

KR450

Auto Keratometer/Refractor

User's Guide

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Introduction

Congratulations on your purchase of the Reichert KR450 Auto Keratometer/Refractor.

The KR450 is a combination automatic keratometer/refractor that uses an auto alignment system and image processing technology to obtain measurements of a patient's eyes.

This User's Guide is designed as a training and reference manual. We recommend you carefully read and follow the steps in this guide to ensure optimum performance from your new instrument.

Please retain this guide for future reference and to share with other users. This guide should be used with product catalog numbers 13960, 13961, and 13901D. Additional copies can be obtained from your authorized Reichert Ophthalmic Instruments dealer or contact our Customer Service Department directly at (716) 686-4500, fax (716) 686-4555, or e-mail: info@reichert.com.

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Classification

The KR450 is classified as Class 1 Equipment
Class 1 Equipment is equipment in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that means are provided for the connection of the equipment to a protective earth conductor in the fixed wiring of the installation in such a way that accessible metal parts cannot become live in the event of a failure of the basic insulation.

The KR450 is classified as Class B Equipment
Class B Equipment provides an adequate degree of protection against electrical shock, particularly regarding allowable leakage currents and reliability of the protective earth connection.

The KR450 is classified as IPX0 Equipment
IPX0 Equipment is ordinary equipment enclosed without protection against ingress of water.

The KR450 is not suitable for use in the presence of flammable anesthetic mixtures with air or with oxygen or nitrous oxide.

According to the mode of operation, the KR450 is a Continuous Operation instrument.

Symbol Information

The following symbols appear on the instrument:



CAUTION - Indicates that important operating and maintenance instructions are included in this User's Guide.



Type B Product Classification
Class 1 Equipment, Continuous Operation



Alternating Current



Protective Earth

Precautions

- Ensure travel lock is disengaged before you connect instrument to power outlet (see page 11).
- Check dataplate for voltage of instrument before connecting to power outlet.
- The instrument must be plugged into an outlet with a ground receptacle. Do not disable or remove the ground pin.
- Instrument is best situated in a cool, dry, dust-free environment.
- Avoid placing instrument where direct sunlight or bright lights can enter the patient window. This could affect the instrument's alignment systems.
- To ensure optimal operation, install instrument on a level, vibration-free surface.
- Make sure patient window is clean — use cleaning cloth provided or lens tissue to clean window.
- Do not use alcohol or other cleaning agents to clean the covers, patient window or screen, as damage may occur to the surface coatings.
- Do not remove or insert memory cards while instrument is turned on.
- There may be potential electromagnetic interference between this instrument and other electronic devices. If interference is present, turn off electronic devices or remove them from the immediate area while operating this instrument.
- Parts and accessories used must meet the requirements of the applicable IEC601 series. Safety standards and/or the system configuration must meet the requirements of the IEC601-1-1 electrical systems standard.
- This product is not suitable for use in the presence of flammable anesthetic mixtures with air or with oxygen or nitrous oxide.



WARNING:
For continued protection against risk of fire, replace fuses only with the same type and rating.

100/120 Volts use "T 0.63AL 250V" fuses
220/240 Volts use "T 0.315AL 250V" fuses



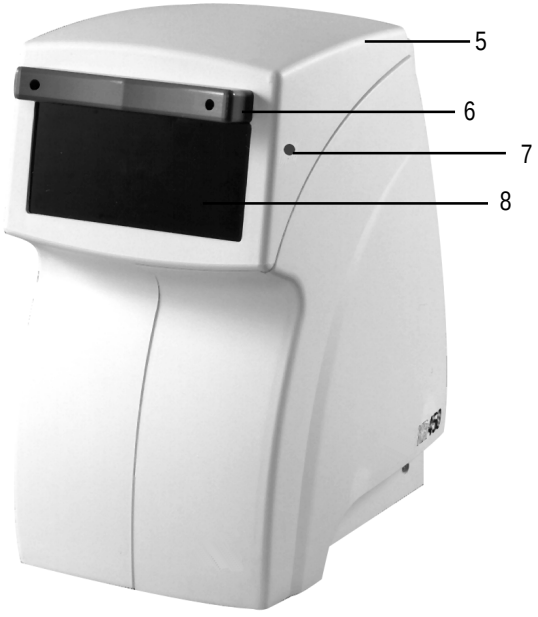
CAUTION:
- To avoid electrical shock, do not remove cover.
- There are no user serviceable parts inside.
- Refer servicing to qualified personnel.

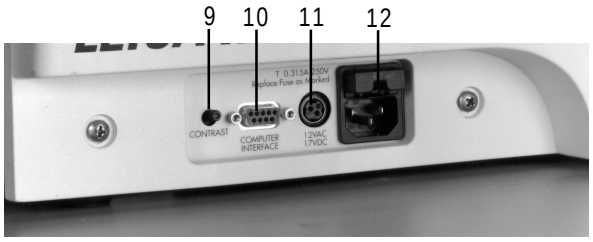
Reichert Ophthalmic Instruments is not responsible for the safety and reliability of this instrument when:

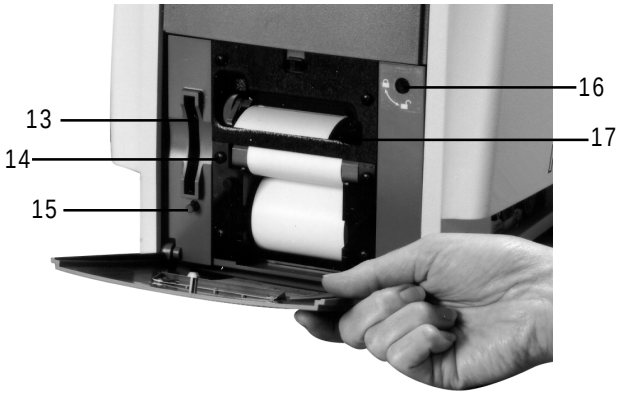
- Assembly, disassembly, repair or modification is made by unauthorized dealers or persons.
- Instrument is not used in accordance with this User's Guide.

Instrument Components









EXTERNAL PARTS

1. Canthus alignment mark
2. Display
3. Control buttons
4. Printer door
5. Headcover
6. Forehead rest
7. Canthus alignment mark
8. Patient window
9. Display contrast control
10. RS-232C port
11. Low voltage inlet
12. Main power & fuse holder
13. PC card slot
14. Printer paper advance
15. Reset button
16. Travel lock
17. Printer

PACKAGE CONTENTS

- KR 450 Auto Keratometer/Refractor
- Power cord
- Dust cover
- Spare printer paper (2 rolls)
- Cleaning cloth
- Phillips-head screwdriver

Instrument Components

Operating System

The KR450 incorporates a user-friendly icon/menu-based operating system. This system will speed up your training time, since you do not have to memorize many functions before using the instrument.

Instrument functions are initiated by pressing the gray buttons located below the icons displayed on the screen (picture below).

Descriptions of icons are provided on pp. 9-10.



GRAY CONTROL BUTTONS

Instrument Components

Icon Glossary

Listed below are descriptions of the icons used in the operating system.

 MODE	Allows access to secondary level menus such as setup and help.
 MEASURE	Initiates keratometer and refraction measurement sequence.
 MEASURE NEXT EYE	Continues the measurement sequence.
 LEFT EYE MEASURE	Initiates instrument alignment and measurement process for patient's left eye (appears only if instrument cannot detect eye).
 RIGHT EYE MEASURE	Initiates instrument alignment and measurement process for patient's right eye (appears only if instrument cannot detect eye).
 CLEAR DATA	Will clear all data on screen and in memory.
 PRINT	Data is sent to built-in printer and RS-232C port.
 REVIEW	Allows access to the review functions.
 REVIEW RIGHT/LEFT	Enables review of right and left eye data.
 MIRE RING	Enables review of circular mire.
 ENHANCED MIRE	Enables review of enhanced mire.
 REFRACTION DATA	Enables review of right and left refraction measurements.
 CONVERT D/MM	Converts keratometric data from power (D) to radius of curvature (mm) or vice versa in the REVIEW mode.

Instrument Components

Icon Glossary (cont.)

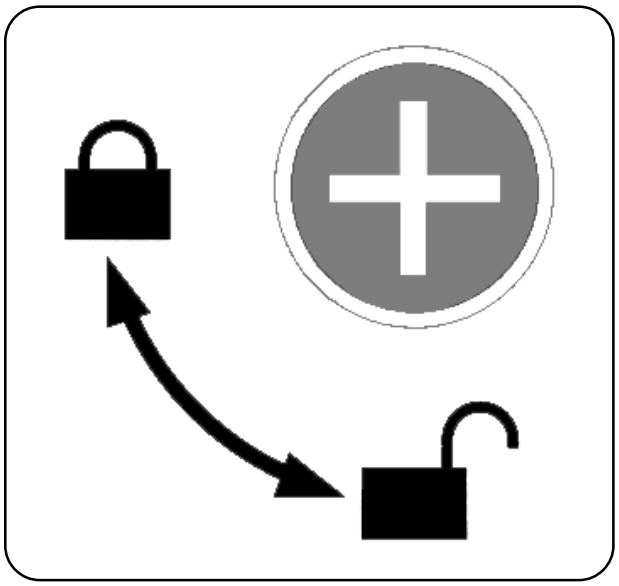
 CONVERT ZERO VERTEX	Converts refraction data to zero vertex distance in the review mode.
 SETUP	Allows access to the default settings so that changes can be made.
 RETURN	Returns to preceding screen.
 RIGHT ARROW	Used in setup menu to move right horizontally.
 LEFT ARROW	Used in setup menu to move left horizontally.
 UP ARROW	Used in setup menu to move up vertically through options.
 DOWN ARROW	Used in setup menu to move down vertically through options.
 SELECT	Used in setup menu to select new setting.
 HELP	Allows access to on-board help instructions.
 SERVICE	Allows access to service menu for qualified technicians.
 TRAVEL LOCK	Used to “park” instrument before shipment.
 PERIPHERAL	Initiates peripheral measurement process.

Disengaging the Travel Lock

The KR450 is shipped with the travel lock engaged to prevent damage during shipment. The travel lock is located behind the printer door in the top right-hand corner (see p. 7, No. 16, for location).

To **disengage** the lock, open the printer door and, using the Phillips-head screwdriver provided, turn the screw head counterclockwise (about four turns) until the screw is disengaged.

Note: The screw is spring-loaded and will remain attached to the instrument.

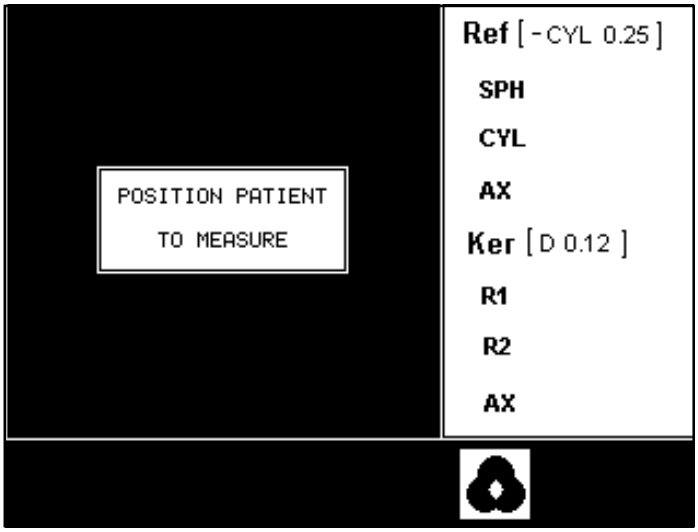


CAUTION: To prevent damage occurring to the internal mechanisms, ensure travel lock is disengaged before connecting instrument to power outlet.

