EVOptica

OPHTHALMIC INSTRUMENTS / ENGLISH EDITION

CHROMA

User Manual

TECHNICAL REVIEW EDITION



Full English translation of the supplied manual. Source inconsistencies are identified for technical review. This document is not a released clinical IFU for a new US configuration.

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About this English edition

This edition translates the supplied original instructions and updates the corporate identity and contact details to EVOptica. It does not change instrument operation, calibration values, treatment parameters or the documented software behavior.

TECHNICAL REVIEW EDITION - NOT A RELEASED CLINICAL IFU

The supplied originals contain unresolved configuration differences, malformed values and, in places, text apparently copied from other instruments. These differences have been identified without guessing a correction. Manufacturer engineering and clinical review is required before releasing instructions for a specific product configuration.

Navigation and original references

Source section numbers below refer to pages in the supplied original. The English layout has its own footer page numbers. The linked section list and PDF bookmarks navigate this edition; original figure, table and contents references retain their source context.

Screenshots and interface labels

Illustrations document the original software interface. Portuguese button labels are retained where needed and paired with English descriptions. This translation does not imply that the underlying software has been localized or that obsolete operating systems and network settings are a new configuration recommendation.

The full configuration and source-review notes appear after the translated instructions. Resolve those notes before releasing this document for a specific instrument configuration.

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SOURCE SECTION 1

CHROMA Corneal Analyzer - Instructions for Use

Product: Corneal Analyzer. Model: CHROMA (original: WAVETEK CHROMA). Revision 3.0.

Corneal topography system with chromatic Placido discs, patented through INPI under a confidential protocol. Copying the software or hardware is prohibited; any attempt is subject to intellectual property law.

EVOptica, 221 S Main St, Fairport, NY 14450, USA. Call/text +1-315-210-8976. contact@evoptica.com. https://evoptica.com.

Illustrations - source section 1



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 2

A Brief History of CHROMA 1.0 and Corneal Topography in Brazil and Worldwide

Corneal topography in Brazil has a history spanning more than a decade, involving several prominent names. These include Prof. Dr. Paulo Polisuk, author of several articles and Topografia de Córnea - Atlas Clínica; Prof. Dr. Wallace Chamon and Dr. Paulo Schor of EPM-UNIFESP; Dr. Renato Ambrósio; and Prof. Dr. Luis Alberto de Carvalho, author of Óptica & Fisiologia da Visão - uma Abordagem Multidisciplinar and a founder of the original manufacturer, Wavetek Ltda.

Corneal topography began with Placido's elegant invention, the famous Placido discs (see illustration). Improvements followed over decades: the Javal keratometer, the photokeratoscope in the 1950s and 1960s, and the videokeratographer in the 1980s with widespread personal computers.

Videokeratographers have been used for more than 17 years by professionals closely involved with corneal topography in Brazil, most with international experience. To offer Brazilian physicians excellent quality and advanced domestic technology at a lower investment, Wavetek developed and launched its first videokeratographer, CHROMA.

For his achievements as an ophthalmologist and inventor of the Placido discs, this new instrument was dedicated to Placido and named CHROMA™ for its technology.

Original development team, August 2012.

Illustrations - source section 2



SOURCE SECTION 3

Abbreviations and Conventions

VC: videokeratographer or videokeratoscope. USP: University of São Paulo. UFSCar: Federal University of São Carlos. IPD: Parqtec Design Institute. PDF: Adobe Acrobat Reader document format (www.adobe.com). CCD: “Charge Coupling Device,” the silicon sensor technology of modern CCD cameras used by CHROMA. ParqTec: São Carlos High Technology Park.

Dioptric power in legends and throughout the text is written out or abbreviated D. Micrometers: microns or um. Millimeters: mm. Names of software buttons and menu items appear between angle brackets (< >).

SOURCE SECTION 4

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SOURCE SECTION 7

Introduction

Welcome to the CHROMA 3.0 user manual. You have acquired one of the most advanced systems available worldwide for analyzing optical abnormalities and topography of the anterior corneal surface. CHROMA was developed and manufactured using Brazilian technology by a team with experience gained at leading vision science universities worldwide.

The original manufacturer, Wavetek, was founded in 2006 when one founder returned from the renowned Center for Visual Sciences at the University of Rochester, a major vision research center at an American university renowned for optics (www.rochester.edu). It was based in São Carlos, the “Technology Capital” in the interior of São Paulo State. That founder also earned his doctorate at the São Carlos Institute of Physics, USP, with a visiting research period at the Vision Science Department of the University of California, Berkeley, USA, and became a recognized ophthalmic researcher and entrepreneur.

Rochester has long been renowned: Bausch & Lomb, Kodak and Xerox are three internationally known companies founded there.

Another founder was an electrical engineer trained at USP’s São Carlos School of Engineering, with more than fifteen years’ experience in ophthalmic optical instrumentation. Familiar with modern physicians’ diagnostic and clinical needs, he also founded the medical department of a nationally and internationally recognized company and became the new company’s commercial director. Other partners were investors of different sizes and economic sectors; they served on the board rather than participating in daily operations.

For further information, visit https://evoptica.com.

CHROMA was developed by qualified professionals for qualified professionals, rather than as an amateur product or merely a second choice for physicians seeking accessible anterior corneal analysis. Its lower cost reflected Brazilian manufacture; its electronic technology was imported from Japan and its optics were made partly in São Carlos and partly in the USA.

SOURCE SECTION 8

CHROMA was developed both for ophthalmologists using a VC for routine examinations and those conducting research, preparing classes, exporting images to the internet or PowerPoint for conferences, and processing those images. CHROMA software supports these various functions.

Our VC is more than a console for quantitative measurement of anterior corneal topography and abnormalities. Its Windows-based software and hardware allow reports containing richer information. Its personal computer platform permits software and hardware upgrades, extending useful life beyond standalone systems. Dedicated consoles are standalone ophthalmic instruments with built-in computers that generally do not use conventional operating systems such as Windows, making software maintenance and upgrades difficult. A failure often requires replacing the entire instrument, creating additional investment and a high probability of obsolescence within a few years.

Thank you for your confidence. We welcome opinions and suggestions through https://evoptica.com or contact@evoptica.com, or by calling/texting +1-315-210-8976.

The original manufacturer was a Brazilian company with international experience, seeking leadership in ophthalmic optics through excellent quality, fair prices and personalized service to each customer.

Thank you for choosing CHROMA. EVOptica team.

SOURCE SECTION 9

1.0 Product

Technical name: Instrument for Measuring Corneal Parameters. Commercial name: Corneal Analyzer. Commercial model: CHROMA. Brand: EVOptica.

Current contact: EVOptica, 221 S Main St, Fairport, NY 14450, USA; +1-315-210-8976 call/text; contact@evoptica.com; https://evoptica.com.

Original manufacturer: Wavetek Indústria Comércio Importação Exportação de Produtos Médicos e Ópticos Ltda. Original Brazilian corporate registration (CNPJ): 08.109.979/0001-42. Original technical officer: Eng. José Elizeu Benigno Ramos, CREA-SP no. 0685024172. These are historical instrument references.

2.0 Components

Figure 1.0.

CHROMA consists of two basic categories: hardware and software. Hardware can be divided into the instrument itself and the computer and peripherals (Figure 1.0).

Figure 1.1 shows the CHROMA optical head, patient head support (chinrest and forehead rest), motorized height-adjustable table, and computer...

Illustrations - source section 9



SOURCE SECTION 10

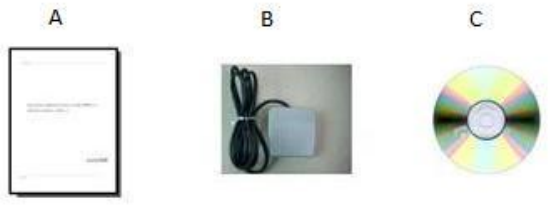
...CPU (Central Processing Unit) and LCD monitor. The CHROMA package should also contain this manual (A), a foot pedal for image capture (B), and an installation CD containing all CHROMA software and digital documentation in PDF format (C); see Figure 1.2.

Figure 1.2 - Materials supplied in the CHROMA package.

Figure 1.1 - All CHROMA hardware components. A color printer may also be installed, depending on the customer's selections.

Note: The CHROMA instrument is rated at 110 volts.

Illustrations - source section 10





SOURCE SECTION 11

DO NOT ALLOW GAMES, ONLINE CHAT SOFTWARE OR ANY OTHER SOFTWARE TO BE INSTALLED ON THE COMPUTER SUPPLIED WITH CHROMA. THE PRODUCT WARRANTY WILL NOT BE VALID IF THIS IS FOUND TO HAVE OCCURRED.

3.0 Technical Specifications

Specification	Value
Photographic coverage	10 × 10 mm (central camera), 5 × 5 (side cameras).
Camera connection	USB.
Magnification	1.3×.
Working distance	35 mm.
Image processing	chromatic.
Database	thousands of patients, virtually unlimited; backups to different media, including USB flash drives.
Monitor (optional)	15-19-inch color LCD.
Computer (optional)	DELL VOSTRO 220s, HP Pavilion Slimline.
Operating system (optional)	Windows Seven.
Supply voltage	110 V.
Power consumption	65 VA normal, 190 VA maximum.
Instrument dimensions	274 × 485 × 200 (W × D × H).
Weight	7.0 kg.
Packaging	internally lined cardboard box.

4.0 Using CHROMA Software

CHROMA software was designed entirely by researchers and engineers trained at USP and UFSCar and developed at the original manufacturer's São Carlos headquarters using modern tools, including C++, Java and HTML. It is designed to be efficient, robust and stable, rarely experiencing crashes (Windows blue screens) and using little computer RAM. Users should find it easy to use as they become familiar with its menus and task screens.

CHROMA software is protected against piracy and reverse engineering attempts. Future versions will be available periodically, and users may exercise upgrade rights during the warranty period.

SOURCE SECTION 12

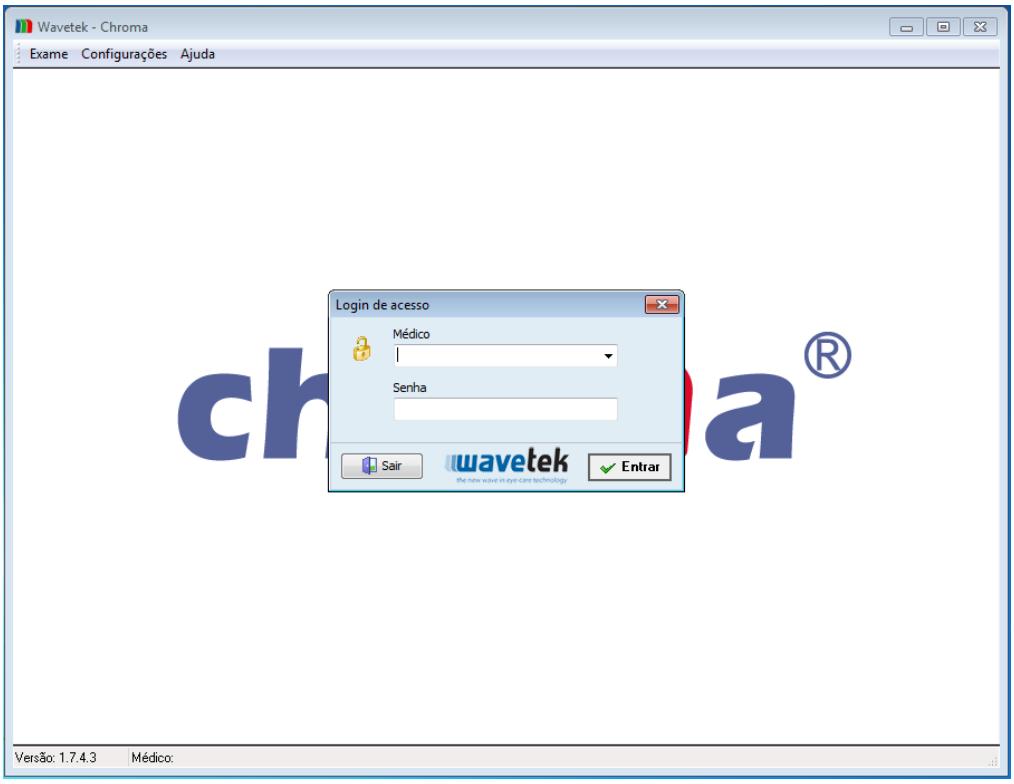
4.1 The Software - First Use

The first time CHROMA software runs, only one fictitious physician is installed, named Physician (Médico).

