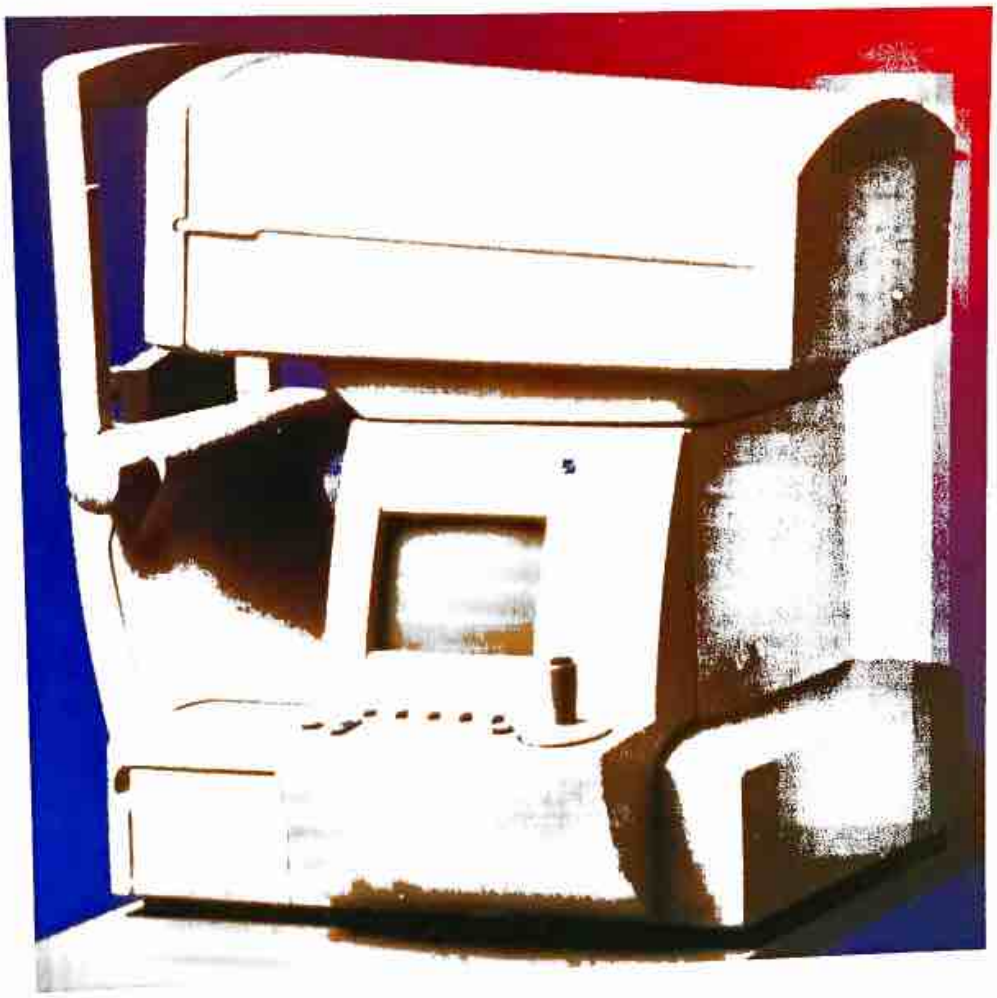
HUMPHREY®

AUTOMATIC REFRACTOR KERATOMETER MODEL 599



USER'S GUIDE

TABLE OF CONTENTS

1 GETTING STARTED

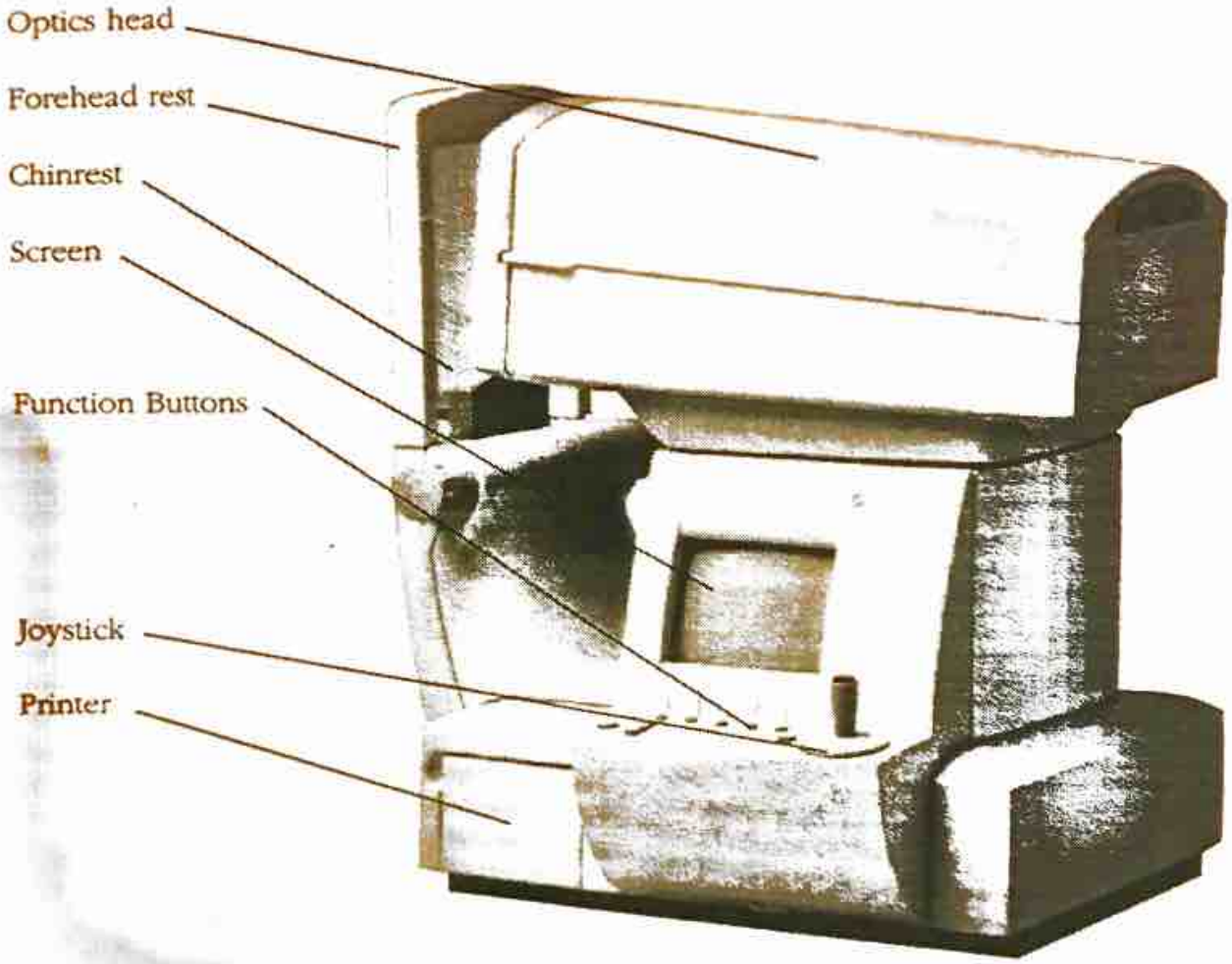
Congratulations on your purchase of the Humphrey Automatic Refractor Keratometer model 599.

This User's Guide is designed to serve as a training and reference aid. It is recommended that you follow the steps in the Quick Start Checklist as an introduction to your instrument.

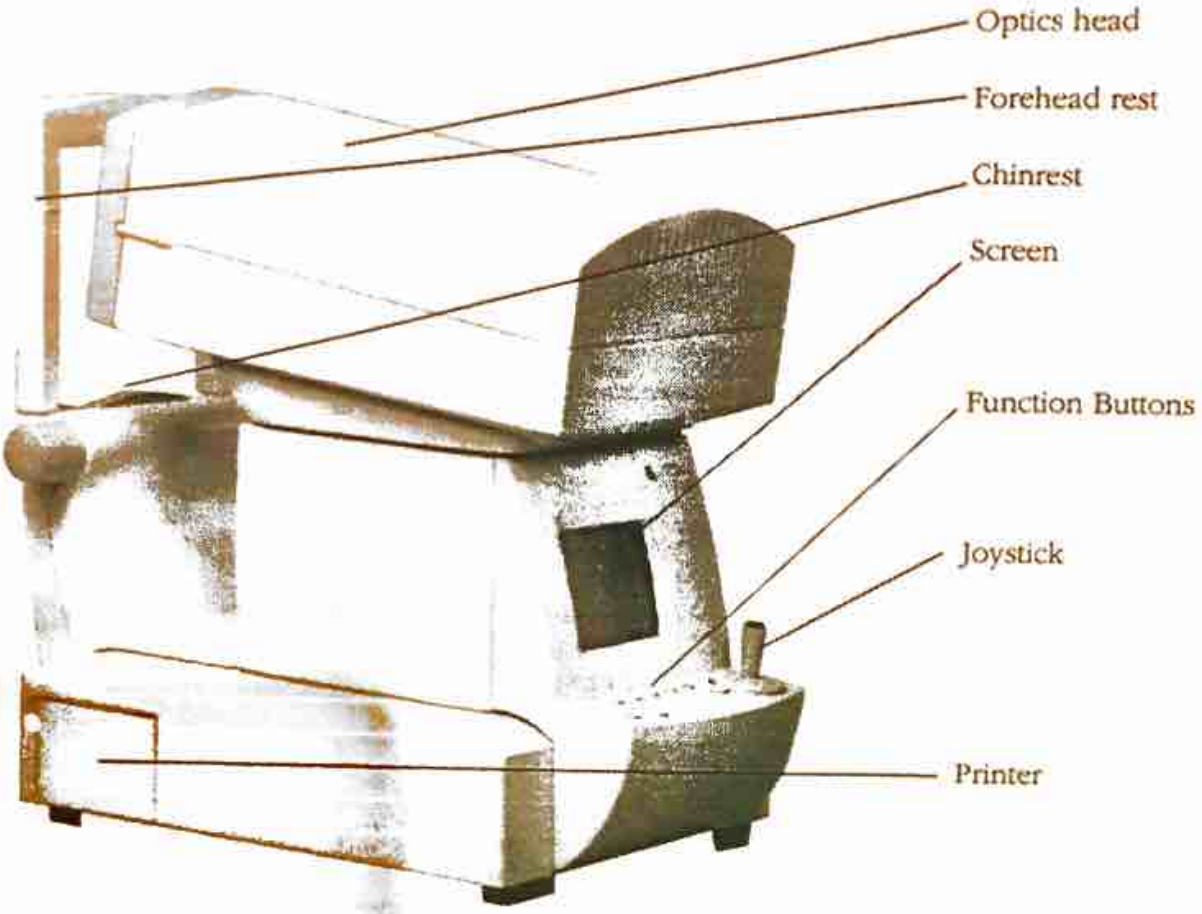
QUICK START CHECKLIST

- ☐ Read "Getting Started" (pages 1–8)
- ☐ Change default settings through the setup option screen, if necessary (pages 9–13)
- ☐ Follow alignment procedures (pages 14–15) and refractive and keratometry procedures (pages 17–30)

One of the unique features of the Humphrey Automatic Refractor Keratometer is that they it be configured in either a 90 or 180 degree position with reference to the patient. If you find it necessary to change the configuration of your instrument, please contact the Humphrey Service Department at (800) 341-6968.

