

Nikon Retinomax 2 Autorefractor



Usage Instructions.

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1.0 Introduction

When you measure the “Refractive Error” of the human eye, you establish how much this eye deviates from a perfect eye. With this measurement you can then select a pair of glasses for the patient which will correct this “refractive error”.

Two primary tests are used to measure refractive error: 1) Objective, and 2) Subjective tests. An “objective” test is one in which the patient need not provide any verbal feedback while the “subjective” test requires constant interaction with the patient. When most people go to the optometrist in the U.S. they will go through a “subjective” eye test. The doctor will put lens in front of your eyes and say “which is better... 1 or 2?”. Some doctors might do an “objective” test first to get a starting point for the “subjective” test. The “subjective” test always takes the most time. Few doctors will ever accept the results of an “objective” test alone.

An autorefractor provides an “objective” test only. However, the Nikon autorefractor has proven to have such accuracy that this test alone provides excellent results when used in an optical clinic setting. It is especially valuable since it does not require that the refractionist (the person using the autorefractor) speak the language of the person he/she is testing.

The purpose of this document is to provide setup and usage instruction for the Nikon Retinomax K-plus 2 autorefractor purchased by several Baptist Medical Dental Mission International (BMDMI) teams. The unit is capable of measuring more about the eye than just refractive error but those additional features will not typically be used by BMDMI teams. For that reason, this manual will only focus on the ability of the unit to measure refractive error.

This manual will also discuss the proper handling and care of the Nikon autorefractor so that not only will the optical team using the instrument use it well; but also, it will be available for the use of all participating BMDMI teams.

This manual is designed for quick and easy understanding and as a readily available reference manual. For more details on this instrument refer to the “Nikon Retinomax K-Plus Instructions” manual.

2.0 Proper care and maintenance of the autorefractor.

2.1 Equipment Complement.

The Nikon retinomax and associated equipment is packaged in the large foam padded carrying case pictured below.



Inside that carrying case are two items: 1) the Nikon Retinomax carrying case shown below:



and the specially assembled battery charging assembly shown below.



Details about all of these items will be provided in the following sections.

All this equipment must be kept secure against physical damage and theft.

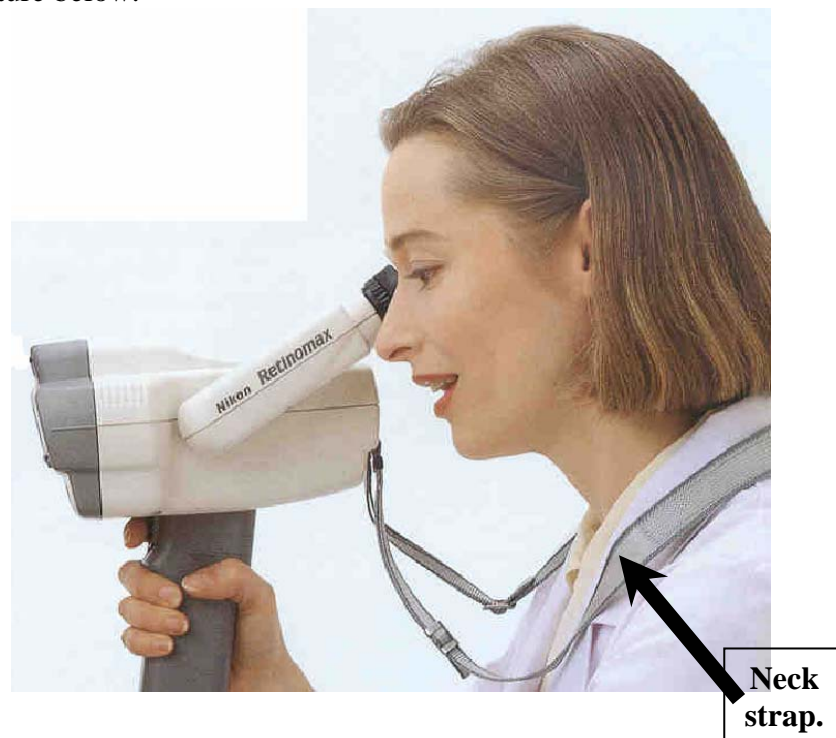
2.2 Physical protection of the equipment

If the equipment is properly packed in the carrying cases, it should not be damaged. Be sure to repack all equipment in the cases before transporting it to the site.

The Nikon Retinomax has a neck strap which must be worn at all times upon removal from the carrying case. Dropping the unit can cost from \$400 to \$1,500 to repair so:

VERY IMPORTANT!
**Do not pick up the unit without first bending over
and putting the neck strap around your neck.
At that point you may pick up the unit.**

See the example in the picture below.



2.3 Prevention of equipment theft.

BMDMI teams who use the autorefractor will likely also have a laptop which they must secure. Below are guidelines for securing both items. Please follow these guidelines carefully.

1. Be sure your clinic has a locked door which you can secure further if necessary. Carry with you several bicycle lock cables which you can wrap around the door in some way to provide additional security.
2. Members of your team should sleep in the clinic if it contains the autorefractor and laptop. **The equipment should never be left in a room which is unoccupied overnight.**
3. Lock the smaller Nikon carrying case when you place it inside the outside carrying case which you also should lock.
4. Use bicycle lock cables to secure the equipment case to some secure part of the building (water pipe, structural beam, etc).
5. Attach a "Kensington lock" cable to the laptop and then place the laptop inside it's carrying case. Attach the cable to some permanent part of the building structure. You can purchase a "Kensington lock" cable at www.cdw.com part number 317140 called "Kensington Slim Microsaver Notebook Security Cable" for about \$40.
6. When you are using the laptop and it is sitting out on a table, continue to keep the Kensington lock cable attached. If the cable is not long enough, extend it with a bicycle lock cable.
7. Carry with you about 4-6 bicycle lock cables to use in various security applications.

NOTICE

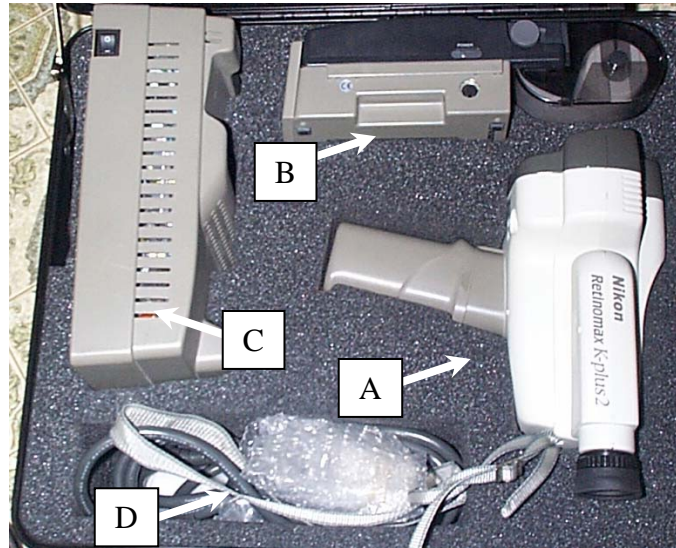
Please protect this equipment from damage and theft.

3.0 Putting together your setup.

There are several steps required to set up your test setup. First you must set up the autorefractor, next connect it to the computer, set up your computer and finally you need to test the computer, autorefractor and your skills with the Model Eye.

3.1 Setting up the autorefractor.

Below is a picture of the components inside the Nikon case. Item A is the autorefractor with the neck strap. Item B is the printer. Item C is the holding stand and recharger base and item D is the power cord, a spare roll of printer paper, and the model eye (see Appendix D). Numerous spare rolls of printer paper are included in the case.



You assemble the equipment as follows. First place item C and B side by side on the table as shown below. Next lift the right edge of the printer to hook over the contacts showing at the arrow.



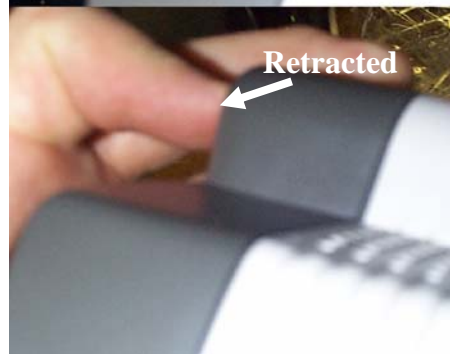
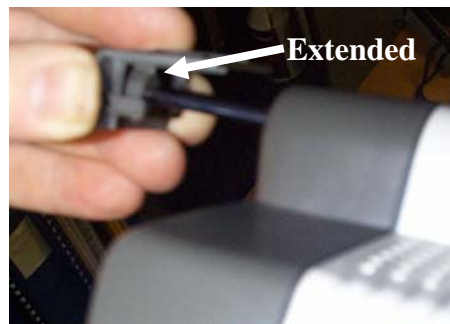
At this point your system will look like the figure below. Connect your power cord to the back of this unit.



