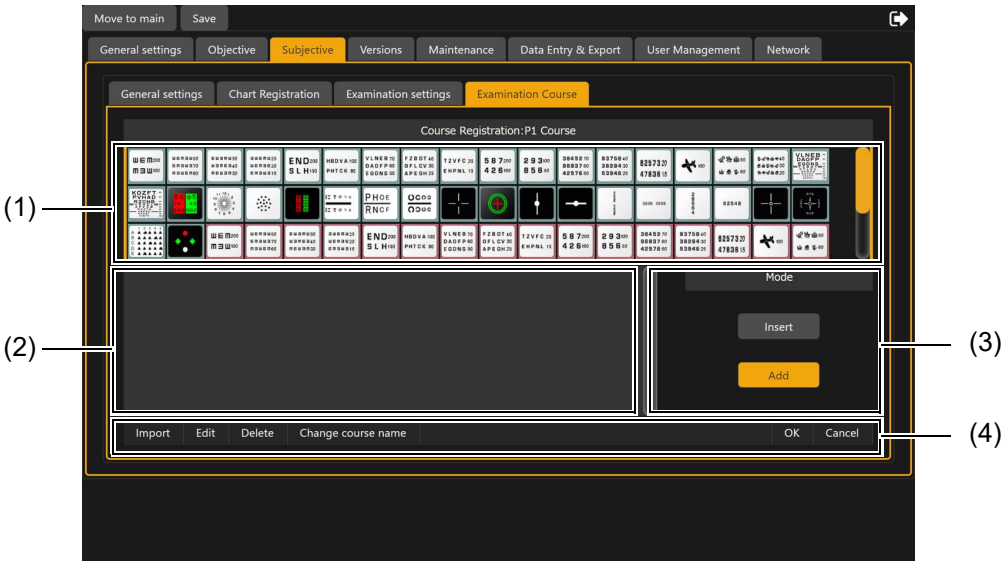


(1) Course list

Registrable eleven course names are displayed in the list.

The name of the registered course is displayed with white letters and the name of an unregistered course is done so with gray letters.

Course test - Course registration screen



(1) Test chart icon list

The list of the charts of the tests which can be registered in a course is displayed.

(2) Course registration list

The registered test procedures are displayed by the chart icons and test names.

Each time you select a chart icon from the test chart icon list, the test is registered as the procedure in the course registration list.

(3) Registration mode

Select a mode to register a test procedure into the course registration list. Tap [Insert] or [Add] to select.

- **Insertion mode**

  Tap the [Insert] button to access the insertion mode. Use this mode when you want to insert a new procedure in the middle of the course registration list. Select the place to insert a new procedure in the course registration list. Then, select a chart icon from the test chart icon list. A new procedure is inserted.

- **Addition mode**

  Tap the [Add] button to access the addition mode. Use this mode when you want to add a new procedure to the last of the course registration list.

(4) Function buttons of the course registration screen

The command buttons, which are used to register a course, are displayed.

- **Import**

  Select a registered course to read the procedure of the selected course into the current course registration list.

- **Edit**

  The test parameters editing screen for the procedure selected from the course registration list is opened.

- **Delete**

  Part or all of the procedures in the course registration list are deleted.

- **Change course name**

  The dialog box to edit the course name is displayed.

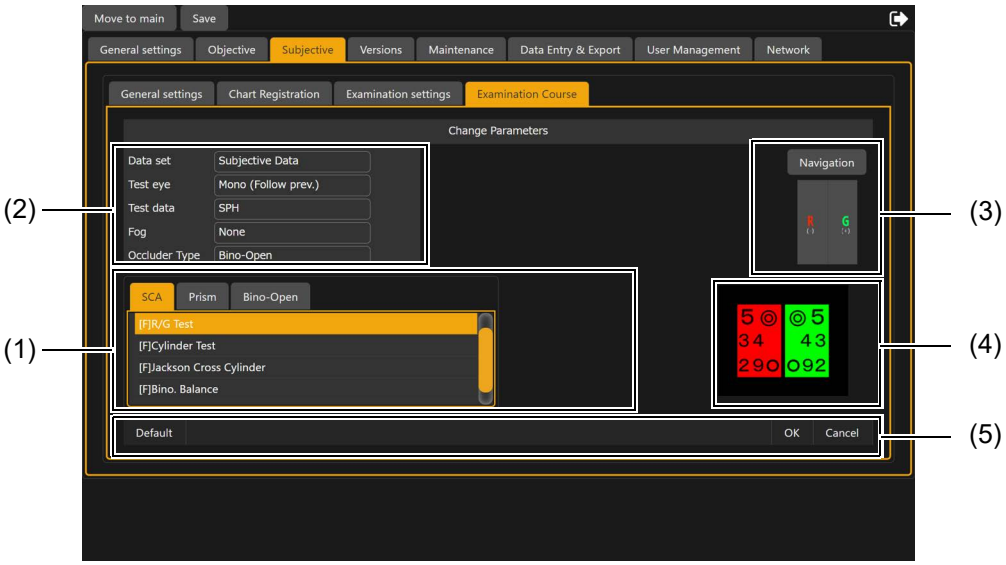
- **OK**

  Holds the changes on the course registration screen and returns to the course list screen.
  At this time, the course settings are not saved. To save the settings, tap the [Save] button at the top of the screen.

- **Cancel**

  Discards the changes on the course registration screen and returns to the course list screen.

Course test - Parameters change screen



(1) Test name list

The test name list is displayed.

The test, which is related to the procedure selected from the course registration list on the course registration screen, is displayed under the first selected condition.

When you change the selected test name here, the parameters related to the newly-selected test are displayed in the test information setting area.

(2) Test information setting

You can edit the parameters to execute the test selected from the test name list.

The setting items and values are described below.

- **Data set**

  Select a data set to be placed in the main data when executing the test.

  Set value

  - Unaided : Set the unaided data to the main data.
  - AR Data : Set the objective data to the main data.
  - Rx Data : Set the current spectacles data to the main data.
  - Old Data : Set the last prescription data to the main data.
  - Subjective data : Set the subjective data to the main data.
  - Final data : Set the final data to the main data.

- **Test eye**

  Select a patient's eye to execute the test.

  Set value

  - Mono (Follow prev.) : Monocular test is executed.
    The test is performed for the right eye. Then, the left eye is automatically tested.
  - Bino-Open : Binocular test is executed.
    When changing the data on the operation panel, the binocular data are changed.
  - Bino (R) : Binocular test is executed.
    When changing the data on the operation panel, the right eye data are changed.

- Bino (L) : Binocular test is executed.
  When changing the data on the operation panel, the left eye data are changed.

- **Test data**

  Select the data to be changed by the operation buttons when executing the test.

  Set value

  - SPH : Spherical power is the data to be measured. This can be selected for far-point test only.
  - CYL : Cylinder power is the data to be measured.
  - AXS : Cylinder axis is the data to be measured.
  - ADD : Addition is the data to be measured. This can be selected for near-point test only.
  - Prism (H) : Horizontal prism is the data to be measured.
  - Prism (V) : Vertical prism is the data to be measured.

- **Fog**

  Select the fog amount to be automatically set for the tested eye when executing the test.

  Set value

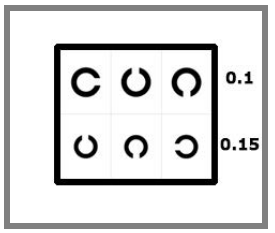
  - 0.25D : +0.25D is added to the spherical power or addition of the tested eye.
  - 0.50D : +0.50D is added to the spherical power or addition of the tested eye.
  - 0.75D : +0.75D is added to the spherical power or addition of the tested eye.
  - 1.00D : +1.00D is added to the spherical power or addition of the tested eye.
  - 1.25D : +1.25D is added to the spherical power or addition of the tested eye.
  - 1.50D : +1.50D is added to the spherical power or addition of the tested eye.
  - 1.75D : +1.75D is added to the spherical power or addition of the tested eye.
  - 2.00D : +2.00D is added to the spherical power or addition of the tested eye.
  - None : Fogging is not done to the spherical power or addition of the tested eye and the test is executed.

- **Occluder Type**

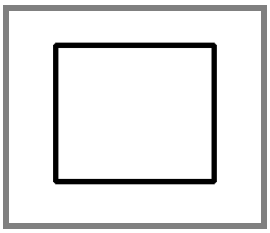
  Select the type of occlusion to be used while the test is being executed.

  Set value

  - Bino Open : When "Bino-Open" is selected, the view of the occluded eye/open eye is shown below.



View of open eye


View of occluded eye

The occluded eye sees the displayed status except the visual acuity targets in the chart. The subjective test can be executed while the patient keeps the binocular vision.

  - Occlude : When "Occlude" is selected, the target, which is displayed for the occluded eye, is turned off.

- Fog: +0.75 : When "Fog: +0.75" is selected, the occluded eye is fogged by the +0.75D spherical lens.
- Fog: +1.50 : When "Fog: +1.50" is selected, the occluded eye is fogged by the +1.50D spherical lens.
- Fog: +2.00 : When "For: +2.00" is selected, the occluded eye is fogged by the +2.00D spherical lens.
- Manual Fog (Open) : When "Manual Fog (Open)" is selected, the eye is not automatically occluded or fogged and is always opened. Select this when the operator wants to set or cancel fogging manually. This method is similar to the manual operation of refractor head.

(3) Navigation icon setting

Select a navigation icon to be displayed above the operation buttons when executing the test selected from the test name list.

Tap the [Navigation icon] button to access the navigation icon list. Select an icon to be used from the list.

(4) Test chart check display/Mask setting

Set a mask to be automatically set when executing the test selected from the test name list.

This setting can be performed only for the visual acuity test chart to which a mask can be applied.

Set the automatically-set mask with the mask set buttons, which are displayed at the top and right side of the large chart or the  button, which is displayed at the left side of the large chart.

(5) Course test - Function buttons of the parameters change screen

The command buttons, which are used when changing the parameters, are displayed.

- **Default**

  Reset to the default parameters, which are related to the chart displayed in the test chart check display area.

- **OK**

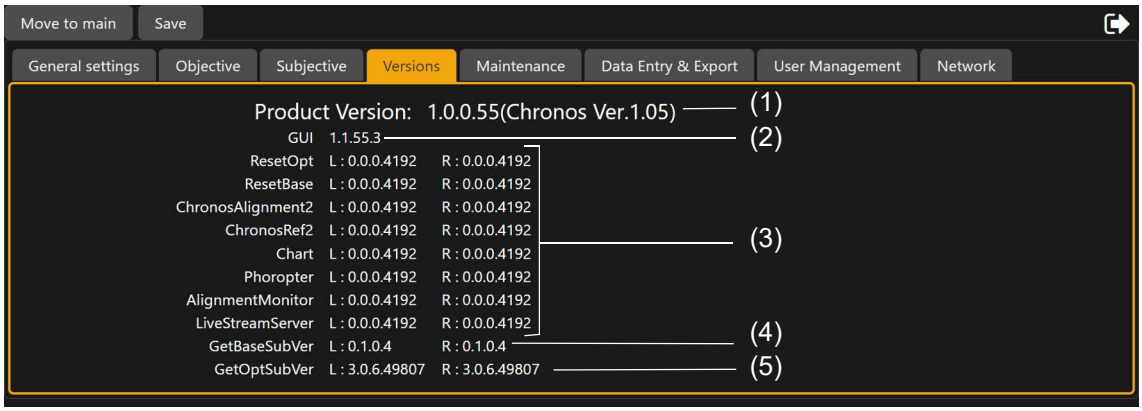
  The instrument returns to the course registration screen as holding the changes on the parameters change screen of "Course test". At this time, the settings of the course are not saved. To save the settings, tap the [Save] button at the top of the screen.

- **Cancel**

  The changes on the parameters change screen of "Course test" are discarded and the instrument returns to the course registration screen.

Versions

The information about the software version is displayed.



(1) Product Version

The version of the software installed in this instrument is displayed.

(2) GUI

The version of the GUI software in the power supply unit is displayed.

(3) Each version of some types of software

Each version of some types of software in the right and left measuring heads is displayed.

(4) GetBaseSubVer

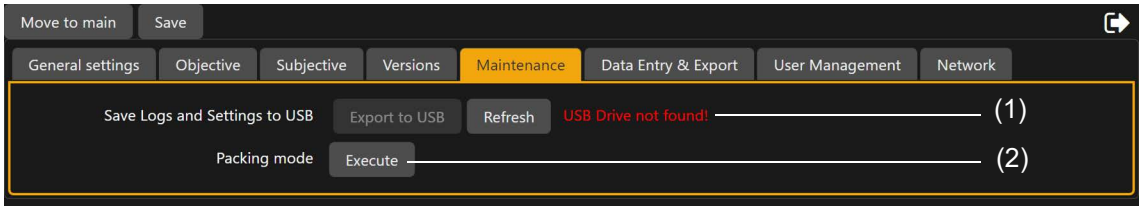
The version of the software in the drive base is displayed.

(5) GetOptSubVer

Each version of some types of software in the right and left measuring heads is displayed.

Maintenance

Carry out setting when you want to save the log and setting information to USB memory or when maintenance is done for the measuring heads.



(1) Save Logs and Settings to USB

Export the Chronos setting information and logs to USB memory. Insert a USB memory into the rear side of the power supply unit and shift to the relevant screen. Then, tap the [Export to USB] button. If the button cannot be tapped, tap the [Refresh] button.

(2) Packing mode

Use this mode for maintenance or packing. Tap the button, and the check dialog is displayed. Tap "OK". Then, the measuring heads move so that the instrument can be packed. Next, when a message asks the user to turn off the system, turn off the power supply unit. When logging in again, the measuring heads are reset to the original position.

Data Entry & Export

In the tab about data import/export, the displayed items are changed according to the values of the set items. So, in this chapter, the tab screen will be classified into two patterns and each pattern will be explained.

(i) When the preinstalled shared folder is used

(1) [Del.: Rx data] button action in the data entry screen

Specify the processing when tapping the [Del.: Rx data] button on the data entry screen.

Set value

- Delete all data.
- Delete except today's data.
- Delete data older than a week.
- Delete data older than a month.

Default

Delete all data.

(2) Data overwrite acceptance loaded from Rx

Set whether the data obtained from the lens meter can be changed or not.

Set value

- Accept : It is permitted to change the data obtained from the lens meter in this instrument.
- Deny : It is not permitted to change the data obtained from the lens meter in this instrument.

Default

Deny

(3) Import data format

Set the format of the lens meter data captured through LAN or the save format of the data captured from the lens meter through serial communication.

Set value

- TOPCON : Format of TOPCON's unique XML format
- JOIA : XML format determined by JOIA (Japan Ophthalmic Instruments Association)

Default

TOPCON

(4) Data acquisition by serial communication

Capture the lens meter data through serial communication.

This function can be used only in the STD-1 format communication with the TOPCON lens meter.

Set value

- ON : The instrument captures the meter data through serial communication.
  When this function is ON, the communication port selection menu is displayed.
- OFF : The instrument does not use serial communication.

Default

OFF

(5) "Use pre-installed shared folder" of "Data Import Folder Configuration"

Set whether the shared folder for import in the power supply unit should be used or not.

The setting here is not changed by the [Reset to Default] button.

Set value

- ON : The preinstalled shared folder is used.
- OFF : The preinstalled shared folder is not used.

Default

None

(6) IP address of Rx data stations

Input the IP address of the Chronos in which the shared folder to import data has been set.

Whether it is possible to refer to the shared folder or not is judged by tapping the [Verify path] button.

To refer to the shared folder of your own, set "blank".

Set value

Input IP address in entry area.

Default

None

(7) "Use pre-installed shared folder" of "Data Export Folder Configuration"

Set whether the shared folder for export in the power supply unit should be used or not.

The setting here is not changed by the [Reset to Default] button.

Set value

- ON : The preinstalled shared folder is used.
- OFF : The preinstalled shared folder is not used.

Default

None

(8) IP address of DB stations

Input the IP address of the Chronos in which the shared folder to export data has been set.

Whether it is possible to refer to the shared folder or not is judged by tapping the [Verify path] button.

To refer to the shared folder of your own, set "blank".

Set value

Input IP address in entry area.

Default

None

(9) Work with CV-5000

When outputting data to the TOPCON refractor head "CV-5000", use this function to output the data with the file name which CV-5000 can import. When this function is ON, a file for CV-5000 is output in addition to the normal output file.

Set value

- ON : When exporting data, the file required to link with CV-5000 is output.
- OFF : The file required to link with CV-5000 is not exported.

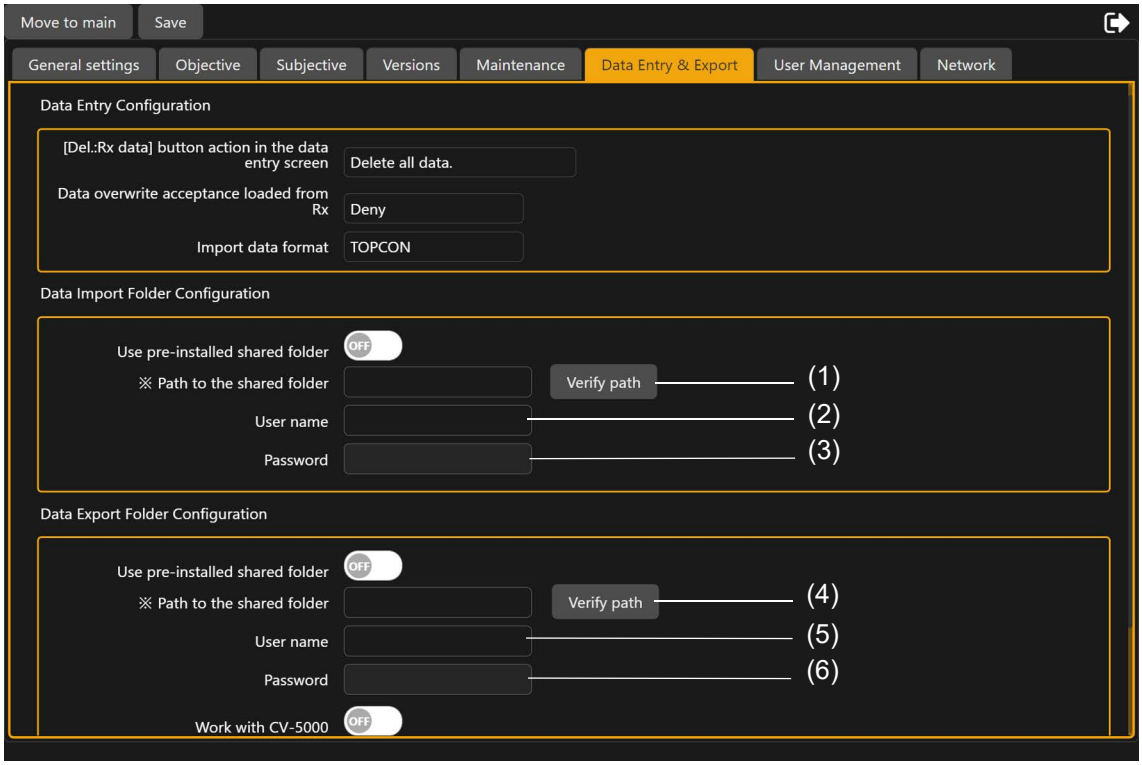
Default

OFF

(10) Reset to Default

Reset the settings on the data [Data Entry & Export] tab to default.

(ii) When the preinstalled shared folder is not used



(1) "Path to the shared folder" of "Data Import Folder Configuration"

Input the IP address of the external device where the shared folder for import has been placed.
Whether it is possible to refer to the shared folder or not is judged by tapping the [Verify path] button.

Set value

Input IP address in entry area.

Default

None

(2) "User name" of "Data Import Folder Configuration"

Input the user name registered in the external device.

Set value

Input the user name in entry area.

Default

None

(3) "Password" of "Data Import Folder Configuration"

Input the password of the user registered in the external device.

Set value

Input password in entry area.

Default

None

(4) "Path to the shared folder" of "Data Export Folder Configuration"

Input the IP address of the external device where the shared folder for export has been placed.
Whether it is possible to refer to the shared folder or not is judged by tapping the [Verify path] button.

Set value

Input IP address in entry area.

Default

None

(5) "User name" of "Data Export Folder Configuration"

Input the user name registered in the external device.

Set value

Input the user name in entry area.

Default

None

(6) "Password" of "Data Export Folder Configuration"

Input the password of the user registered in the external device.

Set value

Input password in entry area.

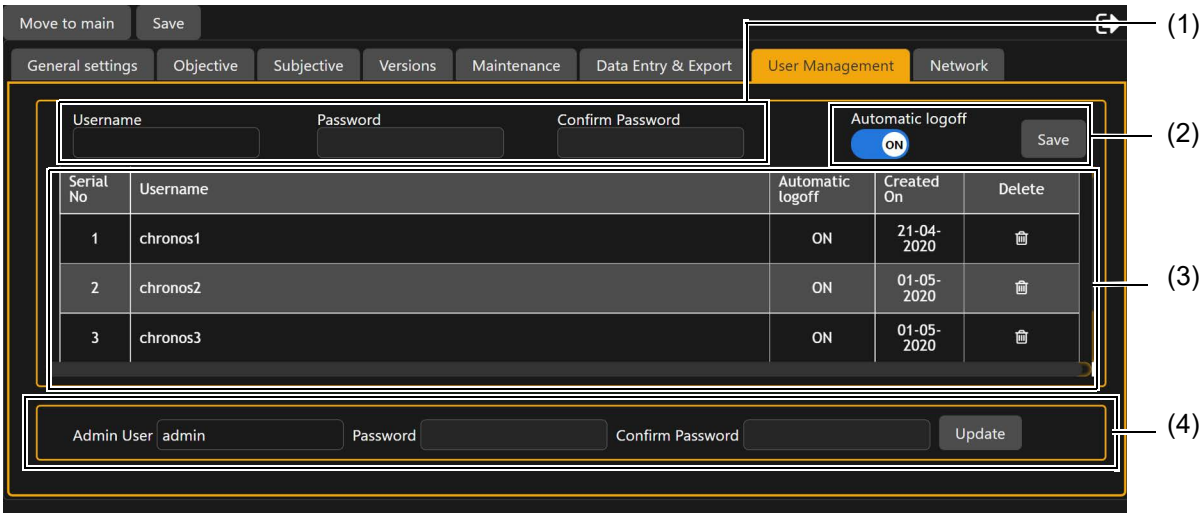
Default

None

User Management

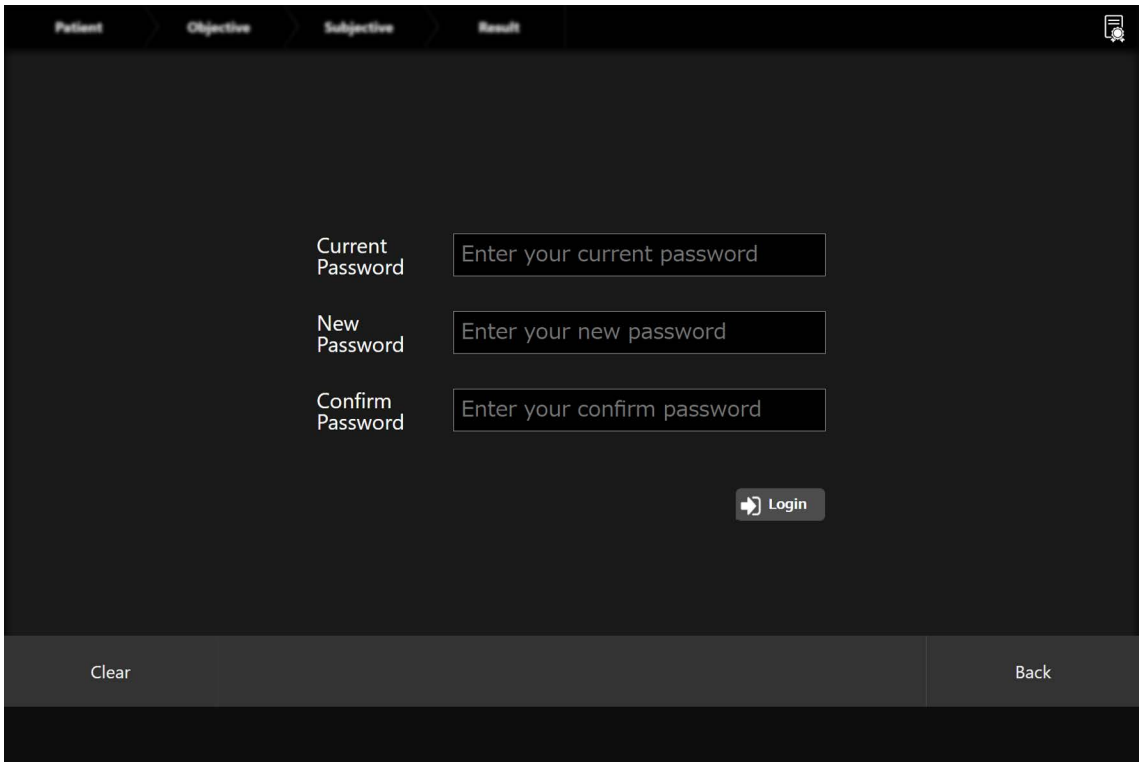
In this tab, you can add/delete the user name, display the registered user list, and change the managing user. When logging in as the administrative user, the screen contents are different from those when logging in as an ordinary user.

(i) When logging in as the administrative user



(1) Login user adding function

Set a new user name and password. Input a user name, the password and the confirm password and then tap the [Save] button. The login user is registered. In Step (2), select a user name. You can change the password of each user name. After changing, log in with the relevant user name and change the password again. (Refer to the screen shown below.)



(2) Automatic logoff setting

Set the ON/OFF of automatic logoff function for a new user. When logging in as a user with automatic logoff setting is ON, when 30 minutes have passed without operating Chronos, you will be automatically logged off for security and the login screen appears. When logging in as a user with automatic logoff setting is OFF, you will not be automatically logged off. If the date changes during login, you will be automatically logged off when displaying the patient information input screen and login screen will be displayed.

Set value

- ON : Automatic logoff function is enabled.
- OFF : Automatic logoff function is disabled.

Default

ON

⚠CAUTION	If the automatic logoff function is disabled, it may cause serious issues in the safety of network connection. Please understand the effects of changing the settings before doing so.

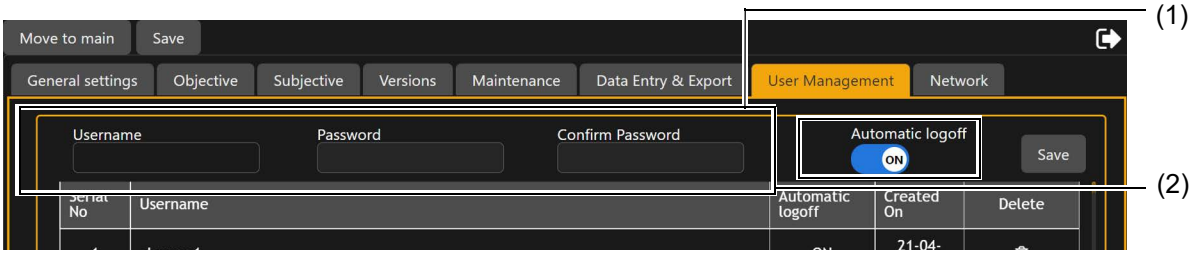
(3) Registered user list

The user names that have already been registered are displayed. You can delete any registered user by clicking the "delete" icon in the "Delete" column.