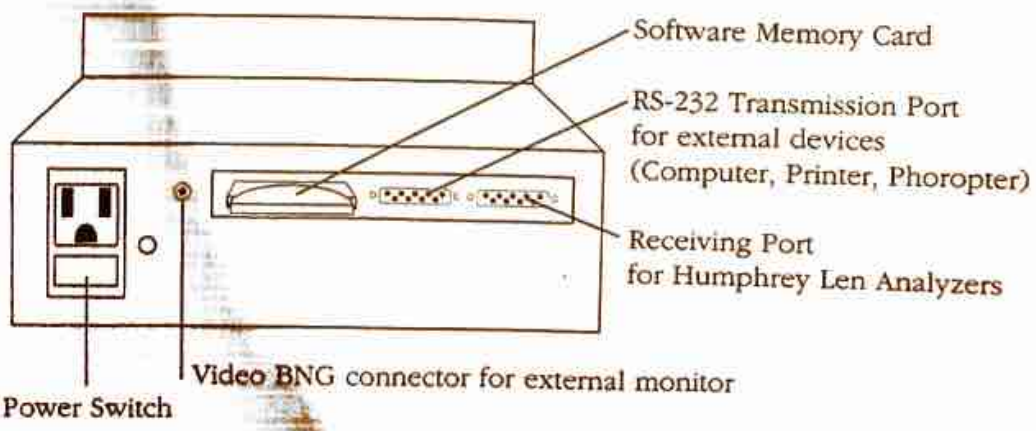


90° patient/operator configuration



180° patient/operator configuration

To install your instrument, simply attach the power cord to the back of the instrument and turn the power switch on.



SAFETY PRECAUTIONS

All Humphrey Automatic Refractor Keratometer (HARK) models should be used in a cool, dry and dust free setting. To prevent electric shock, the instrument must be plugged into an outlet with earth ground. The HARKs are designed to adjust automatically for line voltage. The HARK complies with UL, CSA and IEC safety requirements. Follow all warnings and precautions to ensure the safe installation and operation of the equipment.

CAUTION: This instrument is not anesthetic proof. Do not use in the presence of flammable anesthetic since this may create a risk of explosion.

To prevent possible shock hazards, do NOT touch the BNC Connector labeled "VIDEO" and the patient simultaneously.

If the black plastic lens cover is removed, do NOT touch the exposed live parts and the patient simultaneously.

Although your instrument is designed for continuous operation, it should be turned off when not used for an extended period of time.

- The HARK is classified as Type B, Class 1 Equipment. To prevent the risk of shock, the equipment must be plugged into an earth ground outlet.
- Do NOT use the instrument in or near a wet or moist environment. The HARK is an ORDINARY EQUIPMENT without water entry operation.
- DO NOT overload your AC outlet.
- If the cord or plug is damaged, do not continue to use the instrument. Electrical Shock or fire hazard may result. Call customer service for a replacement.
- The instrument has ventilation openings at the bottom to allow for the release of heat generated during operation. If these openings are blocked, built-up heat can cause failures which may result in a fire hazard.
- DO NOT place the instrument on an uneven or sloped surface.
- DO NOT use accessories that are not designed for this instrument. Use only those parts recommended by Humphrey Instruments to achieve optimum performance and safety. Electrical accessories such as printer and monitor should comply with appropriate safety standard such as the IEC 601-1, CSA 601.1 and UL 2601.

CAUTION: Always replace fuse with the same type and rating. Failure to do so may create a risk of fire.

- DO NOT connect or disconnect cables while power is on.
- DO NOT remove or insert memory card while power is on.

As with many electrical instruments, the HARK's generate radio frequency energy and may cause interference to radio, television reception and other instruments. If this equipment does cause interference to radio or television reception, the following measures may be necessary:

1. Plug the instrument into a different outlet so that the instrument and the receiving device are on different branch circuits.
2. Reorient the TV or radio antenna.
3. Reorient the instrument with respect to the TV or the radio.
4. Move the receiving device and the instrument away from each other.
5. Use only shielded communication cables.

The following symbols appear on the instrument:

Symbol located on power switch indicates that power is OFF.

Symbol located on power switch indicates that power is ON.

Indicates that there are important operating and maintenance instructions included in the User's Guide.

Indicates the presence of uninsulated high voltage inside the instrument. Risk of electric shock. Do not remove the instrument cover or parts.

Fuse rating.

Serial RS 232 communication port.

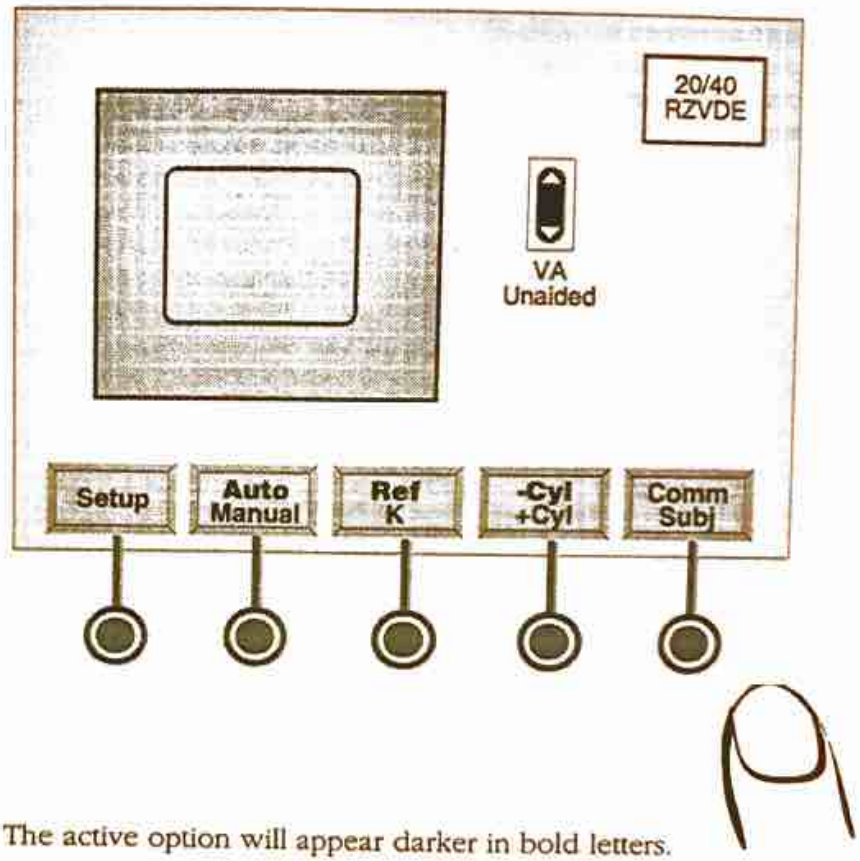
Video output.

Type B ordinary patient applied part.

User Friendly

Basic operation is menu driven which means that you do not have to memorize any commands. Simply press the blue buttons located on the operation panel below the desired option listed on the screen.

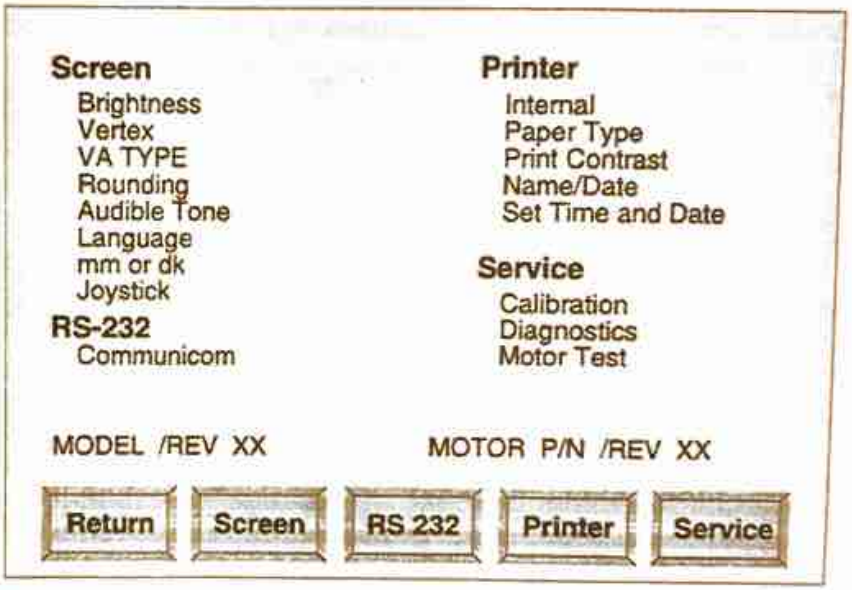
MAIN SCREEN



The active option will appear darker in bold letters.