Bend down and **put the neck strap around your neck** and pick up the unit. Open up the handle and place the Duracell battery as shown in the left picture below. Within the handle is also a picture of a very small battery correctly aligned. Place the cover over the battery and you will see the right picture below.



Place the autorefractor on the stand and you will see the picture on the left below. Be sure the forehead rest is pressed in as shown in the right side pictures.



When you place the autorefractor in the base, be sure that the 3 contacts in the base (shown on the left below) line up with the 3 contacts on the front of the instrument (shown on the right below).



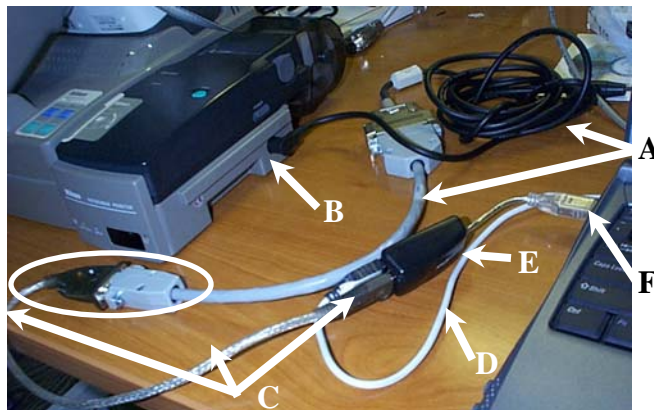
See Appendix A to verify your autorefractor setup. It could differ from what you desire per the settings of the last team.

3.2 Connecting the autorefractor to your computer.

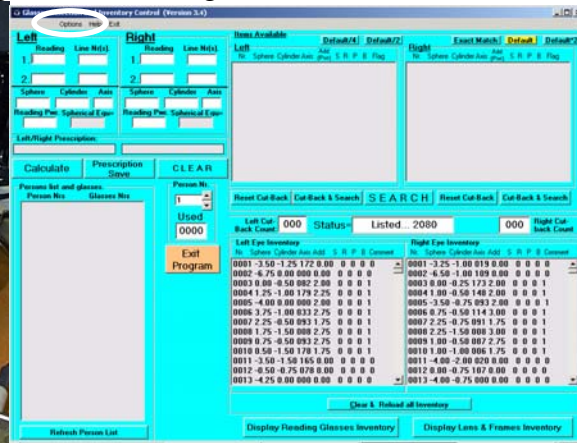
Included in the autorefractor case is a printer to computer connection cable as shown at point A in the below picture. The grey and the black section of the cable is included in the autorefractor shipping case. The grey cable converts to a 9-pin connector found on the backs of most laptops. This cable allows the patient prescription which have been printed to additionally be sent to the computer. The Eyeglasses Inventory Program (Version 3.4 or above) will then automatically search for the number of the glasses which match this prescription. Details about this program will be provided separately.

One end of the cable is connected to the printer (point B) while the other end of the cable is typically connected to the back of a laptop at a serial port connection (see circled connector). Note the angle the connector at point B is plugged into the printer.

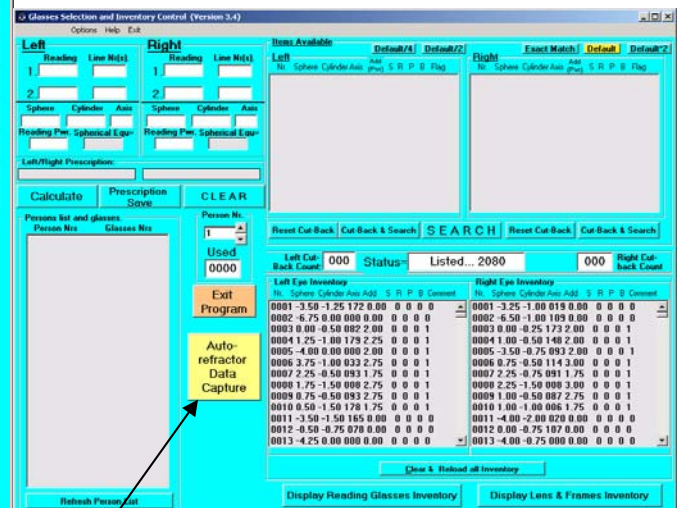
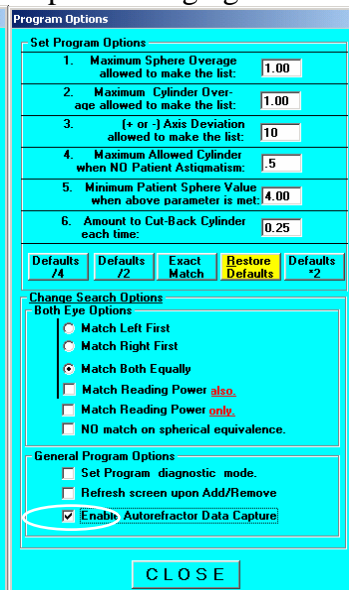
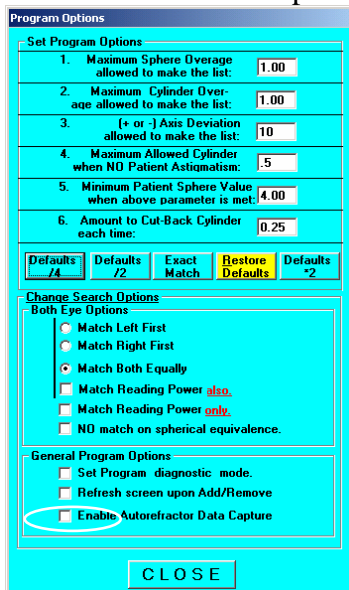
The laptop pictured does not have a serial port connection, so a “Serial-to-USB” converter cable (point C) is used. The white cable (point D) is a connection to a USB mouse for the laptop. The “Serial-to-USB” converter cable and the mouse cable are together connected to a miniature 2 port USB hub (point E) and the miniature hub is connected to the computer at point F. Items C, D, E and F are not included in the kit as they are just required for this particular laptop.



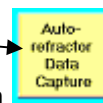
The printer is then powered up by pressing the power button in the direction of the arrow as shown below. See Appendix C for information on putting paper in the printer. Launch the Eyeglasses Inventory program and you will see the window showing below to the right.



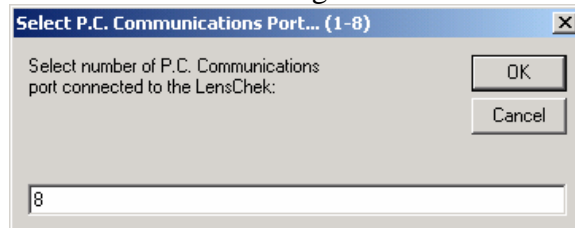
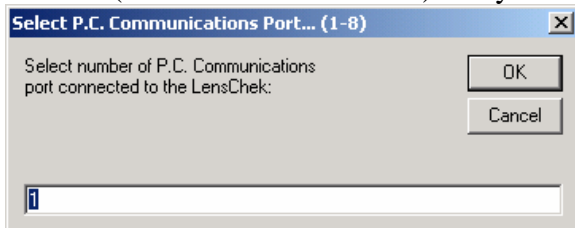
Click the "Options" dropdown circled above and you will see the below window. Click the "Enable Autorefractor Data Capture" option changing it to be as the window on the right.



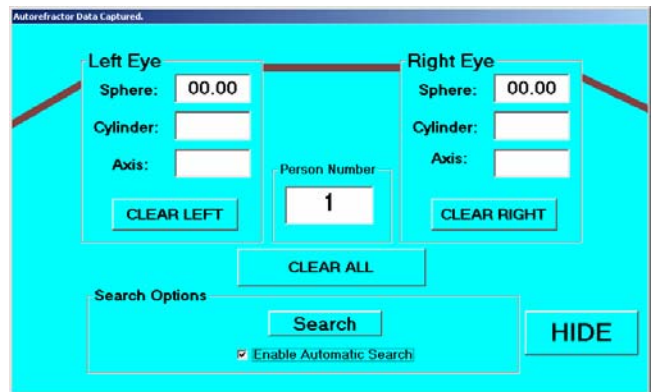
Button appears



Click CLOSE and you will see the third window above. Click the yellow button and you will see the window on the left below. Change the number to be the number of the COM port to which you are connected (in the below case it is 8) and you will see the window to the right.