(4) Administrative user changing function

It is possible to change the password of "admin" having the administrator rights. Input the password and the confirm password. Then, tap the [Update] button. The password is updated.

(ii) When logging in as others except administrative user



(1) Login user password changing function

Set the password which will be used for the login user. Input the password and the confirm password. Then, tap the [Update] button. The password is updated.

(2) Automatic logoff setting

Set the ON/OFF of automatic logoff function for a login user. When the automatic logoff setting is ON, when 30 minutes have passed without operating Chronos, you will be automatically logged off for security and the login screen appears. When the automatic logoff setting is OFF, you will not be automatically logged off. If the date changes during login, you will be automatically logged off when displaying the patient information input screen and login screen will be displayed.

Set value

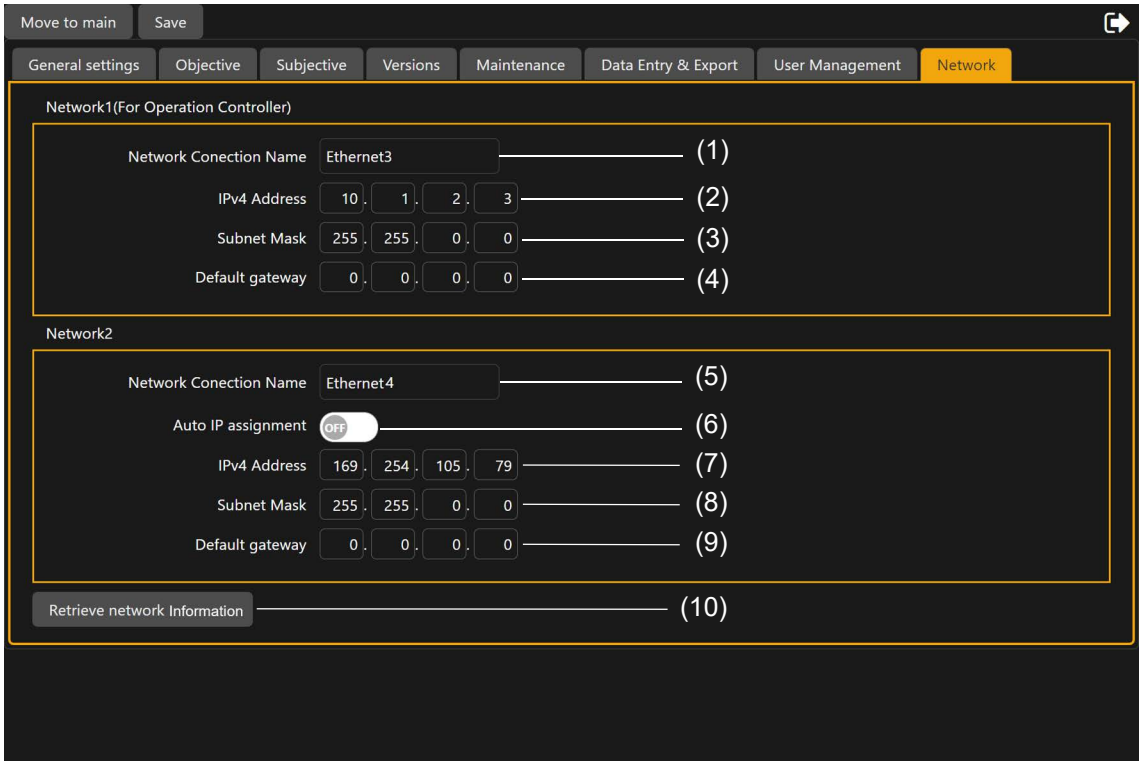
- ON : Automatic logoff function is enabled.
- OFF : Automatic logoff function is disabled.

⚠CAUTION	If the automatic logoff function is disabled, it may cause serious issues in the safety of network connection. Please understand the effects of changing the settings before doing so.

Network

In this tab, you can change the network setting of the Chronos power supply unit.
The network settings that can be made on this screen are for connecting to the operation controller and external network. This is the setting for the additional LAN port by attaching USB ethernet adapter to the USB port on the back of the power supply unit.

NOTE	Our service staff will make the settings. Please contact the service staff when changing the settings.



Network1 (For Operation Controller)

The following setting items from (1) to (4) are the network settings to connect the operation controller.

(1) Network Connection Name

Select the network name to connect with the operation controller.

Set value

- The network name that exists in the power supply unit is automatically displayed.
  If there are two or more configurable networks, select the network to connect the operation controller to.

(2) IPv4 Address

Enter the IP address to join the Network1.
This IP address will be the IP address to access the Chronos from the browser in the operation controller.

(3) Subnet Mask

Enter the subnet mask for the Network1.

(4) Default Gateway

Enter the default gateway for the network 1.

Network2

The following setting items from (5) to (9) will be displayed only when 2 or more USB ethernet adapters are connected to the power supply unit.
This network is a separate network from the network used for connection to the operation controller.

(5) Network Connection Name

Select a network name which is different from the network to connect the Operation Controller to.

(6) Auto IP assignment

Turn this switch ON when the DHCP server on Network 2 will automatically assigns IP address.

(7) IPv4 Address

Enter the IP address to join the Network2 when “Auto IP assignment” is set to “OFF”.

(8) Subnet Mask

Enter the subnet mask for the Network2.

(9) Default Gateway

Enter the default gateway for the Network2.

(10) Retrieve network Information

Retrieve the network information on the current power supply unit and update the information on Network1 and Network2.

BEFORE REQUESTING SERVICE

TROUBLESHOOTING

MESSAGES DURING OPERATION

The list of error messages displayed on the operation controller is shown below. Each error message describes the contents of an error and the remedial measure. To solve the problems, obey the messages.

Message	Error Code
Alignment initialization processing failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	1000
Failed to read the orientation file of the alignment camera. Power off the system, power it on again, and restart. If the error persists please contact our support.	1001
Failed to read the alignment adjustment file. Power off the system, power it on again, and restart. If the error persists please contact our support.	1002
Failed to pass the alignment detection information. Power off the system, power it on again, and restart. If the error persists please contact our support.	1003
Acquisition of alignment detection information failed. Perform alignment again. If the error continues, power off the system, power it on again, and restart.	1004
The alignment could not be completed. Keep your eyes wide open and look straight ahead.	1005
The drive limit of the motor has been reached. Have the subject's head removed from the device and press the drive reset button. Align again after the motor reset is completed.	1009
Failed to get the alignment condition definition information. Power off the system, power it on again, and restart. If the error persists please contact our support.	1011
The alignment correction information could not be acquired. Power off the system, power it on again, and restart. If the error persists please contact our support.	1012
During alignment, the forehead came off after applying the forehead. Firmly attach the subject's forehead to the forehead and re-align.	1016
Failed to align the cornea. Keep your eyes wide open and look straight ahead. If the error continues, measure in IOL mode.	1215
Failed to read the kerato correction file. Power off the system, power it on again, and restart. If the error persists please contact our support.	1301
The patient's forehead was removed from the forehead rest during preliminary positioning. Please make sure that the patient's forehead is placed on the forehead rest and repeat the preliminary positioning.	1416

Message	Error Code
Failed to transfer objective measurement information. Power off the system, power it on again, and restart. If the error persists please contact our support.	2000
Input parameter is wrong. Power off the system, power it on again, and restart. If the error persists please contact our support.	2001
Failed to get the condition definition information of objective measurement. Power off the system, power it on again, and restart. If the error persists please contact our support.	2002
Internal communication error Power off the system, power it on again, and restart. If the error persists please contact our support.	2004
Initialization error during objective measurement. Power off the system, power it on again, and restart. If the error persists please contact our support.	2005
Initialization error during objective measurement. Power off the system, power it on again, and restart. If the error persists please contact our support.	2006
Failed to preprocess objective measurement. Perform the measurement again. If the error persists, power off the system, power it on again, and restart.	2007
Failed to adjust measurement brightness. Keep your eyes wide open and measure again. If the error persists, skip objective measurement.	2101
Failed to adjust measurement brightness. Keep your eyes wide open and measure again. If the error persists, skip objective measurement.	2102 2104
Failed to adjust measurement brightness. Keep your eyes wide open and measure again. If the error persists, skip objective measurement.	2105
Failed to analyze objective measurement Keep your eyes wide open and measure again.	2202
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	3000
The specified chart file is not found. Power off the system, power it on again, and restart. If the error persists please contact our support.	3001
Failed to display the chart. Power off the system, power it on again, and restart. If the error persists please contact our support.	3002 3003
There is no information file for the specified chart. Power off the system, power it on again, and restart. If the error persists please contact our support.	3004

Message	Error Code
The specified chart file is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	3005
Failed to read the specified chart file. Power off the system, power it on again, and restart. If the error persists please contact our support.	3006
Failed to generate Chart. Please try again. If the error persists please contact our support.	3007
Failed to generate Chart. Please try again. If the error persists please contact our support.	3008 3009 3010
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	3100
Failed to read the subjective correction value. Power off the system, power it on again, and restart. If the error persists please contact our support.	3101
An internal communication error has occurred. (CAN initialization failed) Power off the system, power it on again, and restart. If the error persists please contact our support.	3102
Failed to control the device. Power off the system, power it on again, and restart. If the error persists please contact our support.	3103
Left/right discrimination processing failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	3104
The moving direction of the horizontal prism is incorrect. Power off the system, power it on again, and restart. If the error persists please contact our support.	3105
The moving direction of the vertical prism is incorrect. Power off the system, power it on again, and restart. If the error persists please contact our support.	3106
Failed to get the optical head position. Power off the system, power it on again, and restart. If the error persists please contact our support.	3107
Failed to read the horizontal prism correction value. Power off the system, power it on again, and restart. If the error persists please contact our support.	3108
An internal communication error has occurred. (Failed to get horizontal prism position) Power off the system, power it on again, and restart. If the error persists please contact our support.	3109
Failed to read the horizontal prism drive control parameters. Power off the system, power it on again, and restart. If the error persists please contact our support.	3110

Message	Error Code
Convergence control has failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	3111
Failed to move the chart display position. Power off the system, power it on again, and restart. If the error persists please contact our support.	3112
The correction value of the chart display position is incorrect. Power off the system, power it on again, and restart. If the error persists please contact our support.	3113
It is the movement limit of the optical head. Please change the value back to the previous value.	3115
This is the movement limit of the motor for the spherical power lens. Please change the value back to the previous value.	3116
It is the movement limit of the motor for the astigmatic power lens. Please change the value back to the previous value.	3117
This is the setting limit for the astigmatic power. Please change the value back to the previous value.	3118
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	100
initialization processing failed.(X motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	102
initialization processing failed.(Y motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	103
initialization processing failed.(Z motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	104
initialization processing failed.(Theta motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	105
Failed to control pilot lamp. If the error persists please contact our support.	106
X motor drive process failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	107
Y motor drive process failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	108
Z motor drive process failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	109
X motor drive process failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	110

Message	Error Code
The command of PD control is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	111 112 113 114
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	200
Lighting control failed. (Anterior LED1) Power off the system, power it on again, and restart. If the error persists please contact our support.	202
Lighting control failed. (Anterior LED2) Power off the system, power it on again, and restart. If the error persists please contact our support.	203
Lighting control failed. (XY LED) Power off the system, power it on again, and restart. If the error persists please contact our support.	204
Lighting control failed. (Fixation LED) Power off the system, power it on again, and restart. If the error persists please contact our support.	205
Failed to control the motor. (Solenoid shutter) Power off the system, power it on again, and restart. If the error persists please contact our support.	206
Failed to control the motor. (TF Motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	207
Failed to control the motor. (VCC1 Motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	208
Failed to control the motor. (VCC2 Motor) Power off the system, power it on again, and restart. If the error persists please contact our support.	209
Failed to control the motor. (Rotary Prism) Power off the system, power it on again, and restart. If the error persists please contact our support.	210
Lighting control failed. (Kerato LED) Power off the system, power it on again, and restart. If the error persists please contact our support.	211
Failed to read internal parameters. Power off the system, power it on again, and restart. If the error persists please contact our support.	220
Left/right discrimination processing failed. Power off the system, power it on again, and restart. If the error persists please contact our support.	221
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	222

Message	Error Code
Failed to read the setting value. Power off the system, power it on again, and restart. If the error persists please contact our support.	210000
Failed to write the setting value. Power off the system, power it on again, and restart. If the error persists please contact our support.	210001
Failed to synchronize time in between Optical head and Control Box. Power off the system, power it on again, and restart. If the error persists please contact our support.	210002
Failed to detect X motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	220001
Failed to detect Y motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	220002
Failed to detect Z motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	220003
Failed to detect θ motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	220004
Failed to read Base-sub EEPROM. Power off the system, power it on again, and restart. If the error persists please contact our support.	220005
Failed to write Base-sub EEPROM. Power off the system, power it on again, and restart. If the error persists please contact our support.	220006
Failed to read KR-sub EEPROM. Power off the system, power it on again, and restart. If the error persists please contact our support.	221001
Failed to write KR-sub EEPROM. Power off the system, power it on again, and restart. If the error persists please contact our support.	221002
The voltage of 24V power supply decreased by more than 10%. Power off the system, power it on again, and restart. If the error persists please contact our support.	221003
The voltage of 12V power supply decreased by more than 10%. Power off the system, power it on again, and restart. If the error persists please contact our support.	221004
The voltage of 6.8V power supply decreased by more than 10%. Power off the system, power it on again, and restart. If the error persists please contact our support.	221005
The voltage of 5V power supply decreased by more than 10%. Power off the system, power it on again, and restart. If the error persists please contact our support.	221006

Message	Error Code
The voltage of 3.3V power supply decreased by more than 10%. Power off the system, power it on again, and restart. If the error persists please contact our support.	221007
Failed to detect VCC1 motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	421008
Failed to detect VCC2 motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	421009
Failed to detect TF motor initial position. Power off the system, power it on again, and restart. If the error persists please contact our support.	421010
The rotation speed of motor decreased. Power off the system, power it on again, and restart. If the error persists please contact our support.	421011
Abnormal SLD behavior has been detected. Power off the system, power it on again, and restart. If the error persists please contact our support.	421012
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	4000
Time synchronization failed. (Missing time zone information) Power off the system, power it on again, and restart. If the error persists please contact our support.	4001
Time synchronization failed. (Failed to create an internal link) Power off the system, power it on again, and restart. If the error persists please contact our support.	4002
Time synchronization failed. (Failed to open process) Power off the system, power it on again, and restart. If the error persists please contact our support.	4003
Time synchronization failed. (Failed to read data) Power off the system, power it on again, and restart. If the error persists please contact our support.	4004
Time synchronization failed. (Failed to synchronize NTP) Power off the system, power it on again, and restart. If the error persists please contact our support.	4005
Failed to send the emergency stop command. Power off the system, power it on again, and restart. If the error persists please contact our support.	220000
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	300 301 302 303
There is a software version mismatch. The software needs to be reinstalled. Please contact our support to update the software.	304

Message	Error Code
An internal communication error has occurred. There is a problem with the communication between the control box and the measuring head. Power off the system, power it on again, and restart. If the error persists please contact our support.	10000
The communication was disconnected unexpectedly.	10001
The HTTP server returned an error code.	10002
The control command is invalid. Power off the system, power it on again, and restart. If the error persists please contact our support.	10003
There was no response to the control command. Repeat the last operation. If the error occurs again, restart your system.	10004
The setting value is invalid. Power off the system, power it on again, and restart. If the error persists, please contact with Topcon customer support.	11000
Thermal printer may be out of order. Please call our support engineer.	601000
Cannot print because the printer cover is open. Please close the printer cover.	602000
The printer paper is not loaded. Please set the printer paper.	603000
The printer is jammed. Please reload the printer paper and print again.	604000
Failed to obtain network information. Please check the network connection and reboot the system. If the error persists, please contact with Topcon customer support.	70000
Unable to open network configuration file. Refer to the page of "How to operate in case of trouble." in instruction manual and re-set up the network setting file.	70100
Invalid file format. Unable to open network configuration file. Refer to the page of "How to operate in case of trouble." in instruction manual and re-set up the network setting file.	70200
Memory overflow. An unexpected error has occurred. Turn off the system and then turn it on again to reboot. If the error persists, please contact with Topcon customer support.	70300
The number of supported LAN adapters are limited to two ports. Please power off the system and check the number of LAN adapters before booting.	70400
Unable to open network configuration file. Click the [Retrieve network Information] button again.	70500
Invalid file format. Unable to open network configuration file. Click the [Retrieve network Information] button again.	70600
SyntaxError : Unexpected end of JSON input parsererror 200 Power off the system, power it on again, and restart. If the error persists please contact our support.	———

TROUBLESHOOTING

⚠WARNING	To avoid electric shock, do not attempt disassembling, rebuilding and/or repairs on your own. Do not open the cover. Ask your dealer for repairs.

When an error is encountered, review the Check List below.
If, after following the instructions below, you still cannot restore the instrument to a normal condition or if the problem does not fall into any of the categories below, contact your dealer or TOPCON (see the back cover).

Check List

Problem	Condition	Check	Page
The power of the instrument is not turned on.	———	The power cord plug is not connected to the outlet. Connect it.	
		The power cord is not connected to the instrument. Connect it.	
The measuring head does not operate normally.	• Although the power is ON, the measuring head does not operate.	The cable of the measuring head is not connected. Connect it.	45
	———	Do not operate the measuring head forcedly but contact your dealer or TOPCON.	
Auto-alignment is not completed.	• Auto-alignment is not completed and objective measurement does not start.	Check the measuring mirror for stain. If it is stained, clean it.	129
		Check the brightness of the room where the instrument is installed. If the room is too bright, darken it.	
Printing is not performed.	• Paper is conveyed but data is not printed.	Check the paper rolling direction. If it is wrong, set the paper correctly.	42
	• Paper is not conveyed.	When "No paper" is displayed on the control panel, supply paper.	42
The software does not respond quickly.	• Interference has occurred in the wireless LAN.	Refer to the instruction manual of Wi-Fi-router and check the setting and connection environment.	
		We recommend the user to change to cable connection.	39

Printer paper jamming

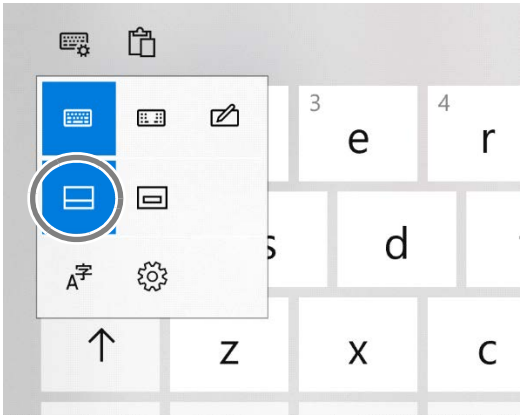
NOTE	If paper jams inside the printer, printing is not done. If you are using the printer in this status, the printer may malfunction.

1. Turn off the power, open the printer cover and turn down the cover completely.
2. Do not pull the printer paper forcedly. Remove the jammed paper.
3. Reset the printer paper. (Refer to "SETTING PRINTER PAPER" on P.42.)

If the touch keyboard overlaps the screen when using the Windows tablet PC

There are some screens where it is necessary to input data through touch keyboard. (The patient information input screen is one example.) Sometimes the keyboard is overlapped with the screen due to the keyboard settings. If this phenomenon occurs, check the touch keyboard settings by the following procedures.

1. Fit the cursor to the keyboard input area on GUI to display the touch keyboard.
2. Tap the button at the upper left of touch keyboard.
3. The menu shown below is displayed. Select the button marked with "◯".



4. After finishing the above-mentioned procedures, the touch keyboard is not overlapped with the screen.

SPECIFICATIONS & PERFORMANCE

Objective measurement		
Refraction measurement range	Spherical refractive power	-25D – +22D (*1, 2)
	Cylindrical refractive power	-10D – 0D (*1, 2)
	Cylinder axial angle	1° – 180°
Corneal curvature measurement range	Corneal curvature radius	5.00mm – 10.00mm
	Corneal refractive power	67.50D – 33.75D (Conversion value when the corneal refractive ratio is 1.3375)
	Corneal principal meridian direction	1° – 180°
Minimum measurement unit	Spherical/cylindrical refractive power	0.12D
	Cylinder axial angle	1°
	Corneal curvature radius	0.01mm
	Corneal refractive power	0.12D
	Corneal principal meridian direction	1°
Display of measured value	Displayed on the screen of the operation controller.	
Minimum measurable pupil diameter	ϕ2.0mm	
PD measurement range	50mm – 80mm	
Minimum PD measurement unit	0.5mm	
Subjective measurement		
Refraction measurement range	Spherical refractive power Cylindrical refractive power These must meet all the conditions mentioned at the right.(*5)	-18.00D ≤ Equivalent spherical power ≤ +18.00D (*3)
		-8.00D ≤ Cylindrical refractive power (Cylindrical power) ≤ 0.00D (*4)
	Cylinder axial angle	1° – 180°
	Horizontal prism (One eye movable range)	±15.0 Δ (*6)
	Vertical prism (One eye movable range)	±2.5 Δ
Minimum measurement unit	Spherical/ADD refractive power	0.25D
	Cylindrical refractive power	0.25D
	Cylinder axial angle	1°
	Prism refractive power	0.1 Δ
Test distance	Far-/Near-point test distance can be set between 25cm and 6.096m.	
Visual acuity measurement range (*7)	0.05 – 1.6	
Chart	Visual acuity test chart, spherical power correction test chart, astigmatism test chart and binocular function test chart	
Background luminance	155±15cd/m^2	
Display of measured value	Displayed on the screen of the operation controller.	
Record of measured value	Printing by thermal printer/external printer, data output	

Measuring head movement	Right-and-left direction	Inside 9mm to Outside 12.5mm
	Up-and-down direction	Down 15mm to Up 15mm
	Back-and-forth direction	Forward: 20mm - Backward: 20mm
Measuring head rotary angle	Convergence 17.5° to Divergence 8.5° (Eyeball torsion axis center)	

(*1) The dioptric powers are indicated with reference wavelength λ_d = 587.56 nm

(*2) Spherical refractive power + Cylindrical refractive power ≤ +22D or Spherical refractive power + Cylindrical refractive power ≥ -25D

(*3) The conversion value with "VD=12mm" is described here.

(*4) The conversion value with "VD=-3mm" is described here.

(*5) The value described here is the maximum value. The measurement range is smaller according to the test distance setting for executing a test or the setting conditions of VD during measurement.

(*6) The value described here is the maximum value. The measurable range is smaller according to the combination of the patient's PD and the test distance.

(*7) 0.1 – 1.6 complies with ISO 10938. ETDRS chart using Landolt Ring (visual acuity 0.25 – 1.6) complies with ANSI Z80.21.

Conformity standards

- ISO 10938:2016 Ophthalmic optics - Chart displays for visual acuity measurement - Printed, projected and electronic
- ISO 8596:2017+Amd.1 Ophthalmic optics - Visual acuity testing - Standard and clinical optotypes and their presentation Verification Result of Conformity
- ISO 10343:2014 Ophthalmic instruments - Ophthalmometers: Type B
- ISO 10342:2010 Ophthalmic instruments - Eye refractometers
- ANSI Z80.21:2010 for Ophthalmics - Instruments - General-Purpose Clinical Visual Acuity Charts

GENERAL INFORMATION ON USAGE AND MAINTENANCE

INTENDED PATIENT POPULATION

Patients undergoing examination with this instrument must be able to follow instructions including:

- Being able to position their face appropriately in the forehead rest.
- Keep the eye open as instructed by the examiner.
- Understand and follow instructions when undergoing examination.

INTENDED USER PROFILE

Ophthalmologists/optometrists/orthoptists/other certified health professionals

ENVIRONMENTAL CONDITIONS FOR USE

Temperature : 10°C - 35°C
Humidity : 30% - 90% (without dew condensation)
Pressure : 800hPa - 1060hPa

For the conditions about environment for use of the external input/output device and the adjustable instrument table exlusively for Chronos, follow the instructions in the user manual of each instrument.

STORAGE, USAGE PERIOD

1. Environmental conditions (without package)
   *Temperature : 10°C - 40°C
   Humidity : 10% - 95% (without dew condensation)
   Pressure : 700hPa - 1060hPa
   * THIS INSTRUMENT DOES NOT MEET THE TEMPERATURE REQUIREMENTS OF ISO 15004-1 FOR STORAGE. DO NOT STORE THIS INSTRUMENT IN CONDITIONS WHERE THE TEMPERATURE MAY RISE ABOVE 40°C OR FALL BELOW 10°C.
2. When storing the instrument, ensure that the following conditions are met:
   (1) The instrument must not be splashed with water.
   (2) Store the instrument away from environments where air pressure, temperature, humidity, ventilation, sunlight, dust, salty/sulfurous air, etc. could cause damage.
   (3) Do not store or transport the instrument on a slanted or uneven surface or in an area where it is subject to vibrations or instability.
   (4) Do not store the instrument where chemicals are stored or gas is generated.
3. Normal life span of the instrument:
   8 years from delivery providing regular maintenance is performed [TOPCON data]

For the conditions about the transportation and storage of the external input/output instrument and the adjustable instrument table exlusively for Chronos, follow the instructions in the user manual of each instrument.

ENVIRONMENTAL CONDITIONS FOR PACKAGING IN STORAGE

Temperature : -20°C - 50°C
Humidity : 10% - 95%
Pressure : 700hPa - 1060hPa

ENVIRONMENTAL CONDITIONS FOR PACKAGING IN TRANSPORTATION

Temperature : -40°C - 70°C
Humidity : 10% - 95%
Pressure : 700hPa - 1060hPa

ELECTRIC RATING

Source voltage : AC100-240V
Frequency : 50-60Hz
Power input : 160VA

DIMENSIONS AND WEIGHT

Main unit

Dimensions : 510 - 540mm (H) × 671 - 766mm (W) × 278 - 357mm (D)
Weight : 31.2kg

Power supply unit

Dimensions : 276mm (H) × 117mm (W) × 197mm (D)
Weight : 3.5kg

SYSTEM CLASSIFICATION

Types of protection against electric shocks: This instrument is classified as Class I equipment.

Class I equipment does not depend only on basic insulation for protection against electric shocks, but also provides a means of connection to a protective earth system of facilities so that metal parts that come into contact do not become conductive while the basic insulation is in failure.

Degree of protection against electric shocks: Type B applied part

Type B applied part is the applied part complying with the specified requirements of the Standard IEC 60601-1 to provide protection against electric shock, particularly regarding allowable LEAKAGE CURRENT.

Degree of protection against harmful ingress of water: IPX0

The Chronos has no protection against ingress of water. (The degree of protection against harmful ingress of water defined in IEC 60529 is IPX0.)

Classification according to the method(s) of sterilization or disinfection recommended by the manufacturer: not applicable.

The Chronos has no part to be sterilized or to be disinfected.

Classification according to the degree of safety of application in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide: Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

The Chronos should be used in environments where no flammable anesthetics and/or flammable gases are present.

Classification according to the mode of operation: Continuous operation.

Continuous operation is the operation under normal load for an unlimited period, without the specified limits of temperature being exceeded.

Class of Laser product: Class 1 Laser product according to IEC 60825-1:2014.

Class 1 equipment is a Laser product which is safe under the rationally predictable operation conditions, and keeps safety for human eyes even if any optical system (lens or telescope) is used as a condensing unit.