CAUTION: If you need to ship the instrument to another location, be sure the travel lock is engaged before packing. This will prevent damage to the instrument during shipment.

Engaging the Travel Lock

If it is necessary to ship the instrument to another location, engage the travel lock as follows:




Mode

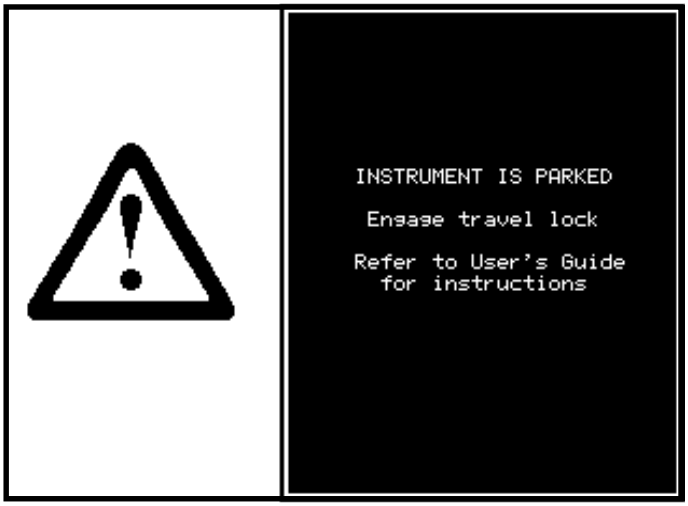
Press the button below the MODE icon. The MODE icon can be found on most operating screens. The screen will change and look similar to the one below:




Travel Lock

Now press the button below the TRAVEL LOCK icon — you will hear the instrument's motors moving into the "park" position. The screen will also change to indicate the instrument is in the "park" position.

Engaging the Travel Lock (Cont.)



Once the instrument is "parked," you can engage the travel lock. Open the printer door and, using a Phillips-head screwdriver, push the screw in and turn it clockwise (about four turns) until you feel the screw tighten fully.

You can now disconnect the instrument from the power outlet and repackage the instrument.

CAUTION: If you are unable to "park" the instrument because of a power supply failure, do the following:

- Disconnect instrument from the power outlet.
- Remove the dark gray forehead rest using a Phillips-head screwdriver.
- Slide the headcover toward you and off the instrument.
- Gently push the aluminum box toward the user's side of the instrument and then push it down. The instrument is now in the "park" position.
- Pack head area with piece of foam or packing material.
- Engage the travel lock, as described above.

If you have questions, contact your local Reichert Ophthalmic Instruments dealer or our Customer Service Department directly at (716) 686-4500.

Mounting to Instrument Stand Arm

The KR450 can be installed on a table top or instrument stand arm. For instrument stand arm installation, follow the instructions below:

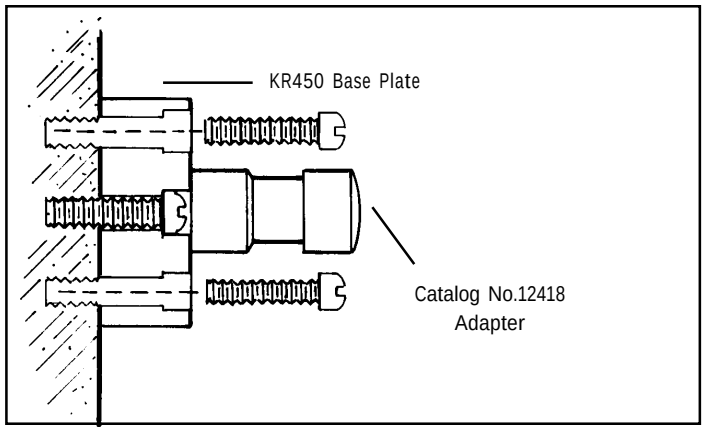
CAUTION: Make sure the travel lock is engaged to prevent damage to internal mechanisms.

- Carefully lay the instrument on its side.
- Attach the adapter (Catalog No. 12418) to the base plate with the three screws provided.

CAUTION: If replacement screws are used, do not use screws longer than 1 inch or 2.5 cm, as this could cause damage to internal components.

- Insert the adapter post into the mounting hole of the stand arm.
- Turn the knob on the instrument arm until the post is stable, The instrument should swivel freely.
- Disengage the KR450's travel lock (see p. 11 for instructions).
- Plug the power cord into the instrument and into the stand arm outlet.

CAUTION: To prevent damage occurring to the internal mechanisms, ensure the travel lock is disengaged before connecting instrument to power outlet.



Low Voltage

The KR450 can operate at 12 volts AC. This feature is especially useful when the instrument is used in Europe on a translating table instrument stand where high voltages are not always available. Use power cord (Catalog No. 13915) to connect the KR450 to the stand's internal transformer.

Once plugged in, the KR450's screen will illuminate and, after a few seconds, will look similar to that shown below. You are now ready to start using the instrument.



If you have forgotten to disengage the travel lock, the screen will change to that shown below (see Disengaging the Travel Lock, p. 11):

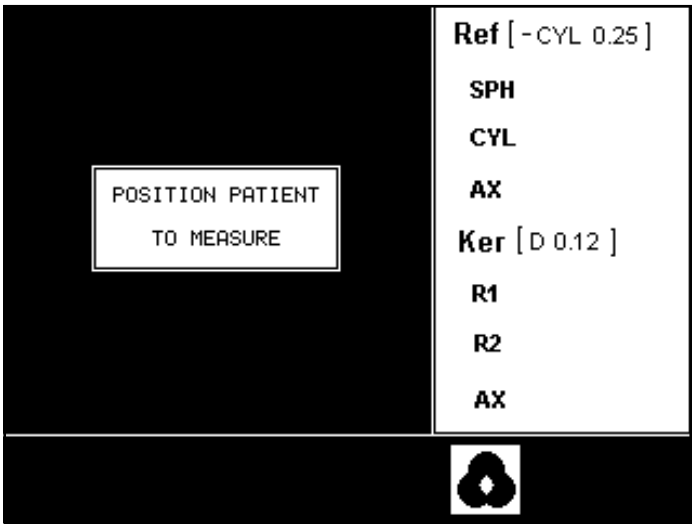


After a period of inactivity, the KR450 will go into a "sleep" mode to conserve energy, causing the screen to go blank. To reactivate the KR450, push any gray button on the control panel located below the screen.

Changing Defaults

The KR450 is shipped to you in the most frequently used configuration. These default settings can be changed using the setup function. Measurement, printer, communication and miscellaneous setting options are listed on pp. 17-21. Once changes have been made, they will remain set until further changes are made.

Follow the steps below if you wish to make changes to the default settings in your instrument:




Mode

To reach the SETUP menu, press the button below the MODE icon. The MODE icon appears on most screens. The screen will change to that shown below:




Setup

Press the button below the SETUP icon. The screen will change to that shown on the following page:

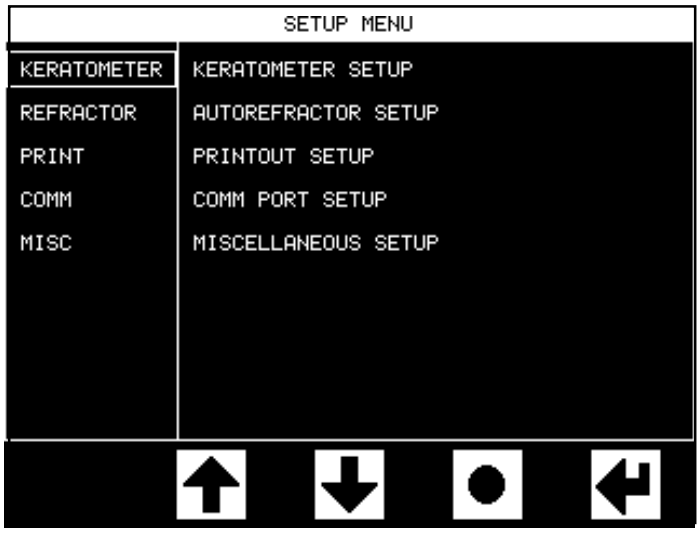

Up


Down


Return


Select

Changing Defaults (cont.)



Move to the function you want to change with the UP or DOWN arrow button, then press the SELECT button. The screen will change to show the parameters you can change within that function.

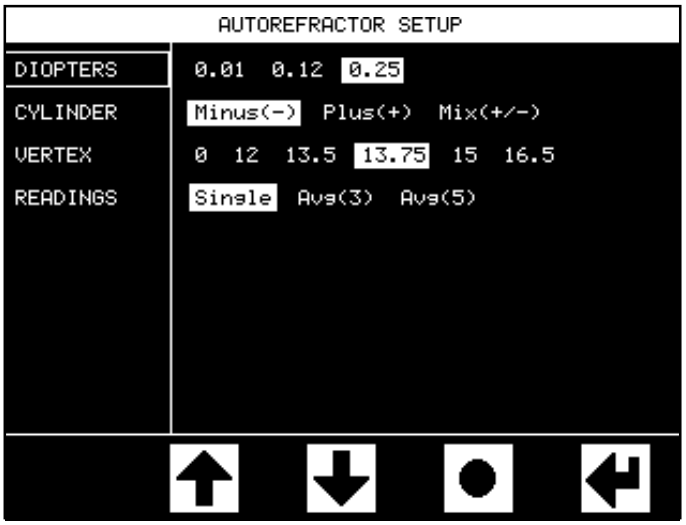

Up


Down


Return


Select

Changing Defaults (cont.)



How to Change Settings

- The current default settings are highlighted with a white box. To change these settings, use the UP or DOWN ARROW button to outline the option in the left column.

- Next, press the SELECT button. The highlighted setting to the right of the option will change and become outlined.

- To move to a new setting, use the LEFT or RIGHT ARROW button to outline your desired setting.

- Finally, press the SELECT button and the new setting will highlight. You have now entered a new default setting.

- To continue to a new option, use the UP or DOWN ARROW and repeat procedure above.

- To change other functions, press the RETURN button. The screen will change back to the SETUP menu.

- To exit the SETUP menu, press the RETURN button a second time.

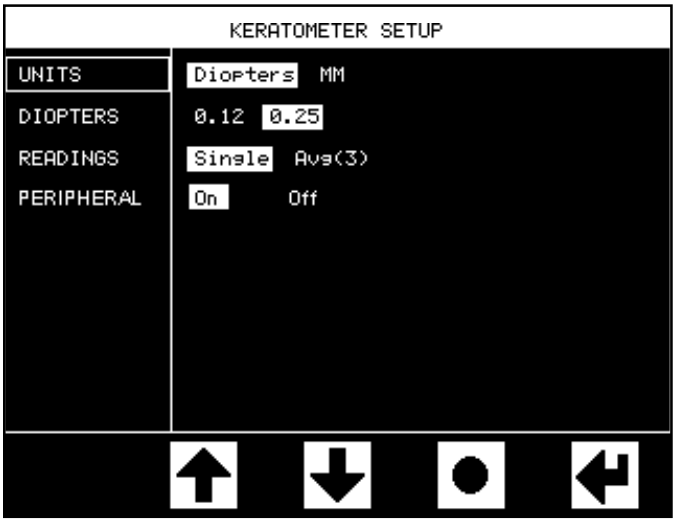

Up


Down


Return


Select

Measurement Options - Auto Keratometer



The following changes can be made to the default settings to alter the measurement parameters:

UNITS	Choose diopters (D) or millimeters (MM).
DIOPTERS	Choose 0.12D or 0.25D rounding.
READINGS	Choose one measurement per eye (Single) or three measurements per eye with the average being shown Avg (3).
PERIPHERAL	Allows peripheral readings to be taken on patient's eye.