Select Physician (Médico) on the home screen and click <Enter> (<Entrar>) to start CHROMA. Follow <Examination> <New> <Review> (<exame> <novo> <rever>). A sample patient is preinstalled with first name Paciente and surname Fictício. The system contains sample corneal topography images and examinations performed on living patients. These images help inexperienced users understand the images CHROMA provides. The examples include not only Test Patient images but also all examination information obtained using them; see “Review Examination,” page 34, for fuller information.

If physicians have already been registered, the same screen appears with the full physician list.

Illustrations - source section 12



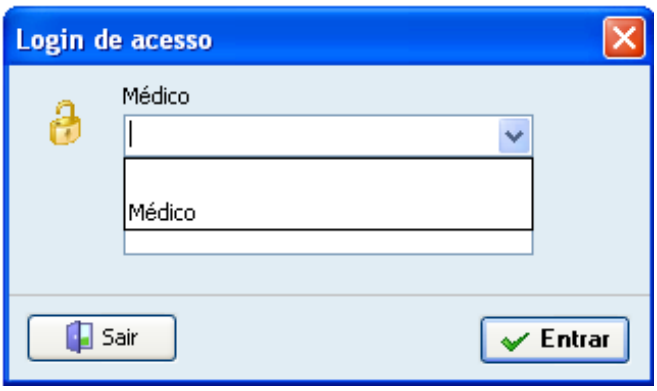
Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 13

Figure 1.3 - Active physician selection screen.

The active physician concept is important in CHROMA software. Selecting the active physician does not prevent changing that physician during an examination. It means that any examination on any new or registered patient is associated with the active physician's database. Selecting the correct physician ensures examinations performed during that session are associated with that physician. This is important because that physician's name is printed on patient reports.

Illustrations - source section 13



SOURCE SECTION 14

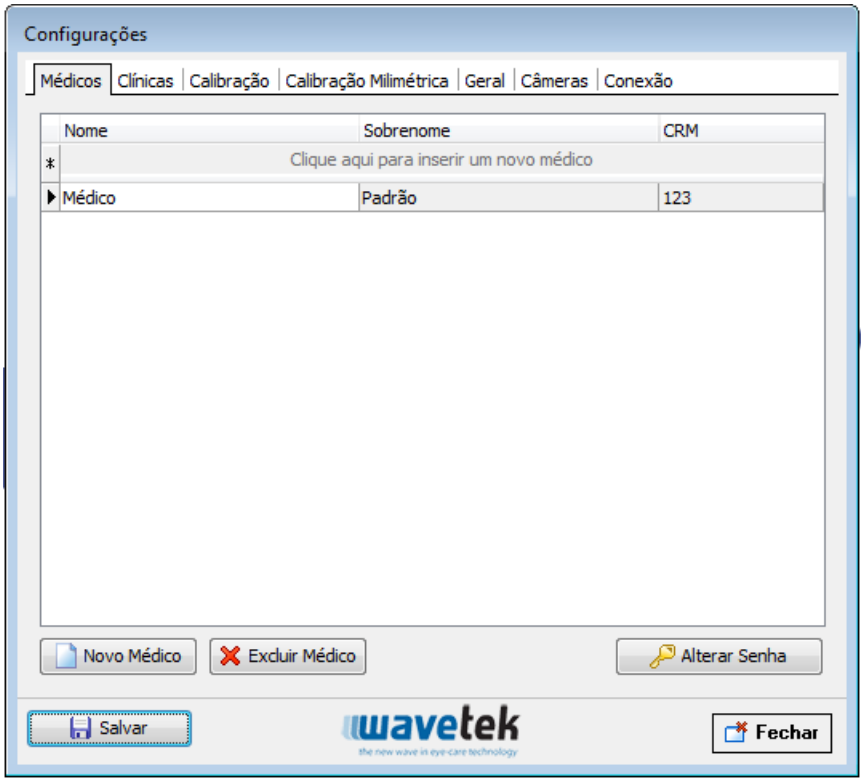
Settings

To add a physician, use <Settings> <Display> (<configurações> <exibir>), click the Physicians (Médicos) tab, then New Physician (novo médico) below to enable the fields. Complete them and remember to save.

Figure 1.4 - Physician data registration and viewing screen.

Click the adjacent Clinics (Clínicas) tab, then New Clinic (nova clínica), to display clinic information fields and a place for the clinic logo. Click the gray square below Logo (Logotipo) to add the logo.

Illustrations - source section 14



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 15

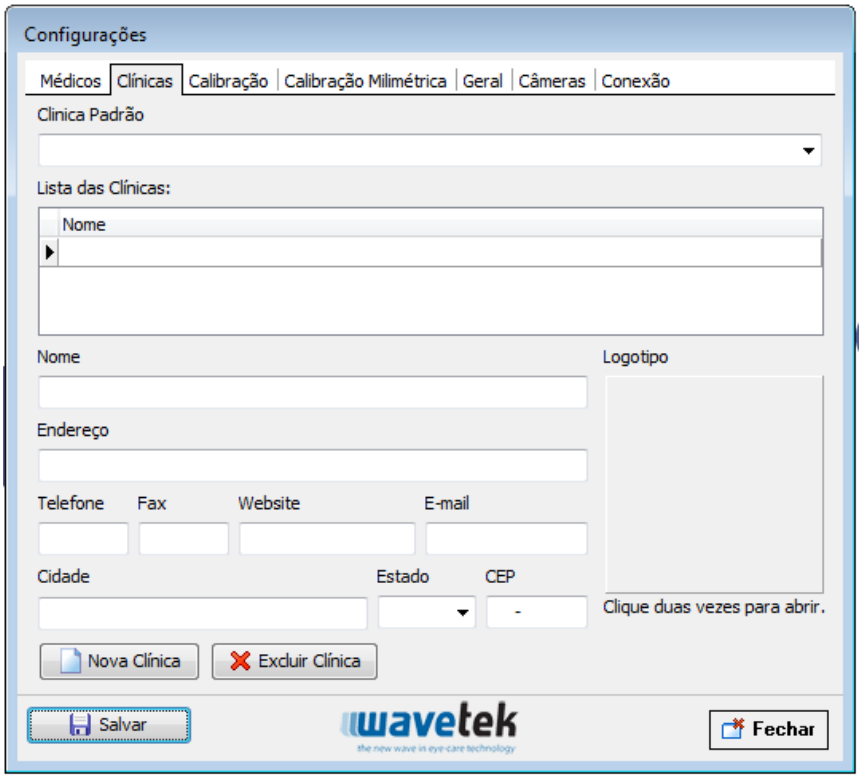
Figure 1.5 - Clinic registration, data viewing and logo insertion screen.

On the Calibration (Calibração) tab, click Start Calibration (iniciar calibração) to begin instrument calibration; see Figure 1.6.

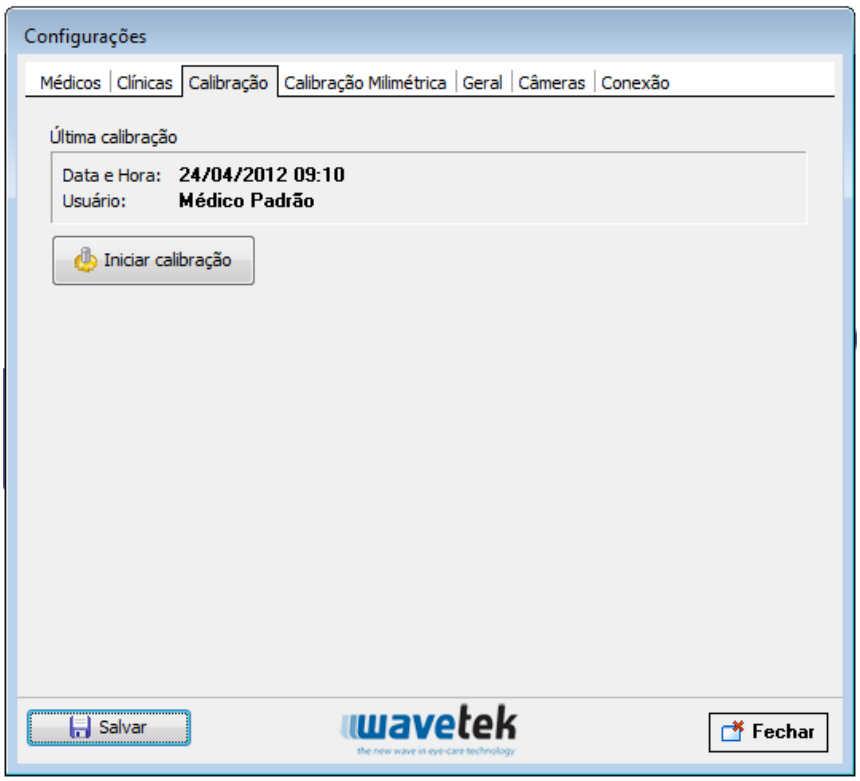
Figure 1.6 - Start calibration screen.

Clicking Start Calibration opens the calibration sphere image capture screen, Figure 1.7.

Illustrations - source section 15



Original instrument or software illustration. See the English instructions and interface labels in this section.



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 16

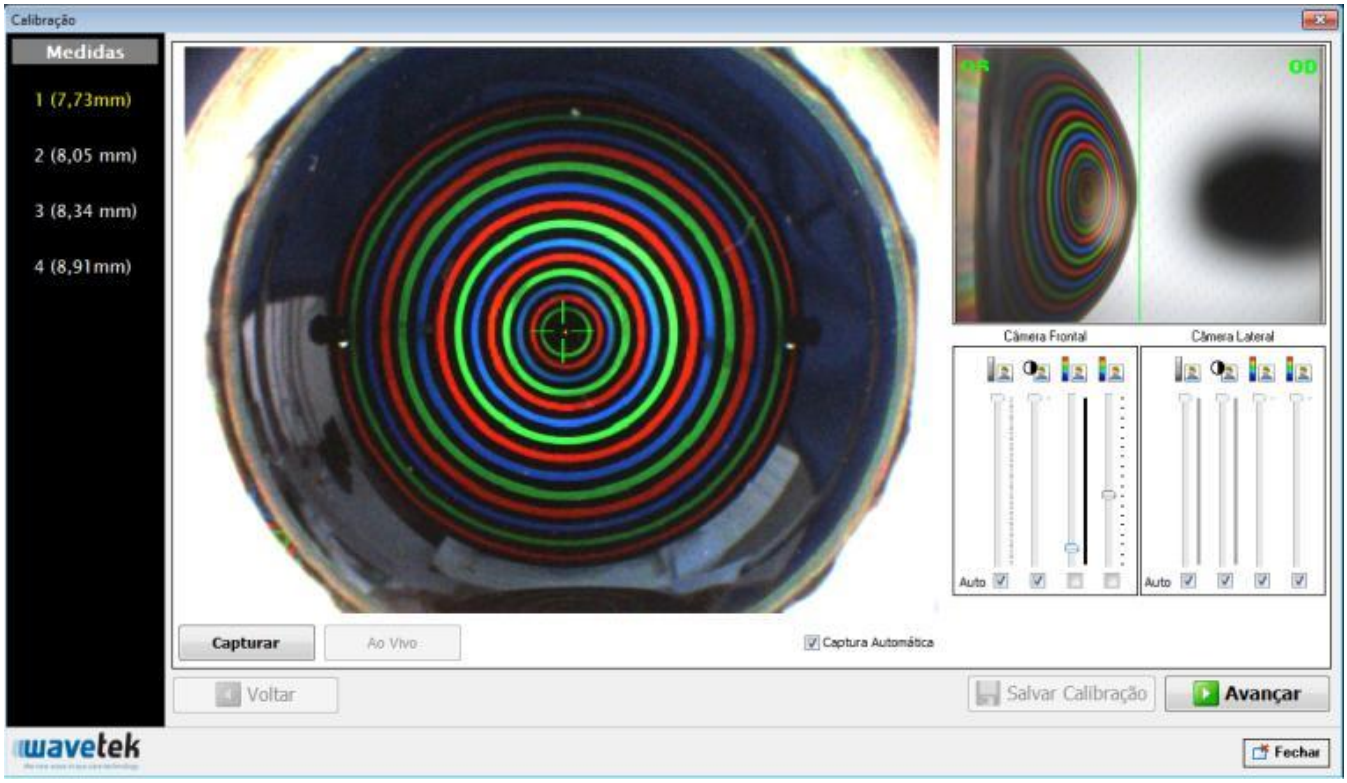
Figure 1.7 - Calibration capture screen. Observe correct alignment of the side and central images before capture.