2 SYSTEM SETUP

Your instrument has been shipped to you with preselected setup options. These default settings, such as cylinder convention, mode of operation, etc., can be changed in the main screen by pushing the blue buttons on the control panel to display your choice in bold letters. Other settings such as vertex distance, rounding, and others, can be changed through the setup menus. Before beginning, enter the setup options screen and select your choices. Remember that once you have preset your choices within the setup options screen, they will remain set until you change them. Refer to the setup options screen below for your choice of options.



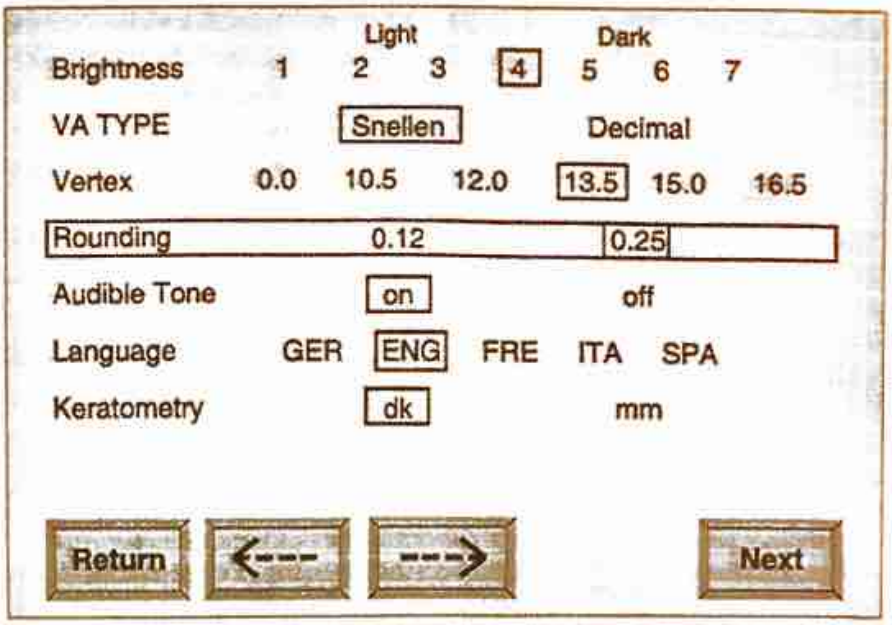
The setup options screen may be accessed by pressing the button under "SETUP" from the refractive or keratometry screens.

The options have been summarized and combined for easy reference in the setup options screen. All bold headers refer to the next screen to be accessed. For example, if you wish to alter screen brightness you will need to press the button under "SCREEN".

The current settings are represented within each screen by bold, darker print. You may choose the setting to be adjusted by moving the highlight bar with the "ARROW KEY".


"ARROW KEY"

SETUP OPTIONS SCREEN



Brightness may be changed from 1 (brightest) to 7 (darkest) by pressing the appropriate buttons (Standard default 4).

VA TYPE displays acuities in fractions Snellen (20/20) or decimal (1.0).

Vertex ranges from 0.0 to 16.5

Rounding choose from 0.12 or 0.25

Audible Tone may be turned on or off

Language German, English, French, Italian or Spanish

Keratometry Choose between (dk) diopters and (mm) millimeters.

By pressing "NEXT" the operator may alter the direction of the optics head through one or both of these two options:

Joystick forward choose between forward, up or down position

Joystick left choose between left or right movement

6 GLOSSARY

Up and down arrow key allows you to change visual acuity lines or to move between options within the set up or refraction and keratometry screens. Also changes sphere, cylinder, and axis values during subjective refinement procedures.

Clears all data.

Read other eye.

Print.

Moves cursor to different line item within highlight bar during set up.

Increase numbers.

Decrease numbers.

Chooses between automatic or manual mode.

For axis refinement.

Interrupts refraction procedure when pressed.

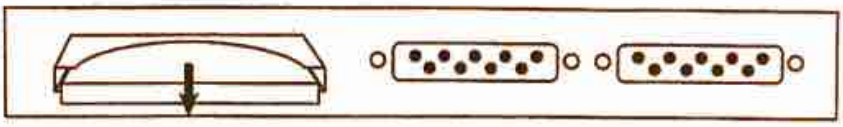
Accesses Communicon screen and Subjective refinement options.

Changes cylinder convention.

INSTALLING NEW MEMORY CARD

The memory card is located in the rear of the unit. Always turn off the power before removing the card from the instrument. Remove current memory card by pulling it away from the unit.

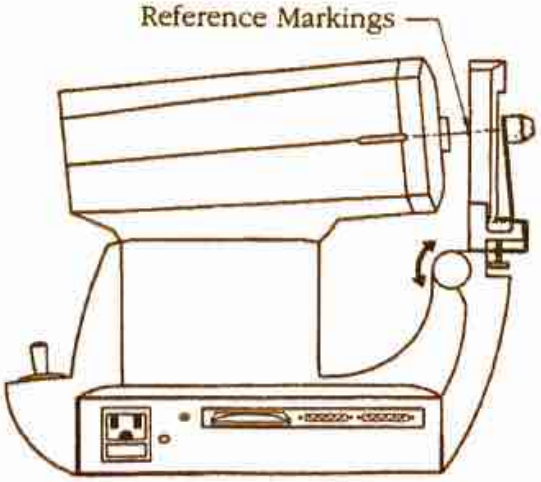
When reinserted, a portion of the card will protrude from the housing.



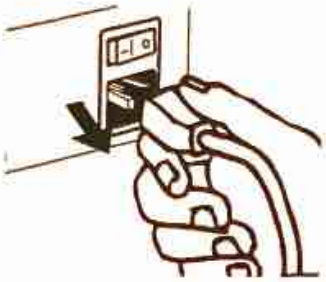
CALIBRATION PROCEDURE

Included in your Accessory Kit is a test piece simulating a human eye. This reference eye is used as a "Test-eye" to determine that the instrument is functioning correctly.

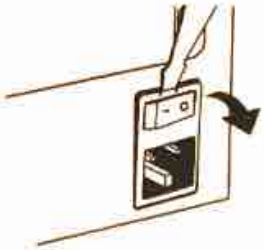
To verify the calibration of your instrument, attach the test-eye to the chinrest base as shown below. When the base of the test-eye fits firmly against the vertical edge of the chinrest, secure it with the thrumb-screw (DO NOT OVER TIGHTEN). Align the pupil with the reference markings on the forehead-rest rails using the chinrest height adjustment knob. Using the joystick align the instrument with the test-eye. Press the "READ" button and compare the measurement with the values on the test eye. Readings should be within ±0.25 diopter.



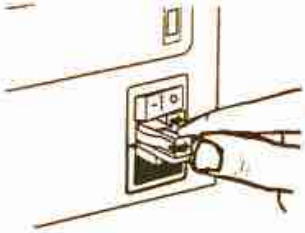
REPLACING FUSES



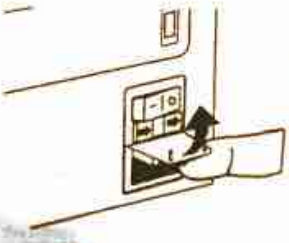
1 Two fuses are located in the rear of the unit. Turn off the power and unplug the power cord.



2 Using a small screwdriver, gently pry open the cover to expose the fuse holder.



3 Slide out each fuse holder (marked with an arrow) and check the filament for breakage. Remove the defective fuse.



4 Insert new fuse in holder. Slide holder back into housing with arrows pointing to the right. Push the cover up and in until it snaps closed. Plug in the power cord.

CAUTION: Replace fuse with exact type and rating
(See instrument Specifications, page 41)

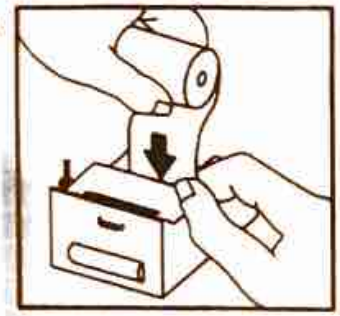
REPLACING PRINTER PAPER

The "Replace Paper" screen automatically appears when the paper supply is completely empty. Should this occur in the midst of printing patient data, you will have an opportunity to restart the printer after a new supply of paper has been loaded. No information will be lost.

When the paper supply is completely empty, follow these instructions:

1) Do not turn off the power. Open the printer door and slide out the printer. Lift the lever on the side of the instrument to release the paper in the platen. Remove the old paper spool.

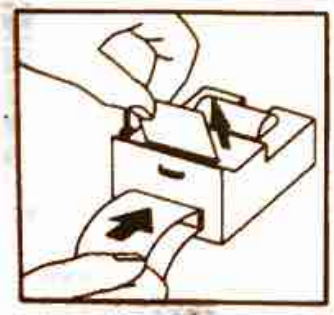
2)



2) Drop in the new paper roll. Orient the roll so that the paper feeds from the bottom and threads through the feed slot.

3) Reinsert paper as shown. Return the lever on the side of the printer to the horizontal position to lock the paper in place.

3)



4) Slide the printer back into the housing. Close the printer door and tear off excess paper.

5) Restart printout by pressing "PRINT" button.

5 MAINTENANCE

All of the Humphrey Refractors are designed to meet the demands of your busy schedule. If there are questions about maintenance, call the Humphrey Instruments Customer Service Department at (800) 341-6968 (in USA) or your nearest Humphrey Instruments representative. See pages 43 and 44 for instructions on repairs to be done under warranty.

CLEANING THE SCREEN AND OUTER CASING

Wipe the screen with a clean cloth and any lens cleaner or isopropyl alcohol. Never spray cleaner directly onto the screen.

Wipe dirt spots on outer casing with a clean cloth and mild detergent or isopropyl alcohol. Never spray detergent or alcohol directly onto casing.

For hygienic reasons, it is imperative to wipe the chinrest and forehead rest after each patient with a clean cloth or with alcohol wipes.