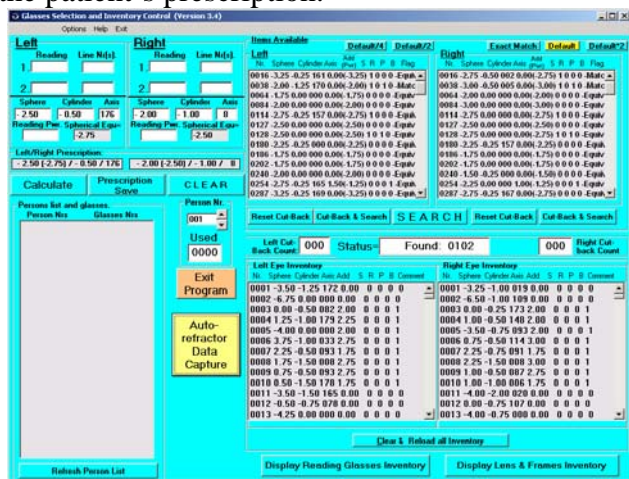
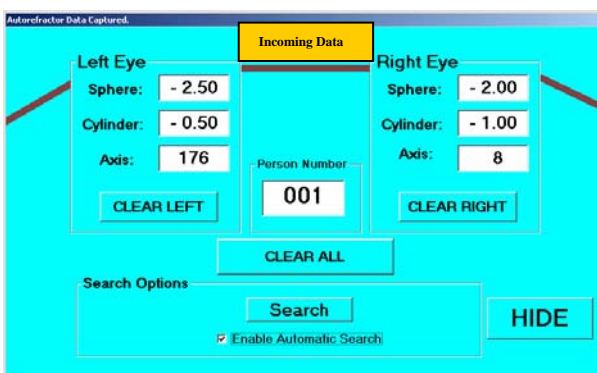
Click OK and you will see the below window on the left. If you want the computer to automatically search the inventory every time you measure a person's eyes, then click "Enable Automatic Search" as shown on the window to the right.



Now you are ready to measure a person's eyes. Details on doing this measurement will be provided in the next section. Let us assume for the time being that you already know how to use the instrument. Measure the person's eyes and then point the instrument toward the printer as shown below in the picture to the left. Press the print button and the printer will print the prescription as shown in the picture to the right.



At the same instant the computer will receive the prescription and you will see "Incoming Data..." appear for a second on the screen. You will then see the window on the left for 3 seconds and then the window on the right will appear. The left window shows the patient's prescription.



The computer has automatically placed the prescription in the left side of the main window and provided a list of 102 possible matches in the right window below. For more exact matches click on **Exact Match**, **Default/2** or **Default/4** and click search again.

The screenshot shows the software interface with the following data:

Left		Right	
Reading	Line N(s)	Reading	Line N(s)
1. -2.50	176	1. -2.00	8
2. -0.50		2. -1.00	

Left/Right Prescription: -2.50 [-2.75] / -0.50 / 176 -2.00 [-2.50] / -1.00 / 8

Found: 0102

Below on the left is the response when Default/4 is chosen. On the right is the response when “Spherical Equivalence” is removed (See “Option” window) and only close matches are allowed.

The left screenshot shows search results for Default/4:

Left		Right	
Nr.	Sphere Cylinder Axis	Nr.	Sphere Cylinder Axis
0114	-2.75 -0.25 157 0.00(-2.75) 1 0 0 0 -Equiv	0114	-2.75 0.00 000 0.00(-2.75) 1 0 0 0 -Equiv
0127	-2.50 0.00 000 0.00(-2.50) 0 0 0 0 -Equiv	0127	-2.50 0.00 000 0.00(-2.50) 0 0 0 0 -Equiv
0128	-2.50 0.00 000 0.00(-2.50) 1 0 1 0 -Equiv	0128	-2.75 0.00 000 0.00(-2.75) 1 0 1 0 -Equiv
0254	-2.75 -0.25 165 1.50(-1.25) 0 0 0 1 -Equiv	0254	-2.25 0.00 000 1.00(-1.25) 0 0 0 1 -Equiv

Found: 0024

The right screenshot shows search results for Exact Match:

Left		Right	
Nr.	Sphere Cylinder Axis	Nr.	Sphere Cylinder Axis
0038	-2.00 -1.25 170 0.00(-2.00) 1 0 1 0 -Match	0038	-3.00 -0.50 005 0.00(-3.00) 1 0 1 0 -Match
0344	-2.25 -1.00 175 0.00(-2.25) 0 0 0 0 -Match	0344	-2.50 0.00 000 0.00(-2.50) 0 0 0 0 -Match
0543	-2.00 0.50 174 0.75(-1.25) 0 0 0 1 -Match	0543	-2.00 -0.25 005 0.50(-1.50) 0 0 0 1 -Match
0556	-3.25 -0.75 173 0.00(-3.25) 0 0 0 0 -Match	0556	-3.00 -0.75 013 0.00(-3.00) 0 0 0 0 -Match

Found: 0009

At this point you look for one of the above pairs of glasses in your inventory and try them on the patient. Typically I ask to retrieve several pairs of glasses. In the above example you might retrieve pairs 38, 344, 543 and 566. The patient then has a choice as to color and size. Further details on the “Eyeglasses Inventory Program” are available by clicking HELP on the program or inserting the installation CD where a help screen will automatically appear.

3.3 Testing your setup with the Model Eye.

Before you begin testing patients, be sure that you verify that the autorefractor is working correctly and also that you know how to use the unit. You can do both by testing the Model Eye as described in Appendix D.

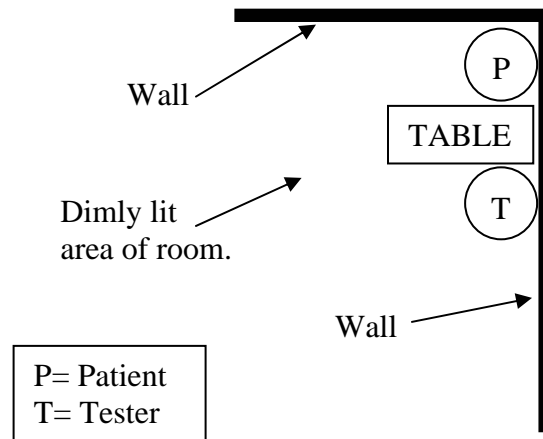
4.0 Eye Measurement Procedures

Training to use the autorefractor is best done using hands on demonstrations and video training. Since demonstration is not possible, this section will be combined with some video training which will be provided on a training CD or VCR tape. All teams can; however, expect that one or more of the missionaries will be trained in the use of the Nikon autorefractor.

After completing the setup procedures described in the previous section, you are ready to measure the eyes of your first patient. Setup your area for testing making sure of the following:

- 1) Your test area is a dimly lighted area of the room.
- 2) The patient and the tester sit in chairs opposite each other with a small table between them.
- 3) Position both patient and tester near a wall with the patient in a corner.

Here is a drawing of the area. Both the patient and the tester will be steadied by the wall. The patient will additionally be steadied by the corner. The area of the room should be dimly lit with no direct light or sunlight.



To do the test you must:

PUT THE NECK STRAP AROUND YOUR NECK

Now power on the unit and have the patient sit opposite you as shown below. Notice in this picture the patient is stabilizing her head against the wall. The tester is stabilizing the unit on her forehead by bridging between the autorefractor and her head with his hand. It would probably be a good idea for both of you to be sitting opposite a small table where you could stabilize your elbow. Two very important keys to the best readings are 1) for the instrument and patient to be stable and 2) for the patient to do little or no blinking during the test.



The patient will see a color picture of a field where there is a Christmas tree in the very center of the field. The tree looks far away and is initially blurred. When the instrument homes in on the eye, the tree becomes much clearer to the patient. When the instrument makes a reading, you will hear a small beep. After 8 good readings you will then move to the next eye.