Calibration Steps

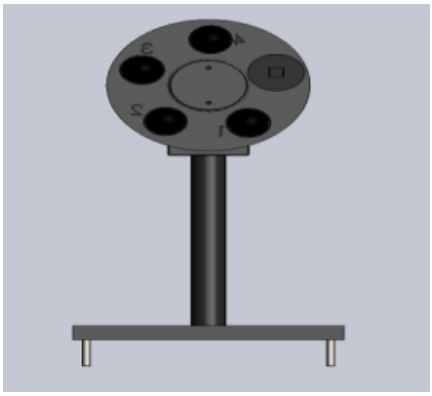
- Have the supplied magnetic calibration sphere assembly ready.
- Position the calibrator in place of the double chinrest, with the spheres facing CHROMA.
- Capture sphere number 1, as shown in Figure 1.7.
- Click Next (avançar), then click the center of the image, precisely on the central LED. Wait for ring processing. Click Interpolate Rings (interpolar anéis), then Save (salvar).
- Repeat for the remaining spheres, always in sequence from 1 to 4. Remember to save the calibration process at the end.

Figure 1.8 - Calibration sphere assembly.

Illustrations - source section 16



Original instrument or software illustration. See the English instructions and interface labels in this section.



SOURCE SECTION 17

Note: Sequence numbers (1, 2, 3 and 4) are marked beside each sphere on the calibrator.

Millimeter Calibration

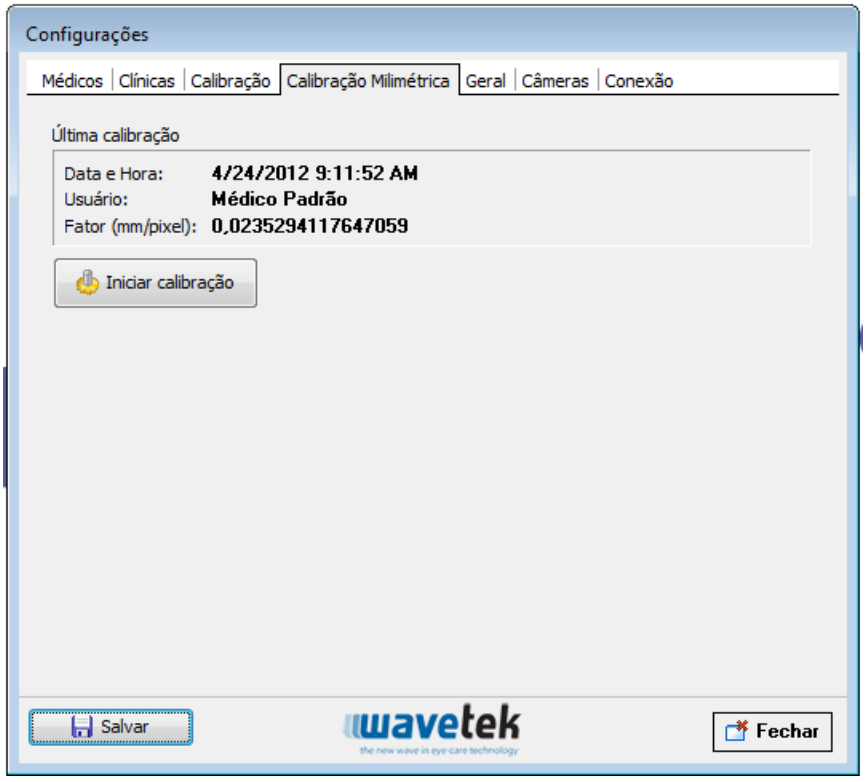
REMINDER: MILLIMETER CALIBRATION MUST FIRST BE PERFORMED BY THE AUTHORIZED TECHNICIAN ON INSTALLATION DAY. IF RECALIBRATION IS REQUIRED, FOLLOW THESE INSTRUCTIONS.

- On the Millimeter Calibration (Calibração Milimétrica) tab, click Start Calibration (Iniciar calibração). The system opens the capture screen.
- Position the center of the CHROMA image at the center of the square target on the calibrator (Figure 1.10).

Figure 1.9 - Millimeter calibration screen.

Figure 1.10 - Millimeter calibration target.

Illustrations - source section 17



Original instrument or software illustration. See the English instructions and interface labels in this section.

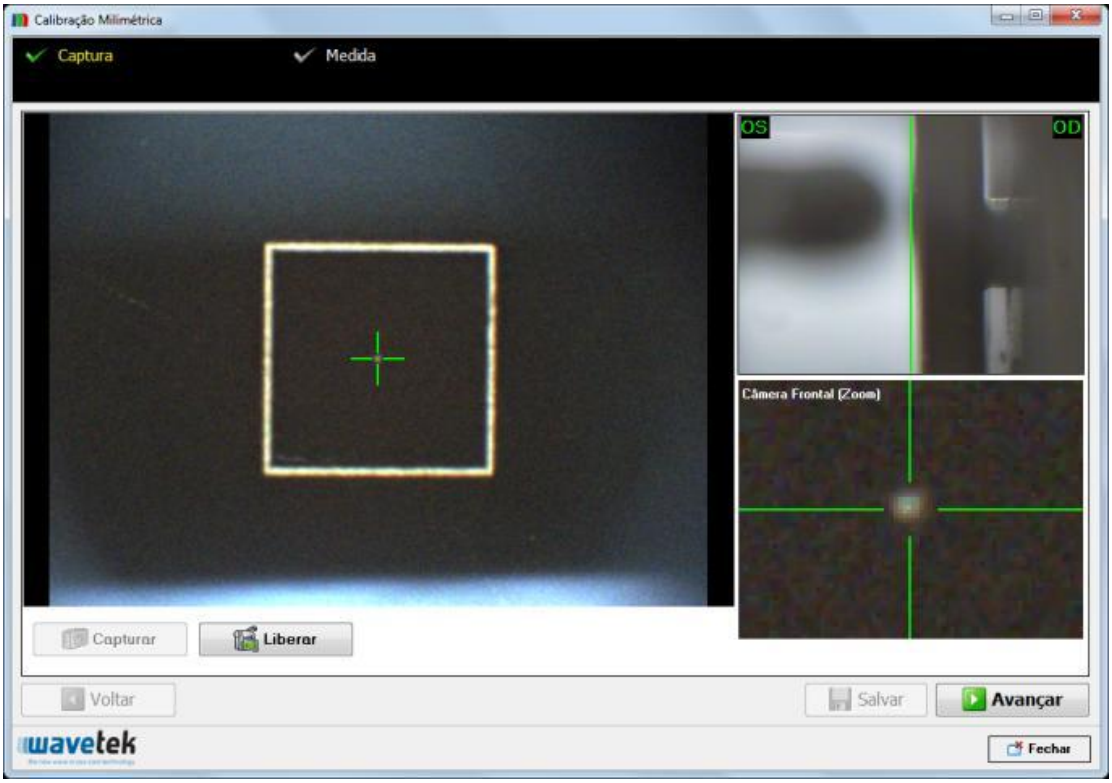
SOURCE SECTION 18

- Capture the image as shown in Figure 1.11.
- Click Next (avançar). Use the mouse to select a square over the square in the image.
- Change Visible Area (Área Visível) to 5 and verify that the calibration sequence produces a value in the range mm/pixel = 0.023 to 0.0249.
- Click Save (salvar).

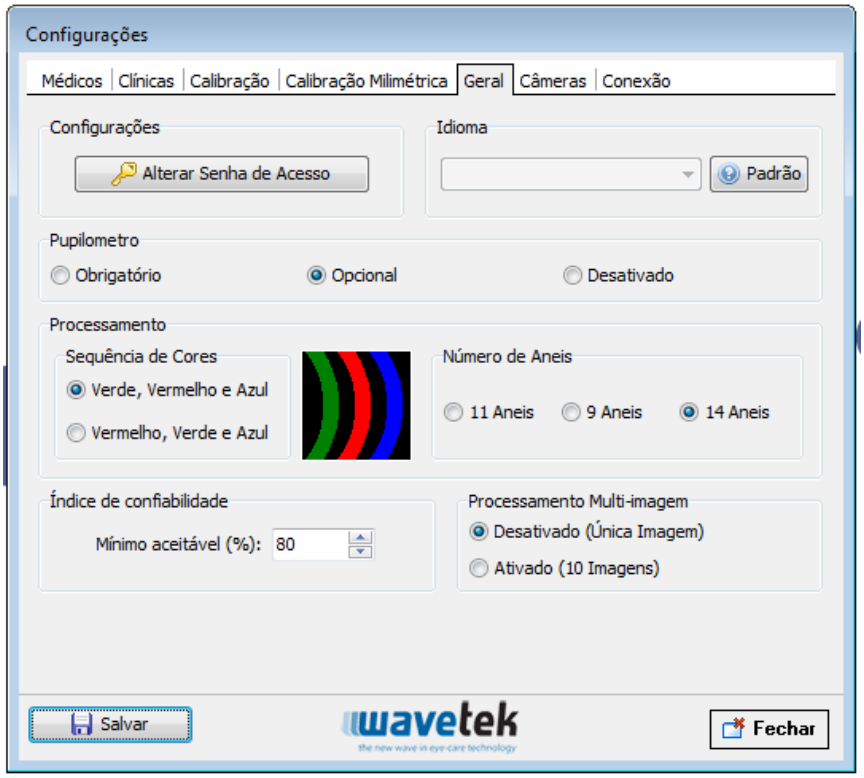
Figure 1.11 - Millimeter calibration capture.

Figure 1.12 - CHROMA general system settings screen.

Illustrations - source section 18



Original instrument or software illustration. See the English instructions and interface labels in this section.



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 19

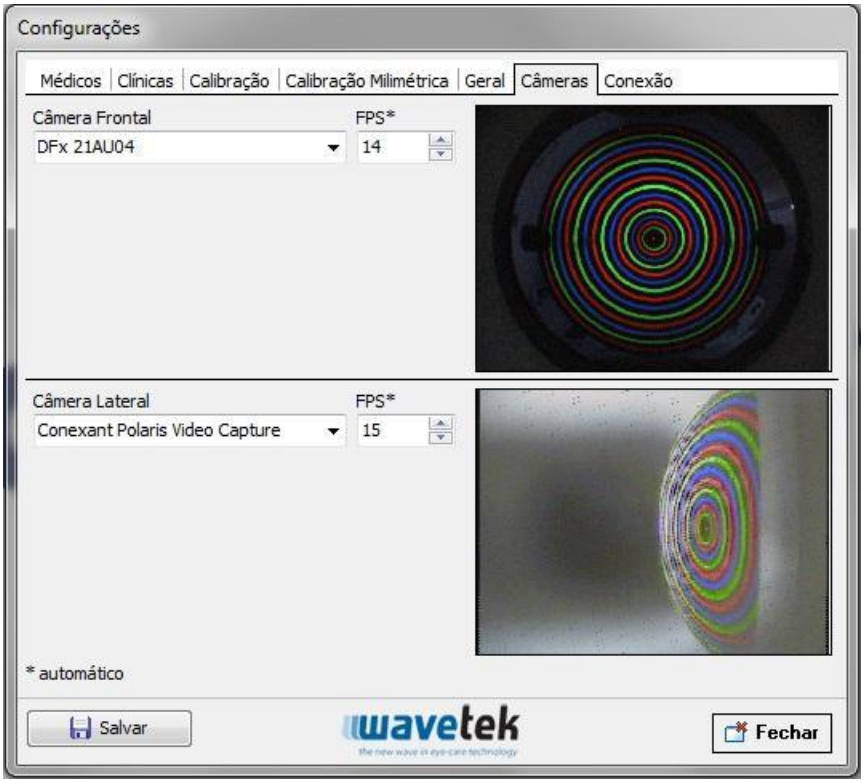
General CHROMA settings on this screen:
1. Change the general screen access password (no password by default).
2. Choose how the pupillometer is used: Required (Obrigatório), Optional (Opcional) or Disabled (Desativado).
3. Set the number and color sequence of cone rings for the instrument version. Never change these fields unless you know precisely which version you have.
4. Set the Reliability Index, IC, according to user experience. As the operator gains experience, IC may be set to a higher percentage.

NOTE: Change values on this tab only if you are sure what you are doing, to avoid system errors.

Cameras

Figure 1.13 - Camera settings screen.