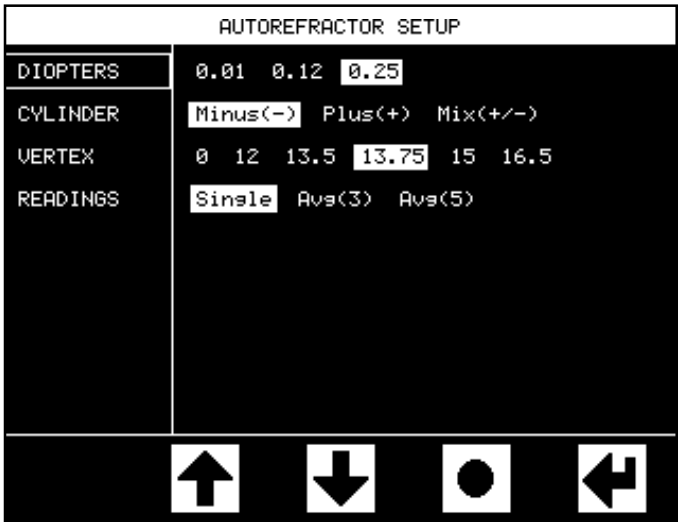

Up


Down


Return


Select

Measurement Options - Auto Refractor



The following changes can be made to the default settings to alter the measurement parameters:

DIOPTERS	Choose 0.01D, 0.12D or 0.25D rounding.
CYLINDER	Choose Minus (-), Plus (+) or Mixed (+/-) cylinder mode.
VERTEX	Choose vertex distances of 0.0, 12.0, 13.5, 13.75, 15.0 or 16.5 millimeters.
READINGS	Choose one measurement per eye (Single), three measurements per eye with the average being shown Avg (3), or five measurements per eye with the average being shown Avg (5).

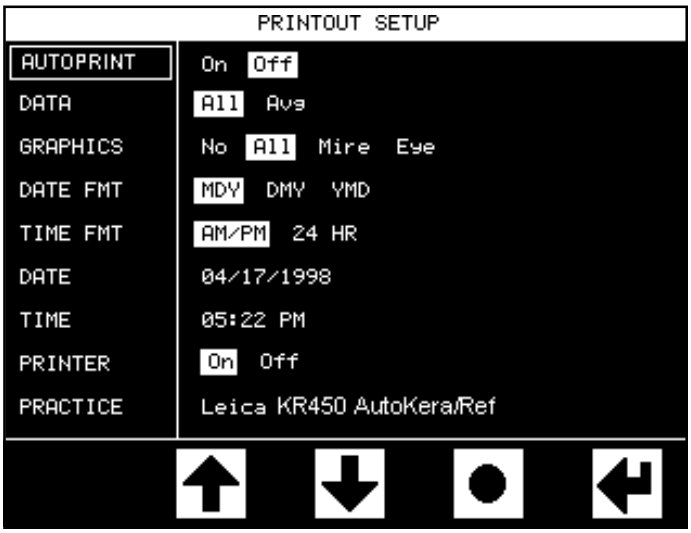

Up


Down


Return


Select

Printer Options



The following changes can be made to the default settings to alter the printer parameters:

AUTOPRINT	Automatically prints data after measurement process is completed.
DATA	Prints all measurement data (ALL) or only average values (Avg).
GRAPHICS	Permits the printing of data only (No), graphics and data (All), mire ring and data (Mire) or eye diagram and data (Eye).
DATE FMT	Choose the printed format. D=Day, M=Month, Y=Year
TIME FMT	Choose the time format.
DATE	Once you have selected the option to be changed, use the PLUS (+) or MINUS (-) buttons to increase or decrease the numbers, then press the SELECT button.
TIME	Change the time following the same instructions to change the date above.
PRINTER	Permits the printer to be turned on or off.
PRACTICE	Up to 30 characters can be printed at the end of the printout. Change characters using the PLUS and MINUS buttons to scroll through the alphabet. Once you have found the letter you require, press the LEFT or RIGHT arrow to move horizontally to change the next letter. To exit, press the SELECT button.

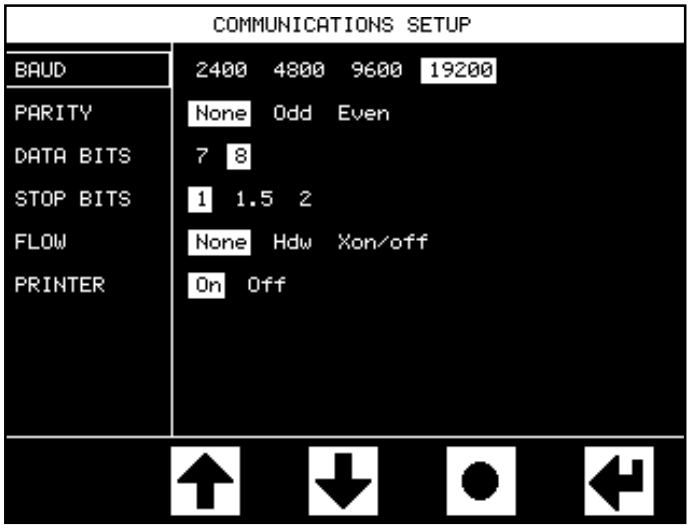

Up


Down


Return


Select

Communication Options



The KR450 can transfer data to an external device, such as a computer, through the RS-232C serial port. Make changes to the Communications Setup settings to match those of the external device connected to the instrument.

PRINTER — You can turn the printer off if you only want to send data to the RS-232C serial port.

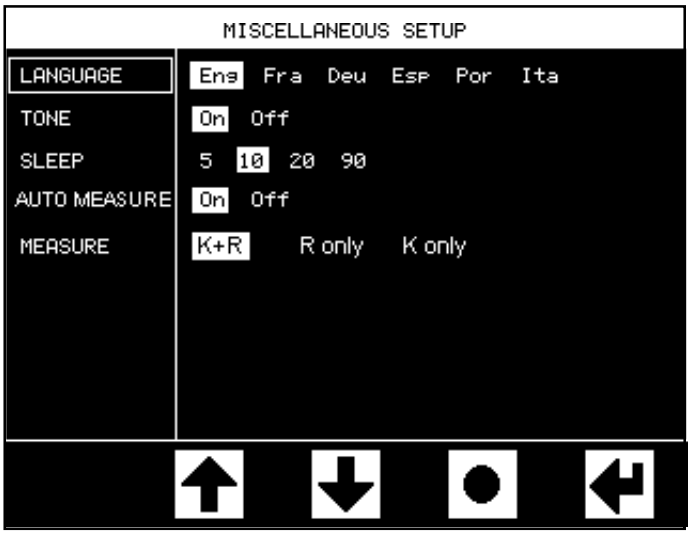

Up


Down


Return


Select

Miscellaneous Options



LANGUAGE	Choose the language used on the users screens.
TONE	Audible tone indicator can be turned on or off.
SLEEP	Choose an inactivity period of 5, 10, 20 or 90 minutes before the instrument goes to “sleep”.
AUTO MEASURE	Sets instrument to begin measurement process automatically (without pressing any buttons) once patient is aligned.
MEASURE	Sets instrument for keratometric and refraction readings (K & R). Choose “R only” for refraction readings only and “K only” for keratometric readings only

Patient Positioning & Alignment

The KR450 features a unique auto-alignment system that enables the instrument to align itself and follow the patient's eye movement. This innovative system makes the whole measurement process quicker and more comfortable for the patient.

- The patient should be seated comfortably on the patient side of the instrument.
- To facilitate patient alignment during the measurement process, we recommend the instrument be positioned in such a way that it encourages the patient to lean forward and slightly down onto the forehead rest. This will cause the patient to gaze slightly downward, reducing problems associated with eyelids or eyelashes during the alignment and measurement process (see Figures A & B).
- Once the patient is seated in front of the instrument, follow the instructions below:

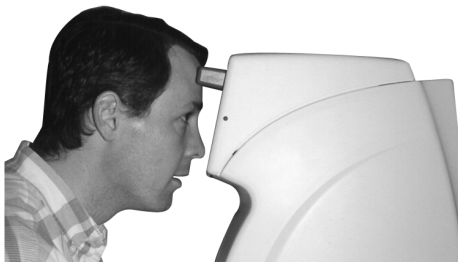


Figure A - Proper patient alignment



Figure B - Improper patient alignment (chin tucked in too far)

1. Ask the patient to look at the green positioning circle (see Figure C) and then to lean forward and place his/her forehead on the blue or white dot located on the forehead rest.

   To ensure correct alignment, point to the side you want the patient to lean against, making sure the patient does not place his/her head in the middle of the forehead rest.

   NOTE: If the patient has difficulty finding the green positioning circle, the patient may need to move up or down on the forehead rest. Use the canthus marks on the sides of the instrument to help with the alignment.



Figure C – Green Positioning Circle

2. Once the patient is leaning against the forehead rest, the instrument will begin the measurement process if the unit is set up in the auto measure mode. The patient will see a fixation target that looks similar to a spoked wheel come into view (see Figures D & E).

Patient Positioning & Alignment (cont.)

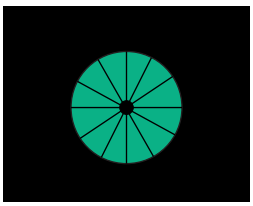


Figure D – Fixation Target

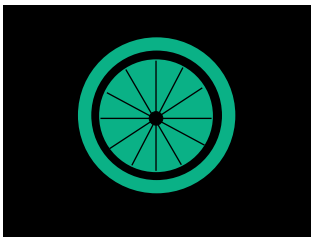
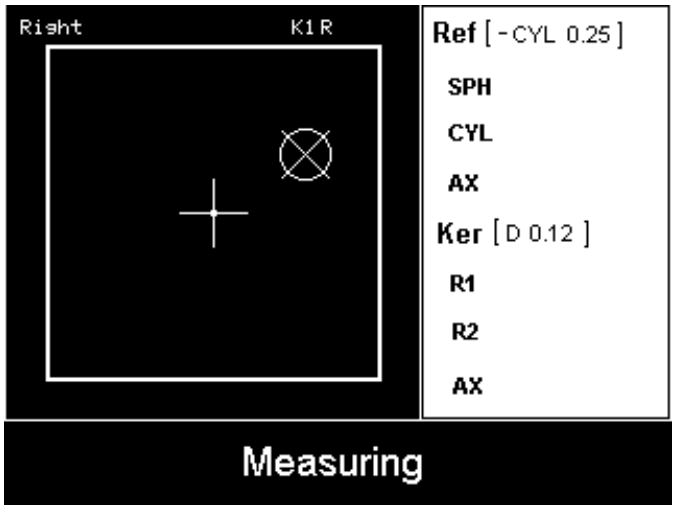


Figure E – Fixation Target when Patient is Properly Aligned and Leaning Against Forehead Rest

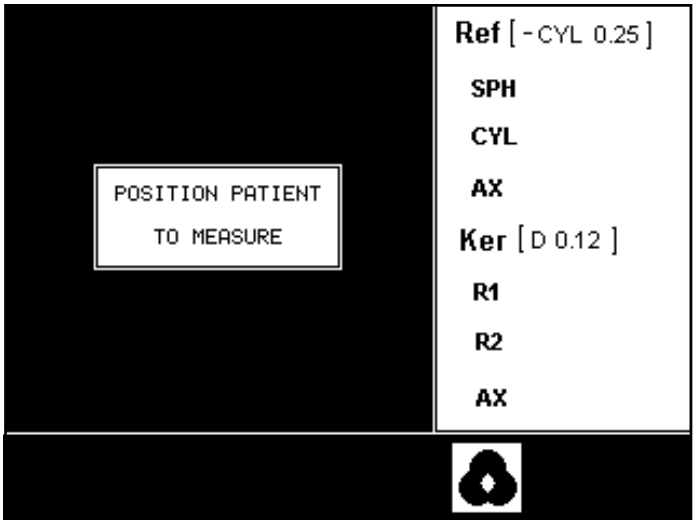
3. Once the patient leans against the forehead rest, the operator's screen will change and look similar to the one below. The measure icon, a white box and cross will appear. This indicates that the patient is within the instrument's acquisition zone. Ask the patient to remain as still as possible during the measurement process.