CLEANING THE PATIENT FIXATION WINDOW

The lens in the patient fixation window has a special coating that is easily scratched therefore careful cleaning is imperative. The fixation window should be checked regularly for dust and smudges because a dirty lens can cause erroneous readings. A particularly high sphere or cylinder reading can be the result of dirt on the patient fixation window.

To clean the window, first use a camel hair brush to gently remove the dust from the lens. Then dampen a lintless camera lens tissue with a camera lens cleaning solution and *gently* wipe the lens surfaces to remove smudges or fingerprints.

Several additional operator panel buttons allow you to control the functions of the instrument. These buttons include:

Arrow Key

Up and down arrow switch allows you to move between visual acuity lines or to move between options within the setup or refraction/keratometry screens. This button also increases/decreases sphere, cylinder, and axis during the subjective refinement process.

Clear Button

Clears all data.

Change Eye Button

Moves the instrument to the other eye.

Print Button

Prints a hard copy of the refraction and keratometry results.

	Messages	Action
Refraction Errors		
	Chin cup may be too high or low	Realign/position patient according to instructions on page 14.
	X motor limit reached Y motor limit reached Z motor limit reached SPHERE motor limit reached C PLUS motor limit reached C CROSS motor limit reached Visual Acuity motor limit reached	Press "RETRY" button. Make sure patient is aligned correctly. Check to see that instrument lenses are clean and smudge free. If error message persists, call customer service.
	Unable to do refraction—Focus using Arrow Key.	Use "ARROW KEY" to focus the datapoints and press the read button.
Alignment Errors		
	Chin cup may be too high or low	Move chin cup and realign/position patient according to instructions on page 14.
	X, Y alignment errors	Patient may not be correctly aligned. Follow instructions on the screen and continue with the refraction/keratometry.
Keratometry Errors		
	Unable to do keratometry—Focus using Arrow Key.	Use "ARROW KEY" to focus the datapoints and press the read button.

"ARROW KEY"

4 TROUBLESHOOTING

For customer service, please call (800) 341-6968.

Printer Errors

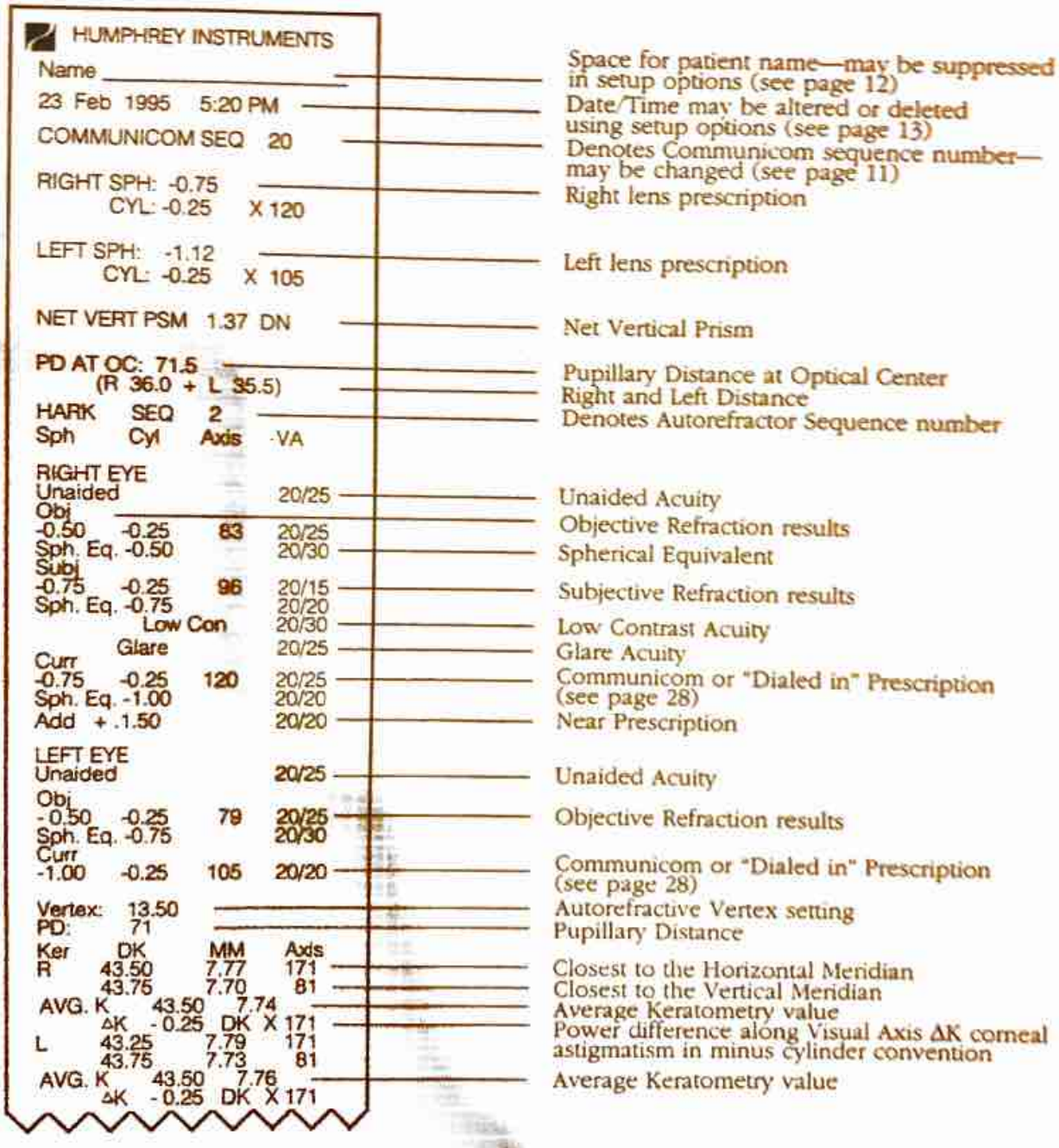
Message/Problem	Action
Printer out of paper	Check printer paper supply, install more paper. Check if paper holder lever has been returned to it's horizontal paper locking position. Check printer setup screen. Press "CANCEL" button to exit print mode.
Printer does not respond	Check printer set up screen to make sure printer is on. Call service if problem persists.

Motor Errors

Messages	Action
X motor failed to home Y motor failed to home Z motor failed to home Sphere motor failed to home C Plus motor failed to home C Cross motor failed to home VAT motor failed to home	Press "RETRY" button. Make sure patient is aligned correctly. Check to see that instrument lenses are clean and smudge free. If error persists, call customer service.

THE HARK 599 PRINTOUT

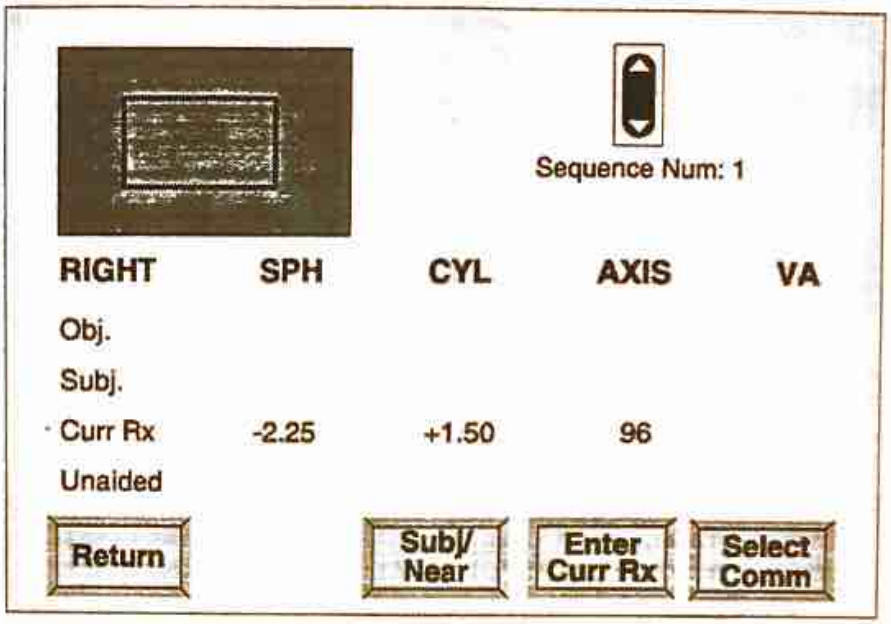
Once a measurement is complete, the HARK 599 will print a hard copy of refraction and keratometry values. In Auto Mode, this will print out at the end of the measurement automatically. In Manual Mode, the "PRINT" button needs to be pressed to generate a printout when the measurement is complete.



"PRINT" button

A QUICK WORD ABOUT THE COMMUNICOM™ SYSTEM

The Communicom ™ System transfers Rx information from the Humphrey Lens Analyzer to the HARK 599. This allows patients to compare their current prescription with the HARK 599's refractive results. To use Communicom™ press the "COMM" button prior to the refraction process. The following screen appears:



The sequence number of the last spectacles neutralized by the Humphrey Lens Analyzer will be displayed in the upper right hand portion of the screen. If desired, use the "ARROW KEY" to increase or decrease the sequence number so the Rx displayed is that of the appropriate patient.

Once you have reached the desired sequence number, press the "SELECT COMM" button again. The patient's current Rx is now included on the CRT display and may be compared with the remaining refractions (See Comparing Prescriptions p. 27).

DIALING IN PRESCRIPTIONS

If you are not using the Communicom™ System and wish to enter the patient's current Rx, simply push the "ENTER CURR Rx" button. Press the "SPHERE" button and enter the prescription by using the "ARROW KEY" to reach the desired sphere power. Repeat the same steps for Cylinder and Axis.

COMPARING PRESCRIPTIONS

After all desired refractions are completed, the patient may be given a choice between the various alternate prescriptions. If using the Communicom ™ System the objective, subjective and plano prescriptions may be compared with the current Rx. Plano prescriptions may only be compared with the current Rx if unaided Visual Acuity was taken before the objective measurement. To allow the patient to compare the prescriptions, simply move the highlight bar with the "SELECT RX" button.