Follow these detailed steps:

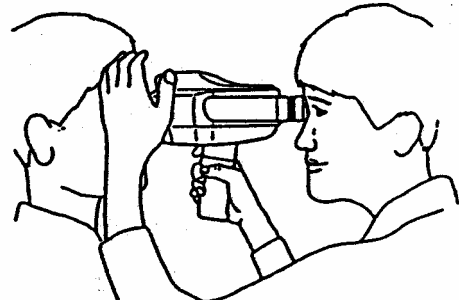
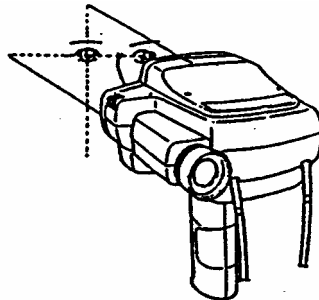
1. **PUT NECK STRAP AROUND YOUR NECK**
2. Pick up and apply power to the unit by pressing the POWER button.
3. Point to the center of the unit and refer to Appendix E for a Spanish language explanation which will help for the patient to read. Tell them they will see the following image of a Christmas tree on a field.



4. Let them know that you will place the forehead rest on their forehead and stabilize the unit to their head with your hand. Below is where they will see the Christmas tree.

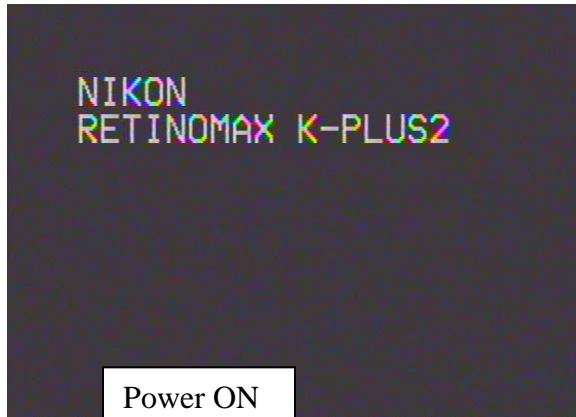


5. Make sure the instrument is set for the Right eye (R light is lit) and then align the eye with their right eye using the horizontal and vertical alignment marks as shown in the figures both below and above. Stabilize the instrument against the patient's head with your hand as shown below.

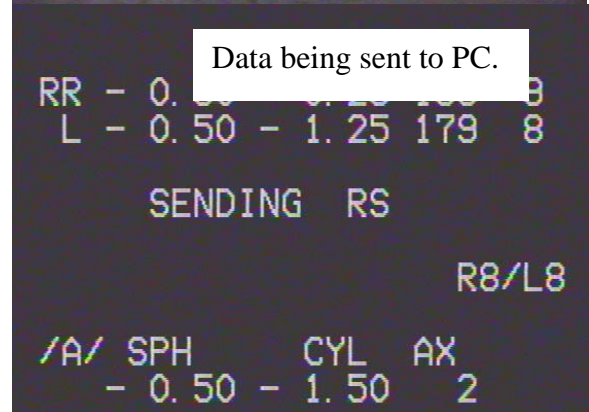
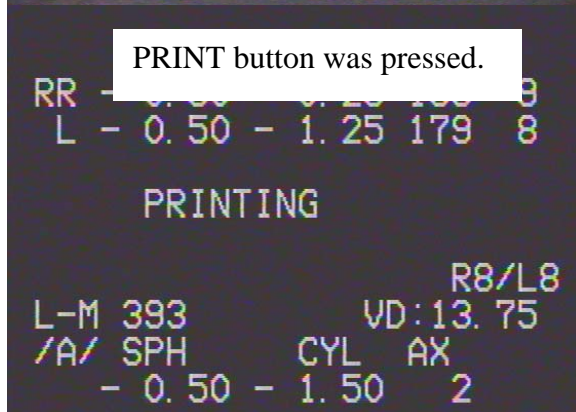
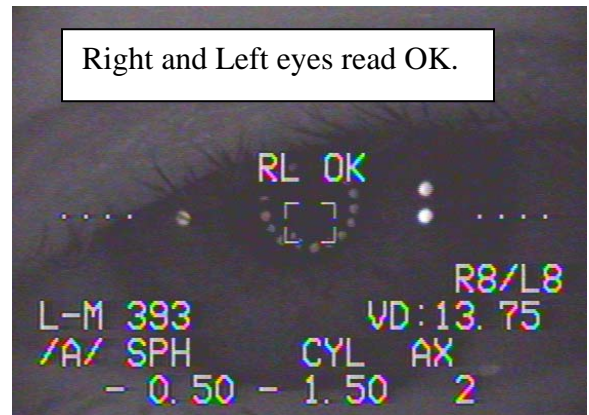
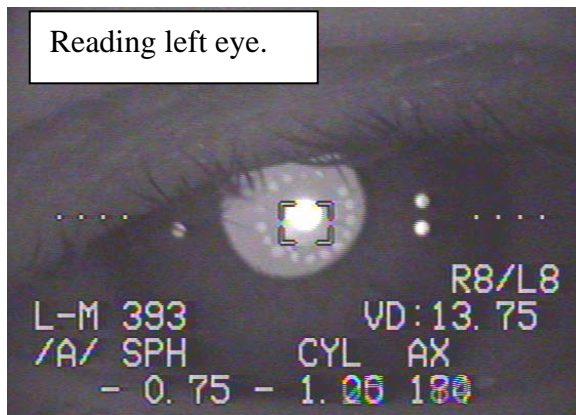
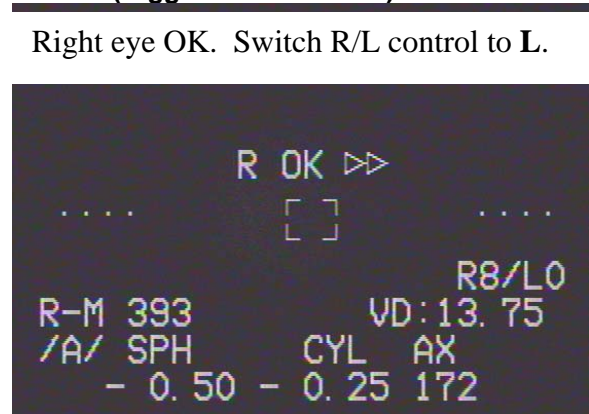
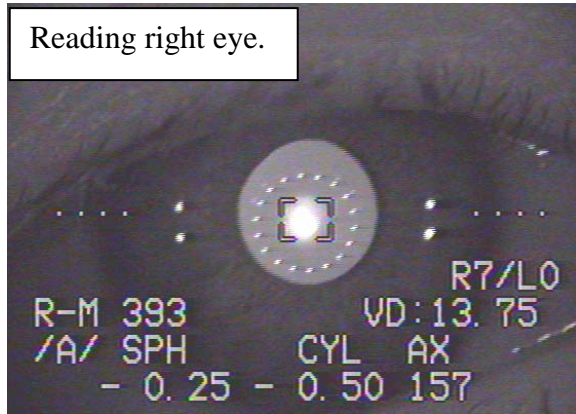


6. At this point you should see the patient's eyes as shown in the following sequence of pictures.

Patient Example number 1.



Press the START button (trigger on the handle).



Below is a copy of the printout for the above patient. See Appendix A.5 for ways to either shorten or eliminate this printout (save paper and battery).

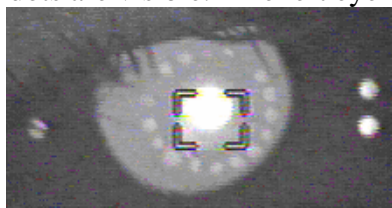
12.24 ' 2 4:41PM			
Name:			
No. 393		VD: 13.75	
-REF-			
[R]	SPH	CYL	AX
	- 0.50	- 0.25	165
	- 0.50	- 0.25	162
	- 0.50	- 0.25	162
	- 0.50	- 0.25	168
	- 0.50	- 0.50	167
	- 0.50	- 0.50	169
	- 0.25	- 0.75	172
	- 0.50	- 0.25	172
	* - 0.50	- 0.25	168
[L]	SPH	CYL	AX
	- 1.00	- 1.00	2
	- 0.75	- 1.25	179
	- 0.50	- 1.25	179
	- 0.50	- 1.75	178
	- 0.50	- 1.25	174
	- 0.75	- 1.00	180
	- 0.50	- 1.25	177
	- 0.50	- 1.50	2
	* - 0.50	- 1.25	179
Retinomax K-plus			

Annotations on the printout:

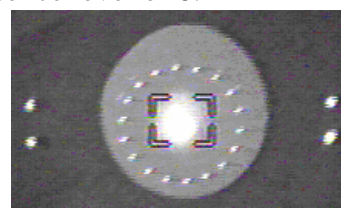
- Patient number: No. 393
- Right eye: [R] section
- Left eye: [L] section
- Average reading sent to the computer: * - 0.50 - 0.25 168 (Right eye) and * - 0.50 - 1.25 179 (Left eye)
- Confidence levels: 9 (Right eye) and 8 (Left eye)
- 8 readings: Indicated by arrows pointing to the 8 individual readings for each eye.