   If the screen does not change, the patient is not aligned properly to the instrument. Have the patient move his/her chin closer to the instrument (see figure A) and/or move up and down on the forehead rest. Use the canthus marks on the sides of the instrument to help with the alignment.

4. If the instrument seems to have trouble acquiring the patient's eye during the measurement process (e.g., it keeps aligning but never takes a reading), it may be necessary to ask the patient to: (1) open his/her eyes wider, (2) tilt his/her head toward the window, or (3) both instructions.

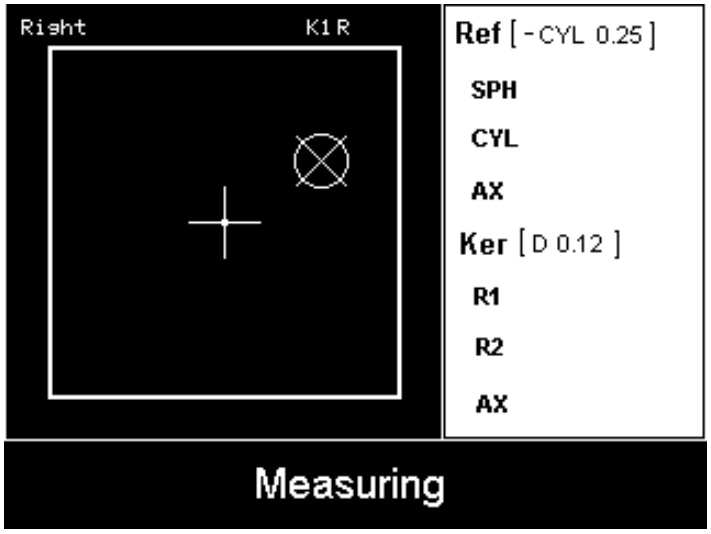


Measurement Process



To begin the measurement process, instruct the patient to lean forward onto the forehead rest, keeping the green fixation target in view. (The fixation target, which looks like a spoked wheel (see Figures C, D & E, pp. 24-25), is located within the green positioning ring.)

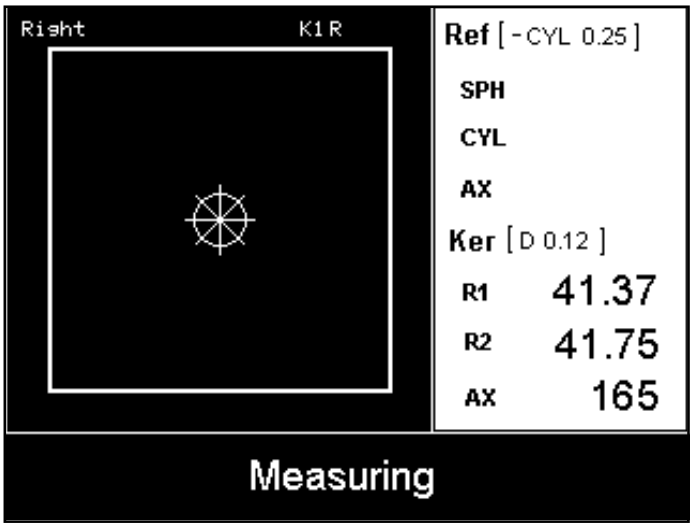
The screen will change and look similar to the one below:



In the auto measurement mode the KR450 will begin the measurement process as soon as the patient's eye is detected.

Measurement Process (cont.)

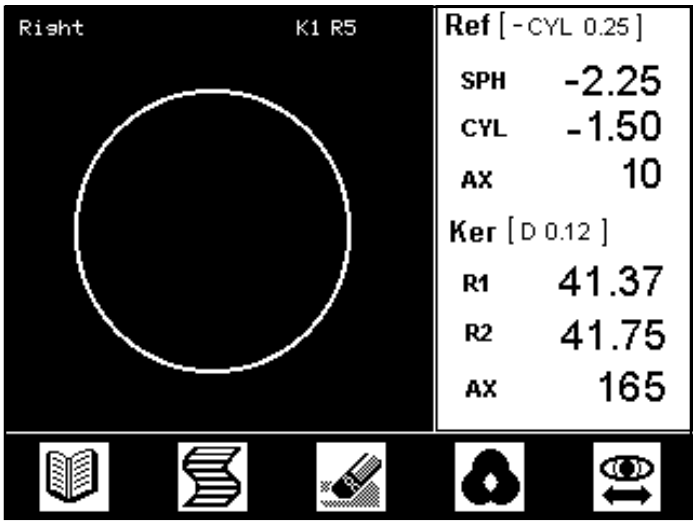
Once the measurement sequence has begun, a circular icon will appear and begin to move around the screen as the instrument aligns itself. If the instrument seems to have trouble acquiring an eye during the measurement process – e.g., it keeps aligning but never takes a reading –, it may be necessary to ask patients to: (1) open their eyes wider, (2) tilt their head in toward the window, or (3) both instructions.



As the alignment continues, you will see the circular icon moving around the screen until it centers. At this point, the icon stops moving and a measurement is taken. You will hear an audible tone (beep), which signifies a measurement has been taken. If the instrument is set to take multiple readings (see pp. 18-20), you will hear multiple beeps after each measurment is taken. The screen will look similar to that shown above.

Measurement Process (cont.)

Once the measurement process is complete, the screen will change and display a mire and measurement data for the eye that was measured. The counter at the top of the screen also indicates the number of measurements taken. The screen will look similar to that shown below:



You now have several options: (1) you can take a measurement of the opposite eye (see p.29), (2) review the data (see pp. 42-44), (3) clear all data (see p. 46), or (4) print the data (see pp. 45-46).


Measure Next Eye


Measure

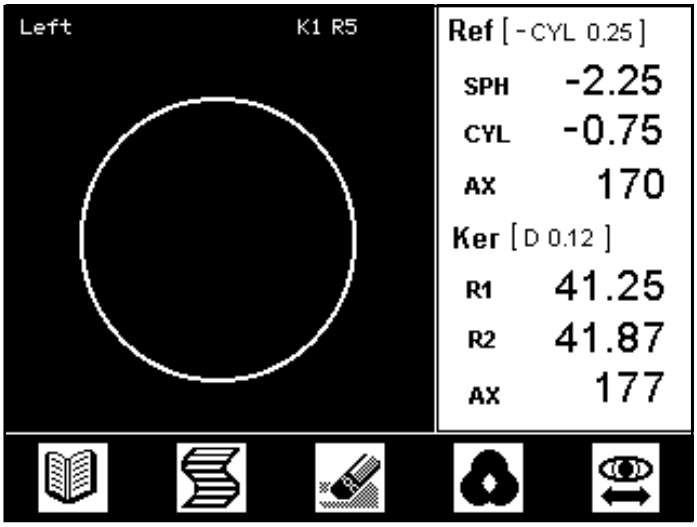

Review


Print


Clear Data

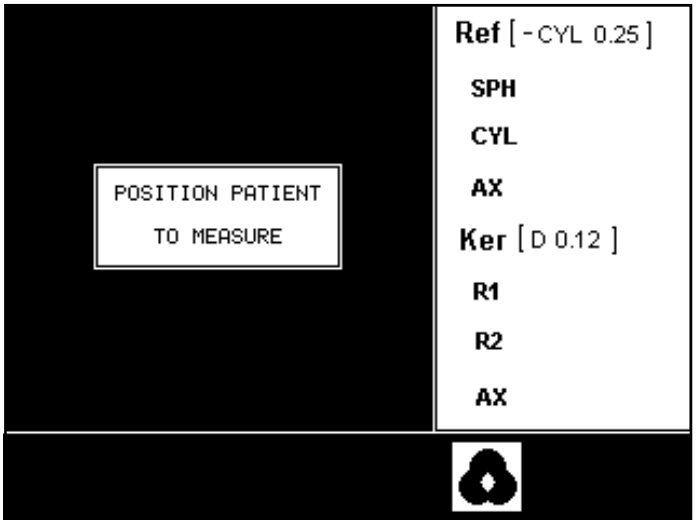
Measurement Process (cont.)

To measure the opposite eye, instruct the patient to move to the opposite side of the forehead rest and view the green fixation target with their other eye. Press the button under the MEASURE NEXT EYE icon. This will repeat the measurement process.



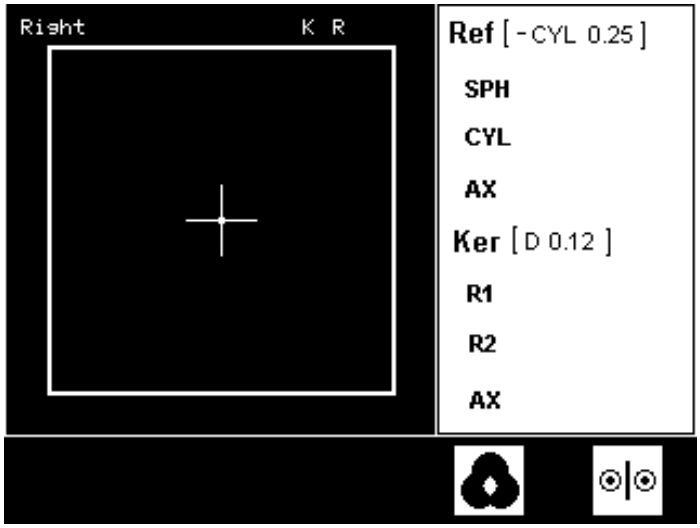
After completing a pair or measurements, the screen should look similar to that shown above. Measurement data and a mire image of the last eye measured is displayed. You now have the following options: (1) review the data (see pp. 42-44), (2) clear all data (see p. 46), or (3) print the data (see pp. 45-46).

Measurement Process



To begin the measurement process, instruct the patient to lean forward onto the forehead rest, keeping the green fixation target in view. (The fixation target, which looks like a spoked wheel (see Figures C, D & E, pp. 24-25), is located within the green positioning ring.)

The screen will change and look similar to the one below:



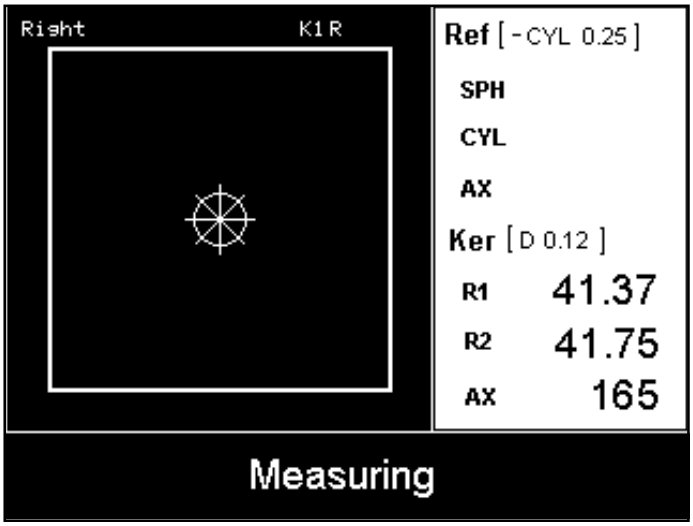


Measure

The eye to be measured will be indicated in the top left-hand corner of the screen. Press the button below the MEASURE icon to begin the measurement process.

Measurement Process (cont.)