Illustrations - source section 19



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 20

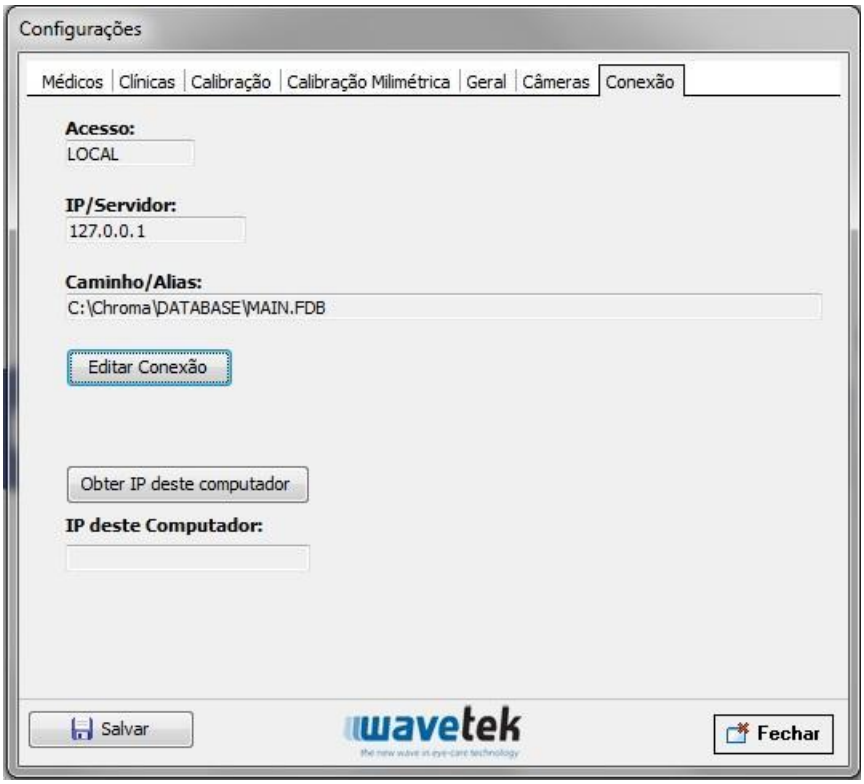
Configure the CHROMA front and side cameras here. Click the small arrows in the boxes below Front Camera (Câmera Frontal) and Side Camera (Câmera Lateral) to select the correct camera. If unsure, check the camera names in the illustration above.

Connection

Figure 1.14 - Connection settings screen.

The connection screen is for CHROMA Viewer users. Viewer is a CHROMA software extension that can be installed on another computer, allowing access to the entire CHROMA database. The computers must be networked.

Illustrations - source section 20



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 21

Understanding the Different Types of Videokeratographer

Several videokeratographer models and types are available. These definitions help users understand where CHROMA fits.

The first type is fully automated, with a built-in computer: dedicated standalone consoles. The advantage is simple focusing and image capture that people with or without experience can perform. The disadvantage is that an entirely automatic measurement process gives no freedom to choose which regions to examine. Such equipment generally comes without an external Windows Seven computer and separate software and hardware. Dedicated systems normally have a simple graphical interface.

The second category comprises instruments with an external IBM-compatible PC, or a PC-based computer built into the housing.

How do these differ from conventional automatic VCs? There are many differences; a basic analogy is buying a Mac versus a PC. If a PC needs a replacement part or software or hardware improvement, it is usually easy to find at an accessible price. The second VC category is scalable: periodic software and hardware upgrades extend system life. A Mac is attractive, fast and elegant, but requires greater investment; replacements may be hard to find, expensive and specific, with only certain components compatible.

This is essentially the difference between the two VC categories. CHROMA belongs to the second: its optical head is completely separate from its processing unit, an IBM-compatible PC running Windows. Another major advantage is that the physician can adjust images and complete discs when considered necessary. Image processing and all CHROMA software modules are virtually automatic and...

SOURCE SECTION 22

...very simple to use, but the critically important part of the examination remains the physician's choice rather than the instrument's.

CHROMA provides scalable software and hardware upgrades without replacing the whole instrument, choice among different printers and monitors, freedom and cost effectiveness, plus a graphical software interface and report printing quality much higher than the video printers attached to the first category. These advantages require greater responsibility and training. The following sections provide tips to shorten the learning curve.

New Examination

4.2 Preparing CHROMA for Examinations

Steps for good Placido disc images:
1. Bright examination environments are not recommended, as this may compromise disc edge quality. Place the instrument in a room with adjustable lighting that can be dimmed or made completely dark.
2. Always select the eye being examined using the external switch. Labels indicate which camera is active and for which eye.
3. Align the central image containing the Placido rings first, then the side focusing image. The central image crosshair must be over the central LED; the side image line must lie on the corneal apex.
4. Capture only after completing these three steps. CHROMA offers foot-pedal or keyboard capture.

SOURCE SECTION 23

4.3 Image Capture Techniques

Anterior corneal topography using the CHROMA focusing system.

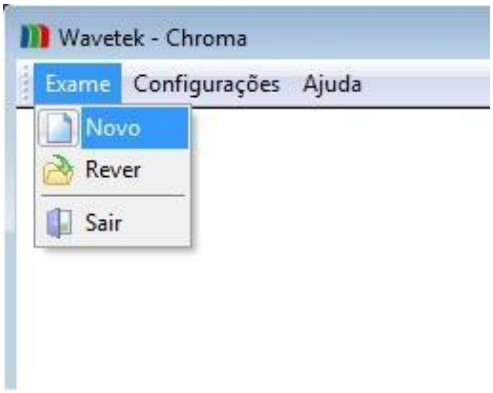
Select <Examination> <New> (<exame> <novo>), as illustrated in the source's Figure 2.0 reference. This opens patient registration.

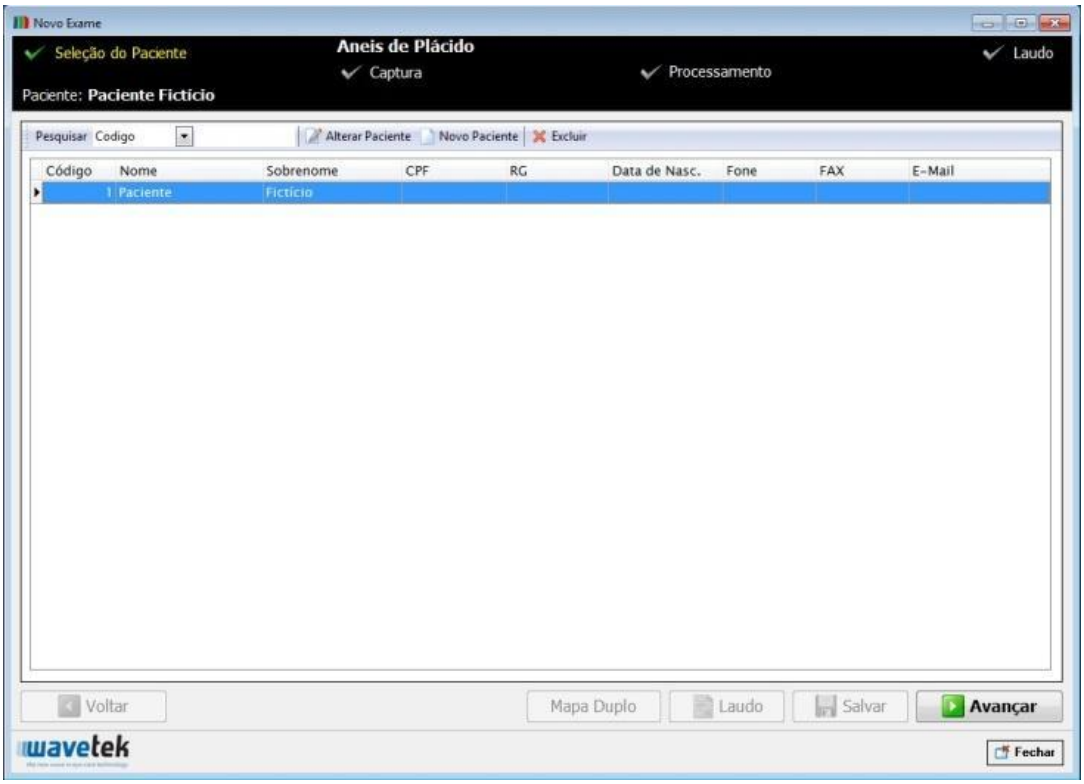
Figure 1.15 - CHROMA examination home screen.

Figure 1.16 - Patient registration and selection screen.

Register patients who are not already registered. For an existing patient, retrieve the record from the database; do not register again. Click <New Patient> (<novo paciente>) to enter the new patient's personal information.

Illustrations - source section 23





Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 24

Figure 1.17 - Registration screen.

Note: CHROMA requires only the patient's first name and surname; all other fields are optional.

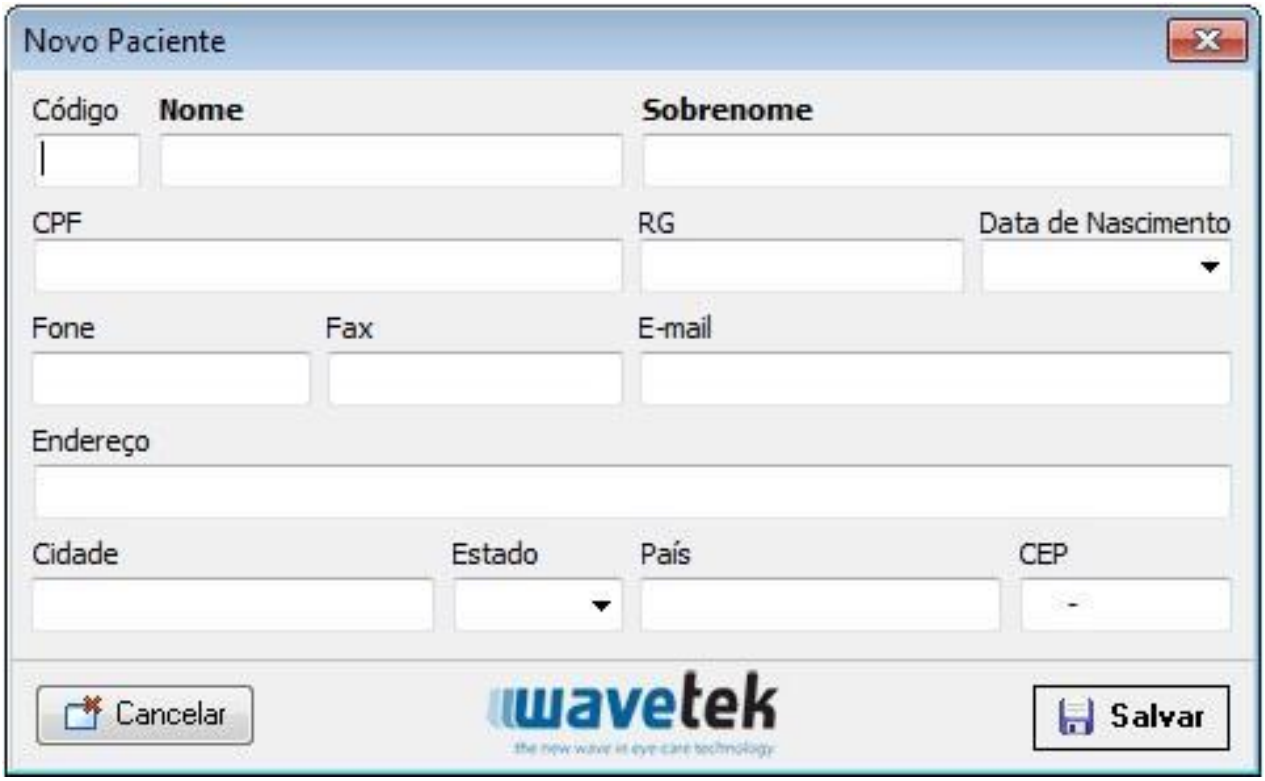
After registration, click <Next> (<avançar>). If pupil capture is configured, the system asks the user to click pupil capture; see the source's Figure 1.17 reference.

Note: Remember to switch the instrument to pupil mode. If you choose not to capture the pupil, skip the following information and proceed to Placido ring capture in the next topic.