BASIC OPERATION PRINCIPLE

Refractometry:
The right and left measuring heads project the refraction measuring ring of the near infrared light to the patient's eye retina and the image reflected by the retina is received by the camera. Arithmetic processing is performed for the received image to measure the spherical vertex power (spherical power), the cylinder vertex power (cylindrical power) and the cylinder axis direction (cylinder axis angle) objectively.
Keratometry:
KERATO ring is projected to the cornea and the image reflected by the cornea surface is received by the camera. Arithmetic processing is performed for the received image to measure the corneal radius of curvature objectively and calculate the corneal principal meridian direction and the corneal refractive power.
Subjective refraction measurement:
The test chart in which the test distance has been optically corrected is presented on the electronic panel (LCOS) built in the measuring heads, the measuring lens is placed on the patient's eye visual field and then the subjective refraction test is performed according to the patient's response.
The type, power, etc. of the test chart and measuring lens are changed by the operation controller (general-purpose IT device).

CHECKPOINTS FOR MAINTENANCE

1. Periodically inspect the instrument and its parts.
2. Before using the instrument again after a long period of inactivity, make sure that it operates safely and normally.
3. Be careful not to stain the measuring window with fingerprints, dirt, etc., in order to perform correct measurement.
4. If the measuring window is soiled, clean it according to " CLEANING" on P.129.

DISPOSAL

When disposing of Chronos parts, follow the local regulations for disposal and recycling.

NOTE

This symbol is applicable for EU member countries only.
To avoid potential damage to the environment and possibly human health, this instrument should be disposed of (i) for EU member countries - in accordance with WEEE (Directive on Waste Electrical and Electronic Equipment), or (ii) for all other countries, in accordance with local disposal and recycling laws.

This Product Contains a coin cell.
You cannot replace batteries by yourself. When you need to replace and/or dispose batteries, contact your dealer or TOPCON listed on the back cover.

EU Battery Directive
This symbol is applicable for EU members states only.

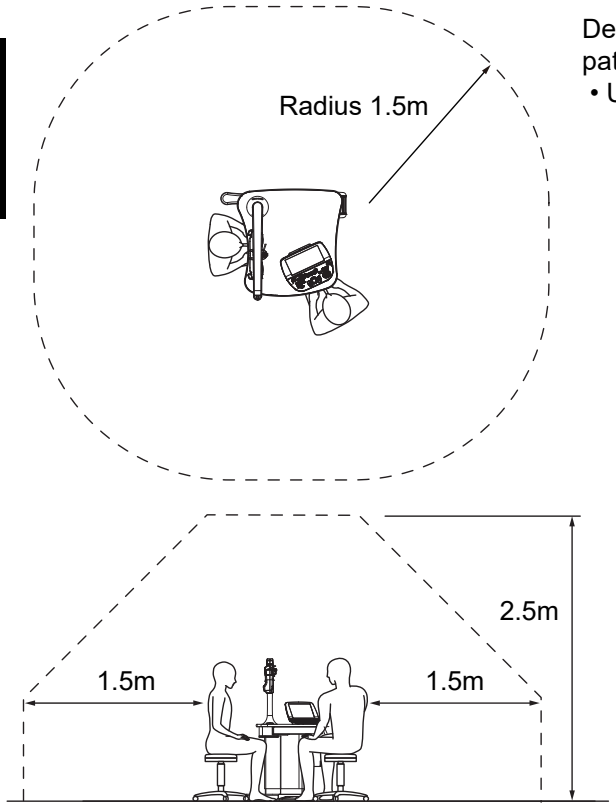
Battery users must not dispose of batteries as unsorted general waste, but treat properly.
If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration.
This will be indicated as follows:
Hg: mercury(0.0005%), Cd: cadmium(0.002%), Pb: lead(0.004%)
These ingredients may be seriously hazardous to human and the global environment.

This product contains a CR Lithium Battery which contains Perchlorate Material-special handling may apply.
See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/
Note: This is applicable to California,U.S.A.only

PATIENT'S ENVIRONMENT

When the patient or inspector may touch the devices (including the connecting devices) or when the patient or inspector may touch the person that comes into contact with the devices (including the connecting devices), the patient's environment is shown below.
In the patient's environment, use the device conforming to IEC 60601-1. If you are compelled to use any device not conforming to IEC 60601-1, use an insulation transformer or the common protective earth system.

Do not use the power strip in the patient's environment. Connect the power supply of the device to the commercial power supply.



Device applicable to the use in patient's environment
• USB-LAN conversion adapter

⚠WARNING	• Connect only items that have been specified as part of the ME system or that have been specified as being compatible with the ME system. • Don't connect an additional power strip or an extension cord to the system.

⚠CAUTION	• Don't connect any device which is not recognized as one component of the system. • The personal computer, the Wi-Fi router and the operation controller must be installed out of the patient's environment.

ELECTROMAGNETIC COMPATIBILITY

This product conforms to the EMC Standard IEC 60601-1-2:2014+AMD1:2020 (Ed.4.1).

The electromagnetic environment assumed for the whole life cycle is home medical treatment environment.

If there is electromagnetic jamming that is higher than IEC 60601-1 test level, the following troubles may occur as loss/deterioration of basic performance caused by electromagnetic jamming:

- Measured value reliability is lowered or measurement cannot be performed;
- Alignment is not correctly completed;
- The values in the output data are not correct;
- Patient ID is not correctly displayed.

a) MEDICAL ELECTRICAL EQUIPMENT needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the ACCOMPANYING DOCUMENTS.
b) Portable and mobile RF communications equipment can affect MEDICAL ELECTRICAL EQUIPMENT.
c) The use of ACCESSORIES, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the EQUIPMENT or SYSTEM as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the EQUIPMENT or SYSTEM.
d) The EQUIPMENT or SYSTEM should not be used adjacent to or stacked with other equipment.
   If adjacent or stacked use is necessary, the EQUIPMENT or SYSTEM should be observed to verify normal operation in the configuration in which it will be used.
e) The use of the ACCESSORY, transducer or cable with EQUIPMENT and SYSTEMS other than those specified may result in increased EMISSION or decreased IMMUNITY of the EQUIPMENT or SYSTEM.
f) Do not use the devices generating electromagnetic waves within 30cm from all the parts of the instrument and system. Those devices may have influence on this instrument.

Item	Length (m)	Shielded	Ferrite Core
AC input power cord (100V)	1.5	No	No
AC input power cord (200V)	3.0	No	No
Power cord	1.9	No	No
LAN cable	3.0	Yes	No
LAN cable	3.0	Yes	No
PE cable	0.85	No	No
LAN cable	3.0	Yes	Yes
USB-LAN conversion adapter	-	-	-
Personal Computer	-	-	-
Wi-Fi	-	-	-
AC Adapter	-	-	-

Guidance and manufacturer's declaration - electromagnetic emissions		
The Chronos is intended for use in the electromagnetic environment specified below. The customer or the user of the Chronos should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The Chronos uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Chronos is suitable for use in all establishments excluding domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration - electromagnetic immunity			
The Chronos is intended for use in the electromagnetic environment specified below. The customer or the user of the Chronos should assure that it is used in such an environment.			
Immunity test	**Test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±15 kV air	±8 kV contact ±15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines Cyclic frequency 100kHz	±2 kV for power supply lines ±1 kV for input/output lines Cyclic frequency 100kHz	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line(s) to line(s) ±2 kV line(s) to earth	±1 kV line(s) to line(s) ±2kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% U_T for 0.5 cycle (with phase angle 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°) 0% U_T for 1 cycle 0° 70% U_T for 25/30 cycles 0° 0% U_T for 250/300 cycles	0% U_T for 0.5 cycle (with phase angle 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°) 0% U_T for 1 cycle 0° 70% U_T for 25/30 cycles 0° 0% U_T for 250/300 cycles	Mains power quality should be that of a typical commercial or hospital environment. If the user or the Chronos requires continued operation during power mains interruptions, it is recommended that the Chronos be powered from an uninterruptible power supply or battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration - electromagnetic immunity			
The Chronos is intended for use in the electromagnetic environment specified below. The customer or the user of the Chronos should assure that it is used in such an environment.			
Immunity test	**Test level**	**Compliance level**	**Electromagnetic environment-guidance**
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150kHz to 80MHz 6Vrms Within ISM band and amateur radio band of 150kHz to 80MHz 10V/m 80MHz to 2.7GHz Proximity electromagnetic field from radio communication equipment [a)]	3 Vrms 150kHz to 80MHz 6Vrms Within ISM band and amateur radio band of 150kHz to 80MHz 10V/m 80MHz to 2.7GHz Proximity electromagnetic field from radio communication equipment [a)]	Portable and mobile RF communications equipment should be used no closer to any part of the Chronos, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = \frac{6}{E}\sqrt{P}$ In the above equation, P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, d is the recommended separation distance in meters (m), and E is the radiation electromagnetic site level in volt/meters (V/m).
Proximity magnetic fields IEC61000-4-39	30kHz, CW 8A/m 134.2kHz, PM2.1kHz 65A/m 13.56MHz, PM50kHz 7.5A/m	30kHz, CW 8A/m 134.2kHz, PM2.1kHz 65A/m 13.56MHz, PM50kHz 7.5A/m	The exterior surface of the Chronos should be kept at least 0.15m from RF emitters such as RFID readers.
NOTE 1 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

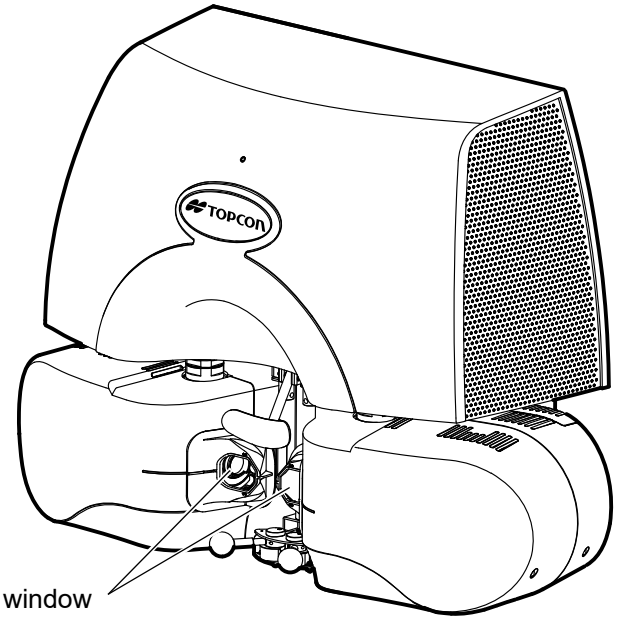
[a] The proximity electromagnetic site of radio communications equipment is shown in the table below.

Test frequency [MHz]	Band [MHz]	Equipment	Modulation	Maximum output (W)	Distance (m)	Immunity test value [V/m]
385	380-390	TETRA 400	Pulse modulation 18Hz	1.8	0.3	27
450	430-470	GMRS 460 FRS 460	FM ±5kHz 1kHz sine	2	0.3	28
710 745 780	704-787	LTE Band 13, 17	Pulse modulation 217Hz	0.2	0.3	9
810 870 930	800-960	GSM 800/900 TETRA 800 iDEN820 CDMA850 LTE Band 5	Pulse modulation 18Hz	2	0.3	28
1720 1845 1970	1700-1990	GSM 1800 CDMA1900 GSM 1900 DECT LTE Band 1,3,4,25 UMTS	Pulse modulation 217Hz	2	0.3	28
2450	2400-2570	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band7	Pulse modulation 217Hz	2	0.3	28
5240 5500 5785	5100-5800	WLAN 802.11 a/n	Pulse modulation 217Hz	0.2	0.3	9

SAFETY OF LASER PRODUCTS

SLD products	**SLD for refractometry**			
	LED emitting port	$0.031cm^2$		
	Output	$5161\mu W/cm^2$		
	Wavelength (Centroid)	875nm		
	Beam divergence (2θ)	5.64deg (0.098rad)		
	Laser type	CW		
		Pulse	Light emitting time	1768 ms
			Frequency	10 kHz
			Pulse width	6.25 µs - 0.1 ms
SLD light source	**SLD for refractometry**			
	Class of laser products	Class 3B		
	Output	14.6mW (CW)		
	Wavelength (Centroid)	875nm		
	Beam divergence (2θ)	H:11deg (0.19rad) V:36deg (0.63rad)		

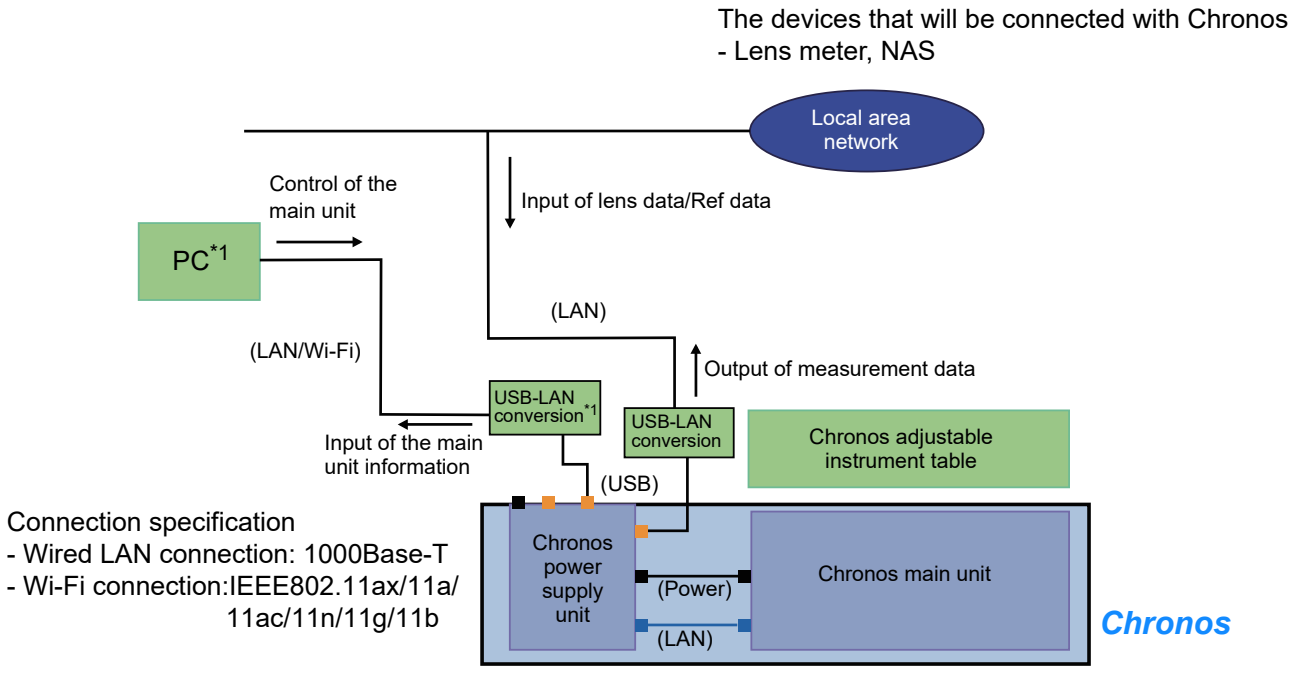
* LED light and laser beam are emitted from the measuring window.



Measuring window

IT NETWORK ENVIRONMENT

- Chronos can be connected with a lens meter and NAS in order to be connected with an external personal computer (PC), input the lens data, Ref data and other data, and output the measurement data by operating the main unit.
- Refer to the Fig. A below for the characteristics, configuration, technical specification, intended information flow and route when connected with an IT network. For remote operation, refer to the Fig. B below.
- When connected with an IT network, ensure the appropriate and sufficient security to prevent the infection with a computer virus, the leak of information, etc.
- When any failure occurs in IT systems, some troubles may be caused by it. For example, the input data/output data cannot be sent/received to/from the devices connected with network, or the operator cannot operate the main unit.
- When connected with an IT network with which a device other than Chronos is connected, the patient, the operator or the third party may suffer unexpected and unacceptable risks. Before using Chronos, it is recommended to identify, analyze, evaluate and manage these risks.
- When the IT network has been changed after the connection, a new risk may occur. So an additional analysis is necessary.
- The change of IT network includes the following items:
  - Change in the IT network configuration;
  - Connection of additional items to IT network;
  - Removal of items from IT network;
  - Update of the device connected with IT network;
  - Upgrade of the device connected with IT network.



*1: Main connection should be done by "PC with the specified specification + USB-LAN conversion adapter". As an auxiliary method, it is also allowed to connect by "a commercial tablet computer + Wi-Fi router".

Fig. A: Configuration of a typical IT network connection

For remote operation

- Remote operation means that the operator operates Chronos from a location remote from the Chronos main unit and the patient.
- Refer to Figure B below for characteristics, configuration, technical specifications, intended information flow and route when connected with IT network.

Preparation for remote operation

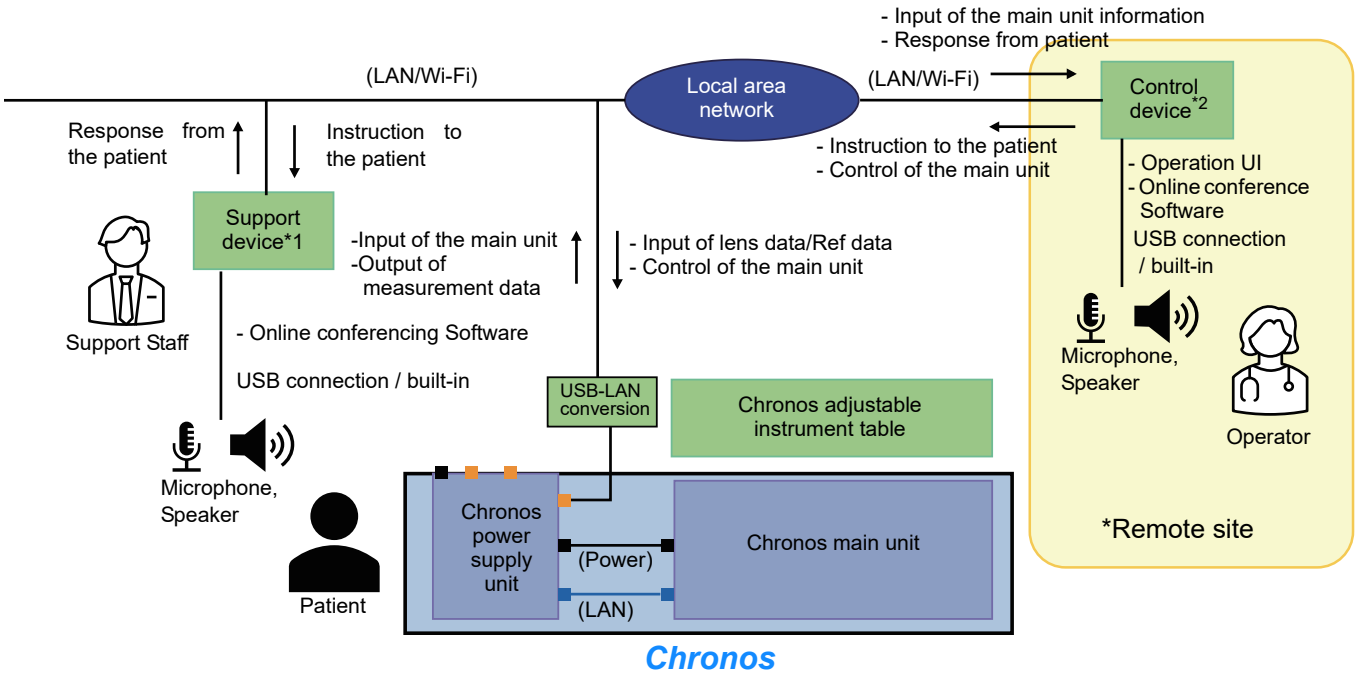
- Place the support staff member near the patient to support the inspection.
- Prepare the support device for voice communication between the support staff member and the operator.
- Install the online conferencing software for voice communication during the inspection on the operating device used by the operator and the support device used by the support staff member.

Operation Flow

1) Support staff member should connect their support device to the facility network and launch the online conferencing software.
2) The examiner should connect the control device to the facility network and launch the operating software and online conference software.
3) Before the inspection, make sure that the operator, support staff member, and the patient can communicate via voice through the online conferencing software.
4) The operator should start the inspection after confirming that the patient and the support staff member are near the main unit.
5) The support staff member should monitor the patient and the main unit during the inspection so that the patient can perform the inspection properly.

Cautions for remote operation

- When connecting to an IT network, check the precautions described on the previous page.
- When the operator uses Chronos from outside the facility, the control device should be connected to the facility network via VPN or other means to ensure security.
- The operator should be aware of his/her surroundings to prevent a third party from viewing the screen of the operating device.
- If voice communication cannot be established due to communication failure, etc., wait until communication is restored or interrupt the inspection.
- Support staff member should always stay close by the patient and the main unit so that the operator can give appropriate instructions to the patient and support staff member can directly check the condition of the patient and the main unit.
- The location of the main unit, the operator, and the data storage device should be in the same country or in a region where the same laws and regulations apply.



*1, *2: The connection should be PC or tablet with specified specifications, it is also allowed to connect by Wi-Fi.

Fig. B: Configuration of IT network connection for remote control

SPECIFICATIONS OF THE CONNECTED DEVICES

The specifications and performance of the devices that should be connected to Chronos are shown below.

- Operation controller and Wi-Fi router

  These devices must conform to EMC standard (CISPR 22/CISPR 24, CISPR 32/CISPR 35 or VCCI; Emission standard: Class B).

Specifications of PC/tablet to be used as the operation controller				
OS	Surface Go2	iPad Air (Third generation)	iPad (9th generation)	iPad Pro (6th generation)
	Windows 10	iPad OS 13	iPadOS 15	iPadOS 16
Screen size	10.5 inches	10.5 inches	10.2 inches	12.9 inches
Resolution/aspect ratio (*1)	1,920×1,280 / 3:2	2,224×1,668 / 4:3	2,160×1,620 / 4:3	2,732×2,048 / 4:3
Wireless communication standard	IEEE802.11 (When the wireless system is built in)			
Browser software	Google Chrome (Ver: 100.0.4896.85 or later) * If you use others except the above-mentioned version, the screen layout may be sharply destroyed.			
Others	IEC IEC 62368-1 (CE marking) SightPilot is only operable in portrait mode.			

(*1) If you use others except the above-mentioned resolution, the screen layout may be sharply destroyed.

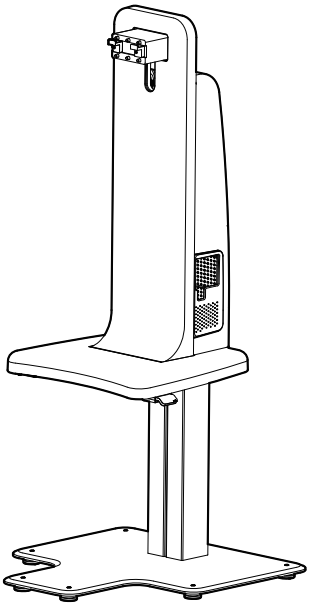
Specifications of Wi-Fi router	
Wireless communication standard	IEEE802.11 (*2)
Others	IEC 62368-1 (CE marking)

(*2) The standard must be fit to the tablet that is to be connected to Chronos.
Unless the standard is fit to the tablet, wireless connection cannot be executed.

- Adjustable instrument table exclusively for Chronos (CGS-1000)

  By using this table, you can change the instrument height freely. So you can perform measurement easily.

  Specifications
  - Size ..... 686 (W) × 711 (D) × MIN:1510/MAX:1845 (H) mm
  - Weight 75kg
  - Power supply voltage .... AC100 - 240V
  - Frequency ..... 50 - 60Hz
  - Power supply input..... 430VA



NOTE	When you want to ask a question/make inquiries about the adjustable instrument table or when you request for repair or any other service about it, contact the dealer whom you purchased the product or the offices described on the back cover.

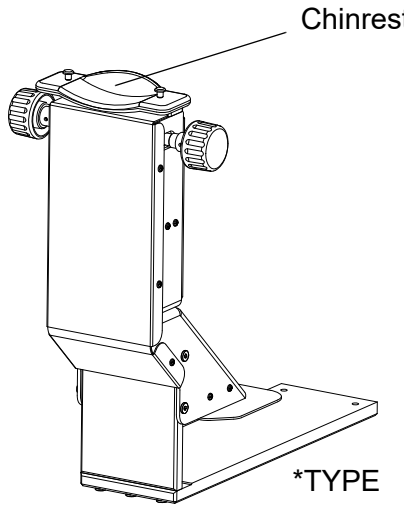
OPTIONAL ACCESSORIES

Chinrest CRX-1000

FEATURES

This device is an optional accessory of Chronos.

This device is intended to be used to adjust the position of patient's head.



*TYPE B APPLIED

- For the details on how to use, refer to the instruction manual of CRX-1000.
- Please ask your local dealer or TOPCON subsidiary office (see the back cover).

REFERENCE DATA

ABOUT THE BARCODE AND THE QR CODE OF THE BACK COVER

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APPENDIX

Use of SightPilot™

GENERAL INFORMATION

SightPilot™ is a smart refraction software integrated to hardware Chronos. The software offers a pre-programmed procedure for determining subjective refraction. The fully delegated algorithm chooses the best lens options for the customer based on a standard refraction process.

GENERAL SAFETY INFORMATION

See Chronos User Manual pages 8-10.

COMPATIBLE DEVICES AND SUPPORTED WEB BROWSERS

Refer to " SPECIFICATIONS OF THE CONNECTED DEVICES" on P.192.

LAUNCHING THE SOFTWARE

SightPilot has been installed to Chronos in advance. It can be launched by adding the URL to the web browser's address bar.
The default URL is:

http://10.1.2.3/sgui.

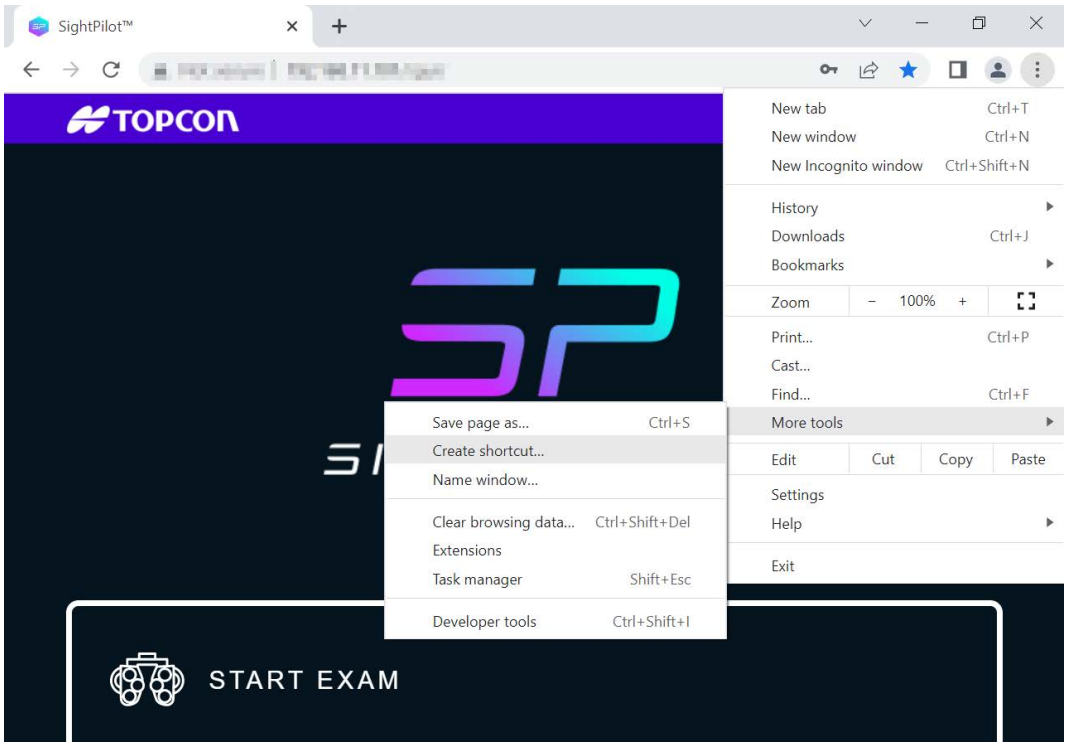
The URL can be modified upon the user's request. In that case, see page 166.
URL can be saved as a shortcut to the home screen/desktop for quick access in the future (instructions below.)