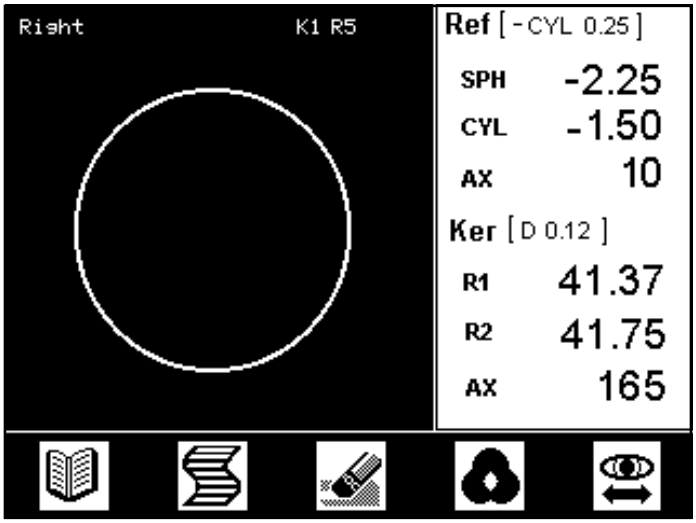
Once the measurement sequence has begun, a circular icon will appear and begin to move around the screen as the instrument aligns itself. If the instrument seems to have trouble acquiring an eye during the measurement process – e.g., it keeps aligning but never takes a reading – it may be necessary to ask patients to: (1) open their eyes wider, (2) tilt their head in toward the window, or (3) both instructions.



As the alignment continues, you will see the circular icon moving around the screen until it centers. At this point, the icon stops moving and a measurement is taken. You will hear an audible tone (beep), which signifies a measurement has been taken. If the instrument is set to take multiple readings (see pp. 18-20), you will hear multiple beeps after each measurment is taken. The screen will look similar to that shown above.

Measurement Process (cont.)

Once the measurement process is complete, the screen will change and display a mire and measurement data for the eye that was measured. The counter at the top of the screen also indicates the number of measurements taken. The screen will look similar to that shown below:



You now have several options: (1) you can take a measurement of the opposite eye (see p.29), (2) review the data (see pp. 42-44), (3) clear all data (see p. 46), or (4) print the data (see pp. 45-46).


Measure Next Eye


Measure

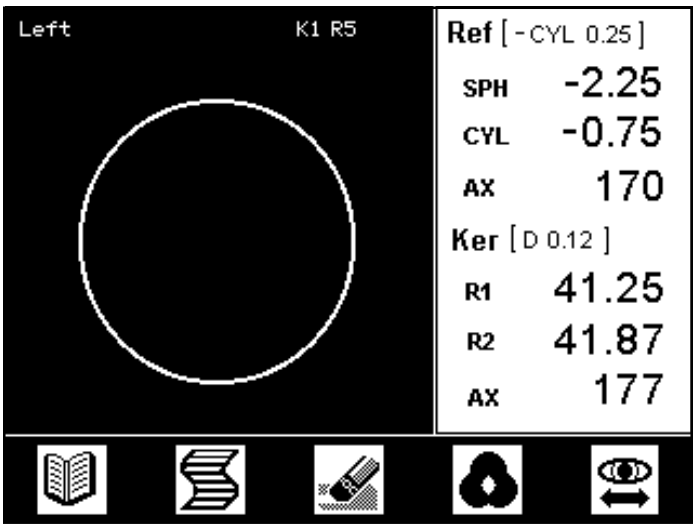

Review


Print


Clear Data

Measurement Process (cont.)

To measure the opposite eye, instruct the patient to move to the opposite side of the forehead rest and view the green fixation target with their other eye. Press the button under the MEASURE NEXT EYE icon. The MEASURE icon will then appear. Press the button under the MEASURE icon. This will repeat the measurement process.



After completing a pair or measurements, the screen should look similar to that shown above. Measurement data and a mire image of the last eye measured is displayed. You now have the following options: (1) review the data (see pp. 42-44), (2) clear all data (see p. 46), or (3) print the data (see pp. 45-46)..

Multiple Readings

The multiple readings mode (see Measurement Options - Auto Keratometer, p. 19, and Measurement Options - Auto Refractor, p. 20) allows successive measurements to be taken, with the average of these measurements being displayed on the screen for each eye. The mire displayed, however, represents the data from the last of these readings — it is **not** an average mire.

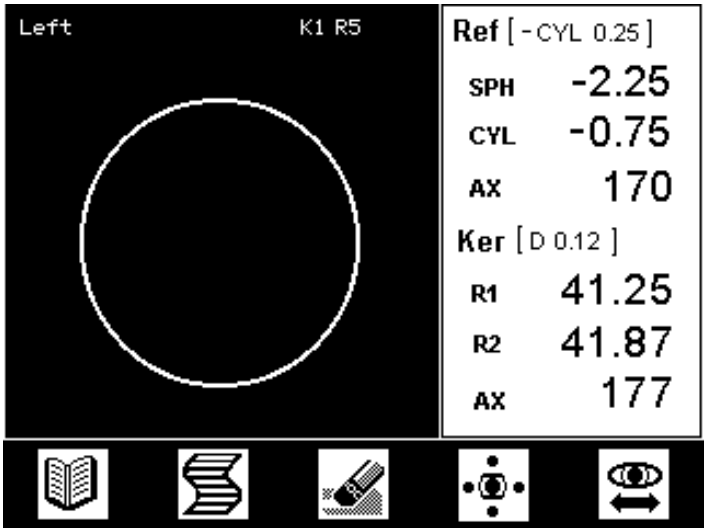
When taking multiple readings, the measurement process is the same as that described on pp. 30-33, except when the button below the Measure icon is pressed, the instrument will take successive readings. You will hear successive "beeps" to signify each reading has been taken. The screen will also indicate the number of readings taken for keratometric and refractive readings. After each beep, you can ask the patient to blink their eyes while fixating on the green target. Once complete, the data and mire will then appear on the screen.


Peripheral

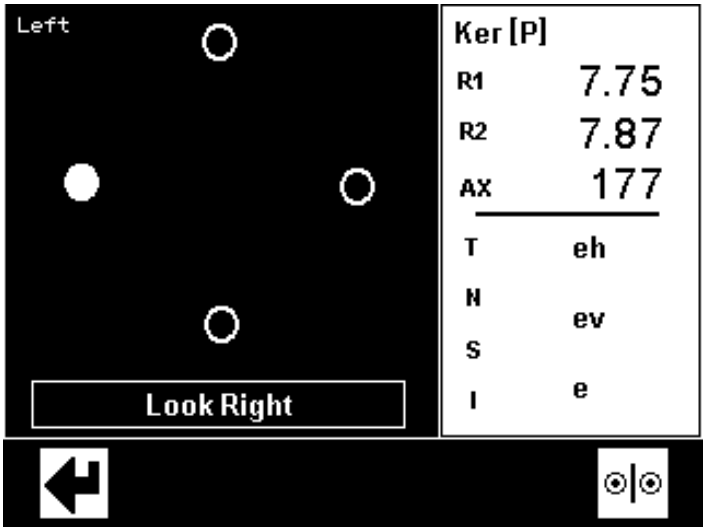
Measurement Process

If the KR450 has been setup to take peripheral measuurments, the PERIPHERAL icon will appear on the screen after a KR measurement or K only measurement has been taken.

See screen below:



To start the peripheral measurment process, press the button below the PERIPHERAL icon. The screen will change and look similar to the one below:

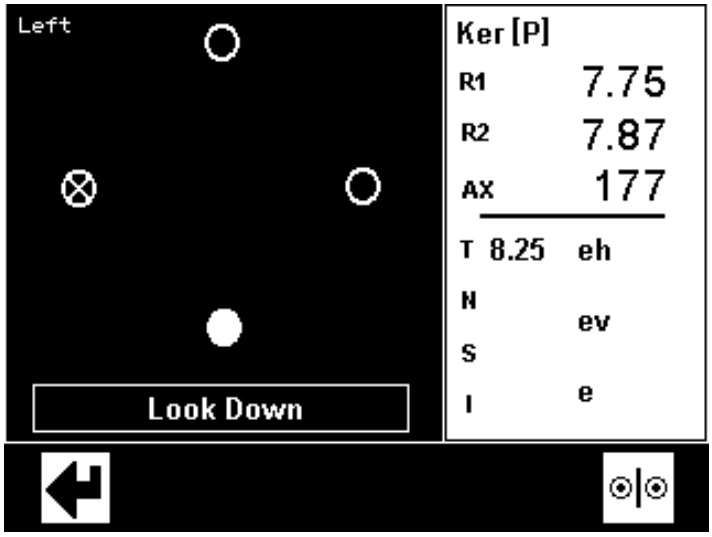



Measure

Measurement Process (cont.)

Follow the instructions on the screen and ask the patient to look in the direction indicated on the screen. The patient should keep his or her head still and refixate in the direction indicated. The patient will see a red fixation light. Once the patient has confirmed seeing the red fixation light, presss the button under the MEASURE icon.

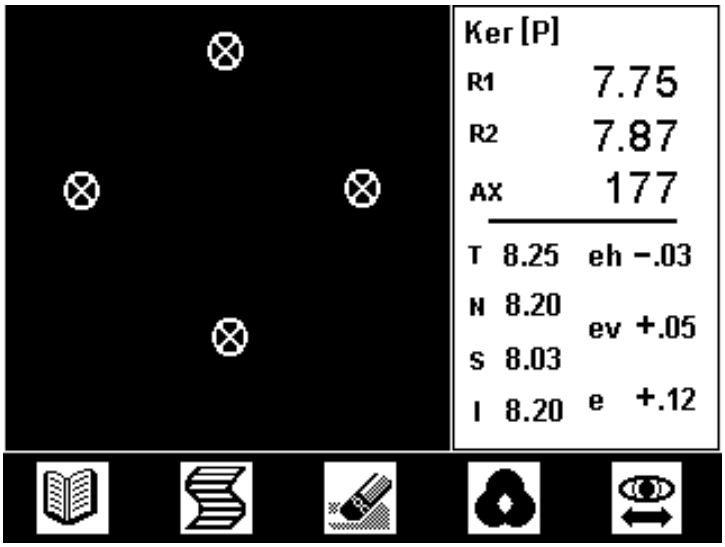
The KR 450 will then begin the measurement process. Once the measurement process is complete, the screen will change and look similar to the one below:



A circle with a cross indicates a measurment has been taken. A solid circle indicates the next measurment to be taken.

Measurement Process (cont.)

A measurement will be recorded, and the instructions on the screen will change. Continue the measurment process until all four measurments have been taken. Once all four peripheral measurements have been taken, the screen will look similar to the one below:

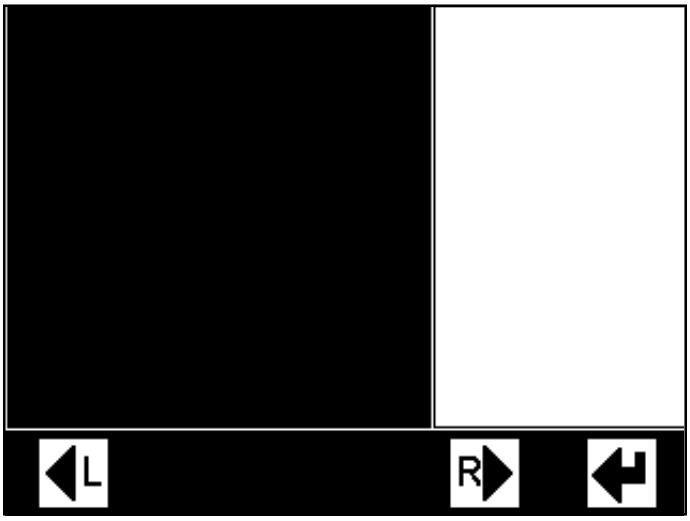


To measure the next eye, press the button under the MEASURE NEXT EYE icon.