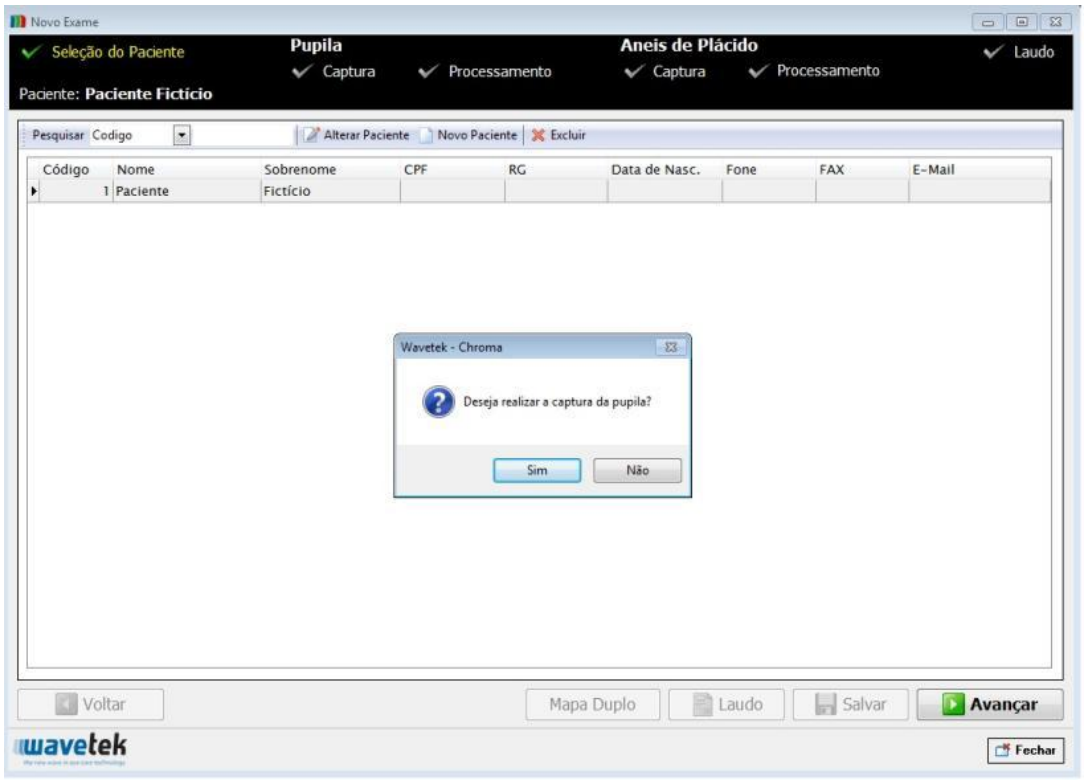
Figure 1.18 - Select pupil capture.

Read the following tips before continuing.

Illustrations - source section 24



Original instrument or software illustration. See the English instructions and interface labels in this section.



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 25

4.4 Preparing Patients for Examination

Patients will not know how to position themselves. Explain that they must keep the head steady and correctly positioned, with the forehead firmly against the forehead rest. For better CHROMA examinations, ask the patient to tilt the head right when examining the left eye, and left when examining the right eye. Keeping the table below the face's natural height helps relax the muscles.

The smaller cone has 14 chromatic rings and requires the patient's head closer to the instrument. CHROMA therefore has a special chinrest that allows head rotation for a more accurate examination.

The patient must keep the eye wide open during the examination.

Instrument positioning:
• Observe the patient's eye in the front image and use the side image to focus.
• Capture the image when these conditions are satisfied.
• See the pupil capture example referenced as Figure 1.18 in the source.

SOURCE SECTION 26

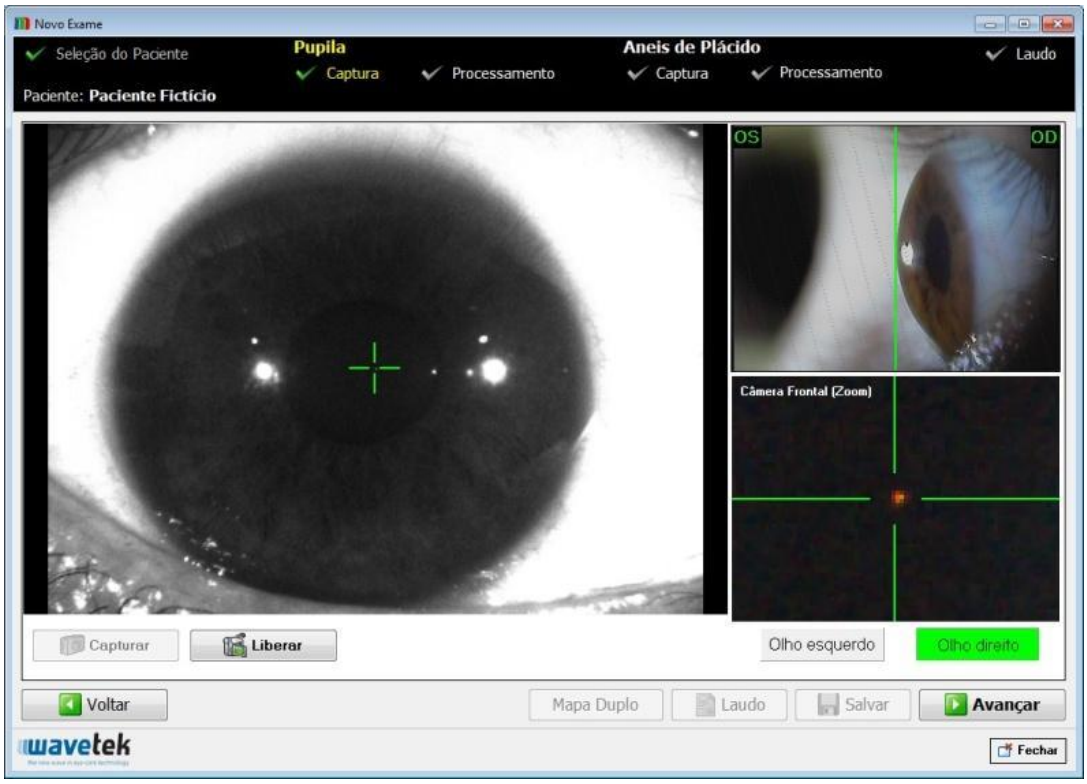
Figure 1.19 - Pupil capture, correct positioning.

The source's Figure 1.18 reference shows the exact pupil capture alignment: in the central image, the central LED reflection lies in the middle of the green reference cross; in the side image, the corneal apex touches the green line tangentially.

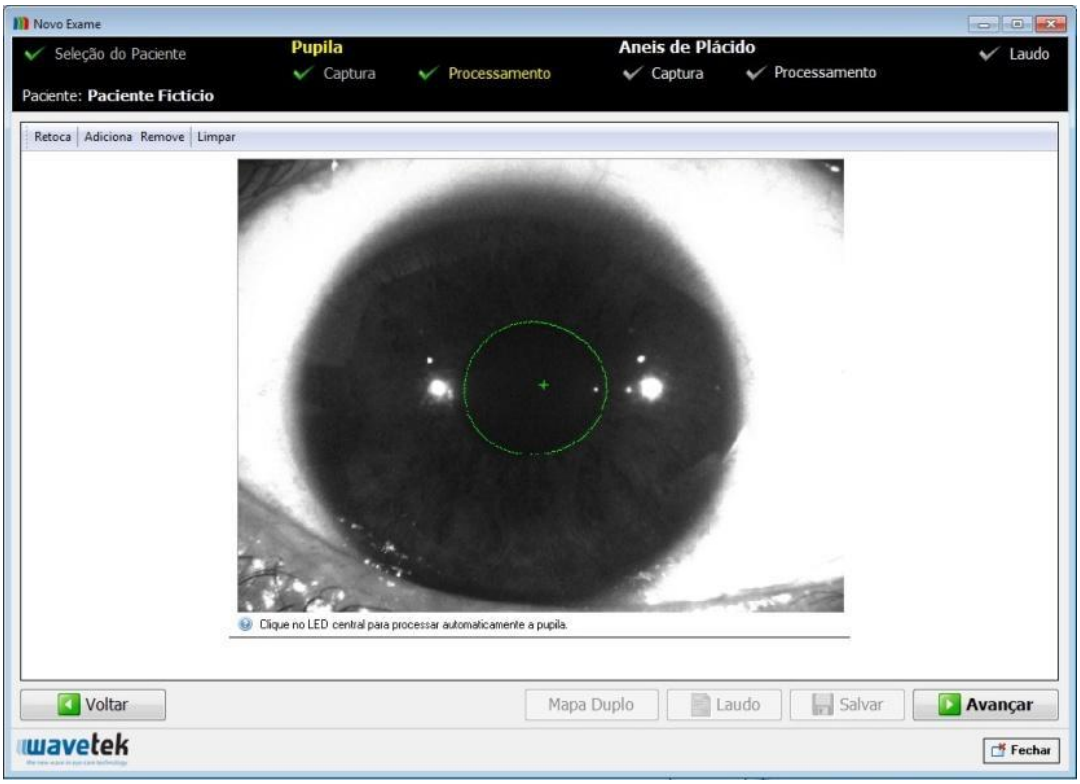
After alignment, capture (freeze) the image and click <Next> (<avançar>) for processing.

Figure 1.20 - Pupil processing.

Illustrations - source section 26



Original instrument or software illustration. See the English instructions and interface labels in this section.



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 27

To process the pupil, click the image center, precisely on the central LED. The software processes it and draws a green circle around the pupil. If detection is incorrect, edit using the controls above the image: Retouch (retoca), Add (adiciona), Remove (remove), Clear (limpar).

After pupil processing, click Next (avançar) for Placido ring capture. Remember to switch the instrument to the colored Placido rings.

Clicking <Next> (<avançar>) leads to Placido disc image capture. Alignment is identical to pupil capture, but with chromatic discs; see the example referenced as Figure 1.20 in the source.

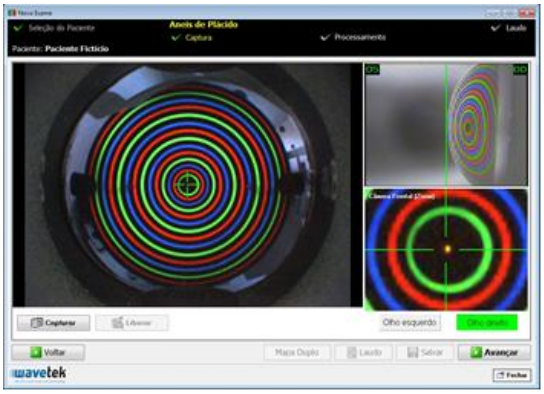
SOURCE SECTION 28

Figure 1.21 - Capture screen.

Capture the chromatic ring image. Observe the alignment again in the source's Figure 1.20 reference. The illustrated capture was simulated on a calibration sphere for easier understanding.

After capture, click <Next> (<avançar>) to open the processing screens referenced as 1.21 and 1.21a in the source.

Illustrations - source section 28



SOURCE SECTION 29

Figure 1.22 - Processing screen, before processing.

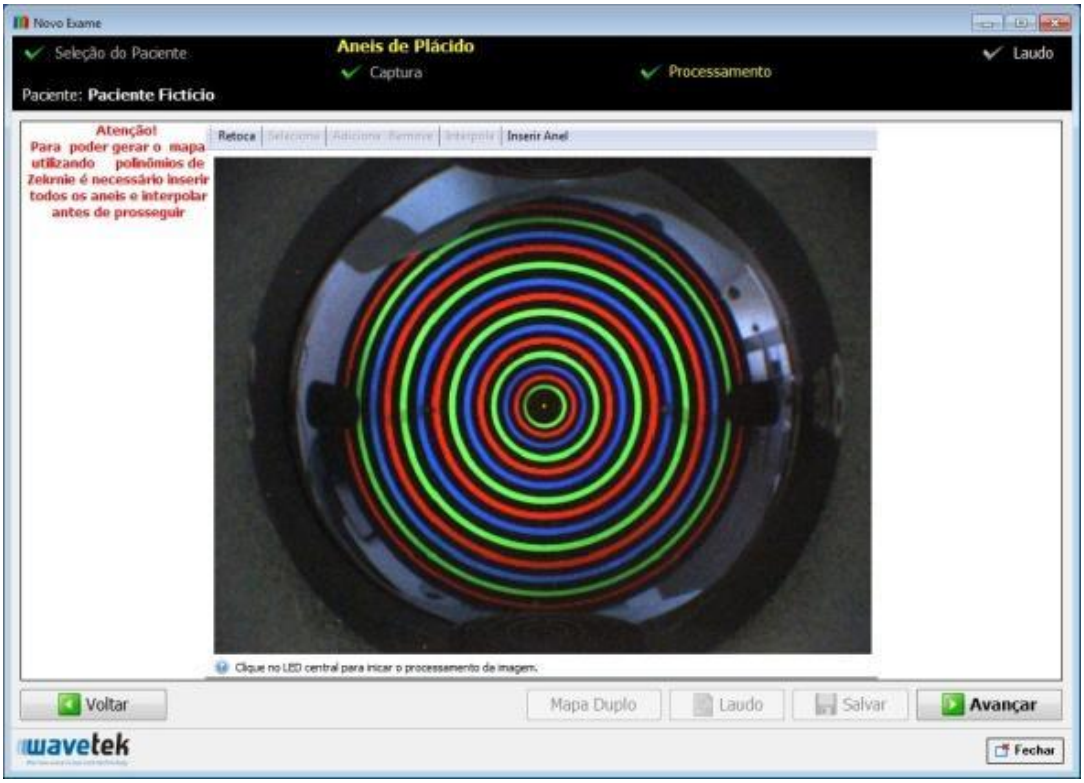
Figure 1.22a - Processing screen, after processing.

