

Nikon

AUTO REFRACTOMETER

Speedy-1

Instructions

Thank you for purchasing this Nikon product.

This instruction manual is written for users of the Nikon "Auto Refractometer Speedy-1."


To ensure correct usage read this manual carefully before operating the instrument.

- It is prohibited to alter this manual in part or whole without expressed permission.
- The contents of this manual are subject to change without any notice.
- Although every effort has been made to ensure the accuracy of this manual, if you note any points that are unclear or incorrect, contact your nearest Nikon representative.
- Note that despite the above, Nikon does not bear any responsibility for any claim over loss due to the use of this instrument.







Caution Symbol in This Manual

Though Nikon products are designed to provide you utmost safety during use, incorrect usage or disregard of the instructions can cause personal injury or property damage. For your safety, read the instruction manual carefully and thoroughly before usage. Do not discard this manual but keep it near the product for easy reference.

Inside this instruction manual, safety instructions are indicated with the symbol shown below. Be sure to follow the instructions marked with this symbol for your safety.

Symbol	Meaning
 CAUTION	Disregarding instructions marked with this symbol may lead to injury or property damage.

Meaning of Symbol on the Instrument's Cover and Nameplate

	AC power		OFF (cut off from power supply)
	Fuse		ON (connected to power supply)
	Caution: Please refer to instruction manual.		Input and Output
	Class B device		

Please Read This First for Your Safety.



CAUTION 1

Intended Use

Only use the Auto Refractometer Speedy-1 for measuring the refractive power.
Do not use this instrument for any other purpose.



CAUTION 2

Do Not Disassemble

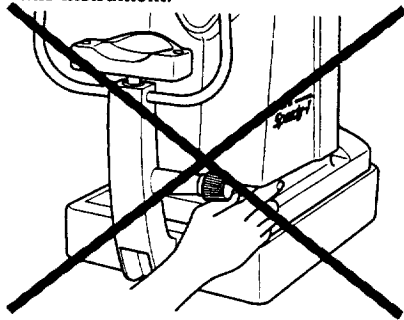
Disassembling this instrument may lead to electric shock and/or malfunction of the instrument.
Never disassemble this instrument.



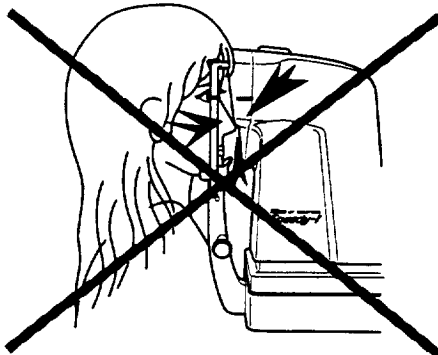
CAUTION 3

During Measurement Operations

- Particularly in the case of little children, take care that patients do not put their fingers in the moving parts of this instrument.

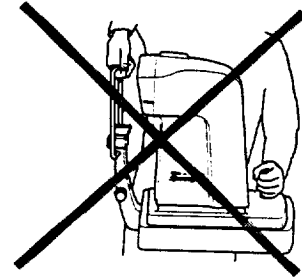
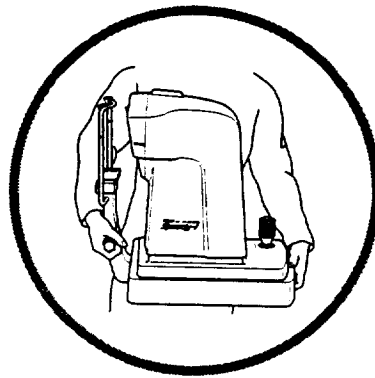


- Take care that the measuring head does not strike the patient's nose. (When moving the measuring head toward the patient or toward the patient's left or right eye.)



**CAUTION 4****During Installation and Transportation**

Be absolutely sure to support the instrument as shown in the figure at left during transportation. Do not carry the instrument by the forehead rest, measuring head or joystick lever.