Instructions for Use - Eye Selection

The KR450 can detect which eye is being measured automatically. This is displayed in the top left-hand corner of the screen.

If the system fails to detect which eye is being measured, the screen will change to that shown below:





Left Eye Measurement

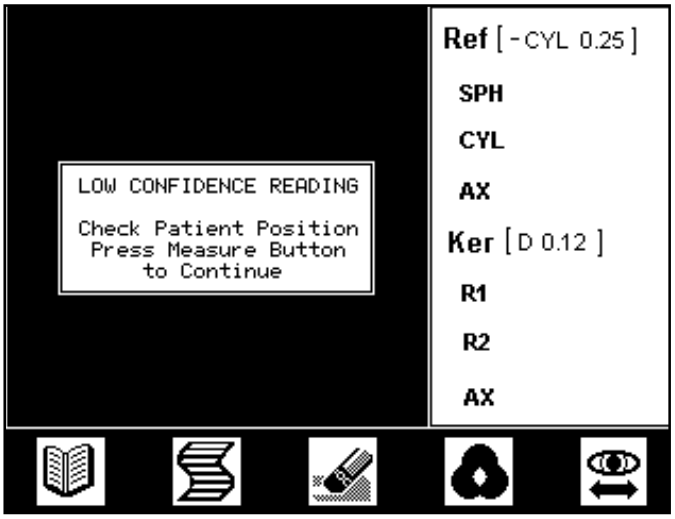


Right Eye Measurement

To select an eye and initiate a measurement, press the button below the RIGHT EYE MEASURE icon or the LEFT EYE MEASURE icon. The measurement process will then proceed as described on pp. 30-33.

Low Confidence Readings

During the measurement process, the KR450 may detect a condition which could create a low confidence reading. Rather than display data that is erroneous, the display will change to that shown below:



Conditions that may cause a low confidence reading are:

1) Patient moves away from instrument before measurement process is complete.
2) Patient may be squinting.
3) Patient may have “drooping” eyelids.
4) Patient eyelashes may be interfering with the alignment system.
5) Patient may have dry eyes.


Measure Next Eye

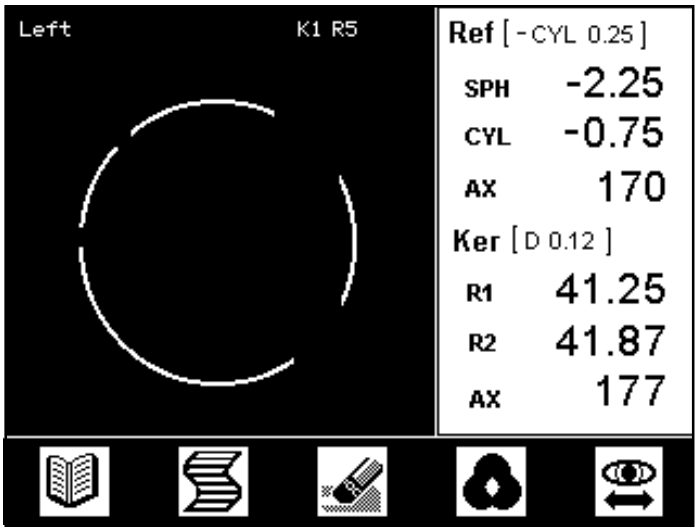

Measure


Clear Data

To continue the measurement process, reposition the patient and ask them to blink and open their eyes wider. Press the button under the MEASURE NEXT EYE icon. Then press the button under the MEASURE icon to continue the measurment process from the point that the error was detected. If you do not want to continue, press the button under the CLEAR DATA icon to return to the initial measurement screen and repeat the measurement process.

Incomplete Mires

In some instances, the mire ring image may look incomplete or broken as shown below:



There are many reasons for this, such as patient eyelashes obstructing the instrument or a dry eye which gives a lower reflective surface to measure. The numerical data associated with this mire will be very accurate due to the advanced image processing technique used to measure the cornea.

If you want to remeasure the eye, simply repeat the measurement process for that eye.

NOTE: For technical reasons, there will always be a very small break in the mire, on the left-hand side of the ring.

Measurement Data

The measurement data displayed on the screen for both the left and right eyes is as follows:

Auto Refractor (Ref):

SPH represents the spherical power of the measured eye.

CYL represents the cylindrical power of the measured eye.

AX represents the axis of the cylinder

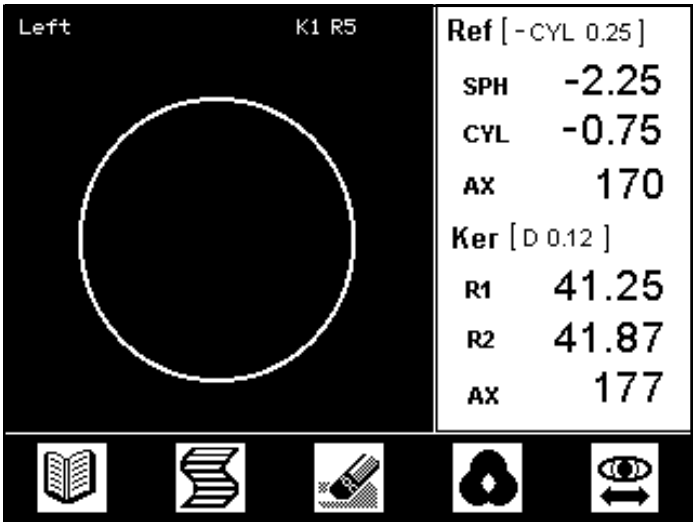
Auto Keratometer (Ker):

R1 represents the maximum radius of curvature (“flattest” curve), lowest power meridian.

R2 represents the minimum radius of curvature (“steepest” curve), highest power meridian.

AX represents the axis of R1.

The screen also shows the cylinder mode and rounding mode for the refractor measurements, and the measurement mode and rounding mode for the keratometric measurements.




Review


Print


Review
Right/Left


Mire Ring


Enhanced Mire

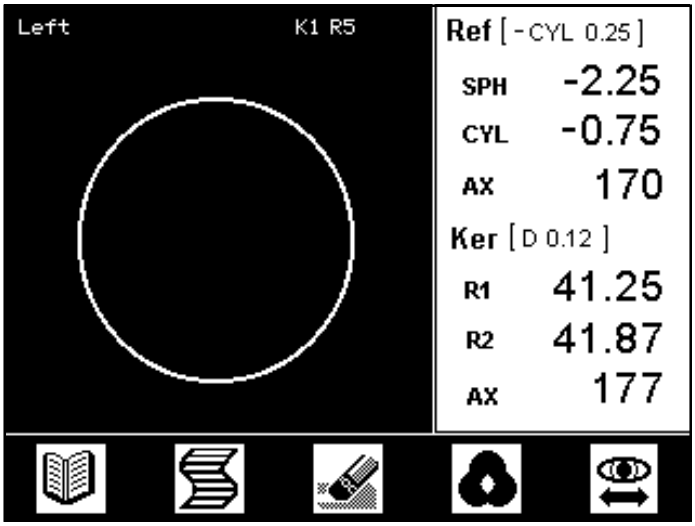


Convert


Refraction
Data

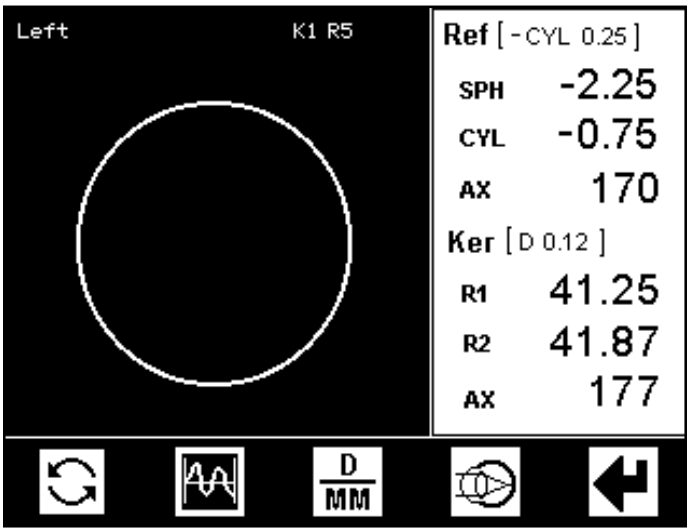

Return

Reviewing Keratometric and Refraction Data



Once the measurement process is complete you have the opportunity to review the measurement data for each eye.

To access the review functions, press the button under the REVIEW icon. The screen will change and look similar to the one below:



You now have the following choices: (1) review the circular mire and all measurement data for each eye, (2) review the enhanced mire for each eye, (3) convert and review keratometric data in dioptric power or radius of curvature, (4) review all refraction measurements.


Mire Ring


Review Right/Left



Convert


Enhanced Mire

Keratometric Data

To review the circular mire, press the button under the MIRE RING icon. To change the mire from either left-to-right or right-to-left, press the REVIEW RIGHT/LEFT button. Left or right is displayed in the upper left hand corner of the screen to indicate the mire ring being viewed.

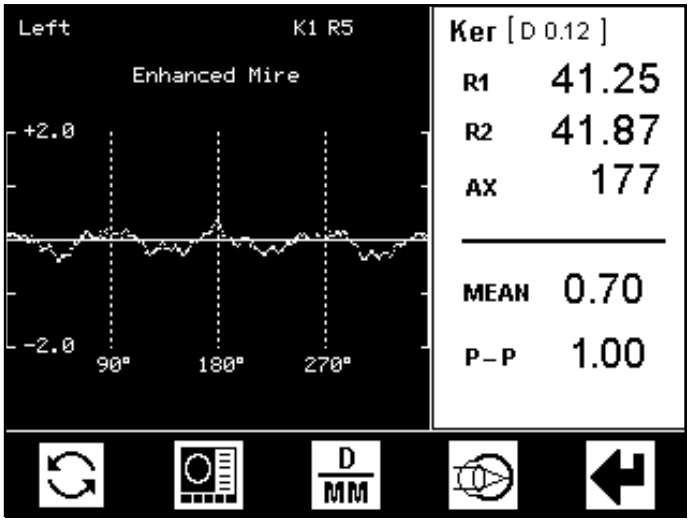
To review the enhanced mire, press the button under the ENHANCED MIRE icon. (For further information, see the Enhanced Mire section below).

Converting Data

The CONVERT icon allows you to review the keratometric data on the screen in either millimeters (MM) or diopters (D). It does not effect the default in setup. When you print, both millimeters and diopters are printed.

Enhanced Mire

To view the enhanced mire, press the button under the ENHANCED MIRE icon; the screen will change and look similar to the one below.



To alternate between the right and left eye, repeatedly press the button under the REVIEW RIGHT/LEFT icon.

The enhanced mire is a linear version of the circular mire. It shows, in detail, how the shape of the cornea is affected by localized imperfections in the region of the circular mire.

The zero reference line on the graph represents a best spherical and cylindrical fit to the circular mire. If there were no localized corneal imperfections around the circular mire, the resulting enhanced mire graph would lie on the reference line. A localized “flattening” of the cornea (a lessening of corneal power) has the opposite effect. The more localized imperfections on the cornea, the more deviations along the enhanced mire graph line.

The P - P (peak to peak) value represents the largest deviation between the highest and lowest points on the graph. This indicates the maximum localized defect on the cornea and helps with understanding the optical performance of the corneal surface.

Enhanced Mire Data (cont.)

The mean value quantifies the overall irregularity of the measured corneal surface and is a useful aid when doing a subjective review of the mire ring image. Minor deviations along the reference line are “normal.” Larger deviations represent points of interest for diagnosis, tracking and characterization of unusual conditions.