Click the image center on the central LED reflection and wait a few seconds during processing; see the source's Figure 1.21a reference.

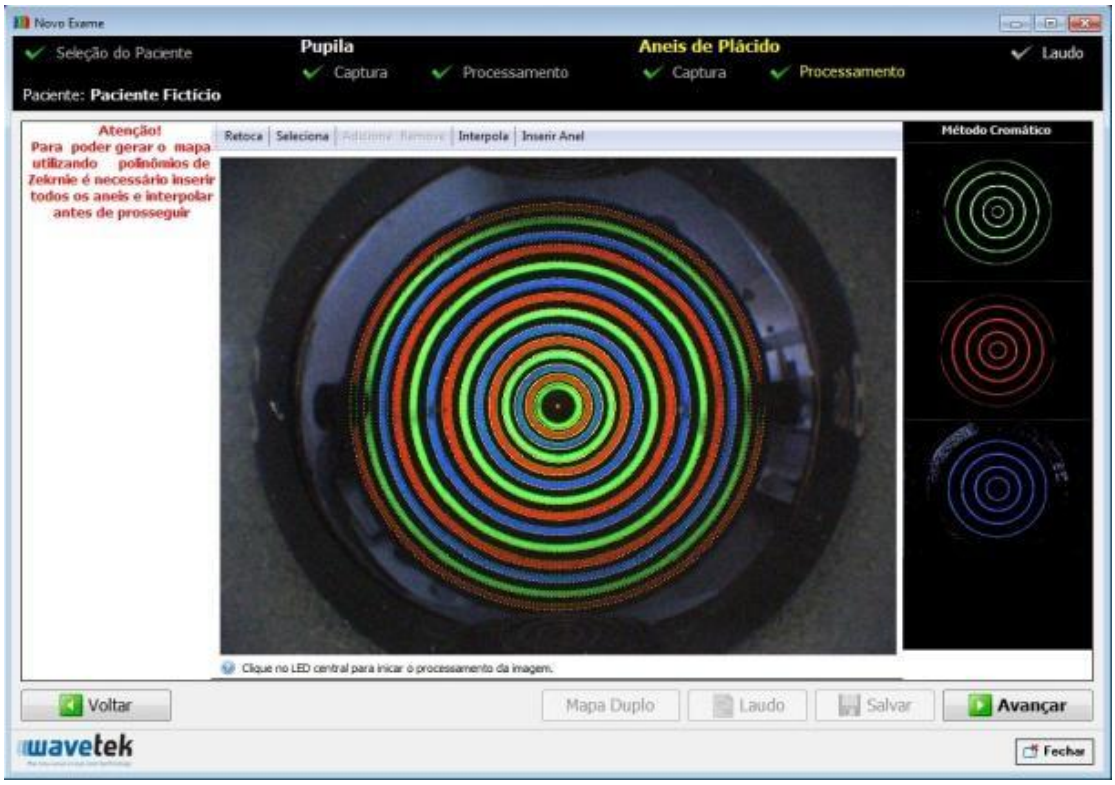
The system automatically detects the rings. On the right it displays the separated, processed chromatic rings: R = red, G = green, B = blue.

Click <Next> (<avançar>) to open the first map screen.

Illustrations - source section 29



Original instrument or software illustration. See the English instructions and interface labels in this section.



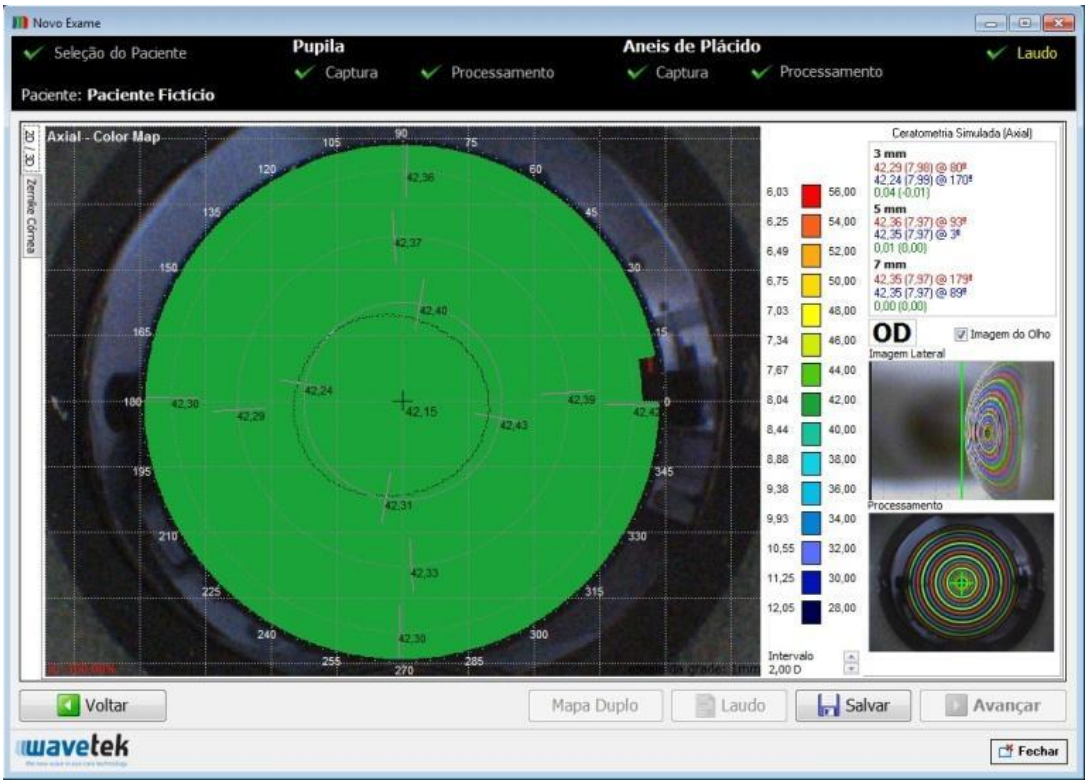
Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 30

Figure 1.23 - Main maps screen, Axial Color Map.

This screen contains the information needed to analyze the patient's anterior corneal topography. At the upper right are simulated keratometry measurements at 3, 5 and 7 mm; directly below are the two images from the moment of capture.

Illustrations - source section 30



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 31

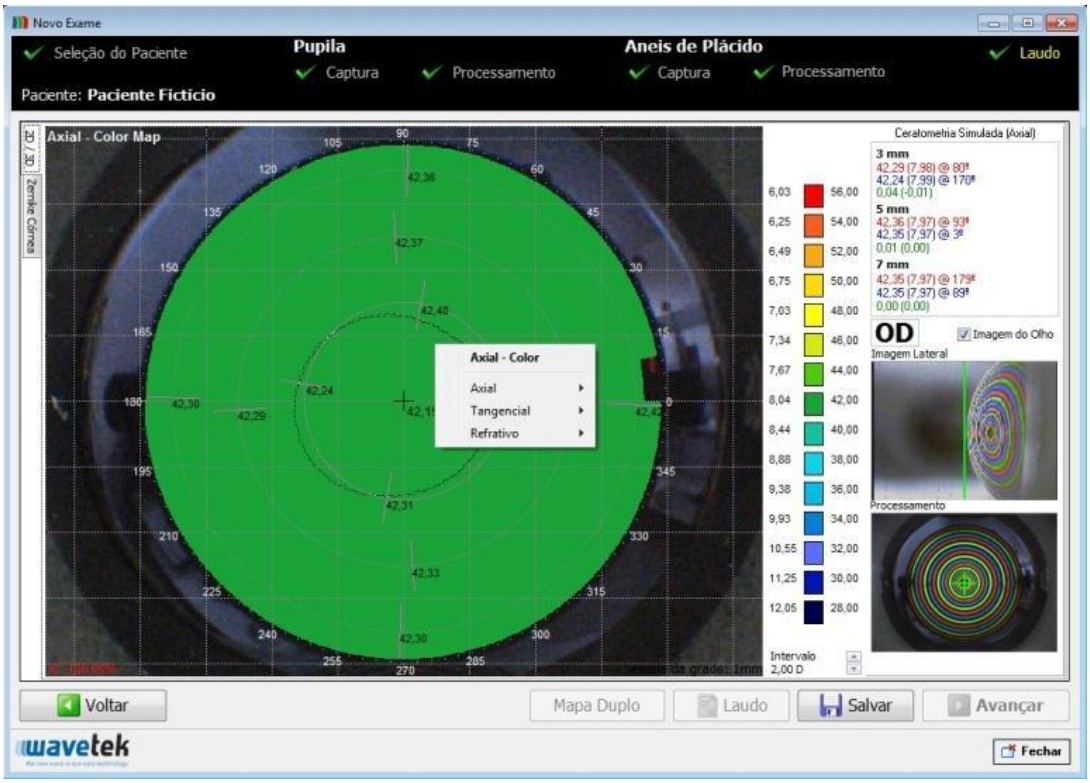
Figure 1.24 - Opening the selection box for new maps.

Select and analyze CHROMA map types here: Axial, Tangential and Refractive. Each offers color, absolute threshold (shown as “absoluto threshoud” in the source), 3D and numerical displays. Select and click a map type to display it.

After analysis, click <Save> (<salvar>). The next screen allows optional notes and confirmation of the examined eye, OD or OS.

To analyze other maps, right-click the generated map to open a selection box, as shown in Figure 1.24.

Illustrations - source section 31



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 32

Figure 1.25 - Notes and eye confirmation screen.

If you decide to examine the second eye, another screen confirms whether pupil capture will be performed. Select <Yes> (<sim>) to open pupil capture as described earlier. Select <No> (<não>) to proceed directly to Placido ring capture.

Remember to select the correct patient eye on the instrument as well.

Illustrations - source section 32



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 33

Figure 1.26 - Confirm continuation of the examination.

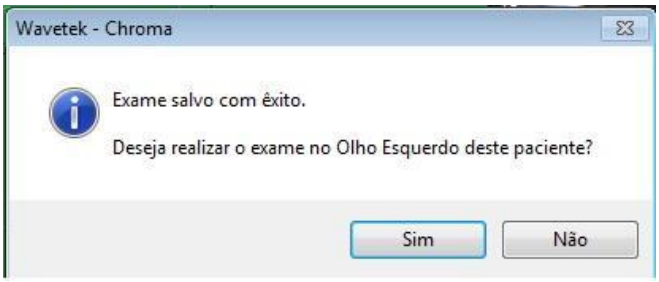
Select Save (salvar). The system asks whether you want to examine the left or right eye (Figure 1.26).

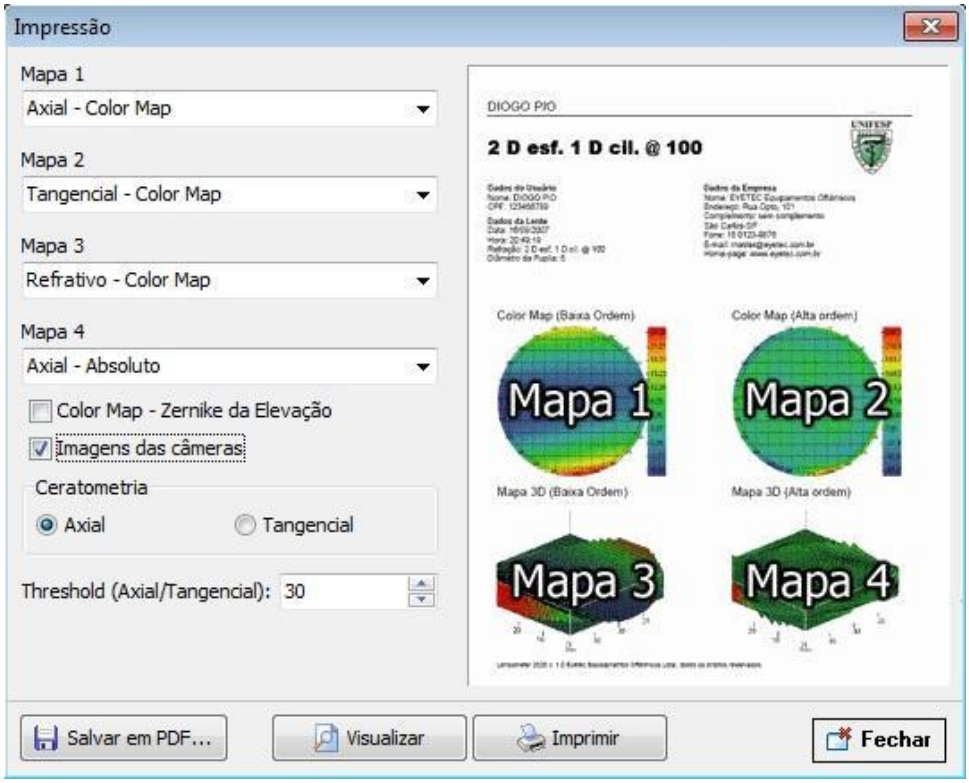
After capturing both eyes and saving the examinations, the first map screen after ring processing enables two buttons: REPORT (LAUDO) and DOUBLE MAP (MAPA DUPLO).