Creating a shortcut with Chrome (Windows/iOS)

When application is launched and initial view is displayed, open the Chrome menu in the upper right corner

1. Select "More tools", "Add to desktop", "Create shortcut", or "Create application shortcuts" depending on the operating system.

Select "Create shortcut..." and follow further instructions.



TERMS AND ABBREVIATIONS

Special terms and abbreviations used in this manual are described below.

Table 1 Terms

Item	Description
Binocular	Vision test performed for both eyes
Guest/Guest mode	User profile used in SightPilot to enable access to the software without the need to create a personal user account and to log in with credentials.
Monocular	Vision test performed for either right or left eye separately
Objective refraction	The automatic measurement to determine the refractive error of the eyes. Objective refraction does not require responses from a customer.
SightPilot Refraction	A term for subjective refraction used in SightPilot user interface A result of subjective refraction when a vision test is performed using SightPilot.
Spherical equivalent (SFE)	Calculated average value of refractive error. (Spherical power combined with ½ of cylindrical power) This value is calculated from autorefraction results and the calculated value determines which visual acuity chart is used in test part "Visual acuity with unaided".
Subjective refraction	The defined refractive error of the eyes based on the customer's pre- fer- ences. Subjective refraction is performed in interaction with a customer. Used as a basis for the prescription of vision correction.
Unaided correction	Vision correction with 0.00 D powers i.e., customer does not have spectacles for far correction.
Visual Acuity (VA)	A measure to describe the ability of the eye to distinguish details in a certain distance

SYSTEM DIAGRAM

Chart 1. Communication and environment of the SightPilot

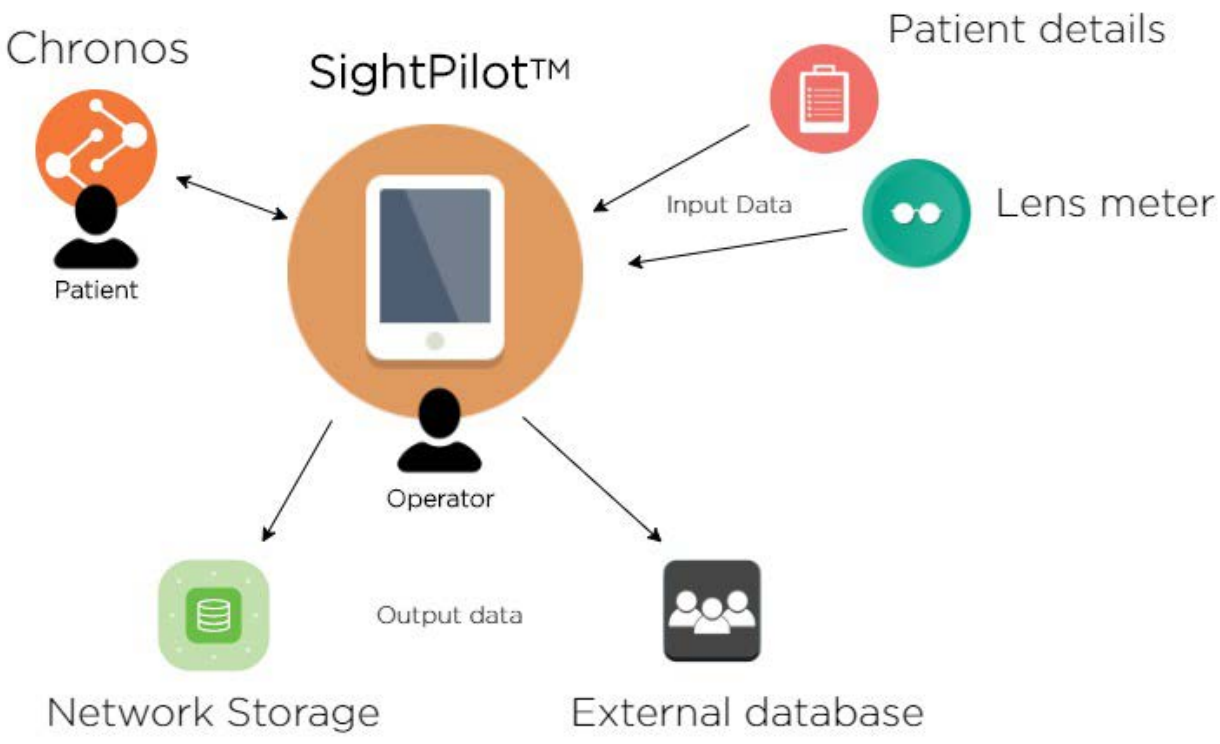
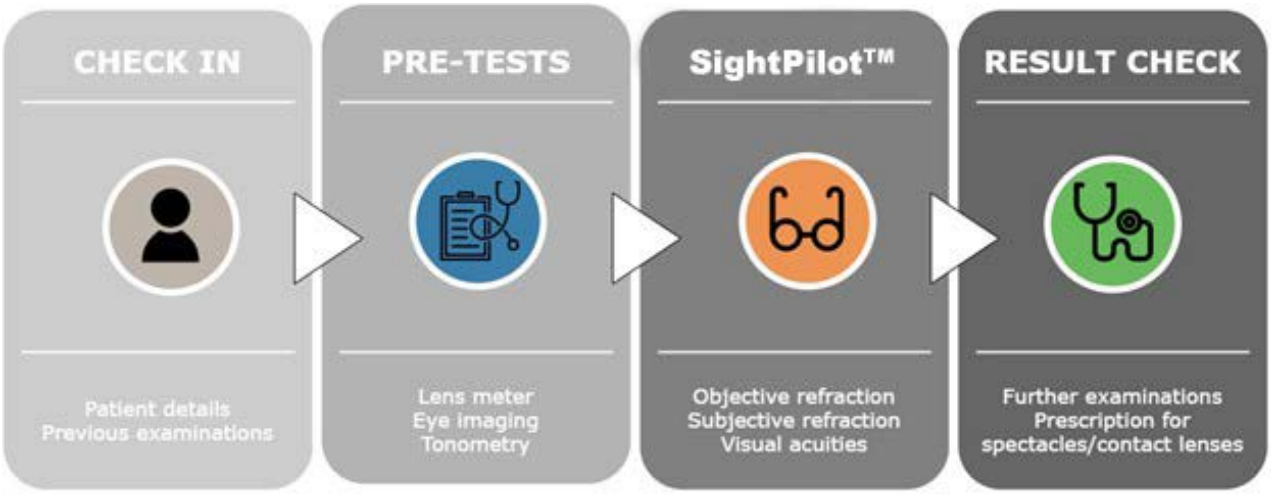


Chart 2. Intended workflow with SightPilot



OBSERVATIONS

The software can only handle one tablet or PC usage at a time

If several devices are connected to same Chronos device, the exam might fail at some point. Same happens if several browser windows are open. Check always that you have only one browser window open when connecting to Chronos.

Test time and date in print report

Test time and date are set according to Chronos settings. Chronos is needed to set local time during the initial assembly in order to have time correctly displayed in the print report file of SightPilot.

Customer identification and merging with existing data

SightPilot can be connected to external databases like electronic health records or practice management systems by XML files. To identify the customer data, customer ID is possible to enter to the software in the customer details step. Any series of numbers or text can be used.

- Examples: birth date, work number, time, etc.

NOTE	• It is not recommended to use social security number as customer ID. • If multibyte characters are used in customer ID, make sure that the language selected in Settings supports multibyte characters (Japanese, Korean, Simplified Chinese, Traditional Chinese).

Saving the examination data

Examination data is not saved automatically when using SightPilot. Therefore, examination data needs to be forwarded or written down for recording data to the external database. By pressing "Export" in the result step, the examination data can be exported to the pre-defined export path (Export results path from the Settings) and imported there to other software. The outcome of objective refraction will be automatically exported to a pre-defined location (Autorefraction path) as an XML file.

Returning to the previous test part

Returning to the previous test part is possible by pressing the "Back" button in the bottom left corner of the screen. Returning to the previous step cancels all the answers and changes that have been done in that test part. Therefore, the test part which returning to has to be performed again from the start. Returning is recommended to use only in cases when the test has proceeded accidentally for example due to unintentional press of some button.

Changing details during the test

During the exam, manually input customer details or other input data, such as previous spectacles, cannot be changed. “Back” button allows returning to the previous step, but the possible changes to refraction values are not saved. When moving back to previous test part, each test part must be performed again from the start.

Deleting examination items

Pressing Finish Exam button will clear all data in Result step. Deleted examination items cannot be sent forward after finishing the test. The caution message will alert if the exam is tried to finish without exporting the results forward.

Customer feels discomfort in vision or double vision

If the customer feels any discomfort in vision or double vision during the test, stop the test, and ask the customer to move off from the device. A subjective refraction test can be interrupted during the "Subjective refraction" part by skipping to results or by pressing Quit. At Result step, exam data can be exported or printed out. If the examination data is forwarded to an eye care specialist, inform the receiver that the exam has been aborted because of discomfort in vision or double vision.

Aborting the test

The algorithm of the subjective refraction test is programmed to abort the test when the customer is considered unsuitable for testing with SightPilot. The test will abort when

- Sphere value changes ± 2.00 D from initial value in Red-Green comparison
- Cylinder power value changes ± 2.00 D from initial value in Cylinder Power Adjustment
- Cylinder axis changes 80 degrees (cyl power <1.00D) or 20 degrees (cyl power =>1.00D)

Screening, Red-Green Comparison and Cylinder adjustment tests include the aborting if the visual acuity is too low or values change too much from initial objective measurement values.

The test aborts in objective refraction if:

- The customer has over 2.00D difference (anisometropia) between sphere values of the eyes
- The cylinder value of another eye is 4.00D or more
- Sphere value is 18.00D or over.

Note that the test abort criteria can be modified from the settings (For details,refer to "SETTINGS" on page 208).

When the test is aborted, the user gets notification stating that the customer is unsuitable for the SightPilot Refraction and the customer needs to be guided to eye care specialist. The phase where the test was aborted is shown in the "Results".

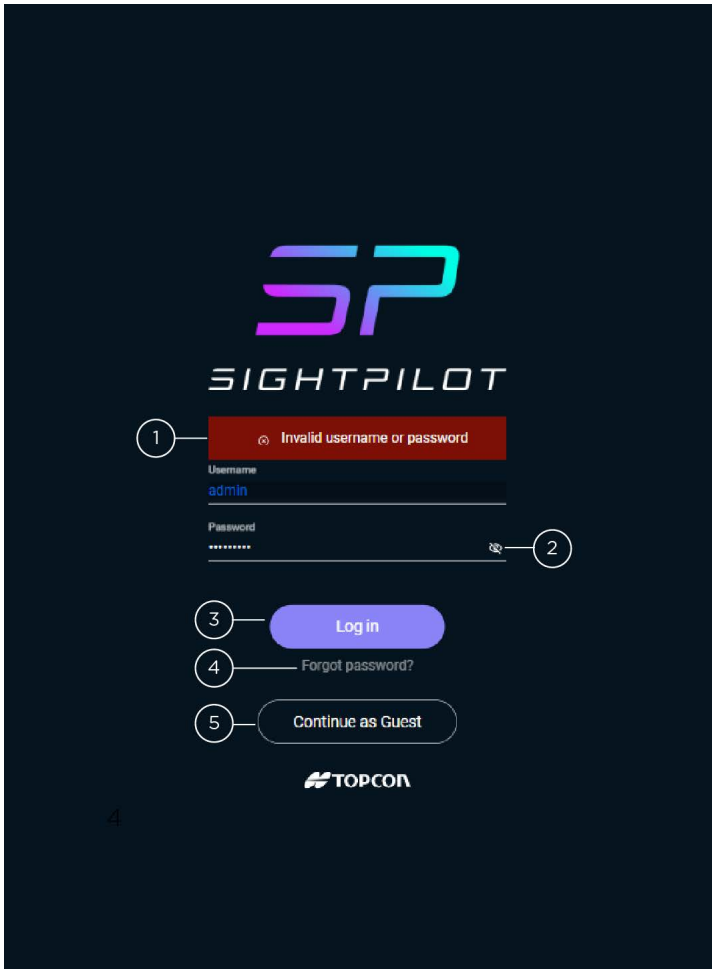
BASIC OPERATIONS

PREPARATIONS

1. Ensure that Chronos has been turned on (see PREPARATION BEFORE MEASUREMENT on page 45).
2. Launch SightPilot by entering the address to the browser's address bar or open the software via shortcut.

LOGGING TO THE SOFTWARE

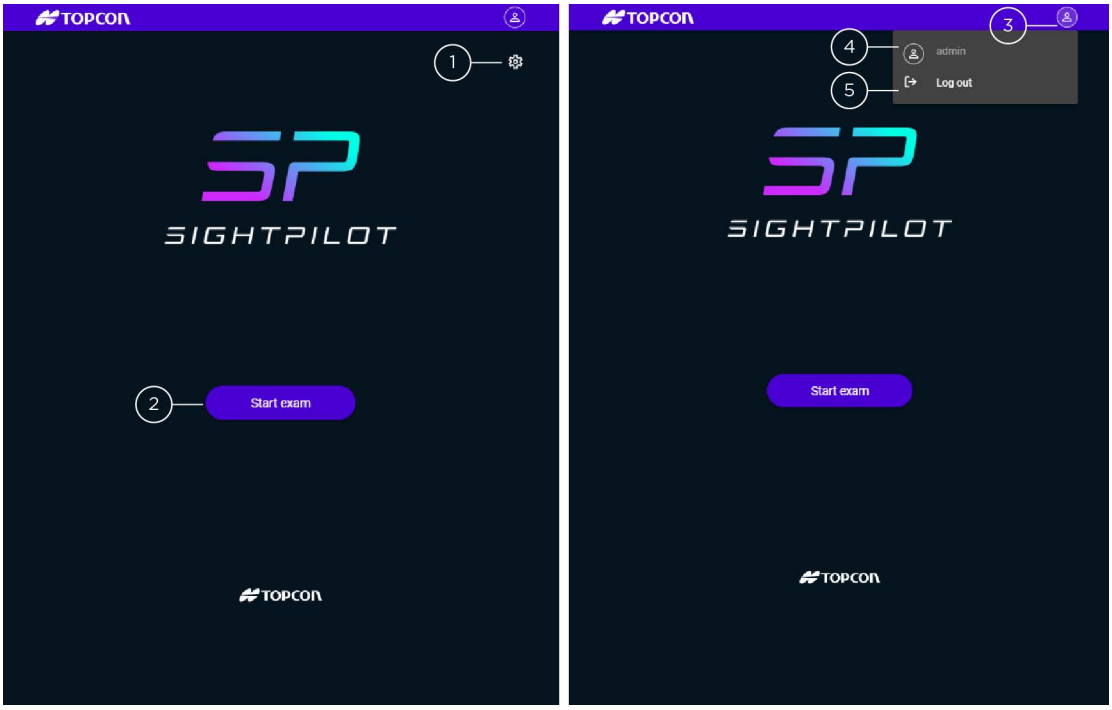
To login to SightPilot, enter username and password. For further information of User Management, see page 164.



1. Software will notify when username or password is incorrect. Credentials are verified through standard GUI's user management module.
2. Password can be shown/hidden with the icon.
3. After entering credentials, continue by logging in to the system.
4. Forgot password? will guide to contact support service.
5. Continue as Guest button enables logging in to SightPilot without the need to provide any credentials. Note, that Guest user has limited access to User settings, and Customer Details view is limited to customer ID and Year of birth (For details,refer to "SETTINGS" on page 208).

NOTE	The software will be logged out automatically after 30 minutes and the test will return to the login page. The exam data of the unfinished test won't be saved.

START PAGE



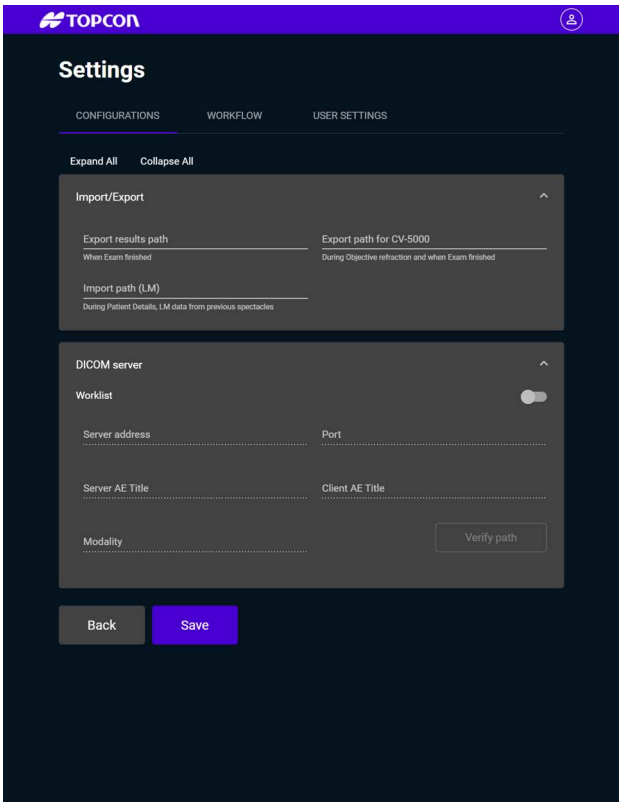
1. By clicking this icon, Settings view is opened and there's possibility to view and modify the settings.
2. Starts the examination and continues to next step.
3. Clicking the icon opens a drop-down menu to access user information and log out function.
4. Information on user name.
5. It is possible to log out of the system at any step of the test. After pressing the Log out icon, the system warns against the possibility of losing data from the current examination.

SETTINGS

Settings are divided into three sections: Configurations, Workflow and User Settings. The Settings view is different depending on the user credentials: Configuration and Workflow settings are visible only for admin users, who can view and modify these settings.

Expand all shows all the settings options that are related to every section. Collapse all gathers the settings into categories without showing the detailed setting options.

CONFIGURATIONS



Item	Action
Import/Export	
Export results path	The selected path will define the location where to export the results when the examination is finished. The path can be local or shared folder. If any specific path is not entered, the default folder is **D:\Chronos\sgui\subjective**

<table>
<tr><td>Export path for CV-5000</td><td>The path is selected to export the results to CV-5000. The results of objective measurement are exported automatically after the measurement is completed. The results of subjective refraction will be exported to CV-5000 by pressing Export in the Results step.

The path can be local or shared folder. If any specific path is not entered the default is

D:\Chronos\sgui\autorefraction\

<table><tr><td>NOTE</td><td>• If SightPilot is not used in Guest mode, the software will be logged out automatically after 30 minutes. The exam data of the unfinished test won’t be saved.</td></tr></table></td></tr>
<tr><td>Import path (LM)</td><td>Defines import path for lens meter data. The path can be a local D-drive path or shared folder. If any specific path is not entered, the default path is

D:\Chronos\sgui\lensmeter\

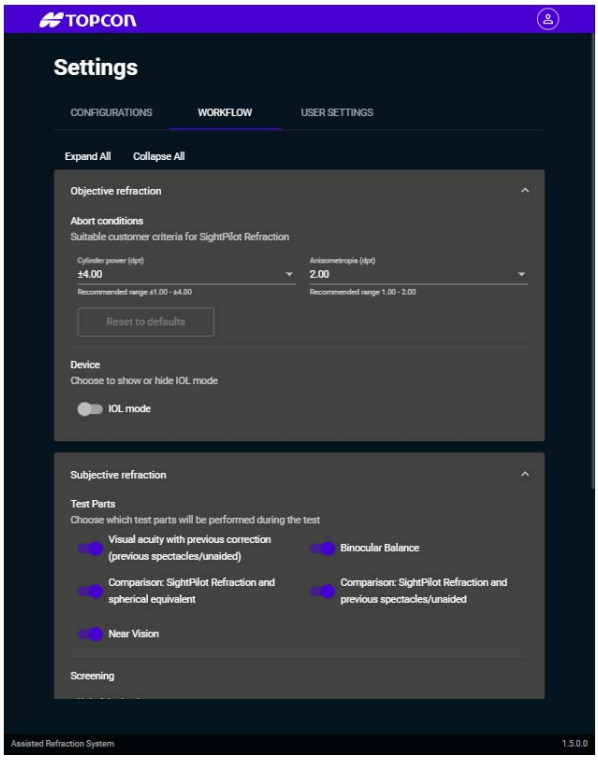
When the shared folder is starting with two backslashes is entered, the Username and Password fields emerge for user authentication.

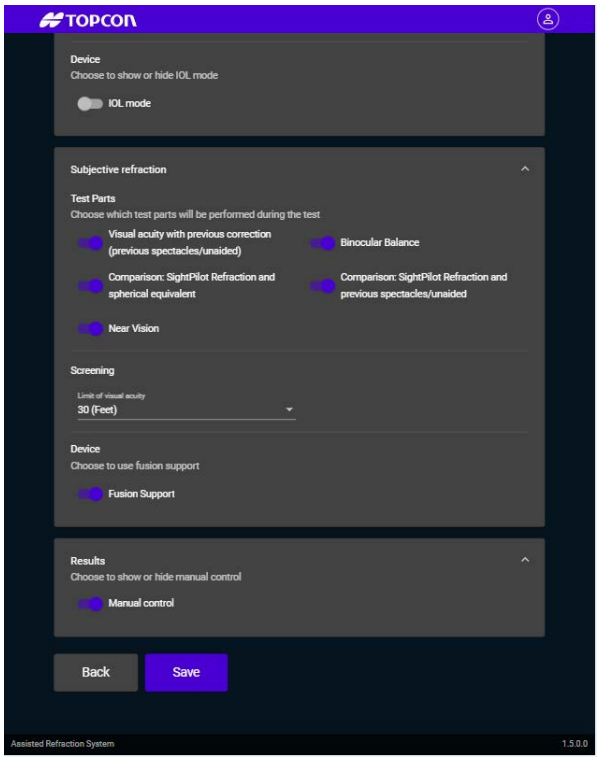
Lens meter data is imported from this path when "Yes, import from the lens meter" is selected in the Previous spectacles step.</td></tr>
<tr><td colspan="2">DICOM Server</td></tr>
<tr><td>Worklist</td><td>Customer information from external EMR/HER is possible to import via DICOM worklist. The worklist can be enabled/disabled via toggle button. Blue color in toggle button indicates that the worklist is in use. When enabled, DICOM worklist is displayed before Customer details step. It is mandatory to use birth year in Customer Details when DICOM Worklist is in use.

When the worklist is disabled, the worklist view is not displayed in the exam flow.

• DICOM worklist settings are managed by Support Service. To have more details in DICOM Server, see Support Manual of SightPilot.</td></tr>
</table>

WORKFLOW

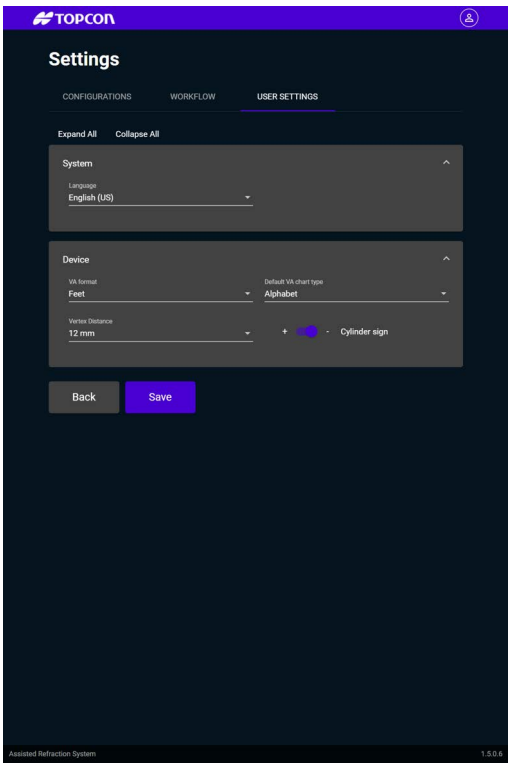


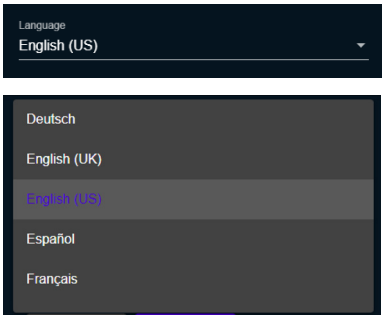


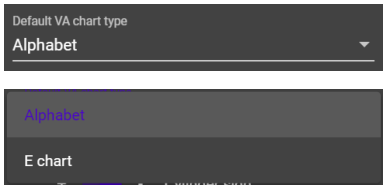
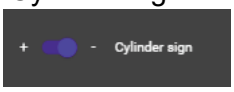
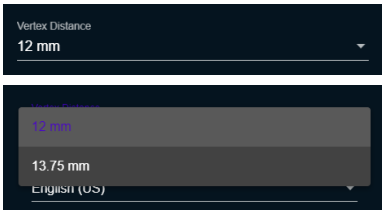
Item	Action
Objective Refraction	
Abort conditions	Abort conditions define suitable customer criteria for SightPilot refraction. Criteria can be modified according to cylinder power and anisometropia in 0.50 D accuracy. • Available range in cylinder power is ± 8.00 D • There is no limit in anisometropia: If selected values are out of recommended range, the information of recommended range will be highlighted in orange color. Reset to defaults button will set both values to recommended range (cyl power ± 4.00 D and anisometropia 2.00 D)
Device	
IOL mode	Sets visibility of IOL mode button in Objective Refraction Can be set on/off

Subjective refraction	
	Test parts that are included in this section are optional and can be enabled/disabled through the settings. Optional test parts are • Visual acuity with previous correction (previous spectacles/unaided) • Near Vision • Comparison: SightPilot Refraction and previpus spectacles/unaided • Binocular Balance • Comparison: SightPilot Refraction and spherical equivalent
Screening	
Limit of visual acuity	A drop-down menu displays a list of Limit of visual acuity for screening test. The available visual acuity values change depending on the visual acuity units. feet • 30(feet) • 40(feet) • 50(feet) Meters（6m） • 9(Meters(6m)) • 12(Meters(6m)) • 15(Meters(6m)) Decimal • 0.6(Decimal) • 0.5(Decimal) • 0.4(Decimal)
Device Setting	
Fusion Support	This toggle switch allows you to enable/disable the gradual change in testing distance from far-point test to near-near-point test.
Results	
Manual control	Manual control button can be enabled/disabled from the Results screen via this option

USER SETTINGS

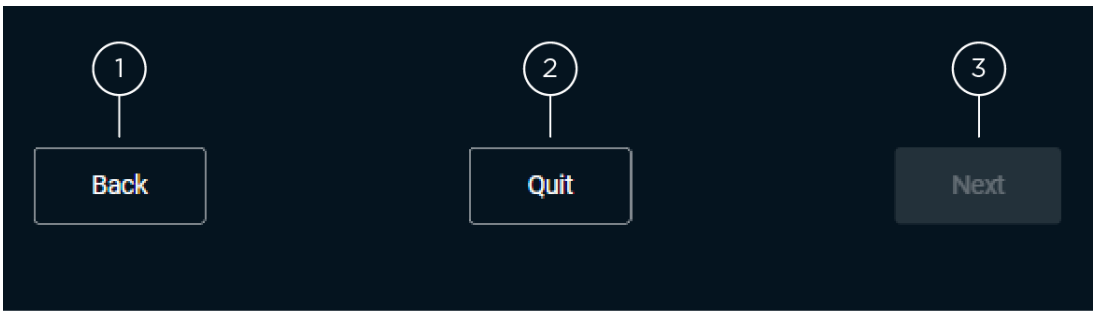


Item	Action
System	
Language 	All available languages can be seen from drop-down menu: Chinese Simplified (汉语) Chinese Traditional (漢語) Czezh (Čeština) Danish (Dansk) Dutch (Nederlands) English (UK) English (US) Finnish (Suomi) French (Français) German (Deutsch) Italian (Italiano) Japanese (日本語) Korean (한국어) Latvian (Lettish) Lithuanian (Lietuvių) Norwegian (Norsk) Polish (Polski) Spanish (Español) Swedish (Svenska)

Device	
Unit of visual acuity 	The available units of visual acuity are displayed in a drop-down menu. The units that can be selected are as follows: • Feet • Meters (6m) • Decimal Selecting a visual acuity unit will change the appearance of the available default VA chart types according to the unit selected.
Default VA chart types 	The available default VA chart types are displayed in the drop-down menu. The VA chart types can be selected are as follows: • Alphabet • E Chart • Landolt Ring When you select Feet or Meters (6m) as a visual acuity unit, Alphabet and E Chart are displayed, and when you select Decimal, Alphabet and Landolt Ring are displayed.
Cylinder Sign 	Cylinder sign for refractive values (+/-) can be switched to plus or minus. The refractive values are presented in positive or negative format as selected. The cylinder power is shown in the Refractive data display and in Results step.
Vertex Distance 	Available values for vertex distance are shown from the drop-down menu (12mm/13.75mm). Selected vertex distance is used during the autorefraction measurement and in the subjective refraction test. Value is included in the print report and export files.