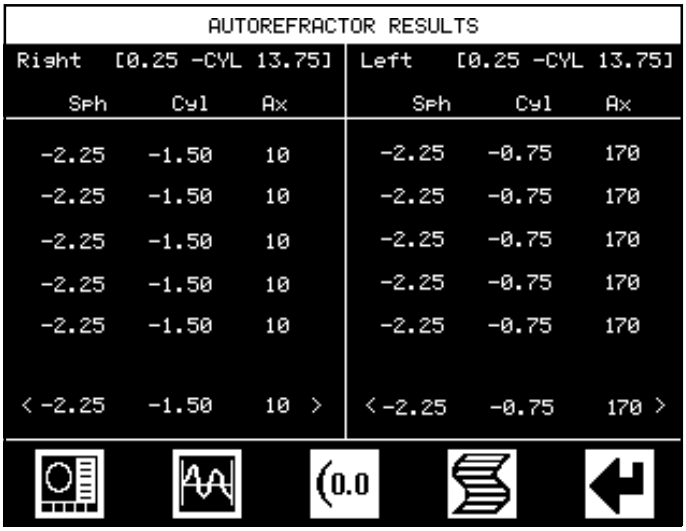
Both the P - P and mean value, because they are quantified, can be used to track corneal changes over time. This is especially useful if a patient is known to have keratoconus or has undergone corneal surgery. These values, combined with the enhanced mire, may also help identify patients who may have difficulty wearing contact lenses because of localized irregularities on the corneal surface.



Refraction Data

Refraction Data

To view all of the refraction measurements, press the button under the REFRACTION DATA icon, the screen will change and look similar to the one below.



This screen shows all of the refraction measurements taken on both the right and left eye. The average reading for each eye is shown at the bottom.



Convert Zero Vertex

To convert the refracting data to a zero vertex distance, press the button under the CONVERT ZERO VERTEX icon.

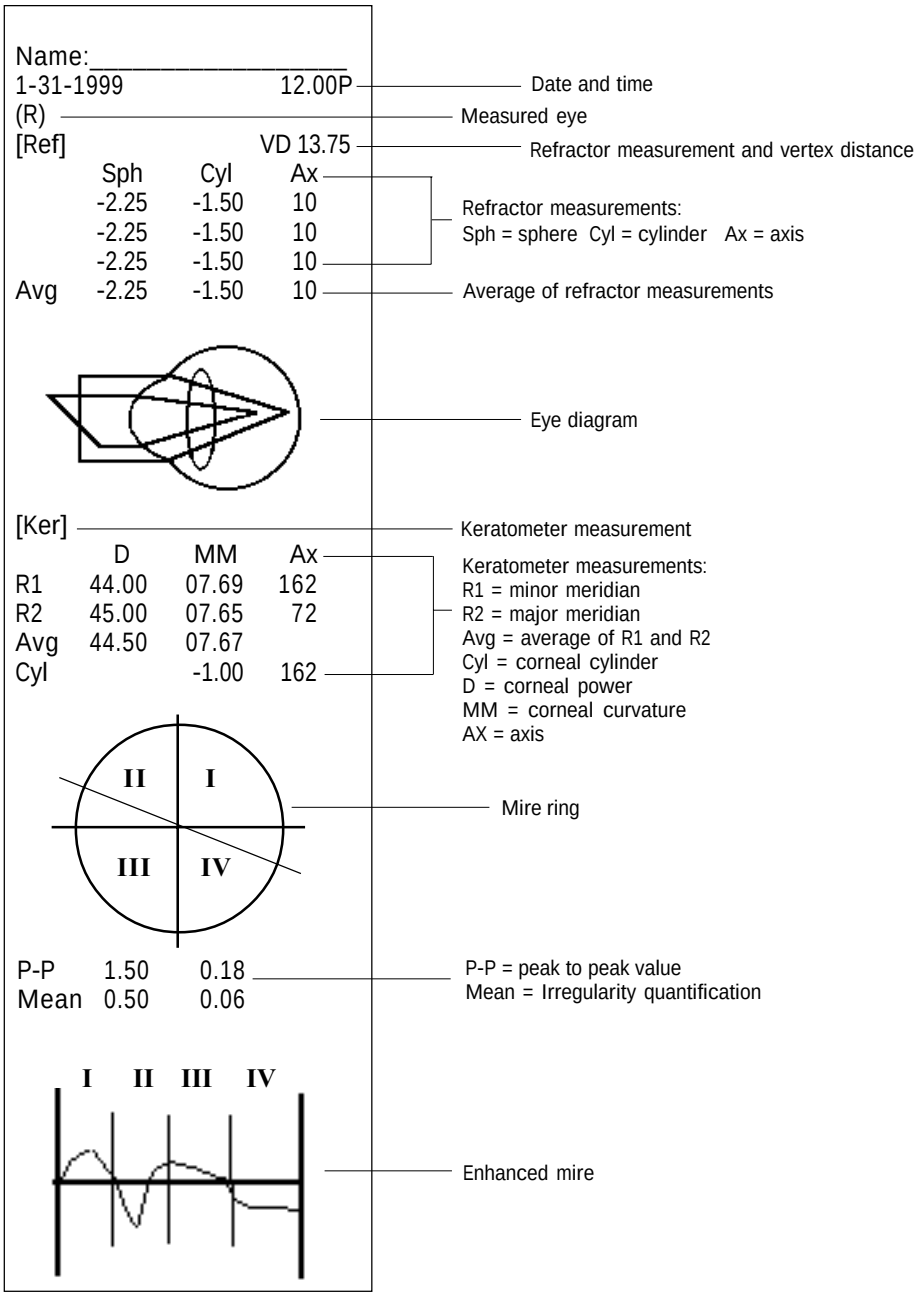


Print

Printing Measurement Data

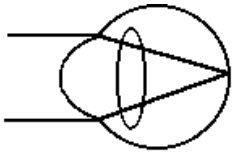
To print the measurement data, press the button below the PRINT icon. There are various print options available. For example, you can print either numeric data, eye diagrams or mire ring data. You can also print various combinations of numeric data, eye diagrams or mires. Refer to Printer Options section on p. 21 for how to select your desired options.

A sample of a printout showing numeric data, an eye diagram and mire ring and enhanced mire is shown below:

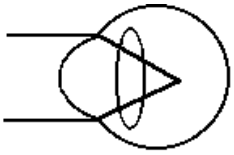


Eye Diagram

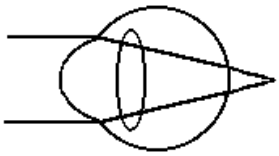
This shows a graphical interpretation of the patient's refractive measurement and can be useful when talking to the patient about their refractive condition. There are six patterns that can be printed:



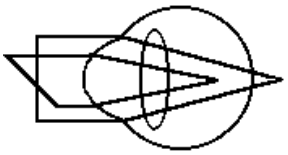
EMMETROPIA



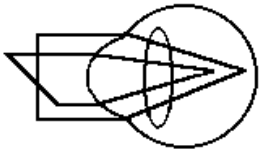
MYOPIA



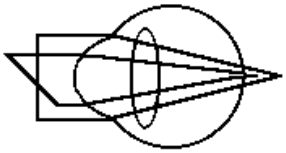
HYPEROPIA



ASTIGMATISM



MYOPIC ASTIGMATISM

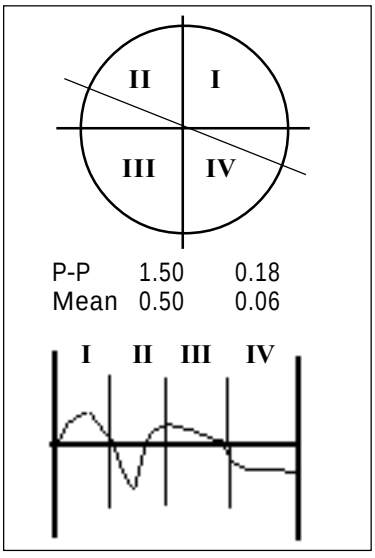


HYPEROPIC ASTIGMATISM

Mire Ring and Enhanced Mire Printout

Both the mire ring and enhanced mire can be printed. This is useful when you are tracking a patient's corneal condition over time. The line running through the mire ring represents the angle of corneal astigmatism. The numbered quadrants in the ring refer to the numbered quadrants along the enhanced mire line.

A sample of a printout showing a mire ring and enhanced mire data is shown below:



NOTE: All thermal paper printouts tend to fade over time. If you need a permanent record, make sure you write down the relevant data onto the patient's record.



Clear Data

Clearing Data

If you decide not to make a printout, press the button under the CLEAR DATA icon. This will clear all data from the memory and the screen. The instrument is now ready for the next patient.


Mode


Help


Up


Down


Return

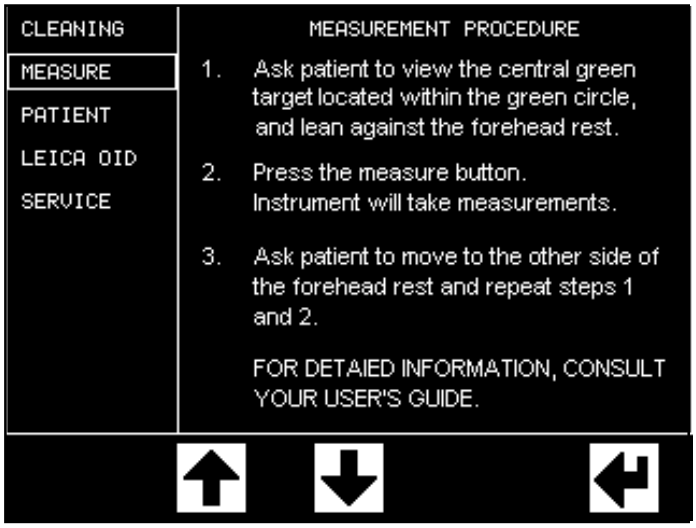
Help Screens

The KR450 includes HELP screens, which provide useful information and tips on the operation of the KR450. These screens are intended to be used as a quick reference to a selection of operations.

To access the HELP menu, press the button below the MODE icon. The screen will change and look similar to that below:



Next, press the button below the HELP icon. The screen will look similar to the one below:



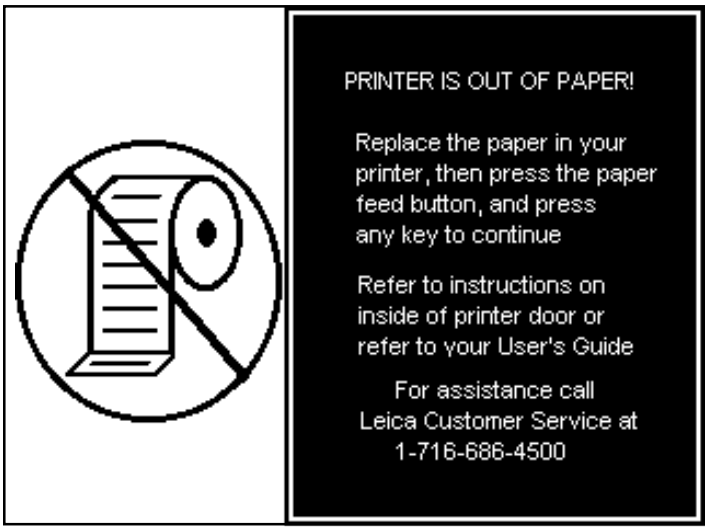
The screen shows a list of subjects in the left column. To access, highlight the subject with the UP or DOWN ARROW. Once selected, the screen will change showing instructions and tips for using the KR450.

Once you have finished reading, use the ENTER/RETURN icon to return to the normal operating mode.