Each eye is read 8 times and an average reading is created. It is this average reading which is sent to the computer. On the printout you will see a confidence level from 1-10. Any reading less than 8 should be redone. Most readings should be 9 or 10 and you should always strive for a confidence level of 10. Reading with a confidence level of 10 occur when the patient is steady (no shaking) and there is little or **no** blinking of the eye. (See model eye test in Appendix D for perfect example.)

Look below at the picture of the left eye and then the right eye being read. Notice how the right eye (which the autorefractor read with a confidence level of 9) shows up clearly with the 4 white alignment dots visible. The circle of dots (called the mire ring) is almost exactly in the center of the pupil. The left eye is in the middle of a blink, the mire ring is not nearly centered and is a bit blurred and only 3 of the 4 alignment dots are visible. The left eye had a confidence level of 8.



LEFT EYE



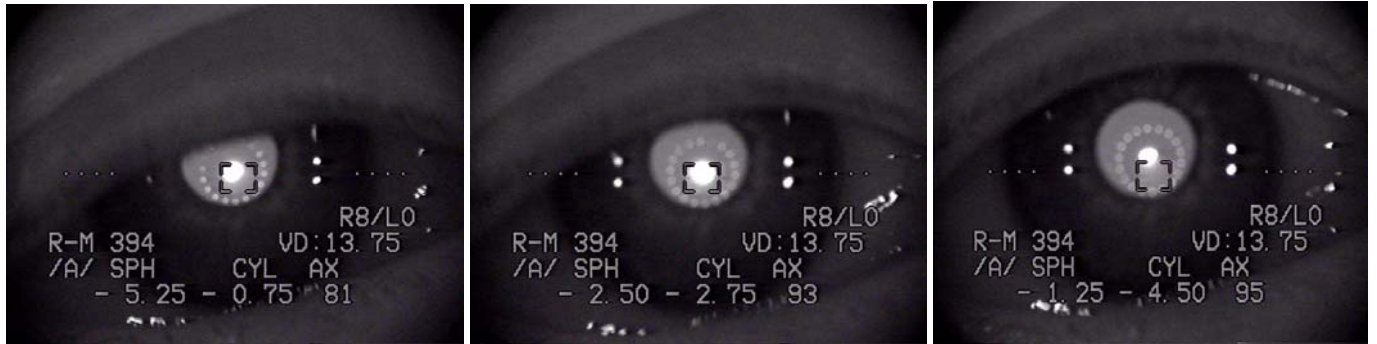
RIGHT EYE

Not all patient measurements will be this easy. When a patient has mature cataracts, the autorefractor will not make a good measurement. If the patient has an eye injury or disease, the autorefractor will not make a good measurement. However, most measurements will prove to be very accurate. Most autorefractor reading problems will be due to problems with the eyes which glasses cannot fix.

Patient Example number 2

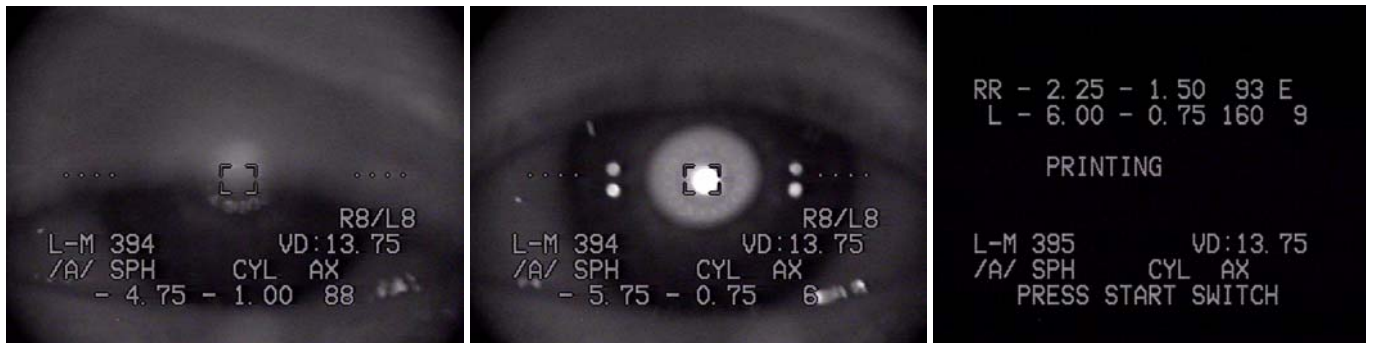
This is an example of a patient that was blinking extremely fast and often. It was impossible to get a very good reading from her.

RIGHT EYE:



In the above notice that the eyelid was coming down over the view several times. This made it very difficult to stabilize.

LEFT EYE:



On the left eye at the very last there was one good shot (in the middle) which improved the accuracy for it.

The printout to the right is from this test. Notice that the right eye gave an "E" (Error) response. This was because all the readings were totally out of range. Between blinks the instrument measured the left eye properly as you can see with the confidence level of "9". Only because the instrument was very fast was it able to do that.

12.26 * 2 10:45AM			
Name:			
No. 394		VD:13.75	
-REF-			
[R]	SPH	CYL	AX
-	6.00		
-	4.75	- 1.25	91
-	4.50	- 1.50	93
-	4.50	- 1.50	92
-	2.25	- 3.75	104
-	1.50	- 4.25	80
-	1.00	- 4.25	102
-	1.75	- 3.50	98
*	- 2.25	- 1.50	93 E
[L]	SPH	CYL	AX
-	5.75	- 0.25	160
-	5.75	- 0.75	6
-	5.75	- 1.00	177
-	6.00	- 0.50	152
-	6.25	- 0.75	106
-	6.00	- 0.75	136
-	6.00	- 0.75	173
-	6.00	- 0.50	157
*	- 6.00	- 0.75	160 9
Retinomax K-plus			

Patient Example number 3

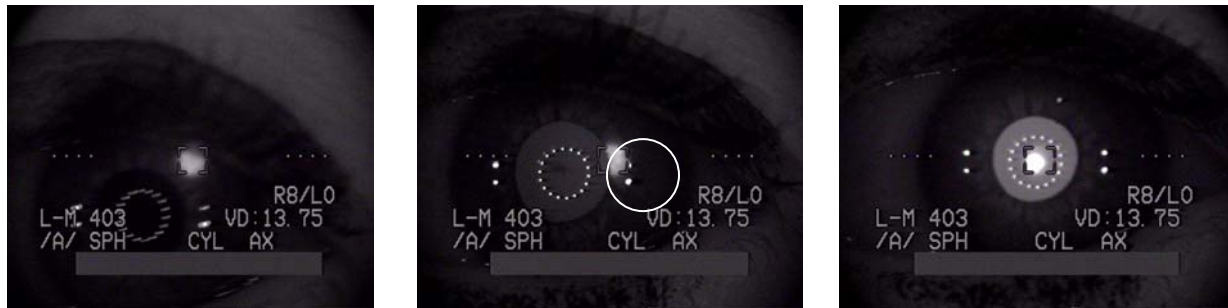
The following person was much easier to read. She did not shake or blink excessively. The right eye was read in just a few seconds.

RIGHT EYE:



The left eye scene below shows (from left to right) me moving in on the eye slowly positioning the small black square (circled in white below) onto the "Mire ring of lights" which you now see on the far right side.

LEFT EYE:



12.27 ' 2 10:31AM			
Name:			
No. 403	VD:13.75		
-REF-			
[R]	SPH	CYL	AX
	- 5.75	- 1.25	20
	- 5.75	- 1.25	10
	- 5.75	- 1.50	174
	- 5.75	- 1.25	174
	- 6.00	- 1.00	175
	- 6.25	- 0.75	172
	- 5.75	- 1.50	177
	- 5.75	- 1.50	177
*	- 5.75	- 1.25	177 9
[L]	SPH	CYL	AX
	- 7.00	- 1.00	12
	- 7.00	- 1.00	10
	- 7.00	- 1.00	8
	- 6.50	- 1.00	161
	- 7.00	- 0.50	177
	- 7.25	- 0.50	10
	- 7.00	- 1.00	10
	- 7.00	- 1.00	10
*	- 7.00	- 1.00	10 9
Retinomax K-plus			

To the right is a copy of the printout. Notice that in both the right and left eye the confidence level of the measurement was 9. You can see that from the number of readings close together. Note that on the Left eye reading you see side by side readings of:

-7.00 -0.50 177 and -7.25 -0.50 10

You might think that an axis of 177 is very far from a 10 but realize that axis numbers count:

177 178 179 0 (or 180) 1 2 3 4 5 6 7 8 9 10

so that is only a difference of 13 degrees in the axis of these 2 readings.