NOTE	• C-drive file system will be reset to its original state after each reboot. • Not saved data will be cleared.

NAVIGATING BETWEEN TEST PARTS

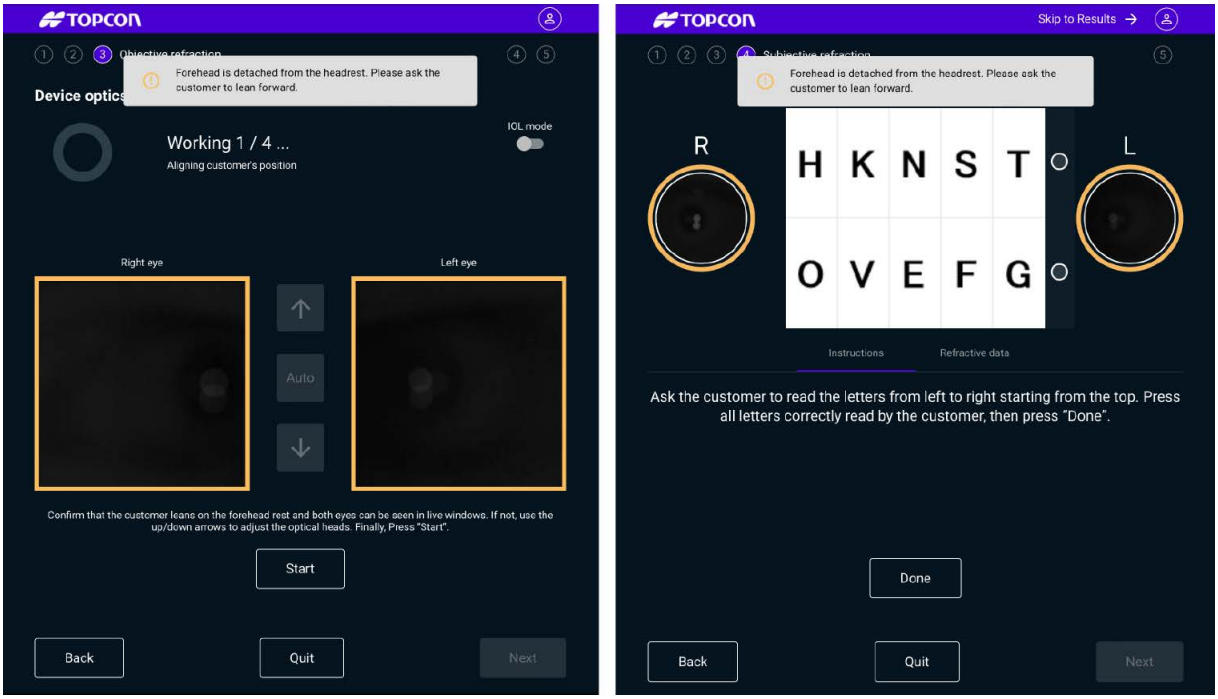


1. “Back” returns to the previous step. Returning to the previous step by pressing Back cancels the changes that have been done in that step. Therefore, the step must be re-performed in order to gain reliable test results.
   Going back to the beginning of the previous step is recommended only in the cases when some button has been pressed unintentionally or the answer has been recorded wrong.
2. It is possible to quit the test at any part or step of the test. After pressing “Quit”, there will be a pop-up message shown asking to confirm quitting the test.
3. “Next” will be enabled when the required data has been entered or required action has been performed. Pressing Next continues the test forward.

ERROR NOTIFICATIONS DURING THE TEST

Headrest detachment

If the customer’s forehead is detached from the forehead rest of Chronos at any stage of the test, there will be a notification shown, and the frames around live camera windows will turn yellow.

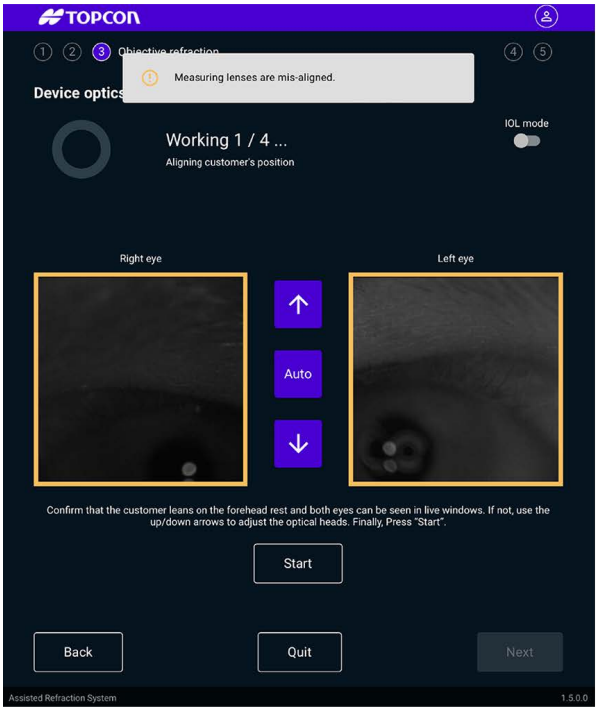


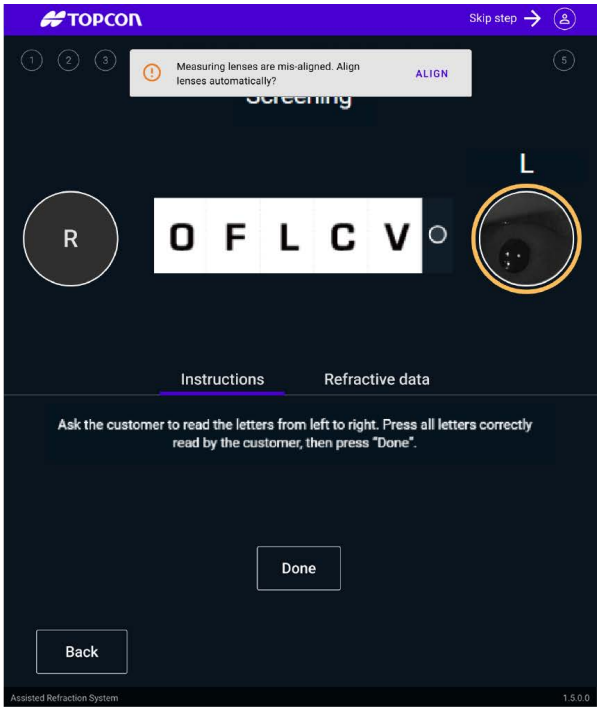
If the error message is shown, advise the customer to lean forward and press their head against the forehead rest of Chronos.
Note that after 30 seconds the notification appeared for the first time, the notification will be shown again if there is still a need to correct the customer’s position.

After the customer’s position has been corrected accordingly, the frames around the live camera windows will turn blue.

Mis-alignment of measuring lenses

The software will notify if the customer's eyes are mis-aligned with the measuring lenses. In this case, the frames around the view of the camera will turn yellow and a notification will be shown.





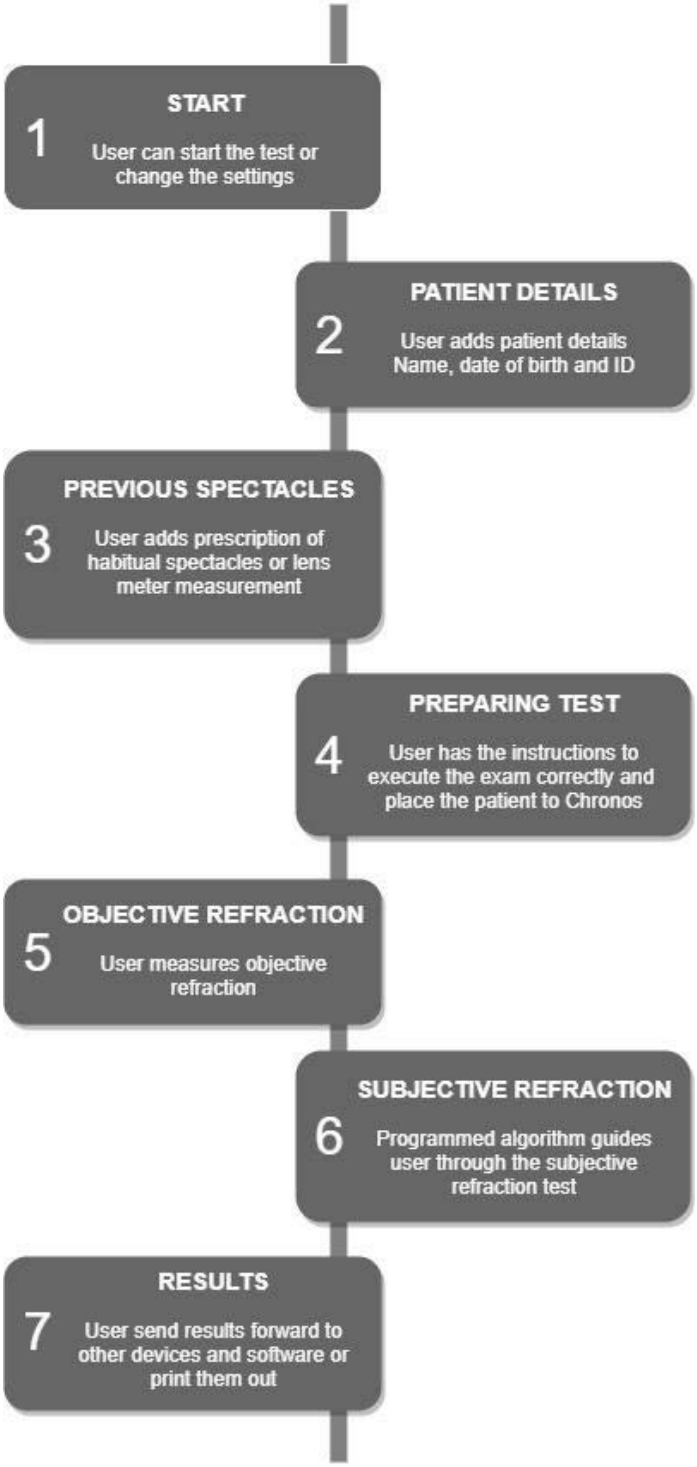
During objective refraction, the position of optical heads can be adjusted manually by using up and down arrows. Alternatively, automatic alignment function can be used by pressing "Auto" button.
During subjective refraction the alignment can be done automatically by clicking "Align" from the notification.

When the alignment is corrected, the frames around live camera windows turn blue, and the test can continue.

SOFTWARE WORKFLOW

FLOW OF OPERATION

Chart 3. Steps of the SightPilot workflow



SightPilot contains six main steps with sub-steps:

1. Start page
    (1) Start Exam
    (2) Settings
2. Customer Details
    (1) Customer Details
    (2) Previous spectacles
3. Instructions
4. Objective Refraction
    (1) Start of the measurement
    (2) Results of the measurement
5. Subjective refraction
    (1) Visual acuity with previous correction/unaided (optional)
    (2) Screening
    (3) Red-Green Comparison (DuoChrome)
    (4) Cylinder Axis and Power Adjustment (Jackson Cross Cylinder)
    (5) Visual Acuity
    (6) Binocular Balance (optional)
    (7) Binocular visual acuity (optional)
    (8) Near addition, Near Addition Adjustment & Near Visual Acuity (optional)
    (9) Comparison test parts (optional)

6.Results

Optional test steps can be enabled or disabled from the Settings. The numbering of the binocular test parts depend on the selection. E.g., if “Binocular Balance” and “Near Vision” are disabled in Settings, the subjective refraction contains only seven test parts.

CUSTOMER DETAILS

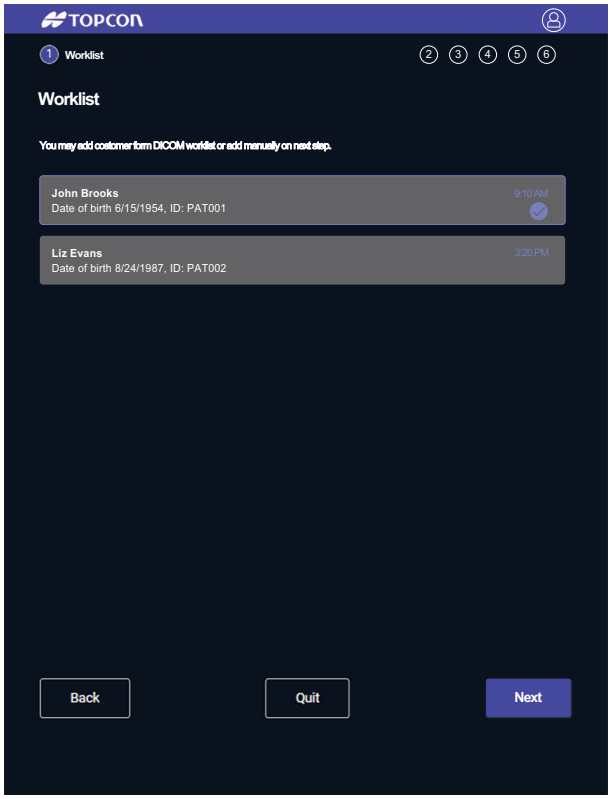
Customer details can be input via DICOM Worklist or manually. It is possible to return to this step by pressing Back button. Customer details will remain filled when coming back to this step.

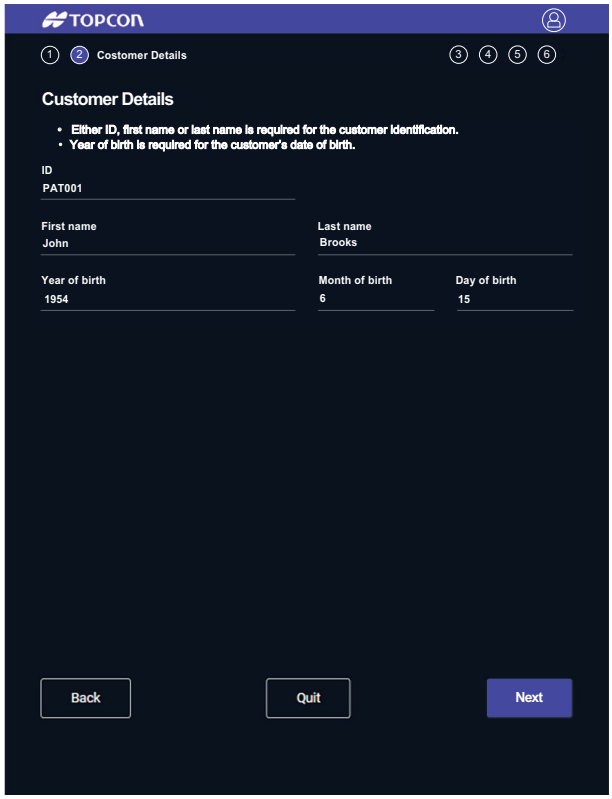
Customer details, DICOM Worklist

If the DICOM worklist is enabled from the Settings, a test part Worklist (1) will be shown. Customers of the current day that have not been referred to examination will be shown in the worklist.

To select the customer from the Worklist:

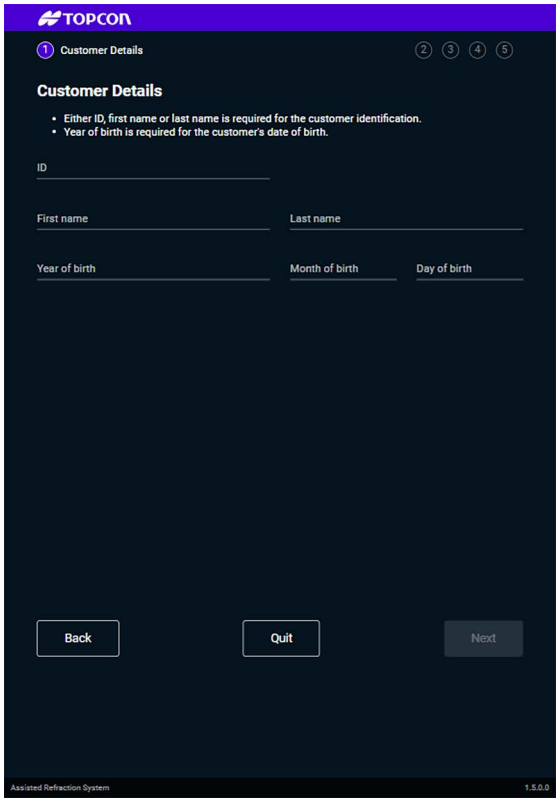
1. Click the customer from the Worklist (selected customer data will be highlighted, see picture below).
2. Click next.
3. Customer details will be filled automatically. Customer data cannot be edited.





Customer details, manual input

After clicking Start Exam in SightPilot, Chronos resets to be ready to start a new examination. Customer details and importing of lensmeter data can be done while Chronos is resetting. The progression to the next stage of the test is blocked until the reset is completed.



Item	Action
ID	A series of numbers or text to identify a customer in other software ID will be visible in export files (XML files or printouts). ID is mandatory for exporting if JOIA Support is required.
First Name	Customer's first name
Last Name	Customer's last name
Birth Date	Customer's date of birth Enter separately • the year of birth • the month of birth (optional) • the date of birth (optional)

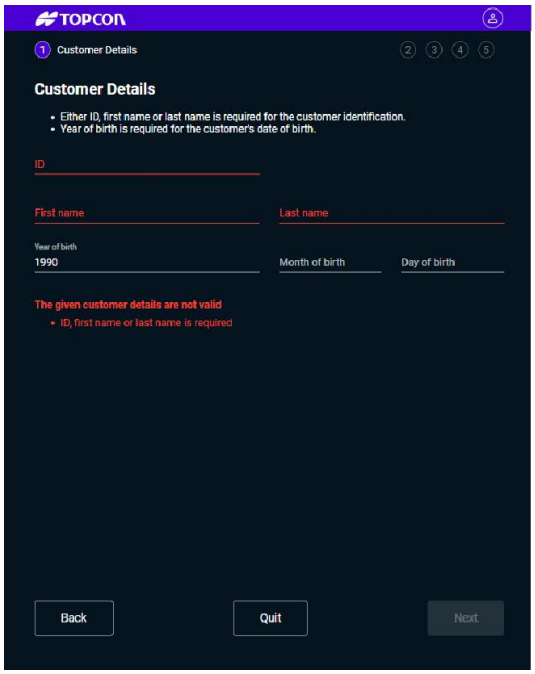
Customer details, Guest user

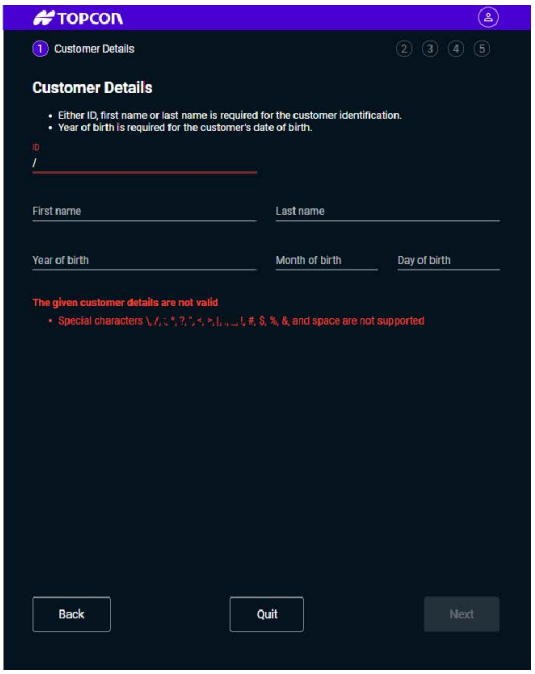
In Customer details the guest user can view and modify only two fields: ID and year of birth.
Both fields are mandatory to fill to continue the test. If the year of birth is not entered, the error message: "Year of birth is required" is displayed.

NOTE	Continuing to the next parts is disabled in cases of missing or invalid information, misspelling of the birth date or if the customer is unsuitable for test.

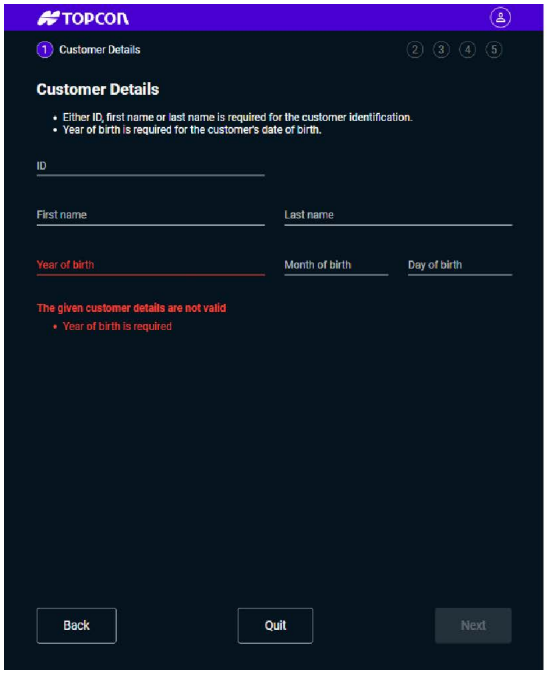
Errors in entering the invalid customer details:

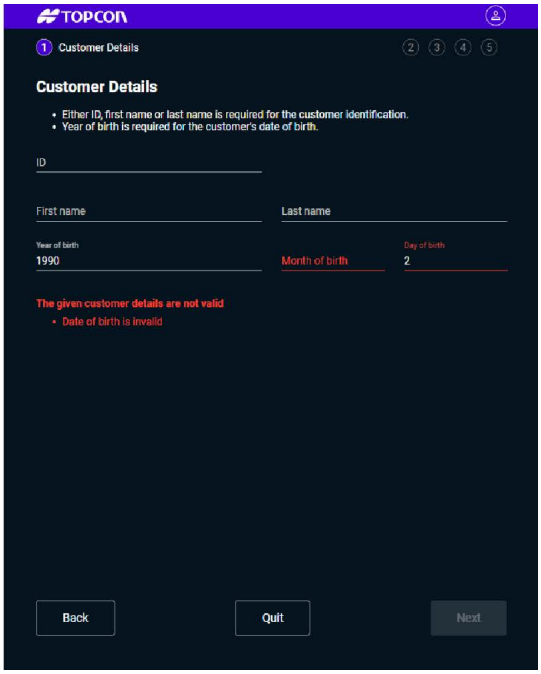
Customer identification missing or unsupported characters are used





Date of birth is input in incorrect format

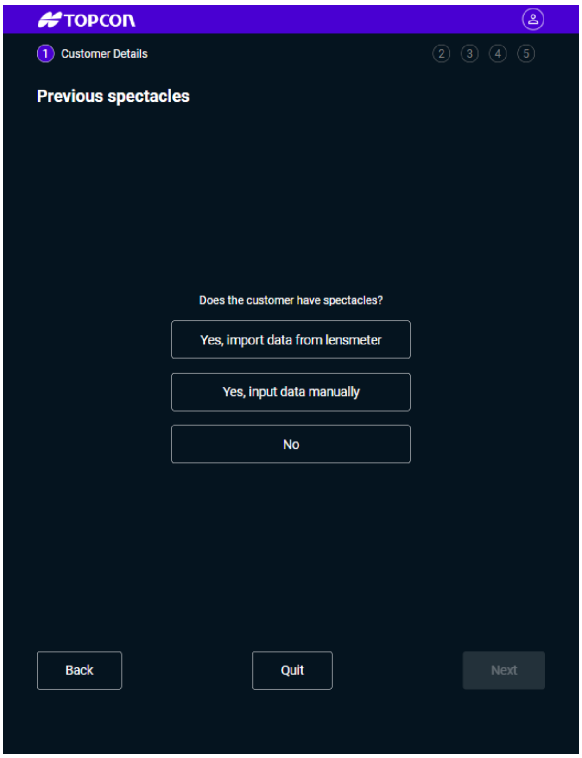




Previous spectacles

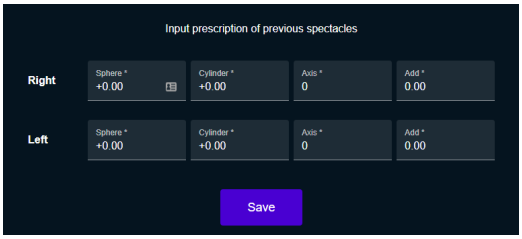
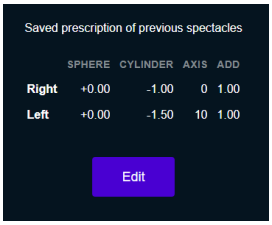
To enter information of previous spectacles, you can either

1. Import the data from lens meter
2. Input data manually or
3. Choose "No" in case customer does not have spectacles



NOTE	• Information on previous spectacles should fill only when a customer uses the spectacles continuously during the day. • The previous spectacle values are intended to be entered in the far correction format.