Figure 1.27 - Preparing a report.

Select Report (laudo) to configure a customized report sheet with up to four maps, all from one eye; see the source's Figure 1.26 reference. Select Double Map (mapa duplo) to generate a double axial map showing both eyes (OD, OS) on one report sheet, for printing or PDF output.

Illustrations - source section 33





Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 34

Review Examinations

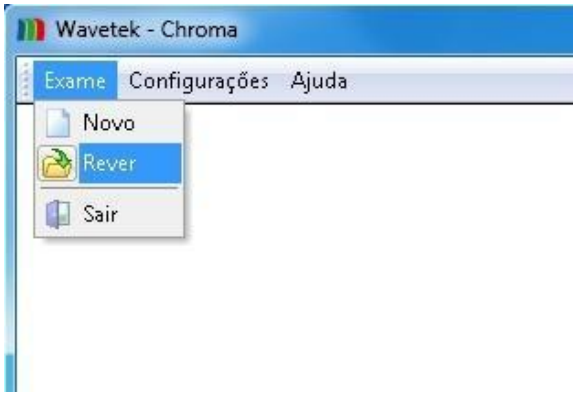
Figure 1.28 - Examination (Review).

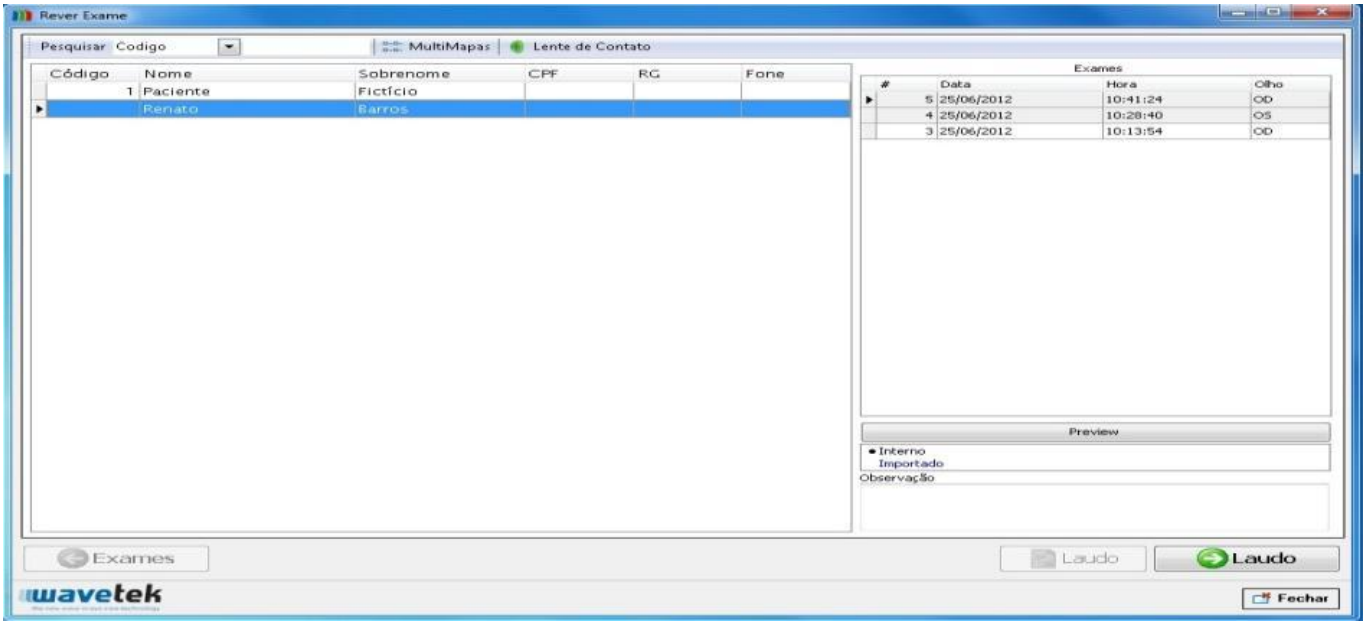
On the review screen, click the name of the patient whose examinations you want to analyze again. If the database contains many patients, use the search system at the top (Figure 1.28).

Figure 1.29 - Examination review screen, patient selection.

CHROMA stores all examination information in its database. Users may view, print or generate PDFs whenever desired. From the home screen, click <Examination> <Review> (<exame> <rever>) to open examination review (Figure 1.29).

Illustrations - source section 34





Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 35

Figure 1.30 - Print preview.

4.5 Backing Up Data

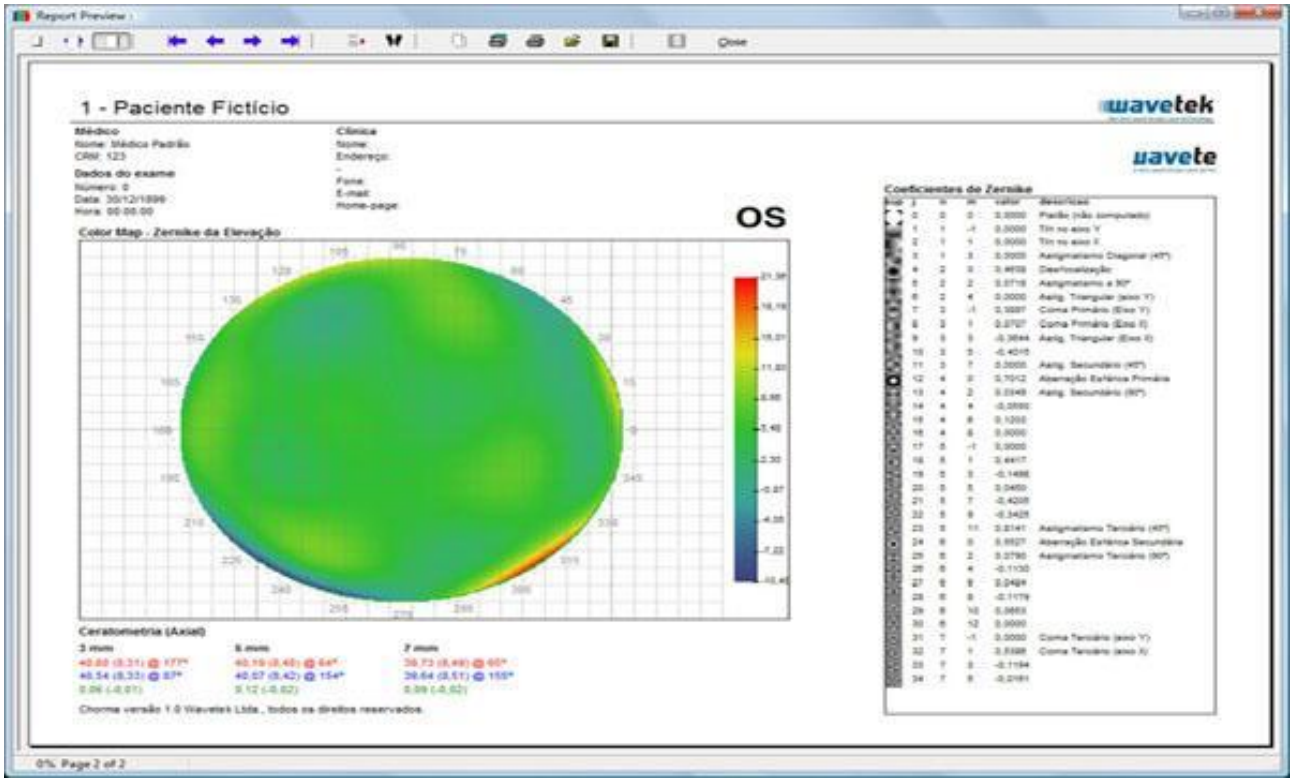
This extremely important option backs up all CHROMA data and examination files. Regardless of how many examinations have been performed, make periodic backups using <Settings> <Backup> (<configurações> <backup>).

WARNING: EVOptica IS NOT RESPONSIBLE FOR LOSS OF DATA OR EXAMINATIONS. OTHER COMPUTER PROBLEMS THAT DAMAGE EXAMINATION DATA ARE NOT OUR RESPONSIBILITY; COMPUTER WARRANTY SERVICE IS DIRECTLY WITH THE MANUFACTURER, DELL. BACK UP TO AN EXTERNAL HARD DRIVE OR MEDIA OTHER THAN THE COMPUTER'S OWN HARD DRIVE.

4.6 Reinstalling the Software in Urgent Cases

If absolutely necessary and unavoidable, carefully follow these steps:
1. Back up all data first (section 4.5).
2. Find the installation CD in the CHROMA manual box.
3. Insert the CD and run the installer. If it does not start automatically, open its folder and double-click the installation file.
4. Copy the medidas folder from the backup over the medidas folder at c:\Arquivos de Programas\wavetek\CHROMA\medidas.

Illustrations - source section 35



Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 36

5. The system is recovered. Recalibrate the conversion factor. Slit recalibration is not required; only this factor needs recalibration.

5 Using CHROMA Hardware

5.1 Computer and Peripheral Specifications - Optional

Every supplied computer has a factory warranty. The original manufacturer was a registered DELL (www.dell.com.br) and Itautec (www.itautec.com.br) customer. Computers supplied to customers, with or without an instrument, came with at least one year of manufacturer warranty and technical support. THE ORIGINAL MANUFACTURER DID NOT USE COMPUTERS ASSEMBLED BY LOCAL COMPUTER SHOPS OR COMPONENTS WITHOUT INVOICES AND REQUIRED PROOF OF COMPONENT ORIGIN.

5.2 Motorized Table Supplied with CHROMA

The table is made by Apramed (www.apramed.com.br). Contact the table manufacturer with questions. It connects to the electrical supply (check voltage: 110), has an extension outlet on the table itself, and an up/down button for motorized height adjustment.

Figure 1.31 - Table base supplied with CHROMA.

Illustrations - source section 36



SOURCE SECTION 37

6.0 Further Help

Several sources offer help to CHROMA users. The original company website provided scientific articles on corneal topography and optical quality analysis, plus links to related websites and journals. Current assistance: https://evoptica.com. Other sources include congresses and wet labs, and national or international events and lectures.

6.1 Possible Problems and Solutions

What if the computer suffers an unrecoverable failure? Reinstall Windows completely, then reinstall CHROMA from the supplied DVD. This is why periodic backups are recommended.

What if the operator is not confident in results? Repeat alignment, Placido image capture and the entire examination until results are consistent with expectations.

Will bumping the instrument cause misalignment? No, but avoid strong housing impacts, including during transport.

Must I recalibrate after moving elsewhere? Yes. Recalibration is strongly recommended at every installation in a different location.

How can I prevent the patient's nose or forehead touching the instrument? Tilt the head to the side opposite the examined eye: left for the right eye and vice versa.

How can I improve poor brightness and contrast before disc processing? This was discussed earlier. CHROMA software can readily improve images before processing and edge detection.

SOURCE SECTION 38

What voltage does the instrument use? Is it dual voltage? The original FAQ says it can connect to any voltage because it has an automatic internal transformer. Source discrepancy: pages 10-11 specify 110 V.

CHROMA is plugged in, but the Placido discs are not lit. Intelligent, environmentally conscious electronics include a microprocessor timing Super LED operation. After 10 minutes, current is cut automatically. The instrument is in standby, not off. Press power-on again to illuminate the disc.

How many times a year should I calibrate? Recalibrate monthly or every two months and check calibration quality as described in source section 3.4. If moved, recalibrate immediately after reinstallation. CHROMA is intended to be virtually portable, but recalibration is essential for examination quality.

How does CHROMA differ from other Placido disc topographers/analyzers? The original instrument was designed and made in Brazil by SENAI-trained technicians and engineers and physicists from USP and overseas schools. Replacement parts and trained technical maintenance were provided. Chromatic disc technology offers greater precision in highly distorted eyes. It includes one year of free software upgrades and anterior corneal analysis with Zernike coefficients, among other features.

Can other physicians use the same software on other computers? No. The software is registered to the customer at purchase, is nontransferable, and includes warranty and technical assistance terms.