"ARROW KEY"

NEAR VISION TESTING

Near vision testing can be accessed after refracting a patient. Press the "NEAR" button to activate the special Near Cross Grid target. The patient should see the grid, though it may be blurry, with the horizontal lines appearing darker. The numerical sphere value display will be 0.00 and the cylinder and axis values will be blank.

Use the upper portion of the "ARROW KEY" to increase the sphere value. Typically you will add to the sphere value until the patient reports that the vertical and horizontal lines on the cross grid are equally clear and dark.

If you wish to determine the visual acuity of the near prescription, you may do so after establishing the add power. Press the "VA Up" or "VA Down" soft key button and the Snellen Chart will be displayed. Move up or down the rows of the Snellen Chart using the "VA Up" or "VA Down" button until you have determined the near Visual Acuity. The distance mode may be reaccessed by pressing "RETURN".

LOW CONTRAST AND GLARE TESTING

Low contrast testing may be done after the refraction and can be selected by pressing the "HI/LOW GLARE" button. To access the button after subjective refinement, push "RETURN" until the option appears on the screen. Begin by pressing the "HI/LOW GLARE" button. The acuity line presented to the patient will have less contrast between background and print than the normal acuity line. Find the smallest row of low contrast letters that the patient can read. The screen will designate "LOW CONTRAST" in the upper right hand corner.

By pressing the "HI/LOW GLARE" button a second time, for glare, the HARK 599 will present a bright light. Repeat the same steps performed during low contrast testing. Press the "HI/LOW GLARE" button once more to return to the normal high contrast targets.


"ARROW KEY"

Step 2
When you have added or subtracted cylinder power based on the patient's response, ask the patient to compare the two positions of the lens again. Proceed as in step 1 above until the patient reports seeing equally well with both lens positions.

SPHERE REFINEMENT

Refining sphere power can be done by using either the "ARROW KEY" alone or by using the Duochrome target. When using the "ARROW KEY" the sphere power is altered according to the direction of the arrow in increment intervals which have been preselected in the setup options screen (.12 or .25 diopters). To refine sphere power, find the smallest line of letters that the patient can read correctly on the Snellen chart. Use the "ARROW KEY" to slowly add plus sphere power until the line is no longer recognizable to the patient. Ask the patient to tell you when the letters become too blurry to read. At this point, use the "ARROW KEY" to add minus sphere power until the lines just come into focus. This value is usually very close to the optimal sphere power. The spherical correction is proper by most standards if adding .25D or .50D plus sphere power noticeably blurs the chart, and adding minus power back in doesn't allow the reading of an even smaller line.

SPHERE REFINEMENT USING THE DUOCHROME TARGET

To refine sphere power with the Duochrome target, add plus spherical power with the upper portion of the "ARROW KEY" until the patient reports that the letters on the red side are definitely sharper than those on the green side of the chart. Slowly add minus with the lower portion of the "ARROW KEY" until both sides appear equally clear. When the letters on the green side appear blurry, too much minus sphere is present. Check to see that the final spherical finding is correct by adding back .25D of plus sphere power with the "ARROW KEY". The letters should blur slightly on the green side and sharpen slightly on the red.


"ARROW KEY"

AXIS

Press the "JCC AXIS" button to access the test. The HARK will automatically present the appropriate acuity line based on the patient's acuity with the objective refraction results.

Step 1
Using the "FLIP LENS" button, alternate lens choices by pressing the button while asking the patient: "Which lens makes the letters better focused and easier to read, lens number one, or lens number two?" Please note that as you press the "FLIP LENS" button, the screen will display the current lens choice in bold lettering above the drawing of the "ARROW KEY".

If the patient sees the target better when choice number 1 is given, use the "ARROW KEY" to move the axis degrees in an upward direction and the change will be reflected on the screen in the axis portion of the prescription. If lens number 2 is preferred, use the "ARROW KEY" in the downward direction. Note: It is a good idea to alter the axis by 10 degrees initially, decreasing the amount of degrees altered as the axis becomes refined.

Step 2
Continue the procedure in step 1 until you approach the correct axis value. At the correct axis, the patient will report seeing equally well with both positions, although it is not necessary to receive that response. It is sufficient when the patient's responses indicate a rotation of the axis back toward the final setting whenever the axis is a few degrees to either side of that setting.

CYLINDER

Once the axis has been determined, press the "JCC CYL" button. The HARK will automatically present the appropriate acuity line. To verify cylinder power:

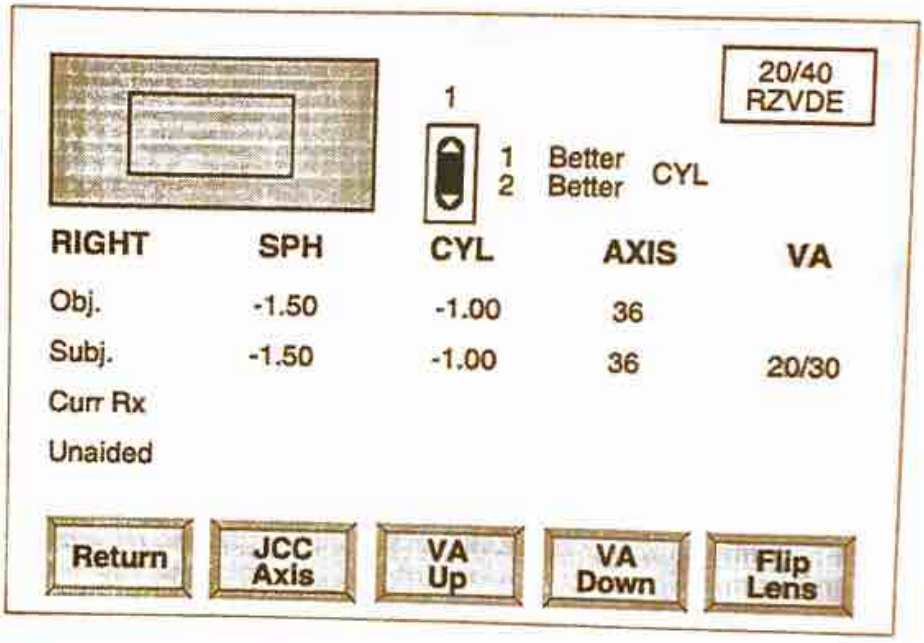
Step 1
Ask the patient to compare lines once again by pressing the "FLIP LENS" button and questioning "Which lens makes the letters better focused and easier to read, lens number one, or lens number two?". Once again, if the patient sees the target better with lens choice number "1" change the cylinder power by pressing the "ARROW KEY" once in an upward direction. If the patient sees the target better with screen lens choice number "2" change the cylinder power by pressing the "ARROW KEY" once in the downward direction.


"ARROW KEY"

CYLINDER POWER AND AXIS REFINEMENT

To refine cylinder power and axis, push the "CYL" or "AXIS" buttons. Cylinder and axis refinement may be performed in two ways. You can either use the "ARROW KEY" which will actively change cylinder and axis or you can use the Jackson Cross Cylinder test.

CYLINDER POWER AND AXIS REFINEMENT USING JACKSON CROSS CYLINDER TEST



The Jackson Cross Cylinder test (JCC) is divided into two portions, determination of the axis, and determination of cylinder power. It is best to begin the JCC test with axis and then go on to refine the cylinder power. You may return to make small adjustments in the axis if you wish at the end of the measurement.


"ARROW KEY"

The previous flowchart reflects the various buttons which need to be pressed to access the necessary subjective refinement options. The alternatives for subjective refinement are:

Refine axis. (p. 23)

Refines cylinder power. (p. 23)

Red/Green target to subjectively refine sphere. (p. 25)

Normal Contrast/Low Contrast and Glare refinement. (p. 26)

Refines axis using Jackson Cross Cylinder test. (p. 24)

Refines cylinder power using Jackson Cross Cylinder test. (p. 24–25)

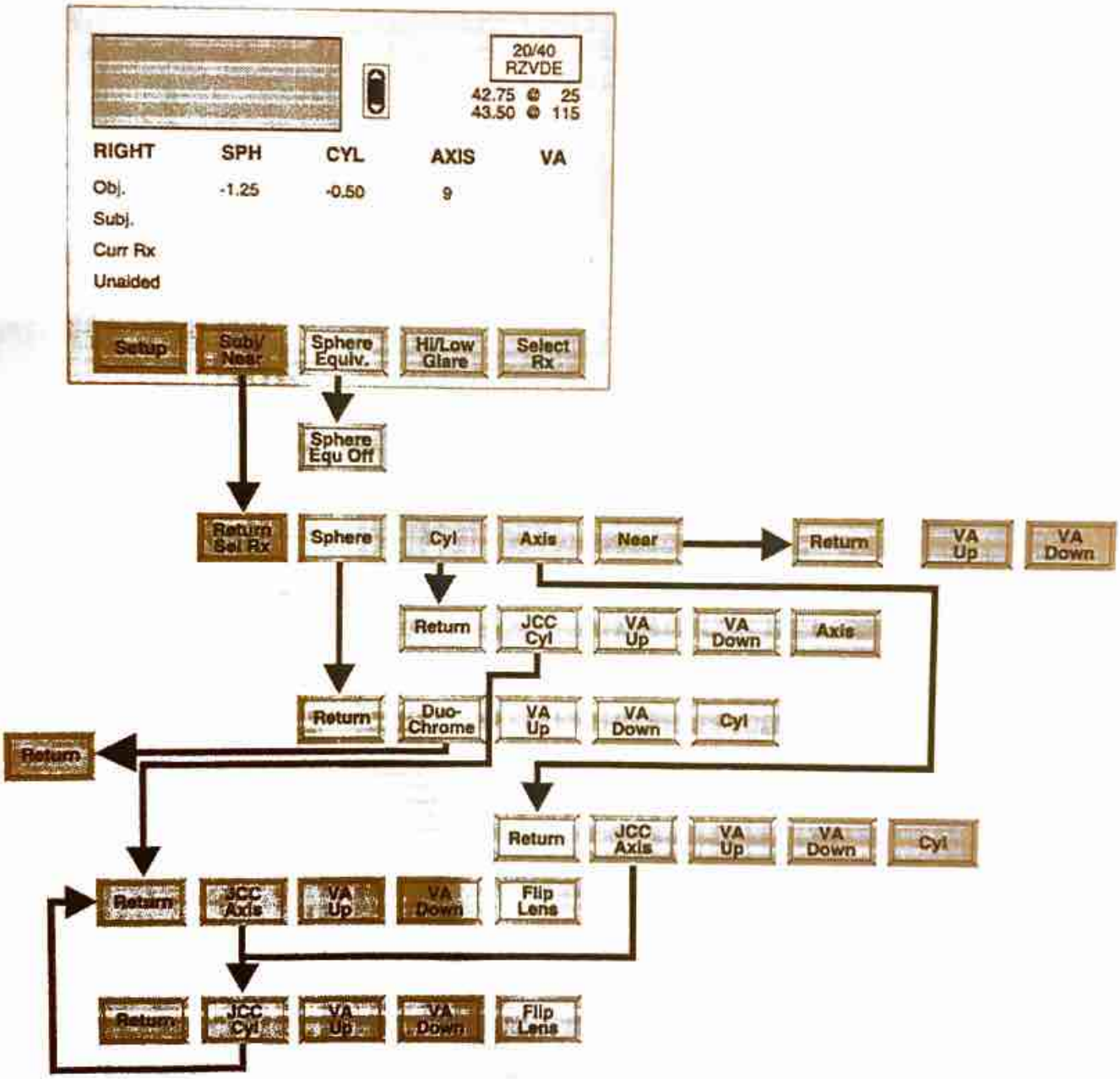
Cross Grid target to subjectively refine near vision. (p. 26)