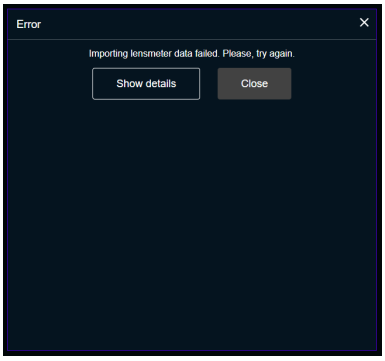
Item	Action
Yes, import from the lensmeter 	Selected when lensmeter data is wanted to be imported to SightPilot. The data in the specified folder will be imported and a data list will be displayed on the screen. Select the lens-meter data to import and check the data is expected. Imported data can be edited by pressing “Edit” button.
Yes, input manually 	Selected when the prescription of previous spectacles is wanted to input manually. • Selection will open the value table to enter data manually. Click "Save" when data is entered.
No 	Selected if the customer doesn't wear spectacles or the prescription of the previous spectacles is not available • When choosing this option, the test continues automatically to the next part.

Item	Action
Value table   	Details of spectacles can be entered to the table manually by pressing the cell • Sphere indicates the amount of lens power, values -18.00 – +18.00 D (0.25D steps) • Cylinder indicates the amount of lens cylinder power, values -8.00 – +8.00 D (0.25D steps) • Axis indicates the direction of cylinder power in degrees, values 0 - 180° (1° accuracy) • Add indicates the amount of near addition power, values 0 – 3.50 D (0.25D steps) Data can be edited if required. To enter the values, use dot instead of comma (For example, 1.00 instead of 1,00)
Save	Saves the entered values and lock the table

NOTE	
	• Continuing is disabled in case of misspelling or if the values are unsuitable for the test. • If the imported lens meter data includes values that exceed the lens ranges of Chronos (see above values in section “Value table”) values cannot be set

Error when importing data from lens meter

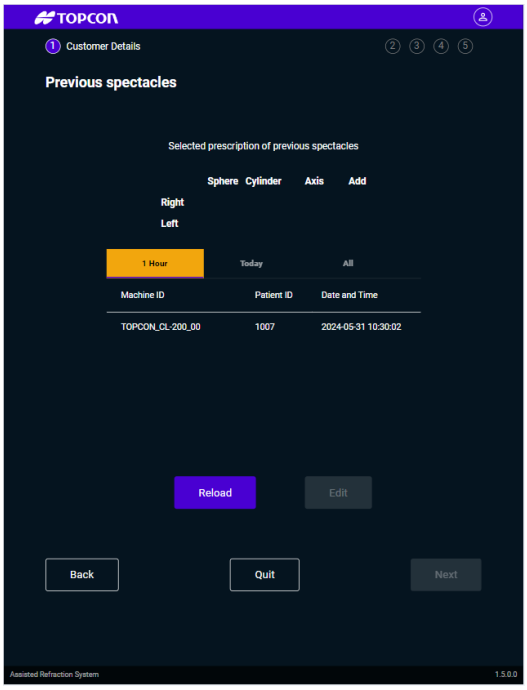
If an error occurs during importing data, the error message will be displayed. If the error re-occurs, see the section "Before Requesting Service".

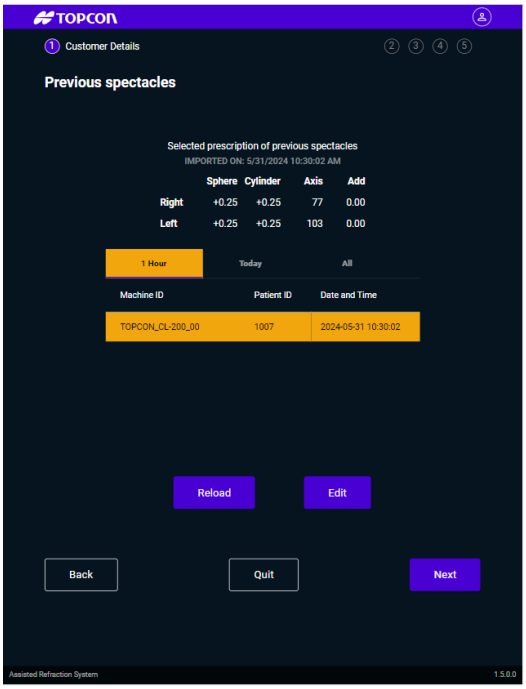


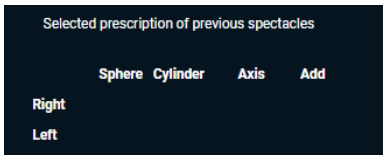
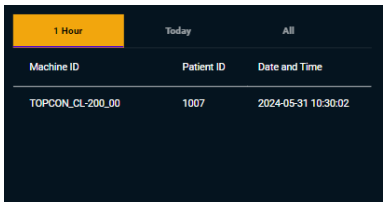
Import data from the lensmeter

Select previous spectacles data from the lensmeter list by following the steps below.

1. Select the data to import.
2. Check the imported data is correct.
3. If the imported data is correct, select "Next".
4. To edit the imported data, select "Edit".

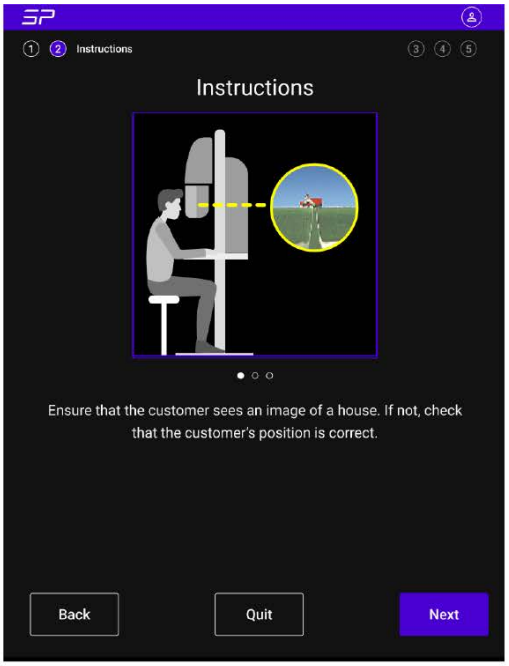


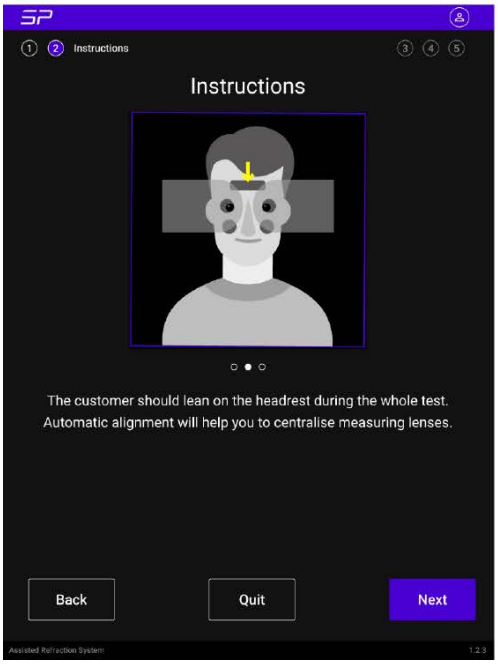


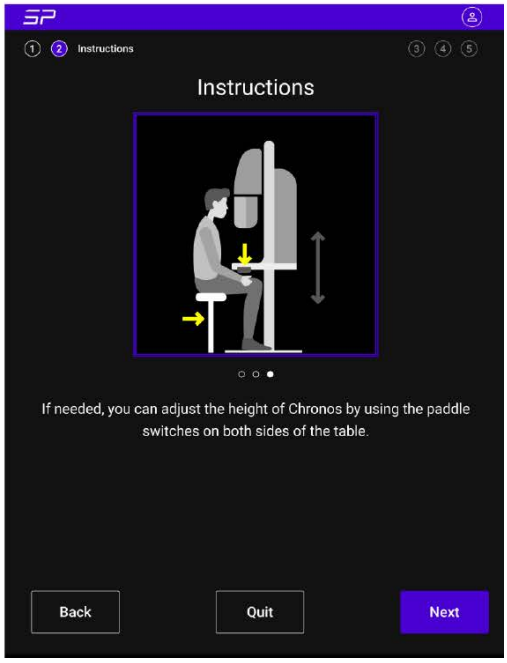
Item	Action
Data Area 	Displays the currently selected data.
Date List 	The eyeglass data from the lensmeter will be imported from "Data Import Folder" and displayed in a list. For details on data import, see "SETTINGS" on page 208. • 1 Hour: displays data from the last hour. • Today:displays Today's data. • All:displays all data. *Touch the tabs for [Machine ID], [Patient ID], and [Date and Time] to sort the data in ascending/ descending order for each item.
Reload	The existing eyeglass data from the lensmeter will be reloaded and reflected in the data list. For details on data import, please refer to "SETTINGS" on page 208.
Edit	You can manually edit the selected data.

INSTRUCTIONS

Instructions step guides you to position the customer properly before starting the test. Position the customer according to instructions and ensure that the customer sees the target image inside of Chronos before proceeding. You can scroll through the images and revisit the instructions if needed.





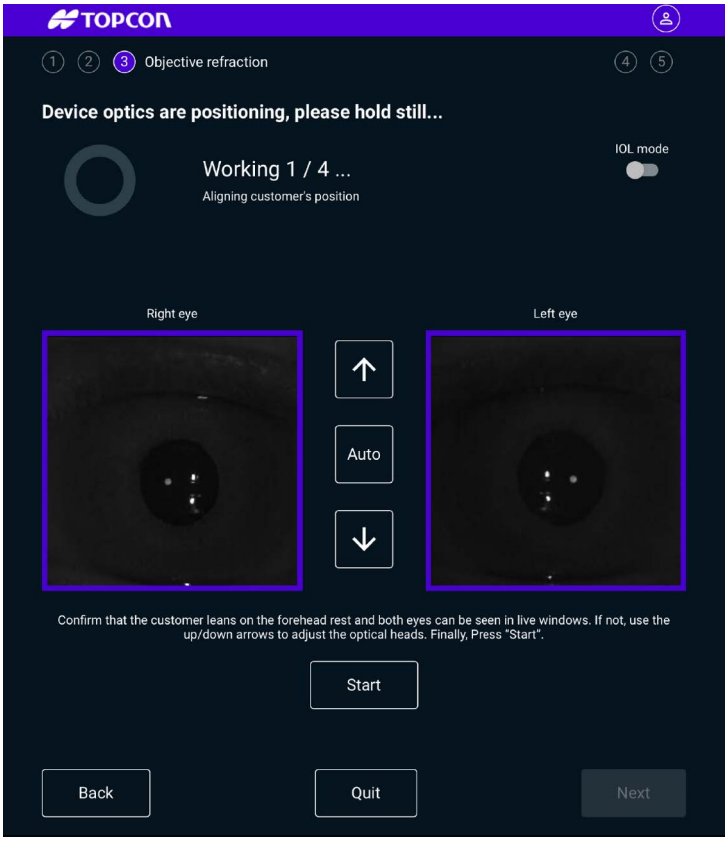


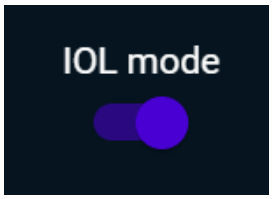
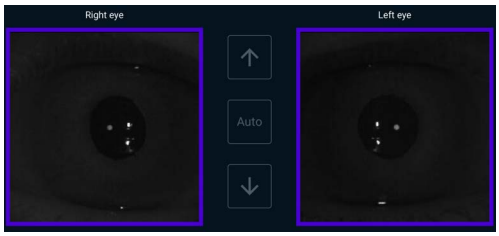
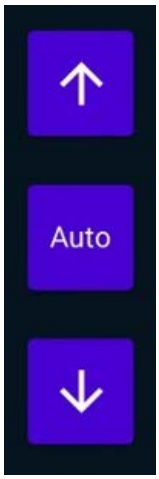
⚠ **WARNING**	When finishing tests, place the customer's head away from the main unit. If the customer's eye or nose touches the instrument, the customer may be injured.

⚠ **CAUTION**	When starting measurement and when finishing tests, make sure that the customer's finger or nose is not put between the measuring head and drive base and between the right and left measuring windows. The customer's finger or nose may be caught by these units which may injure the customer.

OBJECTIVE REFRACTION

The test starts with measurement of objective refraction. The customer’s eyes can be seen from live camera windows.

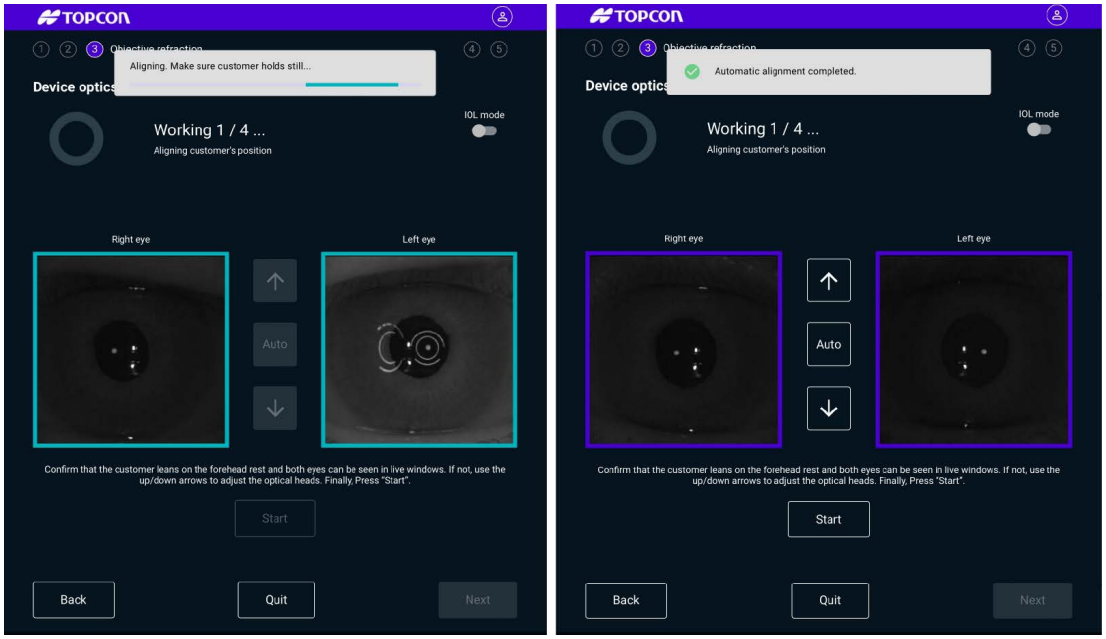


Item	Action
Circle icon 	The icon to indicate progression of the objective measurement. 1. Turns blue when the measurement has been completed 2. Turns red in case of fail in measurement
IOL mode 	IOL mode can be enabled or disabled via switch button. When IOL mode is in use, the keratometry won't be performed.
Live camera windows 	Display of the live video of the customer's eyes.
Alignment 	The optical heads of Chronos can be adjusted manually by using the up and down arrows, or manually by using Auto button.

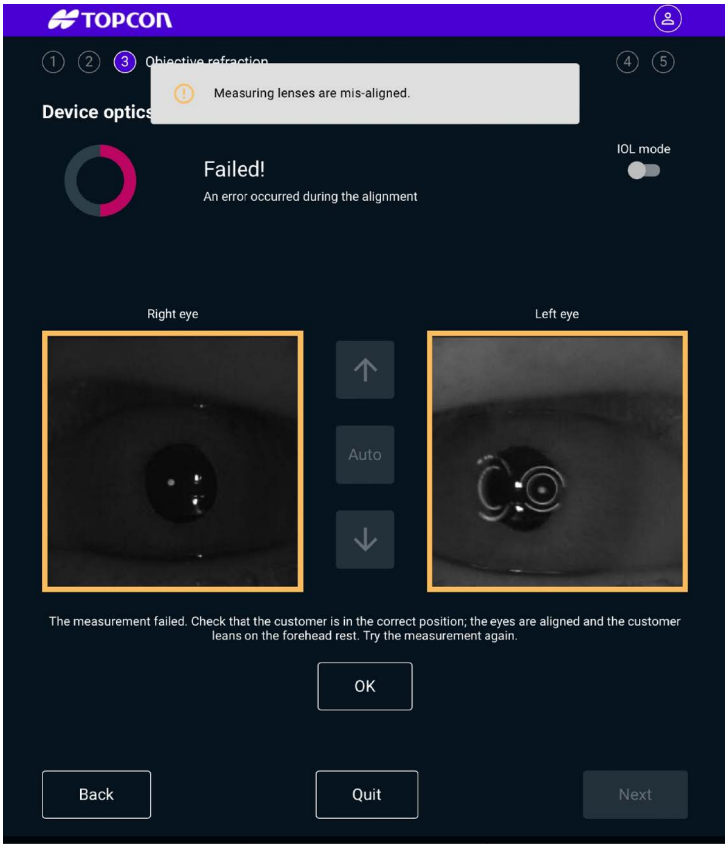
NOTE	Continuing is disabled until the objective measurement has been completed successfully.

Pre-alignment before objective refraction

Before starting the measurement, align the live camera windows with the customer's eyes. You can do this automatically by using Auto button or manually by using up and down arrows. The software will notify when the alignment is in progress by displaying a notification and apperance of turqoise frames around the live camera windows. When the optical heads are adjusted correctly and objective measurement can be started, the frames around live camera windows turn blue.

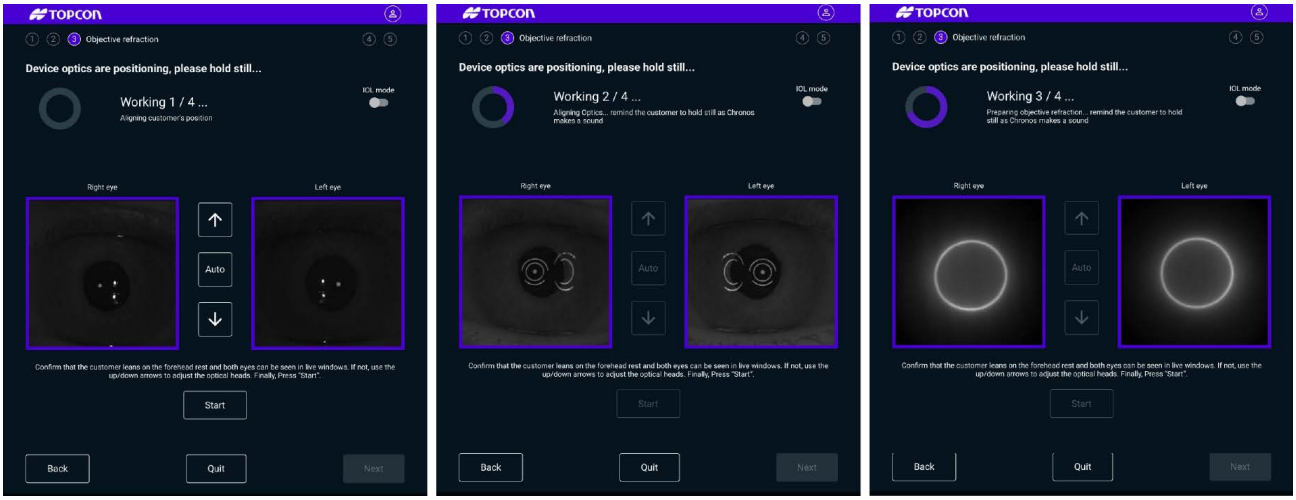


If the automatic alignment fails, there will be an alert note and orange frames around the live camera windows appear. In case of failed alignment, ensure that the customer is positioned correctly in front of Chronos, according to the instructions.



Objective refraction measurement

After the alignment has been done, the objective measurement can be started.



Errors in the objective refraction measurement

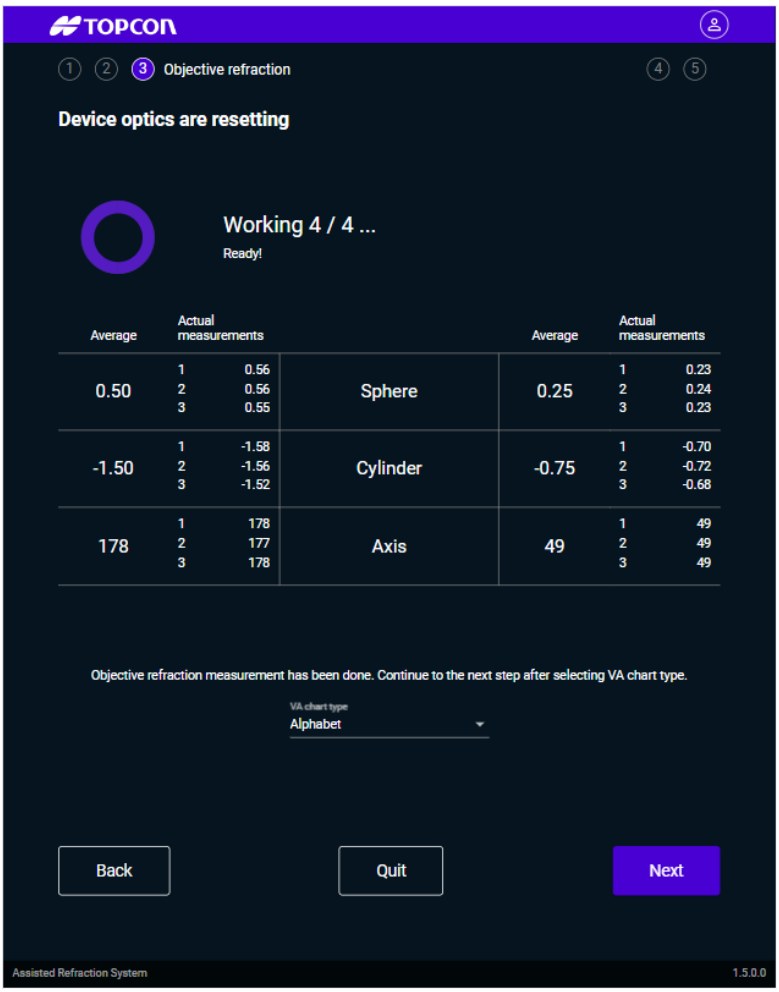
If an error occurs while performing the objective refraction measurement, the circle icon will turn red, and the error message tells the reason for failing. The measurement is recommended to be performed again after checking the customer's posture and eye alignment.

If the measurement fails many times with the same customer, the customer might be unsuitable for testing with Chronos (customer has e.g., strabismus, eye diseases, severely dry eyes). If the problem persists with several customers, see page 256 "BEFORE REQUESTING SERVICE" checklist to resolve technical problems.

Results of objective refraction

The objective measurement consists of keratometry and autorefraction. To perform keratometry Chronos is required to align to corneal apex. For some customers, this alignment mode might not work. In this case, Chronos will change the alignment method automatically and then proceed with autorefraction without keratometry being performed.

A notification about the use of automatic IOL mode will be shown in objective measurement results and in Results view under section Objective refraction.

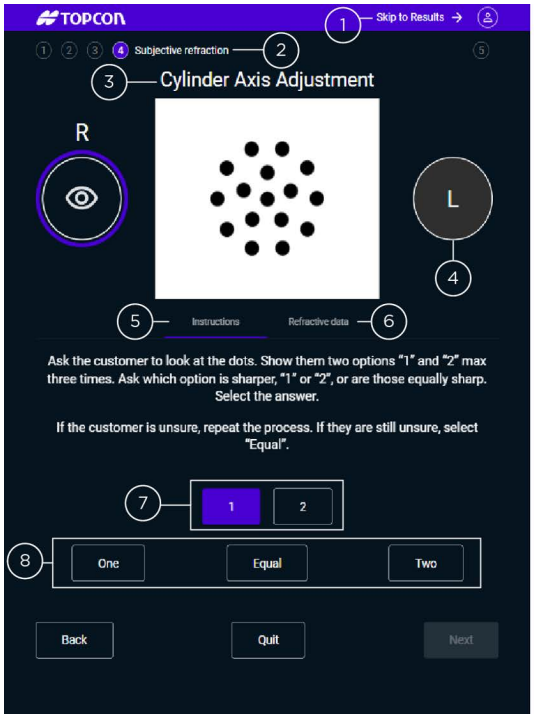


Select VA Chart Type

VA chart types 	The available VA chart types are displayed in a drop-down menu. The VA chart types you can choose from are: • Alphabet • E Chart • Landolt Ring When you select Feet or Meters (6m) as a visual acuity unit, Alphabet and E Chart are displayed, and when you select Decimal, Alphabet and Landolt Ring are displayed.

SUBJECTIVE REFRACTION

General functions in subjective refraction



1. "Skip to results" - button interrupts the test and proceeds to Results view.
2. The main steps (1-5) are displayed on the top left of the screen. The current step is highlighted blue.
3. The title of the step is presented above the test chart.
4. They eye that is not under testing is occluded and highlighted gray.
5. Instructions to perform the test are displayed under the test chart.
6. Click on [Refractive data] to view refractive data as well as lens and visual acuity changes during the test.
7. Test parts that include comparison have buttons "1" and "2" to demonstrate the options with lens changes.
8. After demonstrating the options to the customer, verify the customer's answer by pressing either "One", Equal" or "Two".
9. Test parts that include letter selection have possibility to select all letters by pressing icon on the right side of the letter row.

Part 1. Visual acuity with previous correction

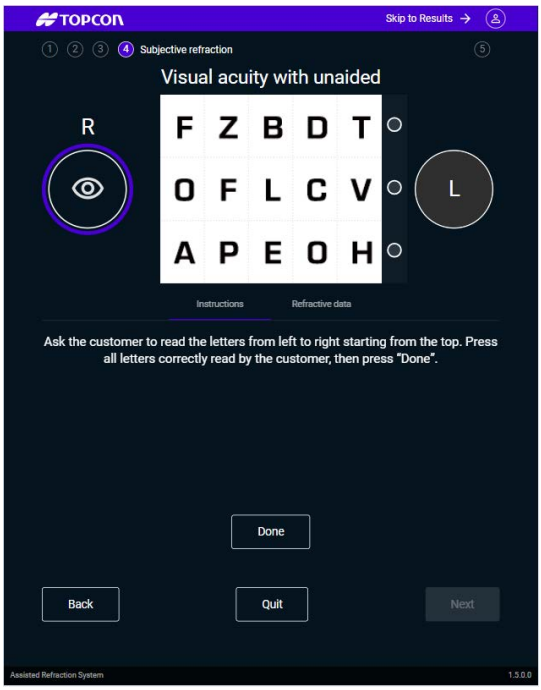
First step of SightPilot Refraction test is Visual acuity with previous correction. This test part provides information of how well a customer sees with their previous spectacles or unaided correction. The headline of this test will depend on whether the lens meter data has been input on Customer details or not.

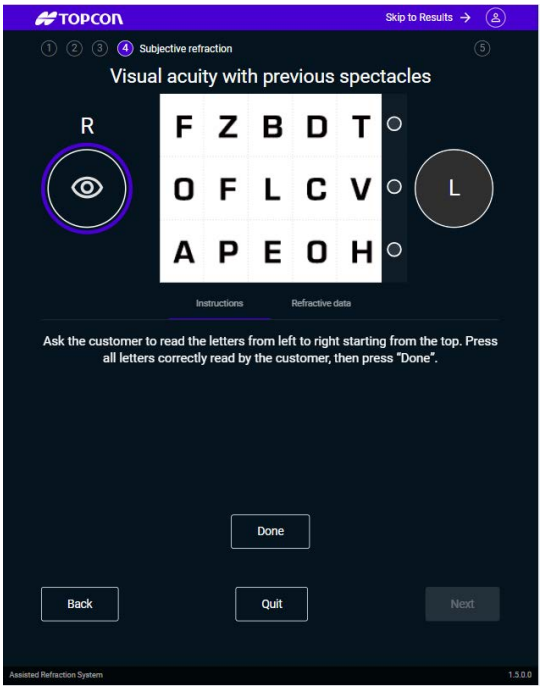
Performing the test

1. After explaining the test procedure, ask the patient to read the letters from upper left to lower right.
2. Select all letters that customer can read correctly. The selected letters turn into green.
3. Select "Done" when a customer has read all letters that s/he can read correctly

The test is performed first to the right eye and then to the left eye. After completing the test for left eye, the test will continue to the next step.