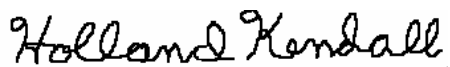
5.0 In Summary

The goal of this document in combination with other training aids is to instill confidence in those who work in the BMDMI optical clinics. It is the fervent prayer of the author that this document will enable these clinics to help the Honduran people get glasses which will not only allow them to read their Bible but will also allow them to improve their standard of living.

I am committed to your success. There will certainly be further revisions to this document. Please send any comments, or corrections to the E-Mail address on the front of this document.

Those working in this optical clinic will truly be blessed. I have found this ministry to be the most immediately gratifying work that I have ever done before. It is truly an inspired calling of our Lord Jesus Christ to perform this very worthy ministry. I fervently pray that all of you who read this manual and use this instrument will be blessed while also blessing others.

God Bless you,

A handwritten signature in cursive script that reads "Holland Kendall".

Holland Kendall

Appendices

Appendix A – Nikon Setup Instructions.

Appendix B – The Battery Charging System

Appendix C – Changing the Printer Paper

Appendix D – Testing Autorefractor with the Model Eye

Appendix E – English and Spanish Patient Information

Appendix F -- Names, Phone Numbers, and Part Numbers

Appendix A- Nikon Setup Instructions.

The Nikon Retinomax K-plus2 will likely be set up properly before you start using it. However, in case anything has been changed the following pages document the steps involved in setting up the unit.

This procedure can also be used to reset the patient number which prints on the printout. This might help you keep track of how many patients that you see each day.

A.1 General Setup Procedures

PUT THE NECK STRAP AROUND YOUR NECK:


Pick up the autorefractor and you will see the following display. Notice the "SET" which is circled below. There are lines from SET to both the MODE and R/L keys. Press them both as you see me doing below.

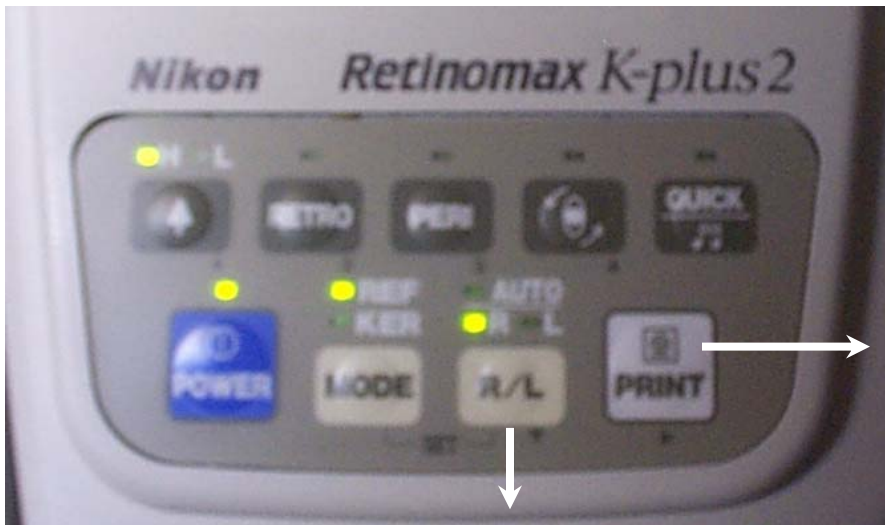


and you will see the following screen.

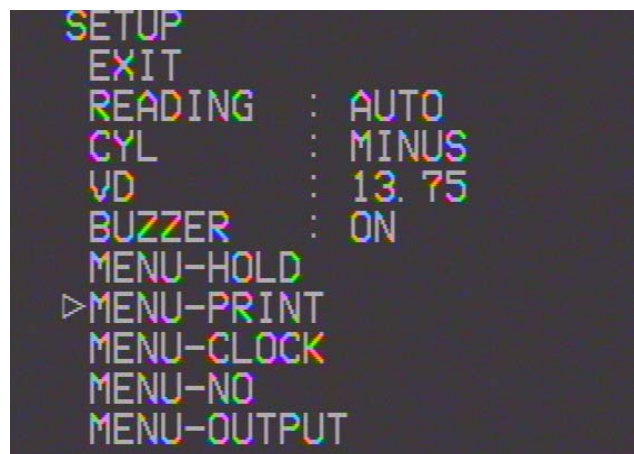
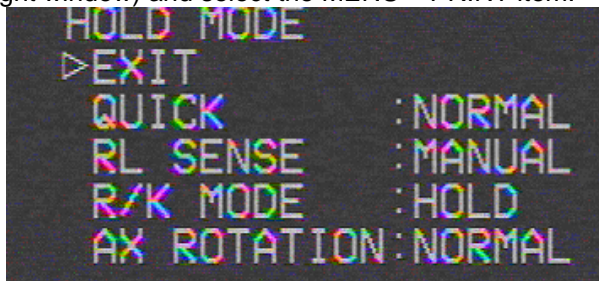
```
SETUP
▷EXIT
READING : AUTO
CYL : MINUS
VD : 13.75
BUZZER : ON
MENU-HOLD
MENU-PRINT
MENU-CLOCK
MENU-NO
MENU-OUTPUT
```

READING, CYL, VD and BUZZER setting should be as shown.

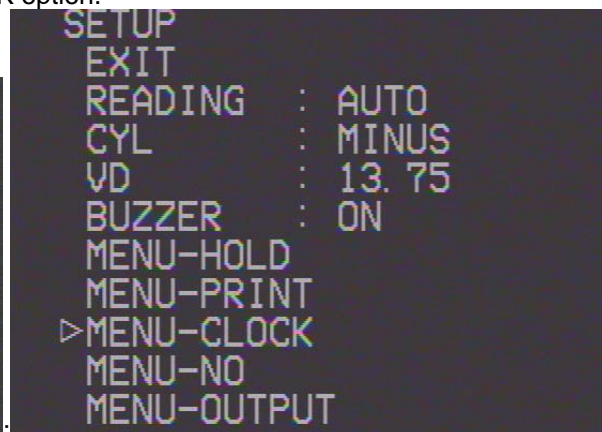
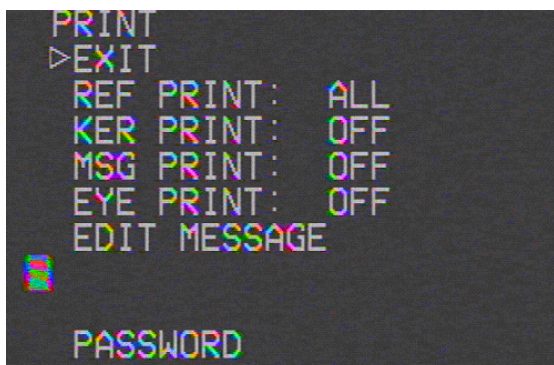
Look at the below picture of the autorefractor keyboard. To move the  symbol down the setup screen you use the R/L key. When you get to the bottom of the screen, press the R/L key again and you are back at the top. To change a parameter from one value to the next possible value, use the PRINT key as shown below.



Next use the R/L key to move the pointer to the MENU-HOLD (as shown in the left window below). Nothing should be changed on this screen. Press PRINT to return to the previous menu (as shown below in the right window) and select the MENU – PRINT item.



and you will see the window on the left. **Normally** nothing should be changed on this screen. See the end of this Appendix for alternate printer setup. Press the PRINT key to return to the previous menu (as shown in windows on the right below) and select the MENU – CLOCK option.



A.2 Setting the clock time.

Press PRINT and you will see the window below. You may want to set the Hour and Minute to the current time. If so, use R/L to move the pointer down to HOUR and use PRINT to change it's value. Do the same for minute. Use the same procedure for other fields in this menu. Move the pointer back to EXIT and press PRINT and you will go back to the previous menu.

```

CLOCK
01. 10 03 10:14 PM
▷EXIT
YEAR      03
MONTH     01
DAY       10
HOUR      10
MINUTE    14
DATE-FORM: MDY
TIME-FORM: AM/PM
/ START:INC QUICK:DEC /

```

A.3 Setting first patient number. (DO THIS BEFORE DAY 1)

Press R/L again to select MENU-NO. Press the PRINT key and you will see the below. Use R/L to position the pointer on RESET.