Refines sphere. (p. 25)

Accesses subjective refinement. (p. 21)

SUBJECTIVE REFINEMENT (Manual Mode)

The Rx results from the HARK 599 may be subjectively refined after objectively refracting each eye in the Manual Mode.



REFRACTION/ KERATOMETRY

After initial acuities have been measured (if desired) make sure the instrument is aligned as described on page 14. Once alignment is complete, press the READ button located on the upper portion of the joystick to begin the refraction/keratometry process. Once the objective measurement of the right eye is complete, press the "CHANGE EYE" button and align the left eye. Press the READ button located on the joystick to begin the left eye measurement. Note: If you wish to subjectively refine your measurement, you must do so before performing an objective refraction on the corresponding eye (see Subjective Refinement p. 21).

FINAL ACUITY

The final acuity is determined in the same fashion as the initial/unaided acuity with the HARK 599 Rx in place. Use the "ARROW KEY" to move up/down the Snellen Chart. Both initial and final acuities will appear on the printout. Press "PRINT" for a hardcopy of the results.

KERATOMETRY

Keratometry may be performed with the HARK 599 using one of the following options:

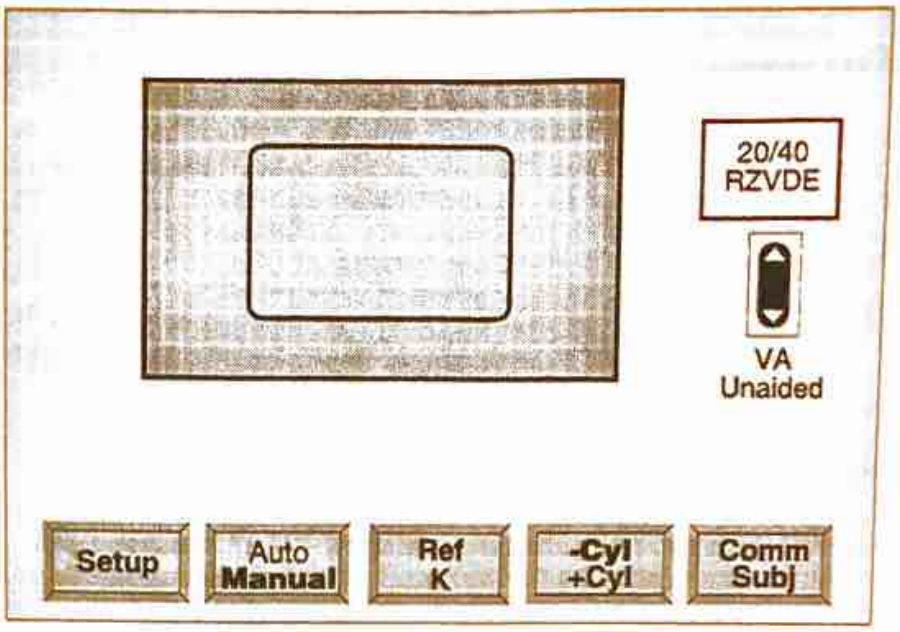
1. Keratometry measurements may be taken automatically during refraction. In this case the "REF/K" button must display both options (Refraction (REF) and Keratometry (K)) in dark letters. The Keratometry results will print on the lower portion of the printout.
2. Keratometry measurements may be taken without performing a refraction. Simply press the "REF/K" button until the Keratometry (K) option appears in dark letters. The printout will display the keratometry results.


"CHANGE EYE" button


"ARROW KEY"


"PRINT" button

OBJECTIVE REFRACTION/KERATOMETRY USING MANUAL MODE



CHECKING ACUITIES (Manual Mode)

Visual acuities can be taken when operating in the Manual Mode. Acuity measured prior to refraction is called the initial or unaided acuity. Acuity measured after refraction is called final acuity. To access Children's Acuity lines, push the "ARROW KEY" in the upward direction until Children's Targets appear.

INITIAL/UNAIDED ACUITY

To determine unaided acuity, begin in the Manual Mode. The 20/40 line of the Snellen Chart will be displayed. If the patient can easily read the 20/40 line use the "ARROW KEY" to move down the rows of the Snellen chart. If the patient cannot read the 20/40 line, use the "ARROW KEY" to move up the larger rows of letters. Unless it is obvious that the letters are too small, it is generally best to urge the patient to try to read the next smallest line. The last line displayed is recorded on the printout as the unaided acuity.

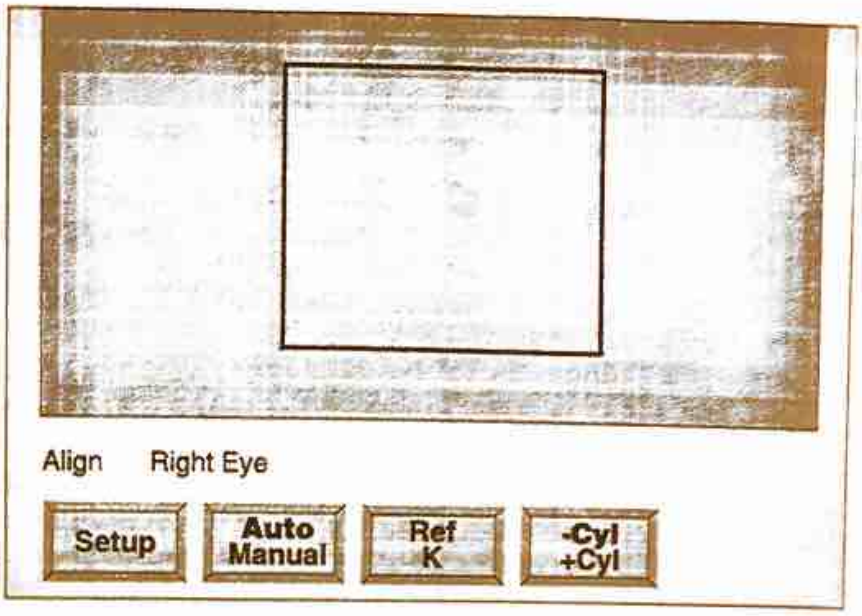
If you are using Communicom™, the HARK 599 will be set to the patient's current Rx (see p. 28). In this case, the initial acuity measured will be the patient's acuity with their current prescription as transferred over from the Lens Analyzer;* or the one which was "dialed in" by the user.

Note: Unaided Acuities can be obtained for both eyes even when Commicom is used.

* If you wish to receive more information about acquiring the Communicom™ System, please contact your Sales Representative for further information, or call Customer Service at (800) 341-6968.


"ARROW KEY"

OBJECTIVE REFRACTION/KERATOMETRY USING AUTO MODE



For objective refractions only. Select "AUTO" mode and make sure the instrument is aligned as described on page 14. The patient will be viewing the starburst target. Once alignment is complete and the READ button located on the joystick has been pressed, the HARK 599 will refract the right eye and then will automatically move to the left eye. Make sure the left pupil is within the white alignment box and press the READ button once again. The instrument will then read the left eye. As soon as the measurement is complete, the HARK 599 will print the refraction and/or keratometry results of both eyes. Multiple copies of the printout may be made by consecutive presses of the "PRINT" button.

"PRINT" button

3 USING THE HARK MODEL 599

OBJECTIVE REFRACTION

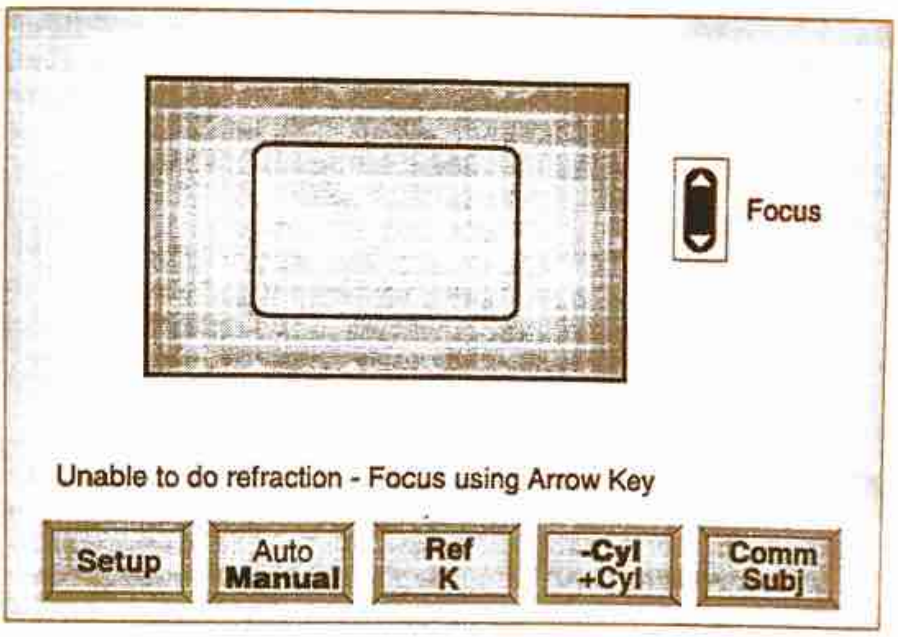
There are two modes to choose from when performing an objective refraction — 1) Auto Mode or 2) Manual Mode.