After Visual acuity with previous correction has been finished, the visual acuity values from both eyes will be emptied from the Refractive data tab.





Principle of the test part

○ Showed visual acuity rows:

1.Visual acuity with previous spectacles

VA format	VA
Feet	20/25
Meters (6m)	6/7.5
Decimal	0.8

2.Visual acuity with unaided

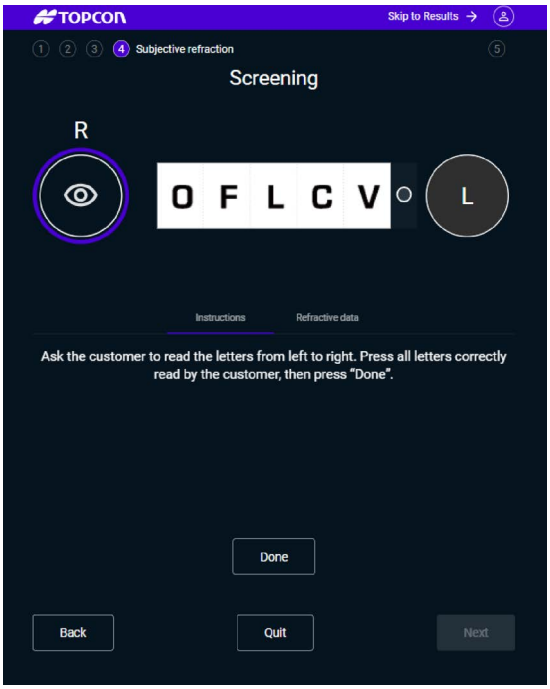
Result in objective measurement (SFE)	VA row Feet	VA row Meters	VA row Decimal
0.00	20/20	6 / 6	1.0
± 0.25 ～ ±0.75	20/25	6 / 7.5	0.8
± 1.00 ～ ± 1.75	20/40	6 / 12	0.5
± 2.00 ～ ± 2.75	20/100	6 / 30	0.2

NOTE

- If the customer cannot see any letters from the charts, the test will continue to next step despite of not seeing any letters.
- If the spherical equivalent exceeds ±2.75 as a result of the objective measurement, proceed to the next test.

Part 2. Screening

The purpose of Screening is to screen out unsuitable customer for SightPilot test in the early steps. The screening threshold is being able to read at least three letters on the chart. Test will be interrupted if visual acuity is lower than the screening limit and then customer needs to be referred to eye care specialist for further examination.



Performing the test

1. Following the instructions, ask the customer to read the letters from left to right.
2. Select all letters that the customer can read correctly.
3. Select "Done" when a customer has read all letters they can read correctly.

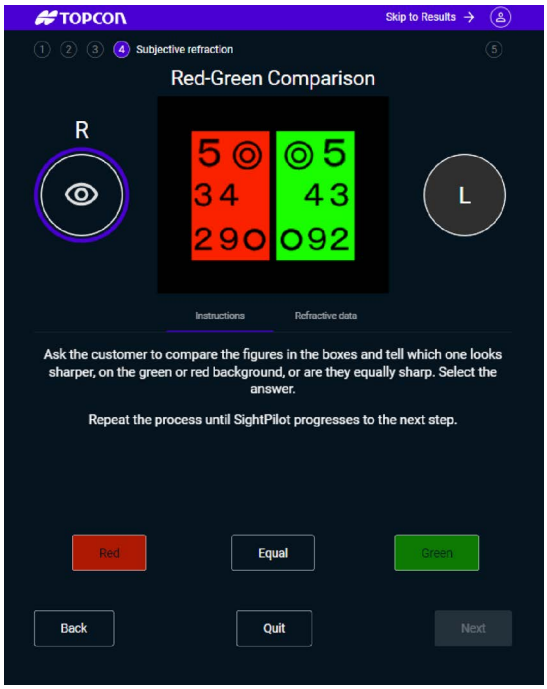
The test is performed first on the right eye and then on the left eye. After completing the left eye testing, the test will continue to the next step if customer's visual acuity is beyond the required value limit of visual acuity.

Part 3. Red-Green Comparison (DuoChrome)

Red-Green comparison test is performed monocularly. The purpose of this step is to adjust the sphere power of the eye and to find the best point where the viewed image is focused on the retina.

Performing the test

1. Read the instructions and asks a customer to compare figures on both sides and tell which one has sharper figures, the green or red or are they equal sharp.
2. Press the answer button (Red/Equal/Green) according to the customer's answer.
3. The test part will be either be repeated or the test will continue to the next part according to customer's answers. Depending on the given answer the test part will be either repeated or continued to the next step.



The functionality of answer buttons

- Red reduces the spherical value by a quarter of a diopter (-0.25 D)
- Green adds the spherical value by a quarter of a diopter (+0.25 D)
- Equal continues to the next test part without making changes to values

Principles of the test part

- The algorithm is programmed to select a greater sphere power and to continue to the next test part when selecting the opposite response compared to the previous one.
- The test will be interrupted if the sphere value changes ± 2.00 D from initial value. This means that selecting the same answer eight times in a row will interrupt the test.

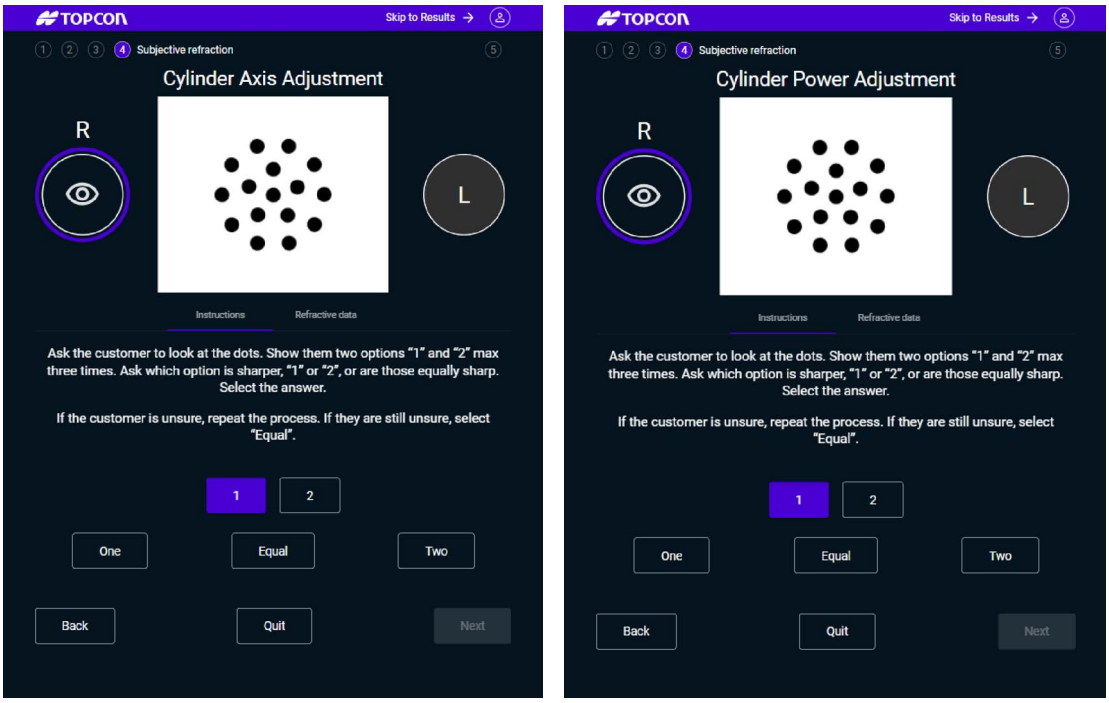
Part 4. Cylinder Axis and Power Adjustment

The test part includes two steps: the first one is for cylinder axis adjusting and the second for cylinder power adjustment. The purpose is to adjust the cylinder power of the eye and its axis in a comfortable direction to correct the eye's astigmatism. Test parts are performed monocularly.

Performing the test

1. Read the instructions and ask the customer to compare options that are presented.
2. Show the customer the options by pressing option buttons "1" or "2".
   (1) Button "1" shows the option one
   (2) Button "2" shows the option two
3. Press the answer button according to the customer's answer. Press button "Equal" if the customer does not see difference between the options or is unsure of his/her answer.
4. The test part will be either repeated or continued to the next step depending on the given answer.

NOTE	• When switching options, wait until the option is switched to the optical heads and the low sound of the Chronos is ended. Let the customer look at the option a few seconds before switching to another one. Show the options max three times and if the customer can't decide, choose answer "Equal". • The differences between options can't be seen on the tablet or PC screen.



The functionality of answer buttons

- "One" changes the axis anticlockwise or adds the cylinder value by a quarter of a diopter (+0.25 D).
- "Two" changes axis clockwise or reduces the cylinder value to a quarter of a diopter (-0.25 D).
- "Equal" continues test to next part without making changes to value.

Principles of the test part

- Cylinder axis adjustment: Axis changes according to the cylinder power
  - Cyl power -0.25D:
    Axis changes 20 degrees until the first reversed answer, after it, axis changes 10 degrees to the opposite and the test continues to the next part.
  - Cyl power -0.50D - 0.75D:
    Axis changes 20 degrees until the first reversed answer, after it, the axis changes 10 degrees to the opposite, test part will be repeated. The next answer, 1 or 2, will change the axis 5 degrees and the test continues to the next part.
  - Cyl power -1.00D or more:
    Axis changes 5 degrees until the first reversed answer, after it, the axis changes 3 degrees to the opposite, test part will be repeated. The next answer, 1 or 2, will change the axis 1 degrees and the test continues to the next part.
- Cylinder Power Adjustment: The algorithm is programmed to select a greater value in cylinder power and continue to the next test part when selecting the opposite response to previous one.
- The test will be interrupted if
  - the cylinder power value changes ± 2.00 D, meaning the same answer is given eight times in a row.
  - the cylinder axis value changes 80 degrees (lower cylinder powers) from the initial values, meaning the same answer is given four times in a row.
  - the cylinder axis value changes 20 degrees (greater cylinder powers) from the initial values, meaning the same answer is given four times in a row.

Part 5. Visual Acuity

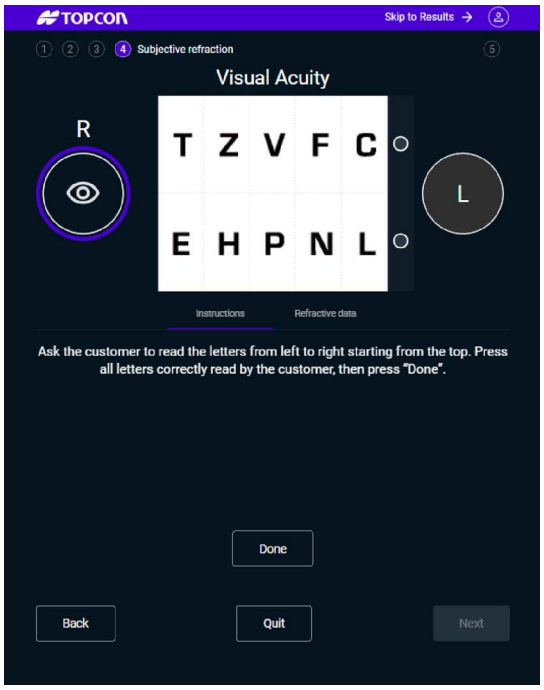
The last monocular test part is Visual Acuity. The purpose of the test part is to record the best visual acuity of the examined eye with defined values.

Performing the test

1. Read the instructions and asks a customer to read letters from top left to bottom right.
2. Select all letters that customer reads correctly. The selected letters turn green.
3. Select "Done" when a customer has read all letters that s/he can read correctly.
4. The best visual acuity will be recorded, and the test continues to the next step.
   - If the customer does not see any letters from the first chart and presses "Done", the chart with larger letters is displayed and the test is repeated.

NOTE	Recorded visual acuities are displayed in Refractive data tab and finally at the end of the test in the "Results" step.

Example of Visual acuity test part for the right eye



Principle of the test part

- Following visual acuity rows are showed in the first chart:

VA format	First	Second	Third
Feet	20	15	-
Meters (6m)	6	4.5	-
Decimal	0.8	0.9	1.0

- If the customer has no letter that they can read correctly and press "Done" to the next step, following visual acuity rows are showed in the chart:

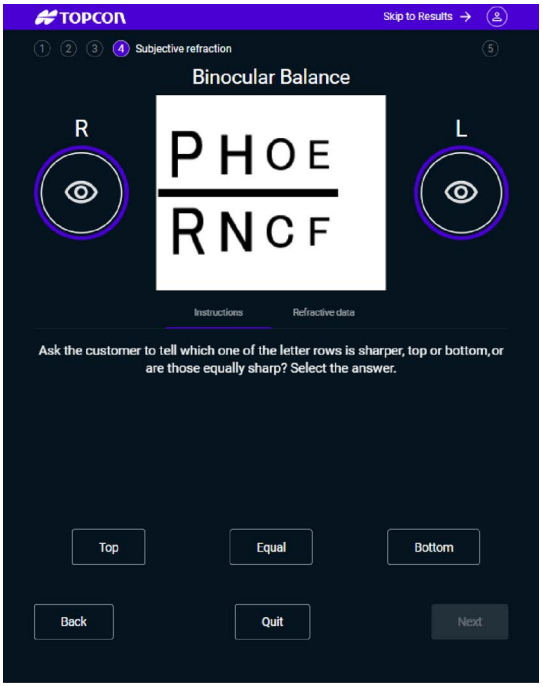
VA format	First	Second	Third
Feet	40	30	25
Meters (6m)	12	9	7.5
Decimal	0.5	0.6	0.7

Part 6. Binocular Balance

The first binocular test part Binocular Balance if it is enabled in the Settings.
The purpose of the test part is to balance the accommodation between the right and left eye.

Performing the test

1. Read the instructions and asks a customer to compare two letter rows that are displayed.
2. Press the answer button (Top/Equal/Bottom) according to the customer's answer.
3. After the answer is given the test will continue to the next step.



NOTE	The customer may experience blurriness or inaccuracy of vision. That is part of the test, and you may notify the customer about the blurriness.

The functionality of answer buttons

- "Top" increases the sphere value of the right eye by a quarter of diopter (+0.25 D)
- "Bottom" increases the sphere value of the left eye to a quarter of diopter (+0.25 D)
- "Equal" continues test to next part without changes to the values

Principles of the test part

- Top row is displayed to the right eye
- Bottom row is displayed to the left eye
- Both eyes see the black line between the rows
- Fog (+0.75D) is added to sphere values during the test part and removed when proceeding to the next test part

Part 7. Binocular Visual Acuity

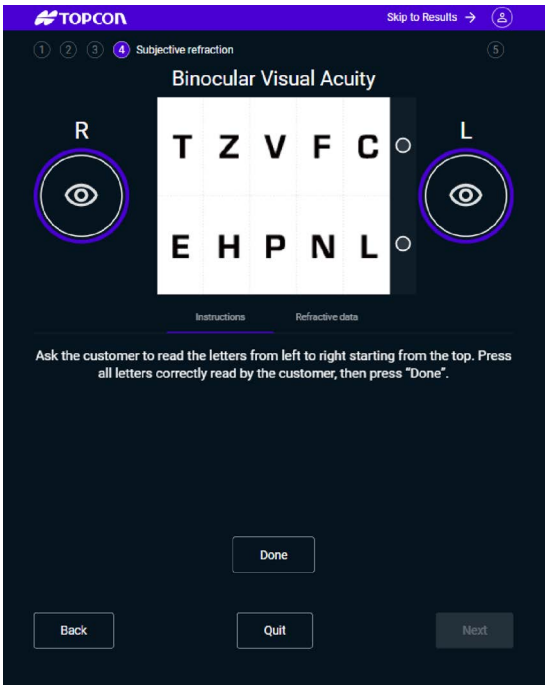
The first binocular test part is Binocular Visual Acuity if binocular balance is disabled. Otherwise, it is the second one.

The purpose of the test part is to record the best binocular visual acuity with the defined subjective refraction.

Performing the test

1. Read the instructions and ask a customer to read letters fromleft right
2. Select all letters that customer reads correctly. The selected letters turn to green color.
3. Select "Done" when a customer has read all letters that s/he can read correctly.
4. The best visual acuity will be recorded, and the test continues to the next step.
   - ○ If the customer does not see any letters from the first chart and pressed "Done", the chart with larger letters is displayed and the test is repeated.

NOTE	Recorded visual acuities are displayed in Refractive Data tab and finally in the "Results" step.



Principle of the test part

- ○ Following visual acuity rows showed in the first chart:

VA format	First	Second	Third
Feet	20	15	-
Meters (6m)	6	4.5	-
Decimal	1.2	1.5	-

- ○ If no letters selected and proceeded to the next step, following visual acuity rows showed in the chart:

VA format	First	Second	Third
Feet	40	30	25
Meters (6m)	12	9	7.5
Decimal	0.8	0.9	1.0

Part 8. Near Vision Test

The near vision test consists of the following four steps.

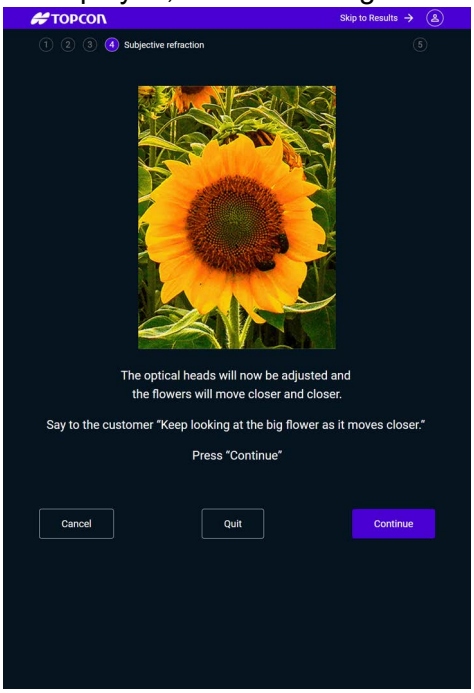
1. Fusion support and fusion possibility check
2. Near Addition
3. Near Addition Adjustment
4. Near Visual Acuity

- The near vision test is optional and can be enabled or disabled in the settings. If the near vision test is disabled, the test proceeds to the next test item.
- Fusion support can be enabled or disabled on the settings. Disabling fusion support will skip to the next exam. For more information, see "WORKFLOW" of "SETTINGS" on page 210.
- Fusion support is performed before the near vision test. After fusion support is performed, once the fusion check confirms that the customer does not have double vision, the test will proceed to near vision testing with both eyes.
- If the customer has double vision, the test will proceed to near vision testing using one eye.
- Near Addition test and Near Addition Adjustment are performed on customer over 40 years old.
- The Near Visual Acuity test is performed on all customers regardless of age.

Fusion Support

Before starting the near vision tests, an image is displayed that seems the object is approaching, to support the smooth fusion. At the same time, the measurement head moves to the appropriate test position.

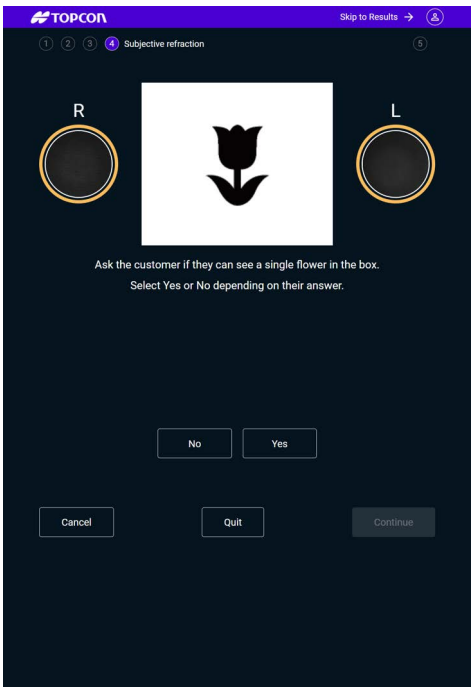
1. The following message is displayed, and a still image of a sunflower is shown to the customer.



2. Ask the customer to keep looking at the sunflower and press "Continue".
   An image of a sunflower approaching will be displayed, and at the same time the measurement head moves to the position for near vision test.

Binocular fusion check

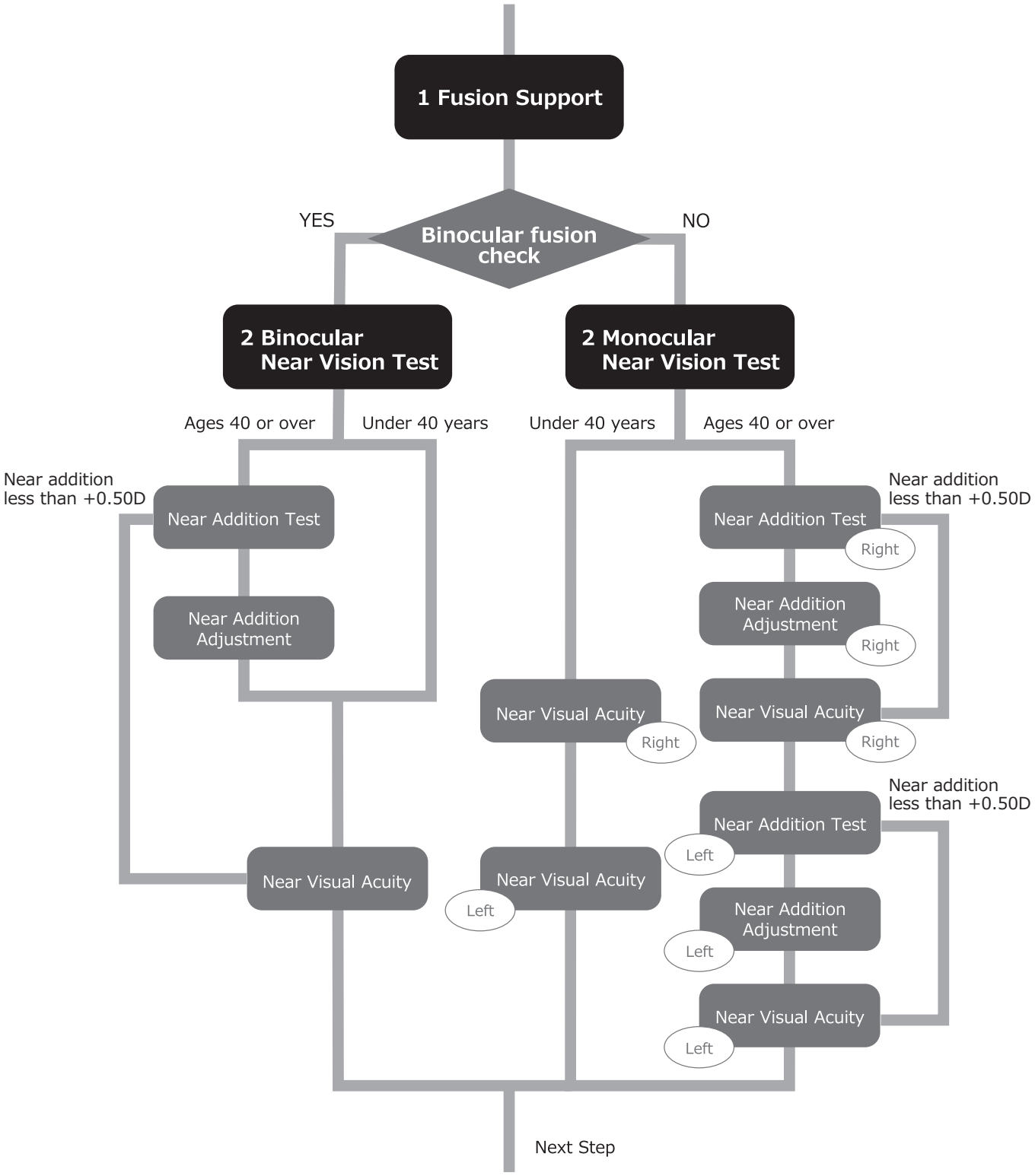
After fusion support ends, a chart (pictograms such as tulips) for checking fusion possibility is displayed. A message is displayed prompting the customer to confirm that they see the objects as one, so ask them.



The object appears as one: Press "Yes" to proceed to the near vision test for both eyes.
The object appears double: Press "No" to proceed to the near vision test for each eye.

NOTE	• After it has been confirmed that the customer does not have double vision, you proceed to the near vision test for both eyes. "Tests both eyes together" will be displayed on the screen and the frames in the live camera windows for both eyes will turn blue. • If the customer has double vision, you proceed to the near vision test for one eye. "Tests one eye at a time" will be displayed on the screen and the frame for only the eye being tested in the live camera window will turn blue.

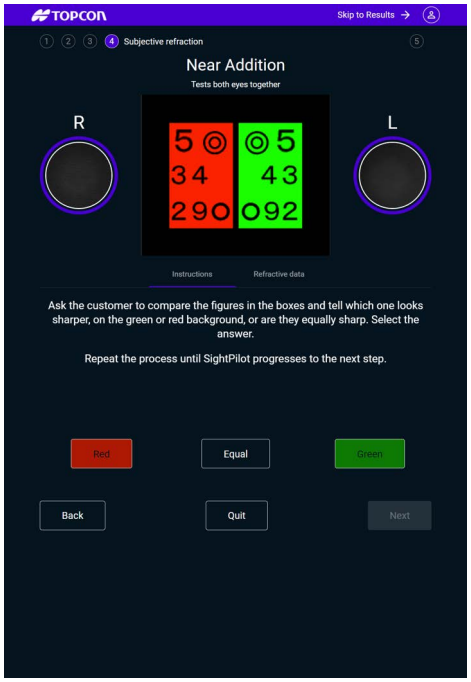
Chart 4.SightPilot Near Vision Test Flow



Near Addition

Performing the test

1. Read the instructions and asks a customer to compare figures on both sides and tell which one has sharper figures, the green or red or are they equally sharp.
2. Press the answer button (Red/Equal/Green) according to the customer's answer.
3. According to customer's answer, the test part will be either repeated or the test will continue to the next part.
   - When you proceed to the near vision test with both eyes, "Binocular Near Vision Test" will be displayed on the screen. When you proceed to the near vision test with each eye, "Monocular Near Vision Test" will be displayed on the screen and only the frame for the eye being tested will turn blue.



Functionality of answer buttons

- Red reduces the addition value by a quarter of a diopter (-0.25 D)
- Green increases the addition value by a quarter of a diopter (+0.25 D)
- Equal continues to the next test part without making changes to values

Principles of the test part

- If the customer answers opposite to their previous answer or presses "Same," you will proceed to "Near Addition Adjustment".
- If the addition value goes below +0.50D, the value will be cleared and you will proceed to "Near Visual Acuity".
- If the customer's answer resulted in the addition of +3.00 D, all the tests will abort.