What is the real advantage of chromatic discs? Is the system patented? Advantages include precision in eyes with greater distortion. The original manufacturer's system is patented and cannot be copied by other companies. Image processing also provides greater precision, alongside other confidential algorithm details.

SOURCE SECTION 39

7.0 Product Storage, Preservation and Handling

Before Installation

7.1 Packaging

All transport and storage precautions are shown on the packaging with standardized symbols, illustrated below.

Symbol	Description
Fragile	Handle carefully during transport and storage.
Maximum stack: 2	No more than two identical units may be stacked one above the other.
Keep dry	Protect against moisture during transport and storage.
This way up	Package orientation during transport and storage.
Temperature limits	0°C to 55°C during transport and storage.

Figure 1.32 - Symbols.

7.2 Storage

Keep the product in its original packaging, protected from moisture and excessive heat. Stack no more than two packaged units, as indicated by the symbol.

7.3 Transport

Avoid vibration, drops and direct package impacts. Fragile product. Handle the unpackaged instrument very carefully to prevent accidental damage. During transport and storage, ensure the following environmental ranges:

Illustrations - source section 39

Simbologia	Descrição
	Frágil. Cuidado no transporte e armazenamento.
	Número máximo de empilhamento. No máximo 2 unidades idênticas podem ser empilhadas uma sobre a outra.
	Necessita de proteção contra umidade no transporte e armazenamento.
	Sentido para cima. Posicionamento da embalagem durante o transporte e armazenamento.
	Limite de temperatura (0 a 55°) para o transporte e armazenamento.

Original instrument or software illustration. See the English instructions and interface labels in this section.

SOURCE SECTION 40

Transport/storage ambient temperature: 0°C to +55°C. Relative humidity: 0% to 90%. Atmospheric pressure: 375 to 795 mmHg.

After Installation

7.4 Placement

Protect from moisture, excessive heat and direct sunlight. During placement and operation ensure: ambient temperature +10°C to +35°C; relative humidity 30% to 75%; atmospheric pressure 375 to 795 mmHg. The source labels the first two lines “transport and storage” within this operating-placement section.

7.5 Preservation

After each use, clean and disinfect with a soft cloth lightly moistened with alcohol. Do not introduce or spill liquids inside. Do not clean with organic solvents (thinner) or chlorine-releasing products. Keep in a clean, dust-free location.

8.0 Warnings and Precautions

8.1 User Precautions

Only trained personnel under a qualified medical team familiar with known corneal topography risks and benefits may use this instrument.

8.2 Explosion Hazards

CHROMA is unsuitable for use around flammable anesthetic gases or other flammable materials, including certain cleaning products. Do not connect or operate in areas with a possible explosion hazard.

SOURCE SECTION 41

8.3 Electrical Hazards

Verify a correctly installed protective earth at the outlet for proper function and safety, in accordance with the applicable ABNT standard referenced in the source.

At the end of work, use the main switch to turn off before unplugging. This prevents possible overload at the next startup. During a power failure, turn off the main switch so a surge when power returns cannot damage the instrument.

Before replacing a fuse, turn off the on/off switch, then unplug to prevent electric shock. Do not use a power cord with any pinched part or damaged insulation.

8.4 Transport and Storage Precautions

Stack no more than two units. Protect from moisture, rain and splashes. Protect this fragile product against transport impacts.

8.5 Maintenance Precautions

Do not repair or replace defective or inoperative components with similar parts from other instruments. Only EVOptica and authorized distributors may repair with original parts and guarantee proper operation.

8.6 Cleaning Precautions

Switch off and disconnect the electrical supply before any cleaning. Do not use high-pressure or steam cleaning equipment, agents releasing chlorine and/or peracetic acid, chemical-process wet cleaning agents, or abrasive substances. Keep clean and disinfected after every medical procedure.

SOURCE SECTION 42

9.0 Product Performance

9.1 Indication and Intended Use

Indication: assists ophthalmic medical professionals in diagnosing vision problems. Useful for routine videokeratography, research, teaching preparation, and image export to the internet or software.

Purpose: quantitative measurement of anterior corneal topography and aberrations, with detailed information for reports.

9.2 Unwanted Secondary or Adverse Effects

Not applicable to this product.

9.3 Product Safety and Effectiveness

CHROMA was designed with nontoxic materials and rigorous technical quality standards for user safety and functionality. According to the original manual, use as instructed will not cause problems or loss or change of physical and dimensional characteristics.

10.0 Installation or Connection to Other Products

10.1 Important Recommendations

Use only electric table models recommended by the manufacturer. Do not install games, chat programs or other software on the supplied computer; doing so voids the warranty.

WARNING! Use of any part, accessory or material not specified by the manufacturer is entirely the user's responsibility.

SOURCE SECTION 43

11.0 Troubleshooting

Problem	Possible cause	Solution
Image is out of focus	the CHROMA Corneal Analyzer is not correctly seated on the slit lamp base.	Check the base fitting and ensure the CHROMA Corneal Analyzer is firmly secured.
Image is out of focus	Play in the locating key that defines the 35-degree angle.	Verify that the locating key is secure and the CHROMA Corneal Analyzer has no mechanical play in its fitting.
No separation of corneal layers	Possible slit lamp misadjustment.	Check the slit lamp properly before starting microscopy.
No separation of corneal layers	Possible defect in slit lamp focusing.	Contact the manufacturer or a specialized technician for slit lamp maintenance.
No image	Possible lack of power at the power supply.	Check outlets, power supply and their rated voltages.
No image	Possible poor contact in communication cables.	Disconnect and reconnect all cables attached to the CHROMA Corneal Analyzer, or exit HERON and reopen it.
Image does not process	Insufficient brightness and contrast during capture, or insufficient slit illumination.	Adjust software brightness; increase slit light brightness or select an area where cells are more clearly visible.
No capture	Poor contact in the foot-pedal cable.	Disconnect and reconnect the foot-pedal cable.

Source discrepancy: the original CHROMA troubleshooting table refers to slit lamp microscopy, corneal layers, endothelial cells and the HERON program. These original references are retained and have not been converted into new CHROMA procedures.

Figure 1.33 - Problems.

Note: If the problem is not solved as described in the table above, contact authorized EVOptica technical support immediately.

12.0 Precautions if Product Operation Changes

If the instrument becomes hot, makes unusual noises or operates abnormally, check whether the issue corresponds to section 11, Troubleshooting. If unresolved, immediately switch off, unplug the power cord, then contact authorized EVOptica technical support for assessment and repair.

SOURCE SECTION 44

13.0 Instrument Cleaning Procedures

13.1 Lens and Reflecting Mirror Cleaning

Remove adherent dirt from lenses or the reflecting mirror with a small soft-bristled brush. If traces remain, use a small piece of cotton moistened with isopropyl alcohol.

13.2 Cleaning and Disinfecting Plastic Parts

Clean plastic parts such as the chinrest support and forehead rest using a soft cloth moistened with water and neutral detergent, then disinfect with medicinal alcohol.

14.0 Sensitivity to Environmental Conditions During Normal Use

CHROMA was designed to avoid sensitivity to electromagnetic interference, external electrical influences, electrostatic discharge, and pressure and temperature variations. Transport, install, handle and maintain it according to this manual.

15.0 Precautions When Taking the Product Out of Service

To prevent environmental contamination or misuse when no longer usable, segregate, package, identify and send the instrument, at the customer's expense and risk, to EVOptica's designated facility for safe disposal.

16.0 Product Packaging

Cardboard box with expanded polyurethane interior lining covered in high-density polyethylene film. Package dimensions: 1030 mm × 700 mm × 530 mm (W × D × H).

SOURCE SECTION 45

17.0 Warranty Terms

The original manufacturer offered a 12-month warranty against material and/or manufacturing defects, beginning on the invoice date.

The warranty is voided by:
1. Failure to follow transport, installation, use and maintenance instructions.
2. Accident, dropping, improper installation, or other damage from misuse or natural agents.
3. Breaking the warranty seal, repair, modification or alteration of the instrument or parts by unauthorized personnel.

After expiry, service, parts and expenses are charged under prevailing company policy. For information, tips, problems or questions: https://evoptica.com; contact@evoptica.com; +1-315-210-8976 call/text.

18.0 Statement of Responsibility

In the source, Wavetek Indústria Comércio Importação Exportação de Produtos Médicos e Ópticos Ltda., represented by technical officer Elizeu Ramos and legal representative Luis Alberto Vieira de Carvalho as signatories, assumed full technical and legal responsibility and declared that all CHROMA information in these Instructions for Use was true. This is the original instrument responsibility statement.

19 References

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- http://bdtd.bce.unb.br/tedesimplificado/tde_busca/arquivo.php?codArquivo=3020
- http://www.abonet.com.br/abo/652/abo65214.htm
- http://buscatextual.cnpq.br/buscatextual/visualizacv.jsp?id=K4728676D4

SOURCE SECTION 46

5. http://www.scielo.br/scielo.php?pid=S0034-72802007000500006&script=sci_arttext

SOURCE SECTION 47

Acknowledgments

The original development team thanks everyone who believes in Brazil's optical industry, especially those helping make it viable in a highly competitive technology sector. Particular thanks to Professors Dr. Harley Bicas, Dr. Paulo Schor, Dr. Augusto Paranhos, Dr. Wallace Chamon, Dr. Claudio Lottenberg, Dr. Jarbas Caiado de Castro, Dr. Fátima Yasuoka and Dr. Liliane Ventura.

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Notes

Configuration and source-review notes

Source limitations requiring technical review

Source section 4: QA correction applied: restored original section-number identifiers in contents entries on source pages 4-5; list conversion had removed the identifiers. Original source page references remain; regenerate contents for the English layout.

Source section 10: Voltage conflict: pages 10-11 specify 110 V, while page 38 FAQ says an automatic transformer accepts any voltage. The brochure separately specifies 110-240 V. Preserve each source value; identify the supplied electrical configuration before release.

Source section 11: Technical table omits units for side-camera coverage 5 × 5 and instrument dimensions 274 × 485 × 200. No units were inferred. Manual weight 7.0 kg and page 25 cone count 14 rings differ from the brochure's 4.0 kg and 16 rings.

Source section 16: Calibration step 1 source contains malformed wording 'em imã' around the supplied calibration sphere assembly. Translation describes the magnetic assembly; exact original wording should be checked against the hardware.

Source section 18: Calibration values retained: Visible Area 5; mm/pixel 0.023-0.0249; four sphere sequence 1-4. No conversion or reconciliation applied.

Source section 35: Reinstallation references a legacy Windows installation path and slit recalibration on page 36. Preserve path and source wording; applicability to current installed software is unverified.

Source section 38: FAQ refers to section 3.4, which is not the calibration section in this revision. Monthly/every-two-month recalibration, 10-minute LED standby, and relocation recalibration wording retained.

Source section 39: Recovered all five packaging-symbol rows from local OCR and source PNG: fragile, maximum stack 2, keep dry, this way up, temperature 0-55°C.

Source section 40: Operating-placement section labels +10-35°C and 30-75% RH as 'transport and storage,' conflicting with the section context. Transport/storage section separately gives 0-55°C and 0-90% RH. Labels and ranges retained with clarification of source wording.

Source section 43: Troubleshooting table appears copied from specular/slit-lamp documentation: 35° locating key, corneal-layer separation, endothelial cell visibility and reopening HERON. All eight cause/solution rows recovered and translated, with explicit source discrepancy note. Do not treat these as independently validated CHROMA procedures.

Source section 45: Warranty, original manufacturer responsibility statement and original Brazilian registration identifiers are historical source terms, not confirmed current EVOptica contracts or US clearances.

Source section 47: Original contents locate Acknowledgments/Notes on page 46, but actual source is page 47. Preserve source mapping and regenerate English contents.

EVOptica

Ophthalmic instruments. Science, engineering and experience connected.

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contact@evoptica.com

Call or text +1-315-210-8976

221 S Main St
Fairport, NY 14450
United States

Explore CHROMA resources

Request a demonstration or quotation

Configuration and market information

US regulatory clearance is in progress. The original ophthalmic product line held clearances in South American markets. Contact EVOptica for the product configuration, documentation and availability relevant to your destination market.

This is a full English technical-review edition of the supplied source document. It preserves source procedures, warnings, values and unresolved source differences. It is not a manufacturer-released clinical IFU for a new US product configuration.

Document information

English EVOptica edition: 05 November 2026.

Source revision: 3.0

Original technical illustrations are retained for traceability. Some legacy interface screenshots show Portuguese controls; English instructions and label glossaries accompany them. Product and software names are retained. Third-party marks identify their respective owners.