If at any time you have questions relating to the use of the KR450, contact your local dealer or our Customer Service Department directly at (716) 686-4500.

Print-Related Errors

Change the instrument's printer paper when the screen below appears on your monitor:



Instructions for changing printer paper are located on the inside of the printer door (see p. 50).

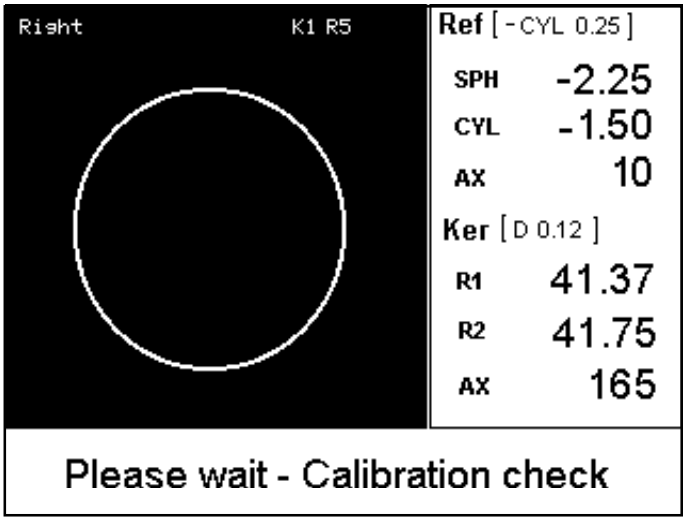
If the printer paper runs out before printing all the measurement data, the data will be stored. Once the printer paper is replaced, a complete version of all measurement data will print out.

After replacing printer paper, if you do not lower the paper release lever, the following screen will appear:



Follow the instructions on the screen.

After all measurement data has been printed, the instrument will initiate a calibration check to ensure optimum performance of your KR450. If you do not utilize the printer functions of the KR450, this calibration check will occur automatically after approximately 10 patients have been measured.



Maintenance

The KR450 requires very little routine maintenance due to its advanced design. For instance, there are no bulbs or lamps to change.

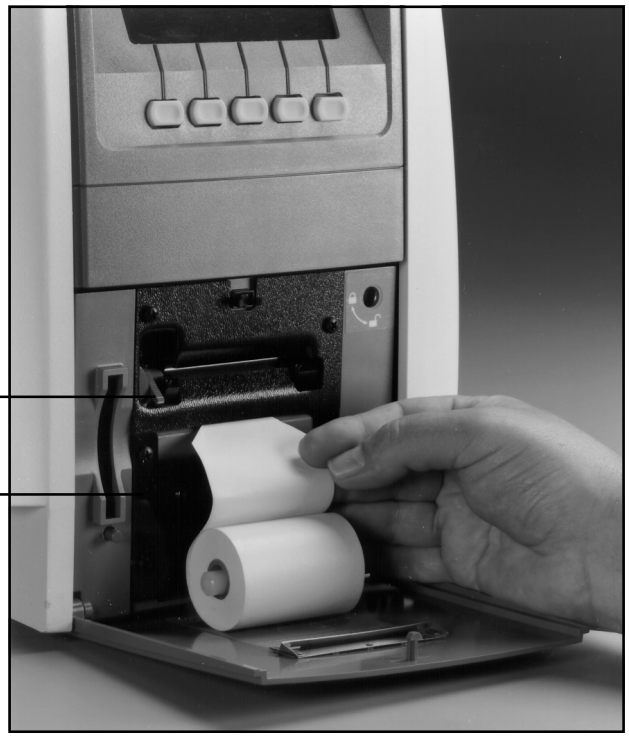
If you have questions relating to maintenance, contact your local dealer or our Customer Service Department directly at (716) 686-4500.

Patient Window

We recommend that you keep the patient window clean to avoid any measurement/ alignment problems. Use the cleaning cloth provided or a **clean** lens tissue. DO NOT USE ANY LIQUIDS SUCH AS ALCOHOL OR PROPRIETARY CLEANERS. If necessary, a clean, soft cloth moistened with a solution of mild detergent and warm water may be used.

Printer Paper

Instructions for changing printer paper can be found on the inside of the printer door. To order replacement thermal paper, call your local dealer and ask for replacement paper, catalog No. 12441.



RAISE PAPER RELEASE LEVER AND REMOVE USED ROLL.CUT OR TEAR (DO NOT FOLD) END OF NEW ROLL INTO A POINT. FEED INTO LOWER SLOT AS SHOWN AND LOWER PAPER RELEASE LEVER. PRESS FEED SWITCH, PAPER WILL EXIT THROUGH UPPER SLOT. ALWAYS USE THERMAL PRINTER PAPER, CATALOG NO. 12441.

Instructions found inside printer door.

Maintenance

Fuses

Fuses are located above the power inlet. (See p. 7, No. 12 for location.) Only replace fuses with T 0.315 AL 250V @ 230V and T 0.63 AL 250V @ 115V as described on the power inlet panel.

Internal fuse (F1) located on power I/0 board replace with T6.3 AL 250V model number 13960 and 13961. Replacement to be performed by qualified service personnel only.

Forehead Rest

For hygienic reasons, after each patient, wipe the forehead rest with a clean cloth or with alcohol wipes.

PC Card

The PC card slot is located behind the printer door. (See p. 7, No. 13) Before removing or installing a PC card, disconnect the KR450 from the power supply and follow installation instructions on the PC card.

Troubleshooting

	MESSAGE/PROBLEM	REMEDY
MEASUREMENT	"Low Confidence Reading"	Reposition patient. Clean patient window. Position instrument away from bright lights.
	Instrument continually aligns — does not take reading.	Reposition patient. Position instrument away from bright lights.
PRINTER	Will not print.	Out of paper. Printer not turned on in setup (see pp. 21 & 48).
	Paper jams in printer.	See instructions on inside of printer door.
	Mires/graphics will not print.	Mire/eye not selected in print setup (see p. 21).
OTHER	No power.	Check fuses and/or power outlet.
	Screen blank.	Adjust contrast control. Instrument in "sleep" mode — push any gray button. Check fuses. Check power outlet.
	Clock/date incorrect.	Change settings in setup (see p. 21).
	Instrument "locks up."	Press red reset button. (See p. 7, No. 15 for location.)

If problems still persist, contact your local authorized dealer or call our Customer Service Department at (716) 686-4500.

NOTE: Circuit diagrams, component parts list descriptions and calibration instructions are available only to the appropriately qualified personnel.

Product Specifications

Keratometer

Radius of Curvature:	5.5mm to 10mm 0.01 mm steps
Corneal Power:	33.75D to 61.25D 0.12D, 0.25D steps
Cylinder:	0 to 10.00D
Axis:	0^0 to 180^0 1^0 steps
Peripheral	4 points at 30^0

Refractor

Sphere	-18.00D to +18.00D 0.01D, 0.12D, 0.25D steps
Cylinder	0 to 10.00D
Axis	0^0 to 180^0 1^0 steps
Height:	17 in., 43.0 cm.
Width:	9 1/2 in., 24.0 cm.
Depth:	13 1/2 in., 34.0 cm.
Weight, unpacked:	32 lbs., 14.5 kg.
Voltage	Catalog No. 13960 100V/120V Catalog No. 13961 220V/240V
Current	Model 13960 - 1.0 amp Model 13961 - 0.5 amp
Frequency	50/60 Hz

Transportation & Storage

This instrument can withstand the following conditions while packed for transportation or storage:

- an ambient temperature range of -40°C to + 70°C;
- a relative humidity range of 10% to 90%;
- an atmospheric pressure range of 500 hPa to 1060 hPa.

Exposure to these conditions should not exceed 15 weeks.

Disposal

This product does no generate any environmentally hazardous residues. At end of product life, follow local laws and ordinances regarding proper disposal of equipment.

Ordering Information

Accessories

Catalog	Description
12418	Instrument stand adapter mount
12441	Printer paper
13915	Power cord for low voltage installations
13964	Reference fixture
13916	External power supply universal input, 16 VDC out @ 0.0 to 3.12 amps Note: External power supply must be medically approved to UL2601-1, IEC60601-1 and CSA C22.2 NO. 601.1

To order, contact your local authorized Reichert dealer.

Other Leica Products, Ophthalmic Instruments Division

To complement your KR 450 Automated Keratometer/Refractor, we invite you to take a look at the other products made by our company:

Keratometer
LENSCHEK™ Advanced Logic Lensometer®
LongLife™ Project-O-Chart
Non-Contact Tonometer (NCT) II
Selectra™ Project-O-Chart
Phoroptor® Refracting Instrument
XCEL® Slit Lamps
AT550 Auto Non-Contact Tonometer
KM250 Auto Keratometer
AR350 Auto Refractor
PL800 Digital PD Meter
AP250 Auto Projector

To order, contact your local authorized Reichert dealer.

Warranty

This product is warranted by Reichert Ophthalmic Instruments, a division of Leica Microsystems Inc. ("Reichert") against defective material and workmanship under normal use for a period of one year from the date of invoice to the original purchaser. (An authorized dealer shall not be considered an original purchaser.) Under this warranty, Reichert's sole obligation is to repair or replace the defective part or product at Reichert's discretion.

This warranty applies to new products and does not apply to a product which has been tampered with, altered in any way, misused, damaged by accident or negligence, or which has the serial number removed, altered or effaced. Nor shall this warranty be extended to a product installed or operated in a manner not in accordance with the applicable Reichert instruction manual, nor to a product which has been sold, serviced, installed or repaired other than by a Reichert factory, Technical Service Center, or authorized Reichert Ophthalmic Instruments Dealer.

Lamps, bulbs, charts, cards and other expendable items are not covered by this warranty.

All claims under this warranty must be in writing directed to the Reichert factory, Technical Service Center, or authorized instrument dealer making the original sale and must be accompanied by a copy of the purchaser's invoice.

This warranty is in lieu of all other warranties implied or expressed. All implied warranties of merchantability or fitness for a particular use are hereby disclaimed. No representative or other person is authorized to make any other obligations for Reichert. Reichert shall not be liable for any special, incidental, or consequent damages for any negligence, breach of warranty, strict liability or any other damages resulting from or relating to design, manufacture, sale, use or handling of the product.

PATENT WARRANTY

If notified promptly in writing of any action brought against the purchaser based on a claim that the instrument infringes a U.S. Patent, Reichert will defend such action at its expense and will pay costs and damages awarded in any such action, provided that Reichert shall have sole control of the defense of any such action with information and assistance (at Reichert's expense) for such defense, and of all negotiation for the settlement and compromise thereof.

PRODUCT CHANGES

Reichert reserves the right to make changes in design or to make additions to or improvements in its products without obligation to add such to products previously manufactured.

CLAIMS FOR SHORTAGES

We use extreme care in selection, checking, rechecking and packing to eliminate the possibility of error. If any shipping errors are discovered:

1. Carefully go through the packing materials to be sure nothing was inadvertently overlooked when the unit was unpacked.
2. Call the dealer you purchased the product from and report the shortage. The materials are packed at the factory and none should be missing if the box has never been opened.
3. Claims should be filed within 30 days.

CLAIMS FOR DAMAGES IN TRANSIT

Our shipping responsibility ceases with the safe delivery in good condition to the transportation company. Claims for loss or damage in transit should be made promptly and directly to the transportation company.

If, upon delivery, the outside of the packing case shows evidence of rough handling or damage, the transportation company's agent should be requested to make a "Received in Bad Order" notation on the delivery receipt. If within 48 hours of delivery, concealed damage is noted upon unpacking the shipment and no exterior evidence of rough handling is apparent, the transportation company should be requested to make out a "Bad Order" report. This procedure is necessary in order for the dealer to maintain the right of recovery from the carrier.

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13960-101-Rev. B