- The initial near addition value in the beginning of the test part is determined according to the customer's age or the following formula. Fractions are rounded in 0.25D steps, with values ranging from +0.25D to +2.5D.

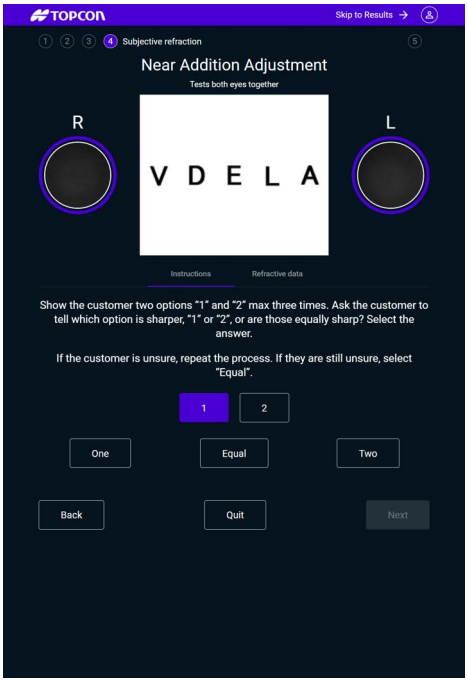
  Table. Initial value in Near Addition test based on customer's age.

Age	Addition / Calculation formula (D)
40-54 years	2.5 - (12.5 - 0.2 x age) / 2
55-69 years	2.5 - (7.0 - 0.1 x age) / 2
70+ years	2.5

Near Addition Adjustment

Performing the test

1. Read the instructions and ask customer to tell which option is sharper, "1" or "2" or are they equally sharp.
2. Show customer the options by pressing option buttons "1" and "2".
   (1) Button "1" shows the option one
   (2) Button "2" shows the option two
3. Press the answer button according to customer's answer.
4. Depending on the customer's answer the test part will be either repeated or continued to the next step.
   ○ When you proceed to the near vision test with both eyes, "Binocular Near Vision Test" will be displayed on the screen. When you proceed to the near vision test with each eye, "Monocular Near Vision Test" will be displayed on the screen and only the frame for the eye being tested will turn blue.



NOTE	• When switching options, wait until the option is switched to the optical heads and the low noise of the Chronos is ended. Let the customer look at option a few seconds before switching to another one. Show the options max three times if the customer can't decide the answer, choose "Equal". • The differences between options can't be seen on the tablet or PC screen. The change in view is only noticed when looking into Chronos.

Functionality of answer buttons

- "1" remains the current addition value and the test continues to next step.
- "2" changes a value quarter less (0.25 D) compared to defined additions value in the previous step. This option can be chosen multiple times decreasing the value until the additions value reaches +0.50 D and the value turns to zero. If the value turns to zero, the test will continue to the next part.
- "Equal" remains the current addition value and the test continues to next step.

Principles of the test part

- Flow of the test depends on the addition value:
  1. ADD <1.25: compare ADD vs NO ADD
     a. If NO ADD is chosen, the test continues to next step.
     b. Once ADD is selected, it will be stored and you proceed to the next step.
  2. ADD => 1.25: compare ADD vs. quarter less
- The algorithm is designed to leave the greater plus value as addition value
- Addition +0.50 D is the lowest value that can be defined in the subjective refraction
- The visual acuity values of the eye chart used in this test are as follows:

  Feet: 20/25
  Meters(6m): 6/7.5
  Decimal: 0.8

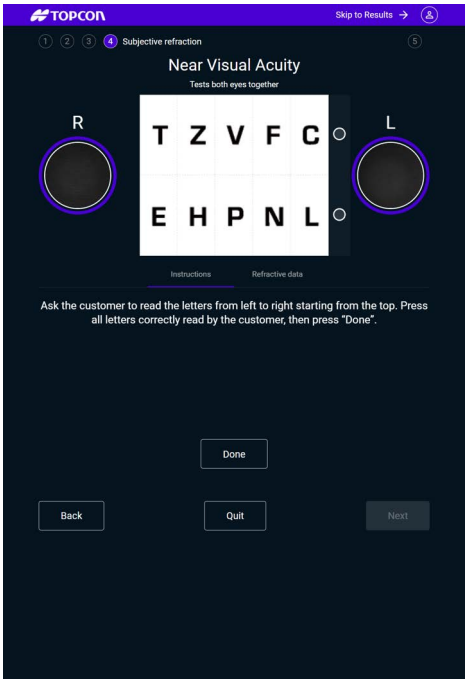
Near Visual Acuity

Near Visual Acuity is performed to record the best binocular visual acuity at near distance (40cm/16inch).

Performing the test

1. Read the instructions and ask customer to read letters from the top left to bottom right.
2. Tap to select all letters that a customer reads correctly. The selected letters turn to green color.
3. Select "Done" when a customer has read all letters that s/he reads correctly.
4. The best visual acuity will be recorded, and the test continues to the next step.
   - If the customer does not see any letters from the first chart, press "Done" and the chart with larger letters will be displayed, and the test is repeated.
   - When you proceed to the near vision test with both eyes, "Binocular Near Vision Test" will be displayed on the screen. When you proceed to the near vision test with each eye, "Monocular Near Vision Test" will be displayed on the screen and only the frame for the eye being tested will turn blue.

NOTE	Recorded visual acuity is displayed in refraction data tab and finally in the "Results" step.



Principles of the test part

- Following visual acuity rows are showed in the first step:

VA format	First	Second	Third
Feet	20	15	
Meters (6m)	6	4.5	
Decimal	0.8	0.9	1.0

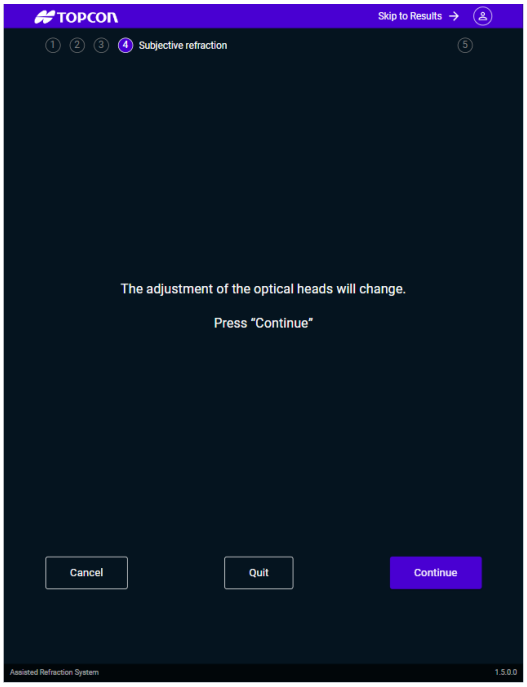
- If there are no letters selected and pressed "Done", and proceeded to the next step, following visual acuity rows are showed in the chart:

VA format	First	Second	Third
Feet	40	30	25
Meters (6m)	12	9	7.5
Decimal	0.5	0.6	0.7

Before moving to next test part

Before moving on to next test part the adjustment of the optical heads will change from near mode to far mode.

1. Ask customer to lean backward.
2. Tell the customer about the moving of the optical heads and noises of Chronos.
3. Press Continue to move to the next step.



Part 9. Comparison step

The last test part is Comparison. The test part includes two steps:

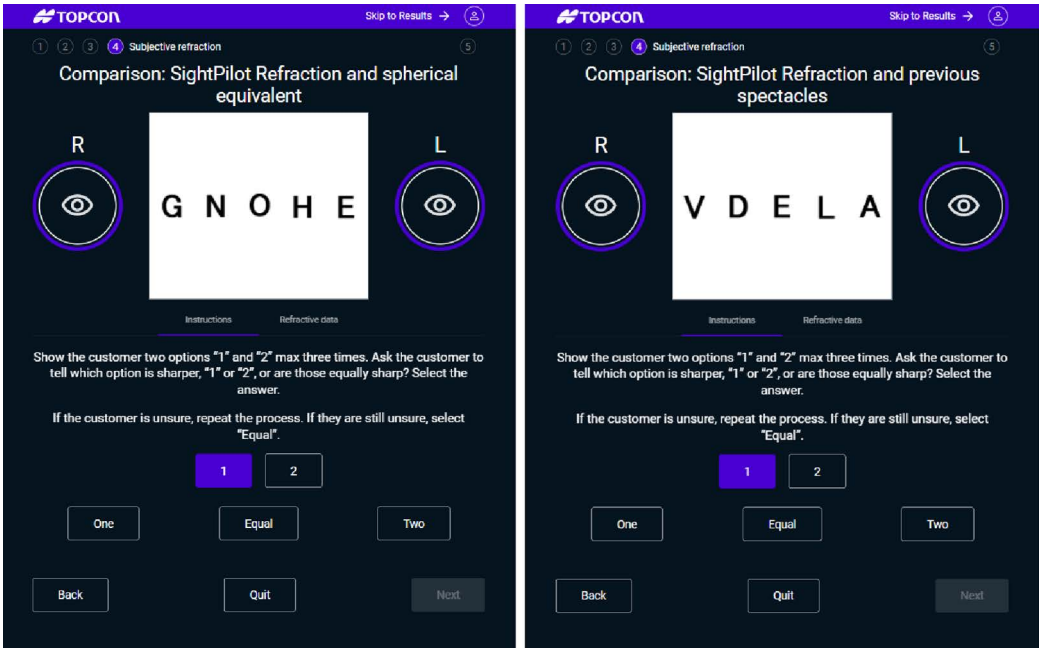
1. Comparison of Sightpilot Refraction and the spherical equivalent values.
2. Comparison of SightPilot Refraction and previous correction or unaided.

- The previous correction can be either value of previous spectacles or unaided correction. The purpose is to know the customer's preference between the compared values.

NOTE	If the cylinder value is 1.0 D or higher, the test will skip the first comparison step. (Comparison of Sightpilot Refraction and the spherical equivalent values)

Performing the test:

1. Read the instructions and asks a customer to compare options.
2. Show the options by pressing option buttons "1" and "2".
   - Button "1" shows the option one
   - Button "2" shows the option two
3. Press the answer button "One" or "Two" or "Equal" according to the customer's answer.
4. After the first answer the test continues to the next step, after the second answer the test is finished. On the next screen press "Next" to proceed to the finish page (Results).



The functionality of answer buttons

- One: The customer prefers SightPilot refraction (subjective refraction)
- Two:
  I. The customer prefers spherical equivalent of SightPilot Refraction (subjective refraction)
  II. The customer prefers previous correction
- Equal: The customer doesn't see the difference between compared values

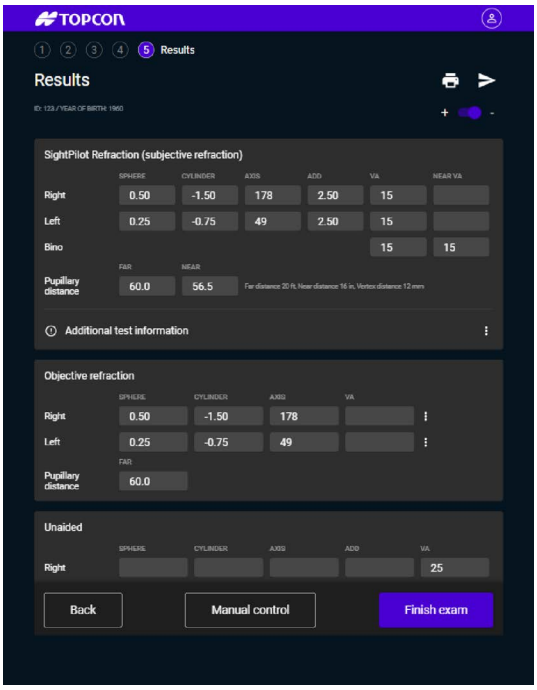
Principles of the test part

- The visual acuity values of the eye chart used in this test are as follows:

  Feet: 20/25
  Meters(6m): 6/7.5
  Decimal: 0.8

RESULTS

Results include values of subjective refraction, objective refraction, and previous spectacles.

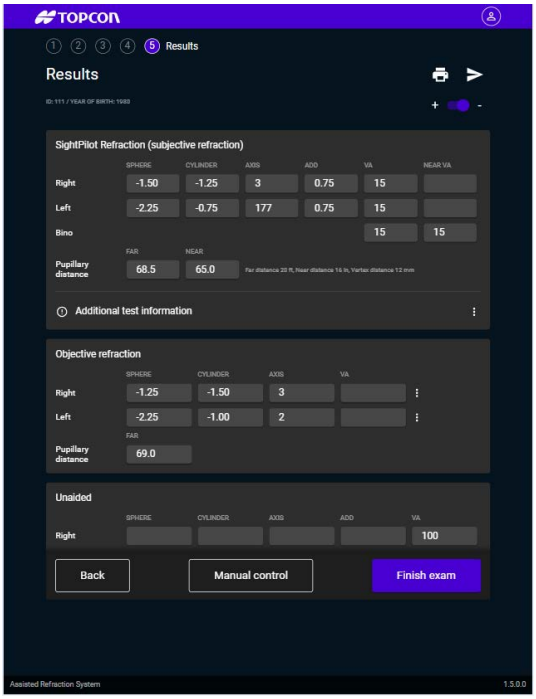


Item	Action
Exporting the results 	Export options are: - Printing the results through Chronos internal printer - Export results and all examination data to pre-defined paths in the "Settings" view forward for using in other devices or software
Converting results into plus or minus format 	Enables viewing of th results in plus or minus format
Back	Return to previous step
Manual control	Switch to the Chronos manual operation screen to perform examination manually after completing the examination with SightPilot.
Finish exam	Finish the test by clearing all examination data and returning to start. The Chronos will be reset.

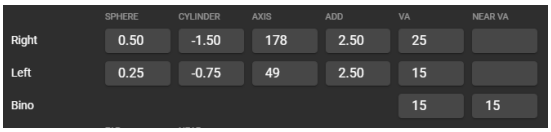
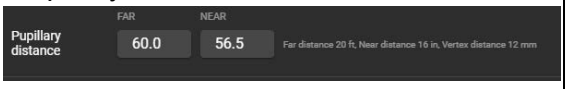
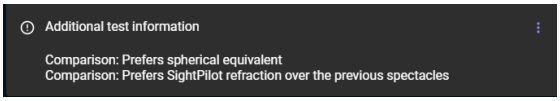
If some measurements or results have not been performed, they won’t be visible in the "Results" step. This may occur when

- Customer does not have (information on) previous spectacles
- Test aborts during subjective refraction

In this example, the customer does not have previous spectacles, so the section Previous spectacles is not visible in Results.

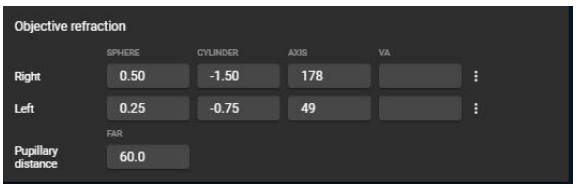


SightPilot Refraction (subjective refraction)

Item	Action
Value table 	Details of SigtPilot Refraction are displayed in the value table • Sphere indicates the amount of lens power, values -18.00 + 18.00 D (0.25D) • Cylinder indicates the amount of lens cylinder power, values -10.00 – 10.00 D (0.25D) • Axis indicates the direction of cylinder power in degrees, values 0 – 180° (1°) • Add indicates the amount of near addition power, values 0 – 3.00 D (0.25D) • VA indicates far visual acuity values (monocular and binocular) • Near VA indicates binocular near visual acuity value
Pupillary distance 	Binocular pupillary distance is displayed for far and near distances including information of vertex distance.
Additional test information 	Customer's preference tested in Comparison test parts are presented is displayed under section Additional test information. Test information is hidden by default, and they can be made visible by clicking three dots on the right.

Objective refraction

Objective refraction part in Results displays the results of autorefraction measurement taken in step 3 (Objective refraction).



It is possible to expand objective refraction results so that the results of actual objective measurements are displayed. The measurements of the eyes are presented under the related eye (right and left). The collapse menu can be opened for either one eye or for both eyes simultaneously.
To view the actual measurements, open the collapse menu by clicking the three dots next to the VA box. (picture). This section is collapsed by default. If there are no actual measurements the expand functionality is hidden.

Previous spectacles
Previous spectacles section includes information of refractive values of previous spectacles. If a customer does not have spectacles, this section won't be visible in Results step.

Information on export files
Following information will be included in export files (print and xml):

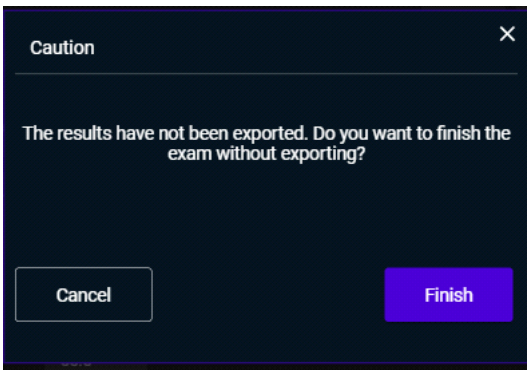
Include information of what info is going to be included in print file

- recorded visual acuities of previous spectacles to print file (monocular values)
- unaided visual acuity values (monocular values) if there are no previous spectacles
- Keratometry measurements average values added to print (D and MM columns)
- Aborted status added to XML export file when test is aborted in objective refraction. When user has finished objective refraction test during exam and exam is aborted due to insufficient objective refraction results, the exam status aborted is included in the export XML file (general, Examdata.xml, CVImport)
- Test duration

When user exports exam data then the export files will be created including the exam duration in format HH:MM:SS in the element <Duration>. The exam start time is when the user press "start exam" and the end time is when the user ends up in the result step. If user returns to the previous steps after completing the test, then new end time will be recorded when the user proceeds again to the result step. The latest end time will be taken into account when counting duration and it will be exported.

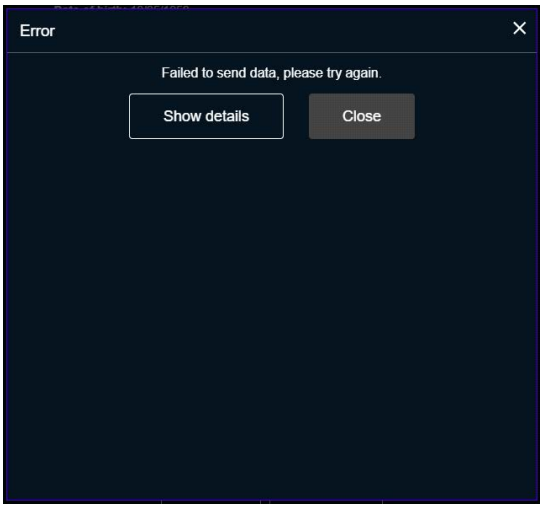
Caution to finish exam without export

The caution message appears when "Finish" is pressed without exporting or printing exam data.



Error in sending data

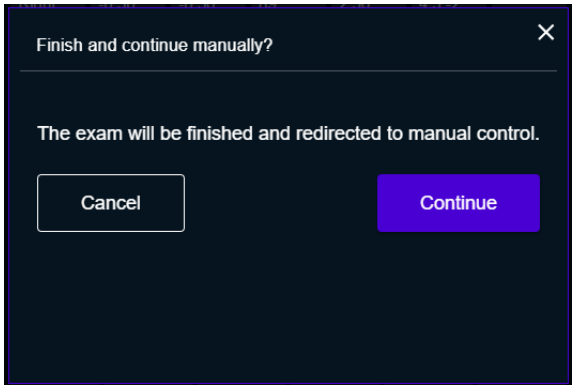
If any error occurs, follow the instructions in the error message on how to continue. If the problem is constant see the checklist of technical problems in "Before requesting service".



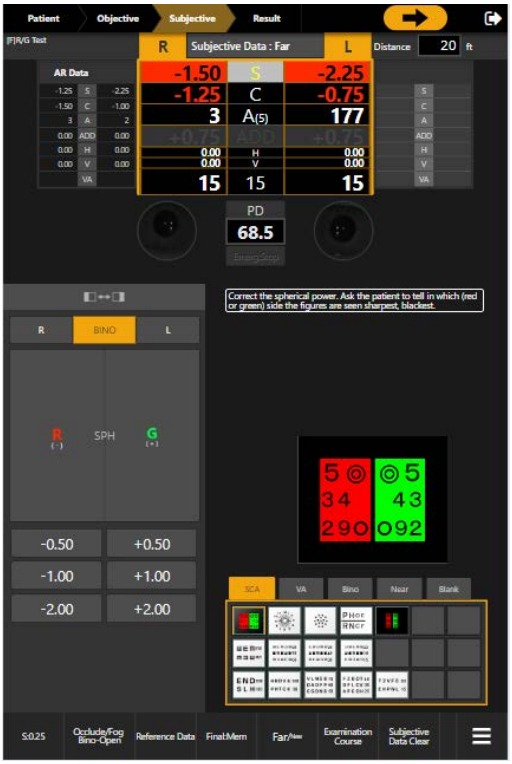
Manual control

After completing the SightPilot Assisted Refraction exam the test is possible to continue to perform manually.

Press the button "Manual Control" in the result step. The pop-up message emerges to confirm the redirecting to manual control.



After confirming, the user will be redirected to the Subjective test screen to control Chronos manually.



All exam and customer data from SightPilot are exported so that the testing can be continued straight after redirecting. The exam in SightPilot will be finished so that the user cannot return anymore to the result step of SightPilot. Instead, user can export and print exam data by forwarding to Result screen. See detailed instructions to use manual control in Chronos' manual.

Return to SightPilot to start new exam by pressing "Task shift" button on the top right corner of Result screen.

BEFORE REQUESTING SERVICE

USER MAINTENANCE

To ensure the safety and performance of the software, all maintenance work, unless specified in this manual, shall only be conducted by trained service engineers.

Check out the maintenance of Chronos in this manual page 128.

IN CASE OF ERROR

When an error is encountered, review the Check List below.
If, after following the instructions below, you still cannot restore the software to a normal condition or if the problem does not fall into any of the categories below, contact your local distributor or TOPCON (see the last page).

Check list of technical problems

Problem	Condition	Check
The software does not launch	The web browser opens but the software doesn’t open	Check that the address and the network are correct. Check also that the network works.
The launching of the software freezes	The software launches but the start page is not displayed.	After rebooting Chronos, launching the software may take a moment, wait until the software launches properly. In other cases, relaunch the software. Contact the support service if the issue persists.
The software freezes	The software is running but no button can be pressed or there is no other way to proceed.	Shut down the application by closing the browser and try to launch it again. Reboot Chronos if needed.
The software lags significantly	The software is running but is proceeding very slowly.	Shut down the application by closing the browser and try to launch it again. Try to clear the browser's cache. If it won't work reboot the Chronos.
The screen does not appear correctly	In some pages, the buttons are overlapping or aren’t showing at all	When using software with PC, smaller the screen by clicking Ctrl and -. If the problem still exists close the window and launch the software again.
Application error occurs	The error message of Application error appears in the screen	To ensure correct functionality relaunch the software when Application Error occurs.

Problem	Condition	Check
The live video of customer's eyes won't work	Live videos of customer's eyes are not displayed correctly.	Close the software and restart it. The videos do not affect the subjective refraction, so if the problem occurs during the test, it can still be performed normally. If it won't work, reboot the Chronos.
The software starts the subjective refraction test in the wrong part	The subjective refraction test starts with other than part 1, customer Screening.	Shut down the application by closing the browser and try to launch it again. If it does not work, clear the browser's cache.
The user sees different test part/chart on the screen/desktop than customer's sees in Chronos	The user sees different test part/chart on the screen/desktop than customer sees in Chronos.	Return to previous part and try again or shut down the application by closing the browser and launch it again. If it won't work, try to clear the browser's cache, and reboot Chronos.
Lens meter data does not get imported	In the previous spectacles step the importing the lensmeter data fails or is not displayed	Go to the settings view and check the setting for import path. See details on section "Settings". Lens meter data can be also entered manually if importing doesn't work.
Results are not forwarded	1. The software fails to send data 2. The software sends data successfully, but the data cannot be imported to other software/ devices	1. Try to send data again. Go to settings view and check the setting for export path. See details on section "Settings". 2. Contact the support service.
Printing fails	Printing doesn't work and the error message pops up.	Check that the paper is set to the printer of Chronos correctly and it is not run out. Otherwise, check the Printing section in the manual of Chronos.

FAQ

1. I cannot login because software doesn't access my credentials.

- Contact support service who can check software accounts or refer user manual page 164.

2. I have added customer details, but I can't continue to the next step.

- Check that all required details are entered. The error message on the screen notifies the reason for the error. Note that the age range is SightPilot is 8-110 years.

3. I have manually entered customer's prescription of previous spectacles, but I can't continue to the next step.

- Check that all cells have same value. If the prescription does not include some value, enter 0.00 in those cells. Values are accepted every 0.25 diopters. If prescription includes values with different step range, round the value to the closest value of step 0.25.
    a. E.g. sphere value +0.12 is rounded to +0.25.

4. I can't import values from the lens meter.

- Try to import values again by returning and selecting again "Yes, import data from the lensmeter". If it doesn't work, you can add values manually.
- Check the settings of the import path.

5. The objective measurement fails.

- Ensure that a customer is an upright position, and the forehead rest is just above their brows. Check also that you can see a customer's eyes in the live camera windows on the screen. Adjust the height of the optical heads if eyes are too low or high. If measurement still fails refer customer to the eye care specialist (optician/optometrists/ophthalmologists).

6. I accidentally pressed the answer button and the test continued to the next test part. How can I return to previous test part?

- Each test part includes the "Back" button to return to the previous test part. Returning will re-start the test part so all given answers in that test part will be canceled. Therefore, the test part must be re-performed from the beginning. This happens also when the test part includes several steps, for instance when pressing back during the second step of the Near Addition.

7. I accidentally pressed the answer button, and I would like to cancel the answer. How can I do that?

- If unintentional answers have been given and the test part has remained same, you can cancel the answers by pressing "Back". Both will cancel the given answers in the test part.

NOTE	Returning to previous part will re-start the test part

8. The test aborts. What that means?

- If the customer is unsuitable for examined by SightPilot meaning that their visual acuity is too low, the refraction values change too much during the test, or the refractive error is unsuitable for the testing, the test will abort. If test aborts, refer an eye care specialist to complete the refraction.

9. I want to stop testing during the subjective refraction test. How can I do that?

- If the user wants to stop testing for any reason, it is possible by clicking "Skip to results" or “Quit exam”

10. I am trying to finish the test, but the caution message is displayed. What that means?

- When the user press "Finish" in the final step, all data will be cleared, and the test will be returned to the start. The caution message ensures that the examination data has been sent forward, so it won't be lost unintentionally.

Holding period of maintenance parts

In principle, for this product, the minimum holding period of the maintenance parts (parts to keep the product's performance) is 8 years since the end of production according to the TOPCON regulations.

Some of the maintenance parts are the commercial parts. When a long time has passed since the release date, these parts cannot be supplied before the holding period expires for certain reasons (for example, the manufacturer has discontinued the production of them). We kindly ask for your understanding.

When calling please give us the following information about your unit:

- Model name: REFRACTION SYSTEM Chronos
- Serial No.: Shown on the rating plate on the rear side of the main unit
- Period of use: Please inform us of the date of purchase.
- Defective condition: Please provide us with as much detail as possible on the problem.

REFRACTION SYSTEM
Chronos

USER MANUAL

Revision 13.00
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REFRACTION SYSTEM

Chronos

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