In Auto Mode, once the instrument performs an objective refraction and/or keratometry for the right eye, it automatically moves to the left eye to obtain the refraction and/or keratometry readings, and automatically prints the results for both eyes. This allows virtually hands-free operation and is the simplest way to obtain an objective refraction.

In Manual Mode, the instrument takes an objective measurement which may be altered and refined. If visual acuities, subjective refinement, near vision testing, or low contrast and glare testing are to be performed the instrument should be operated in Manual Mode. The instrument will present the 20/40 line of the Snellen chart before and after the refraction on each eye in Manual Mode. This enables acuities to be taken if the operator so desires. The operator also controls the eye to eye movement of the instrument by pushing the "CHANGE EYE" button.

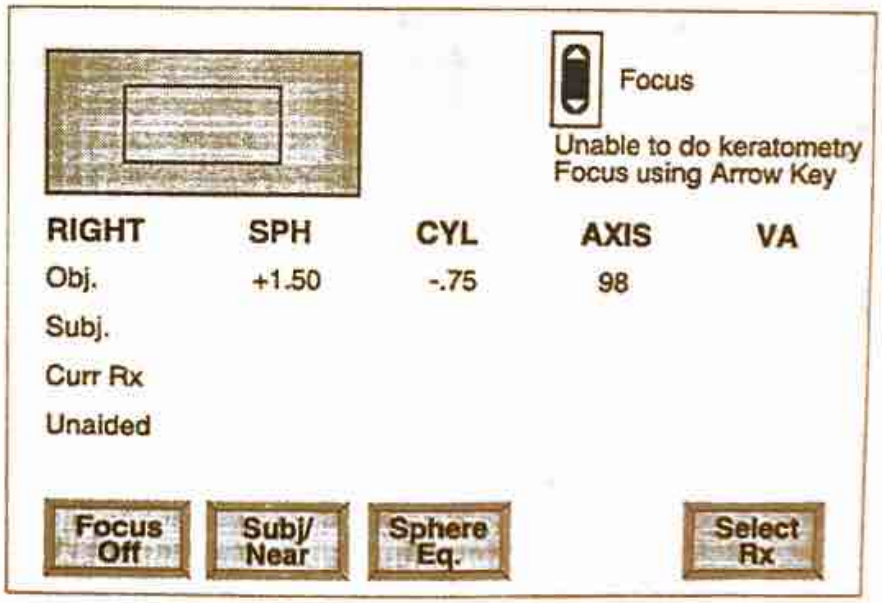
The HARK 599 automatically calculates pupillary distance in Auto or Manual Mode. The patient's P.D. will appear on the bottom of the printed results for each set of eyes. Tear off the printout by pulling it up and to the right against the serrated lip of the printer.

"CHANGE EYE" button



INTERRUPTING KERATOMETRY (Models 597K and 599 only)

If Keratometry readings are not desired, press the "FOCUS OFF" button to continue with the refractive refinement.



USING THE HARK

The HARK can refract and perform keratometry on most patients and can be operated under most lighting conditions. Subdued, ambient lighting is recommended for difficult patients because it increases comfort and facilitates maximum pupil size. For patients with very small pupils, the process may be slightly more time consuming. In such cases, it is a good idea to ask the patient to keep very still during the measurement cycle. The use of mydriatics may make refraction and keratometry possible with patients who cannot be measured because of extremely small pupils or cloudy media. Cyloplegia is not deemed necessary.

INTERRUPTING A REFRACTION

The HARK has an option that will allow you to interrupt the refraction process without completing the reading. Simply press the button under "CANCEL" to stop the refraction procedure. This option will only interrupt the eye that is being refracted, allowing the operator to re-refract that eye.

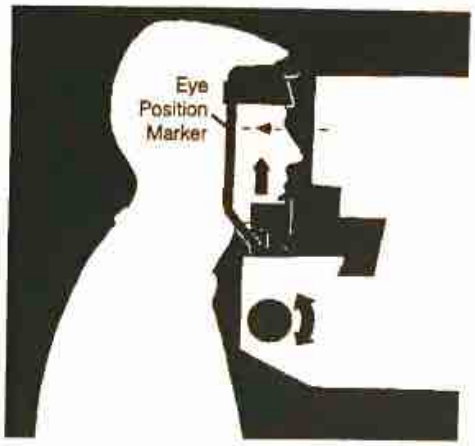
MANUAL FOCUS (Refraction and Keratometry)

If the HARK has difficulty in obtaining a refraction or keratometry reading, it will automatically go into the manual focus mode. This occurs when either the distance between cornea and optics head is not far enough, or it may be due to an irregularly shaped cornea.

If this occurs, a message "Unable to do refraction—Focus using Arrow Key" or "Unable to do keratometry—Focus using Arrow Key" will appear (see page 16). Use the "ARROW KEY" to manually focus the eye by pressing the up or down arrows until the eight data points become clear. Press the read button to obtain either the refraction or keratometry.

PATIENT POSITIONING

The patient should be seated comfortably on the patient side of the unit. Raise or lower the power table to bring the chin rest level with the patient's chin and adjust the chin rest with the adjustment knob. The patient's canthus should be at the same level as the marker on the side of the forehead rest assembly while the patient's forehead rests comfortably against the headpiece. Adjust as necessary by turning the chin rest knob.



ALIGNING THE PATIENT

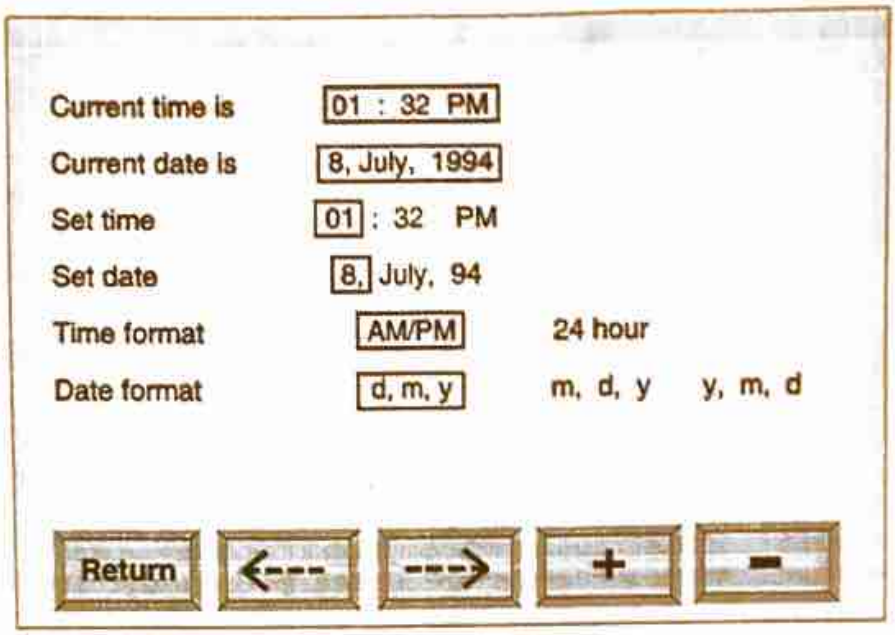
The instrument will initially position itself on the right eye when the instrument is first turned on. If you wish to measure the left eye push the "CHANGE EYE" button.

Ask the patient to hold still and look at the target. The instrument tracking function will begin automatically. Using the joystick, roughly align the instrument so the patient's pupil is located anywhere within the white box on the CRT screen. Once the pupil is inside the white box, release the joystick. The automatic alignment feature will take over and complete the alignment process.

On occasion, when the patient is not correctly aligned with the unit, an alignment error may occur. Raise or lower the chin cup, move the patient's head to left or right as necessary and continue with the refraction. These instructions will also appear on the screen.


"CHANGE EYE" button

SETUP OPTIONS
TIME/DATE



This screen is accessed through the printer set up screen. Use the "ARROW KEY" to move vertically from one category to the next. Use the buttons below the "←" and "→" to move horizontally to choose the desired setting within each category.

Set Time — Alter time by pressing the "+" or "–" buttons after reaching component to be changed.

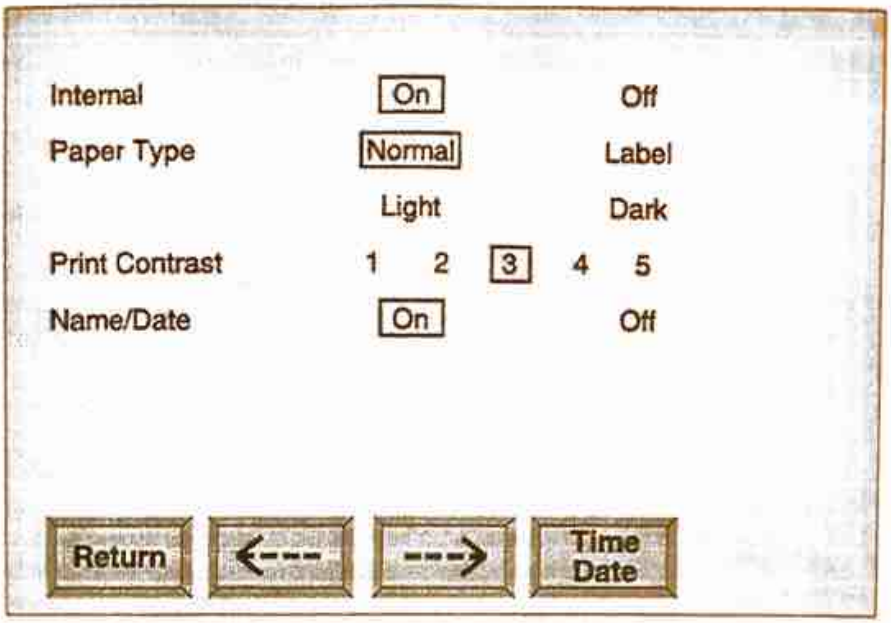
Set Date — Alter date by pressing the "+" or "–" buttons after reaching component to be changed.