<pre> SETUP EXIT READING : AUTO CYL : MINUS VD : 13.75 BUZZER : ON MENU-HOLD MENU-PRINT MENU-CLOCK ▷MENU-NO MENU-OUTPUT </pre>	<pre> NO. 441 EXIT 001 010 100 ▷RESET / START:INC QUICK:DEC / </pre>
--	---

where the current patient number is 441. Move the pointer down to RESET (as shown above right) and press the PRINT key and you will reset the patient number to 1 (as shown below left). Use R/L to position on the EXIT above (as shown below right) and press PRINT to return to the main menu.

<pre> NO. 001 EXIT 001 010 100 ▷RESET / START:INC QUICK:DEC / </pre>	<pre> NO. 001 ▷EXIT 001 010 100 RESET / START:INC QUICK:DEC / </pre>
---	---

Press R/L to select the MENU-OUTPUT option as shown below.

```

SETUP
EXIT
READING  : AUTO
CYL      : MINUS
VD       : 13.75
BUZZER   : ON
MENU-HOLD
MENU-PRINT
MENU-CLOCK
MENU-NO
▷MENU-OUTPUT
  
```

A.4 Sending Printer Output to Computer

Press PRINT to select this menu and you will see the below:

```

OUTPUT
▷EXIT
PRT UNIT NO. : 1
PRT RS OUT   : REF
PRT RS PROT  : NK9600
RS232C OUT   : OFF
RS232C PROT  : NK1200
  
```

The first three items (**PRT UNIT NO.**, **PRT RS OUT**, **PRT RS PROT**) are for setting up the printer output to the inventory control computer using the included cable. The next two options (**RS232C OUT**, and **RS232C PROT**) control how the autorefractor talks to a computer when it is directly cabled to that computer. We have not purchased that cable to avoid having a wire hanging from the hand held unit.

HOWEVER, when connecting the printer to the computer this screen must be set up exactly as above for this option to work properly. If for some reason you do not want the printer to control the inventory control computer, change this screen to be as below: First select the PRT RS OUT line and set it to OFF as shown in the window to the right.

<pre> OUTPUT EXIT PRT UNIT NO. : 1 ▷PRT RS OUT : REF PRT RS PROT : NK9600 RS232C OUT : OFF RS232C PROT : NK1200 </pre>	<pre> OUTPUT EXIT PRT UNIT NO. : 1 ▷PRT RS OUT : OFF PRT RS PROT : NK9600 RS232C OUT : OFF RS232C PROT : NK1200 </pre>
--	--

NOTE

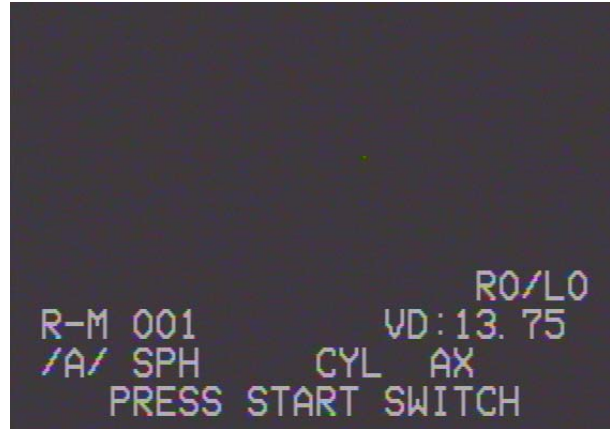
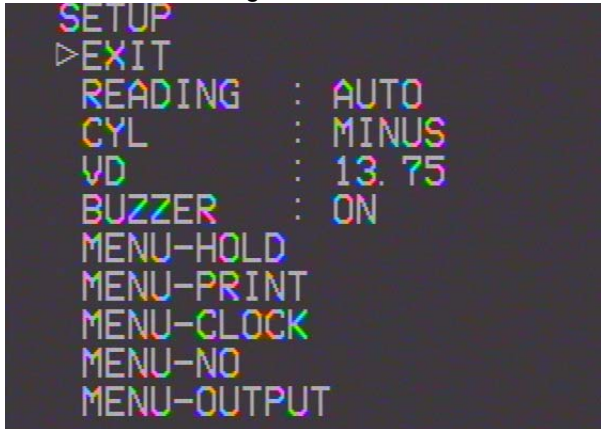
If the printer is not cabled to the computer and PRT RS OUT is set to REF, the printer beeps continuously after every printout and must be power cycled every time to be used again.

For the printer to send it's output to the computer, set this screen as shown below:

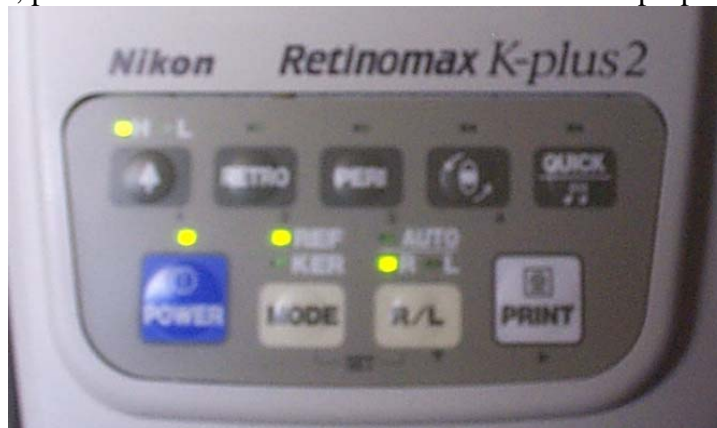
```

OUTPUT
EXIT
PRT UNIT NO. : 1
▷PRT RS OUT   : REF
PRT RS PROT  : NK9600
RS232C OUT   : OFF
RS232C PROT  : NK1200
  
```

Now move the cursor back to EXIT and press PRINT and you will see the left side window below. Use R/L to move the cursor back to EXIT and press PRINT and you have now exited SETUP And your screen should show the below window on the right.



Be sure that the front panel lights are set as shown below. **H**, **POWER**, **REF**, and **R** lights are on and all other lights are off. If not, press the button next to them to set them to the proper state.



A.5 Alternate printer setups.

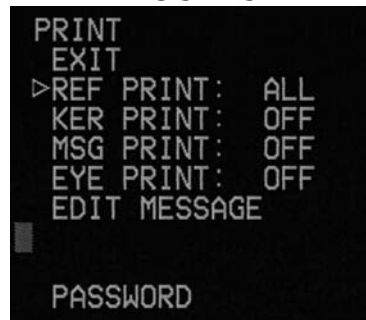
If you choose, you can set the printer up several ways.

- 1) Send all output to the printer. This setup is the default setup mentioned previously.
- 2) Print out only “representative” values. This will produce a shortened printout eliminating the 8 separate Right and Left readings. The lines with the confidence levels print.
- 3) Turn off all printer output.

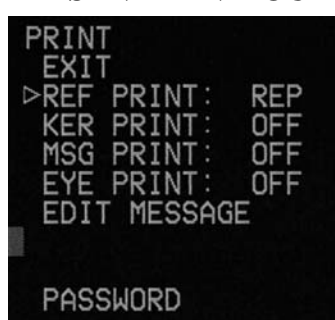
None of these settings stop sending data to the computer. Options 2 and 3 save battery and paper.

Here are the three settings:

ALL OUTPUT



REPRESENTATIVE OUTPUT



NO PRINTER OUTPUT



Appendix B - The battery charging system.

The Nikon Autorefractor hand-held unit is totally battery powered. When you place the unit on the charging stand (as shown to the right) and the charging stand is plugged into AC power, the unit will start charging only if the batteries are below 50%. To force a recharge, press the CHARGE buttons. Recharging will start automatically if the battery is below 50%; otherwise, you must force a recharge.



Beneath the printer is a Duracell DR10h camcorder battery which can provide power to the printer. It can be removed to provide power to the autorefractor. The DR10h battery is available at WalMart, Meijers, and Circuit City. 8 are included with this kit.

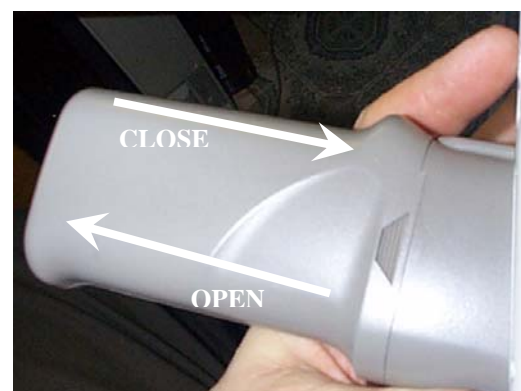


With the autorefractor placed on the stand and the battery in the printer, these two batteries can be completely recharged in 90 minutes. They can be "refreshed/renewed" in about 4 ½ hours. Refreshing a NiCad battery can extend its life greatly; however, it should be done no more often than once a week.

If you need a single battery recharged quickly, the battery case in the printer and the base is the fastest recharger. To force a recharge, press the CHARGE buttons (for autorefractor and printer). To force a refresh press the appropriate RENEW button.



The battery is inserted into the handle of the autorefractor as shown below:



During extensive use of the autorefractor, it is expected that its battery will last a little over 1 hour. It is therefore important to have several charged batteries ready for replacement. That is the function of the battery charge rack shown to the right. Using 8 rechargers, it can charge 8 batteries simultaneously. Each battery is numbered and should be returned to the same number battery charger. As soon as a battery is discharged, place it back to recharge and get the next battery in sequence.

The autorefractor will power down when battery power is too low.



Each charger in the rack looks like the picture to the right. Since all lights all ON this battery is fully charged.

Refresh Button →



One red light on is 25% charged and first 2 minutes of charging. 2 red lights is 47% charged. 2 red lights and one amber is 80% charged and all lights is fully charged as the right figure above shows. It is normal for the battery to be warm or even hot during charging.

To the right you will see the installation steps for a battery.



- 1) Insert the battery as shown
- 2) Push it down & hold
- 3) push to right to latch.

Should all lights be flashing, the battery is overheating. Remove battery and let it cool off and then place it back in the recharger.

ON THE LAST NIGHT OF YOUR STAY. (You will leave the next morning).

As soon as you are through with the autorefractor on the **last** day, put all batteries back in the battery rack. Press the REFRESH button on all the battery chargers. This will discharge all batteries according to this light indication: 4 amber is more than 90%, 3 amber is more than 80%, 2 amber is more than 50% and 1 amber is below 25%. The chargers will then completely recharge the batteries. For NiCad batteries this will greatly extend their life.

NOW make a note and place it in the case indicating the last battery you used. The next team should use the next battery in sequence.

Appendix C – Changing the printer paper

A roll of printer paper should print the prescriptions of 250 patients when doing the full size printout. Use the following pictures to replace the printer paper. **REALIZE** that if you give out of printer paper you can stop the printer from printing but still send the data to the computer to do the search. See Appendix A for how to change this setup.



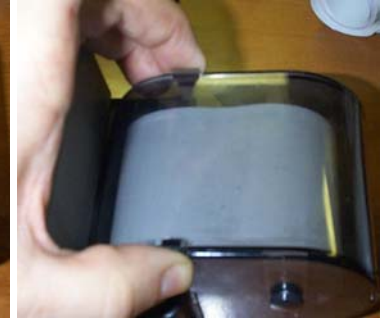
----- Lift paper release lever -----



Turn printer over



Lift plastic paper cover



Lift plastic paper cover



Release roll lock



Release other roll lock



Remove spent roll



Insert new roll



Depress roll lock



Depress other lock



Push paper in slot



Close and latch cover



Return paper release lever.



Roll paper up a little.

Appendix D – Testing Autorefractor with the Model Eye.

The “Model eye” (shown below) is a very important device. It will allow you to determine that the autorefractor is working correctly. It is also a good way for you to practice your measurement skills.

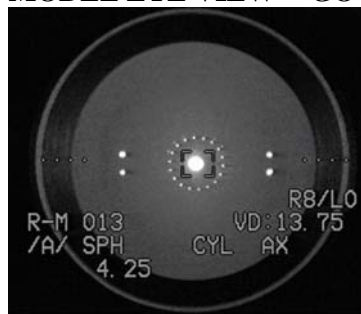


If the instrument is operating correctly and you test the model eye properly, you should measure +4.00 +/- .25 Diopters (+3.75 through +4.25). Place the model eye in the charging base as shown in the left picture. Now measure the eye as shown in the figure on the right side. Sight directly into the eye.



When you look through the viewfinder, you should see the view marked GOOD. Notice how the eye is perfectly centered in the viewfinder and all 4 alignment dots are showing. The square is centered within the mire ring (ring of lights). The reading is 4.25 and the printout is below.

MODEL EYE VIEW -- GOOD



```

1.14 3 7:36PM
Name:
No. 013 VD:13.75
-REF-
[R] SPH CYL AX
+ 4.25
+ 4.25
+ 4.25
+ 4.25
+ 4.25
+ 4.25
+ 4.25
+ 4.25
+ 4.25
* + 4.25 10
    
```

MODEL EYE VIEW -- BAD



```

1.14 3 7:40PM
Name:
No. 014 VD:13.75
-REF-
[L] SPH CYL AX
+ 3.50
+ 3.50
+ 3.50
+ 3.50
+ 3.50
+ 3.50
+ 3.50
+ 3.25
+ 3.50
* + 3.50 10
    
```

If you measure the eye improperly, you might see something like the view marked BAD with its printout below. In this case you got too low and too close to the eye.

Be sure to return the model eye to its bag and the bag to the Nikon case. Please do not lose the model test eye.

Appendix E – English & Spanish language patient information.

ENGLISH VERSION PATIENT INSTRUCTIONS

(Actions you should perform are in italics on the English version only.)

This instrument will test your eyes for glasses.



(Point to the instrument)

You will look into this



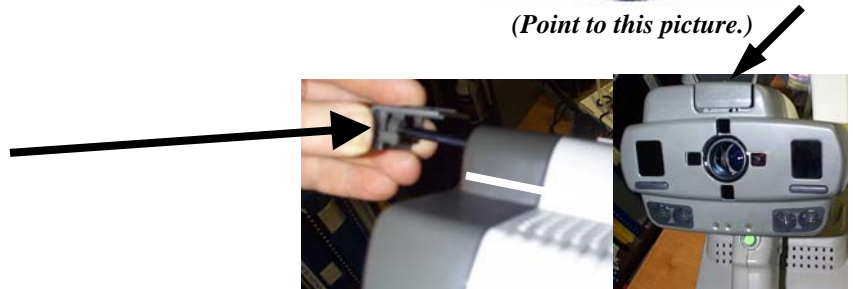
(Point to the lens as shown above.)

and see a field with a Christmas tree far away like this:



(Point to this picture.)

I will rest this on your forehead.



(Point to the headrest)

I will place my hand on the side of your head to steady the instrument.



(Point to the hand on the face below)

PLEASE try not to blink your eyes during the test.

SPANISH VERSION PATIENT INSTRUCTIONS

(A copy of this will be in the autorefractor case)

Este instrumento revisara sus ojos para saber que anteojos necesita.



Ud. va a ver aqui adentro:



y va a ver algo como con un arbol de navidad asi como este:



Yo voy a poner esto en su frente.



Yo voy a poner mi mano en su cabeza para sostener este instrumento.



NO CIERRE sus ojos cuando se los este revisando.

Appendix F – Names, Phone numbers and part numbers

Distributors from which to buy Nikon parts:

Latham & Phillips (Unit was purchased from them)
 Tel: 800 755-5919 or 1-614-871-6200
 2300 Southwest Blvd P.O. Box 280
 Grove City, OH 43123
 E-mail: melissae@LPOproducts.com
 Web: www.LPOproducts.com
 Attn: Melissa Epling

Lombart Instruments (Accessories and cables for instrument came from here)
 5358 Robin Hood Road
 Norfolk, Virginia 23513
 Attn: Peter Leadem
 1-800-446-8092
 Web: www.lombartinstrument.com

Service location:

Nikon Technical Support Center (Provided part numbers and advice on use.)
 Attn: Mr. Uvaldo Salcedo
 Service Manager
 19601 Hamilton Ave.
 Torrance CA 90502
 1-800-258-2884
 E-Mail: usalceda.nikon@att.global.net

This is where we will call should the unit need normal maintenance or emergency repair.

PARTS:

Item description	Part number	List Price	Supplier
Monitor cable	88519	\$120	Either of above distributors.
Interface cable	88517	\$210	Either of above distributors.
Model Eye	88528	\$85	Either of above distributors.
Battery (Printer & Autorefractor)	DR10h	~\$40	(Meijers, WalMart, Circuit City, etc)
Printer Paper	????	???	Staples (see note below)

Note: For printer paper I got a box of 6 rolls of wide carriage FAX paper which was 98 feet long. I then had a friend with a band saw cut it into appropriate width (58mm) rolls. These are ¼ of the price of paper from Nikon and it works just as well.