Time Format — Choose from either AM/PM or military time.

Date Format — Choose format in which you like the date displayed; d=day, m=month, y=year.

"ARROW KEY"

SETUP OPTIONS
PRINTER SET UP



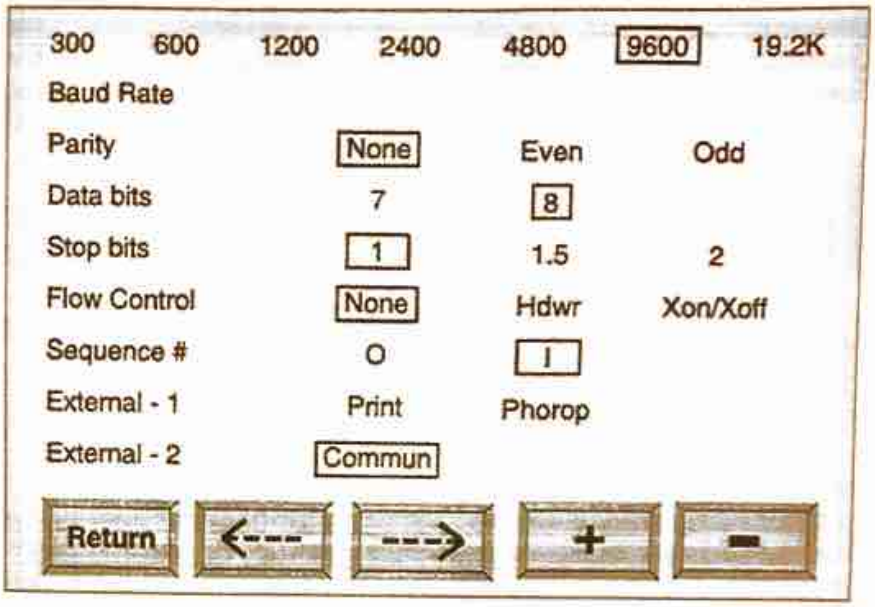
Internal — You may turn the internal printer on or off

Paper Type — Choose from normal paper or adhesive paper.

Print Contrast — Ranges from 1 to 5

Name/Date — You may select to turn off the name and date space on the printout.

SETUP OPTIONS
RS232



All of the Humphrey Automatic Refractor Keratometers can transfer data to an external device (printer, computer, etc.) via the RS232 serial port. The serial parameters (baud rate, parity, data bits, stop bits, flow control) should match those of the external device.

Sequence # Appears as a reference number on the printout.

Turns on the spherical equivalent.

Accesses subjective refinement or near vision testing.

Access allows modification of time and date (Printer Setup Menu).

Moves visual acuity line down to larger row of letters to check acuities during subjective refinement.

Moves visual acuity line up to smaller row of letters to check acuities during subjective refinement.

7 SPECIFICATIONS

INSTRUMENT SPECIFICATIONS

HUMPHREY AUTOMATIC REFRACTOR KERATOMETER MODEL 599

Physical

Dimensions:	Height	Width	Depth
	457mm	305mm	406mm
	18"	12"	16"
Weight:	22.6 Kg		
	49.8 lbs.		

Operating Conditions: +10º C to 40º C
20% to 85% Relative humidity
700 hPa to 1060 hPa Atmospheric Pressure

Electrical

Line voltage:	100 – 120 V/230V
Frequency:	50–60 Hz Single phase
Current:	100 – 120V 2A, 230V 1A
Fuse Rating:	T 3.15 Slow Blow, 250V, 5 x 20 mm
Current Leakage:	Less than 100uA at 120V
	Less than 500 uA at 240 V

Performance

Values for Sphere, Cylinder, Axis and Acuity Lines are based on a Vertex Distance of 0.0

Sphere:	–17D to +20D	
Increments:		.12D, .25D
Cylinder	–7D to +7D	
Increments:		.12D, .25D
Axis:	0º – 180º	
Increments:		1º
Acuity Lines	20/10 – 20/400	
Vertex Distance	0.0, 10.5, 12.0, 13.5, 15.0, 16.5 mm	
Keratometry Range:		30.00D to 60.00D or
		5.60mm to 11.20mm
Increments:		.12D or .01mm
Keratometry Axis:		0º–180º
Increments:		1º

For cylinder refinement.

Red/Green target for subjective sphere refinement.

Exit from Service Password screen.

Allows you to manually dial in prescription.

Used with JCC test.

Press if you do not wish Keratometry.

Allows you to access low contrast and glare targets.

Jackson Cross Cylinder test — Axis refinement.

Jackson Cross Cylinder test — Cylinder refinement.

Expresses Keratometry results in millimeters or diopters (Screen Setup Menu).

Allows you to access Cross Grid targets for Near Vision testing.

Accesses Joystick Control from Setup Options Screen (Screen Setup Menu).

Printer Setup, Date and Time setup.

Performs Refraction, Keratometry or both.

Goes back to the previous screen.

Goes back to Rx selection screen.

RS-232 setup (System Setup Menu).

Service Entry—To exit press "ENTER" button (System Setup Menu).

Screen Setup Menu (System Setup Menu).

Accesses Communicom options.

Allows patient to view Objective, Subjective, Current and Plano Rx.

Options screen (System Setup Menu).

Subjectively refines sphere.

Turns off the spherical equivalent.

Charts

Cross Grid Target
Snellen Optotypes (20/400–20/10)
Red-Green (Duochrome)
Near Vision
Low Contrast
Children's Targets

Printout Information

Date/Time
Objective Refraction
Subjective Refraction
Near Vision
Visual Acuities
Low Contrast Acuities
Current Rx
Keratometric Measurements
Vertex Distance
Inter-pupillary Distance
Glare Acuities

Operator Interface Output

Video Display: 5" CRT
Resolution: 640 x 480 pixels
256 level grayscale
Paper size: 58 mm thermal paper
Audible prompts and indicators

Operator Interface Input

Function Soft Key Buttons

Interfaces

Two RS 232 serial communication ports
Selectable baud rate: 300 to 19.2K
Composite monochrome video output

Accessory Kit

Power Cord (P/N 14449 for 110 V/120V) or (P/N 22581 for 220V/240V)
HAR Manual (P/N 35265-11)
Dust Cover (P/N 35264)
Test Eye (P/N 35261)
Packing List (P/N 35267)
Thermal Printer Paper (Box of 5 rolls) (P/N 32751)
Fuses (2) 3 AMP metric (P/N 18605)
Adhesive Paper (Box of 2 rolls) (P/N 28817)
Reorder card (P/N 35263)
Lens Cleaning Kit (P/N 07671)
Texpad Alcohol Wipes (P/N 06566)
Customer Response Card (P/N 12978)

8 WARRANTY AND SERVICE CONTRACT

WARRANTY

For one year from the date of delivery to the original purchaser, Seller warrants its HARK (the "instrument") to be free from defects in material and workmanship. In the event of failure, Seller's obligation is limited to repairing or replacing on an exchange basis parts which have been promptly reported by the Purchaser during warranty period as being defective and are so found by seller upon inspection. The procedure for warranty claims shall be as follows: When the Purchaser believes the instrument defective, the Purchaser shall promptly report the defect to the Seller. The Seller shall provide "in the customer's office" service to repair the Purchaser's instrument.

At the Seller's discretion, the repair of the HARK may be made in the Seller's repair Depot. In this case, all shipping costs will be paid by the Seller unless the Purchaser's HARK is found upon inspection not to be eligible for repair under this warranty, in which case the Purchaser shall be responsible for one-half the shipping costs. If the instrument is determined to be ineligible for repair under the warranty, Seller will so notify Purchaser, and repairs desired by Purchaser will be performed at Seller's normal rates. All replaced parts become the property of the Seller. The warranty covers all parts, labor, travel and expenses for the warranty period.

This warranty does not cover consumable items such as operating supplies, paper, ribbons, bulbs, and manuals and will not apply if repair or parts replacement is required because of accident, neglect, misuse, transportation or causes other than ordinary use, or supplies that do not meet the proper operating specifications of the Seller. This warranty does not apply to any articles that have been repaired or altered except by the Seller.

Every reasonable effort has been made to ensure that the product manuals and promotional materials accurately describe the instrument's specifications and capabilities at the time of publication. However, because of ongoing improvements and product updates, the Seller cannot guarantee the accuracy of printed materials after the date of publication and disclaims liability for changes, errors and ommissions. Seller shall in no event be liable to Purchaser for loss of profits, loss of use or consequential damages. Purchaser agrees that Seller will not be liable for any damages caused by the Purchaser's failure to fulfill the Purchaser's responsibilities as to proper installation, use, management and supervision of the instrument. This warranty shall apply only to the original Purchaser and shall not, in any way, be transferable or assignable.

THE FOREGOING WARRANTY IS IN LIEU OF ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. (ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.)

Technical documents are available upon request.

SERVICE CONTRACT

A Warranty Extension Agreement (Service Contract) is available after the one-year warranty period expires, and may be purchased at any time. This Warranty Extension is for one year and is subject to the Terms and Conditions applicable to the specific instrument. Please contact Customer Service for details (800) 341-6968.

9 NOTES AND UPDATE INFORMATION