- Recommended operational conditions are an air pressure of 800 to 1060 hPa, a temperature of approximately 10°C to 35°C, and a relative humidity of 30 to 70%.
- Although the instrument is dust-proof, do not use it in a room where there is a lot of dust or dirt.
- The best place for installation is a dimly lit room. Do not face the patient side of the instrument toward a bright window or source of light.
- Although this instrument conforms to EMC standards (IEC60601-1-2:1993), it does emit a weak electromagnetic signal. If use of this instrument affects other equipment such as televisions or radios, separate it from the affected devices or change the direction it faces.
- When transporting this instrument, always be sure to first tighten its securing screws. (→ P.8)
- Since this instrument is not water-proof in construction, never take it into locations where liquids such as rain or beverages may get inside.
- If condensation (dew) forms, do not use the instrument until the condensation disappears.

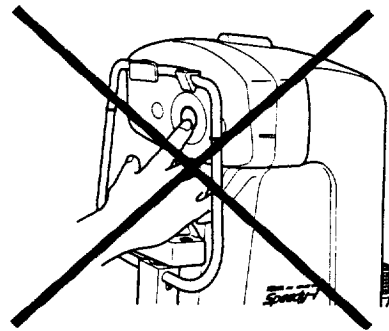
**CAUTION 5****Other Notes on Handling**

- Do not scratch, break or alter the power cord or overly bend, pull, twist or bundle it. Also, placing heavy objects on the power cord or subjecting it to heat may cause it to break, resulting in fire or electric shock. If the power cord becomes damaged, be sure to replace it with a new cord.
- If there is any dust on the power plug blades or the surface they connect to, pull out the power plug and remove the dust. The dust or grime can make the power plug and AC power outlet to be out of contact and may result in fire.
- This refractometer is a precision optical instrument containing many electronic components. Be sure to handle it carefully and do not subject it to strong physical shock.



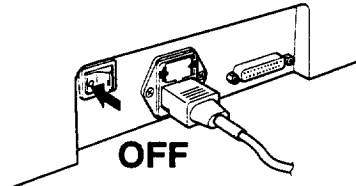
CAUTION 6 Maintenance and Storage

- The recommended transportation and storage environment is a temperature of -25°C to 45°C and relative humidity of 20 to 85%.
- When replacing a fuse, be sure to turn off the power switch and pull out the power cord. Be sure to use only a fuse of the specified rating. Electric shock or fire may occur if a fuse other than of the specified rating is used. (Specified fuse: time lag fuse T1AL/250V, SCHURTER 0034.3117) (→ P.36)
- Measurement results are adversely affected if the measuring window glass surface becomes soiled with grease from the patient's nose, fingerprints or dust. Be sure to always keep the measurement window glass clean.



When cleaning the measurement window glass, take care not to scratch or break it. (→ P.37)

- When finished using the instrument, turn off the power switch and cover it with its plastic cover.



- The internal battery
The instrument includes a primary lithium battery as the power source for the clock function and all setting functions stored in memory. If the battery goes out, the time and date printed on the measurement printout will be wrong. Also, settings will not be stored in memory and default settings will be restored every time the power is turned off. Contact your nearest Nikon representative when replacing batteries.
- Disposing of the unit
If you dispose of the unit, be sure to follow the local regulations regarding the disposal of products containing lithium batteries.

■ Equipment Supplied ■

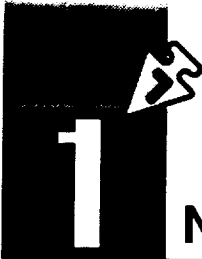
Main unit, power cord, plastic cover, blower, spare fuse, transport securing screw hole caps (2), printer paper (5 rolls), model eye for inspection, Philips screwdriver, and instruction manual (this booklet)



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Nomenclature

Infrared signal generator

Sends a signal to an Auto Optester "Remote Vision".

TV monitor

Enables the operator to take measurements while monitoring the patient's eye on the TV monitor. Measurement data is also displayed on the monitor.

FUNCTION keys

Press to enter various setup modes and retro mode.

SET key

Press to enter a given setup screen.

POWER lamp

Lights when the power switch is set to ON.

PRINT key

Press to print out data. Printouts are made automatically in auto measurement mode. (→ P.17)

Measurement switch

Press to start measurements. It is not necessary to press this switch in auto measurement mode or continuous measurement mode.

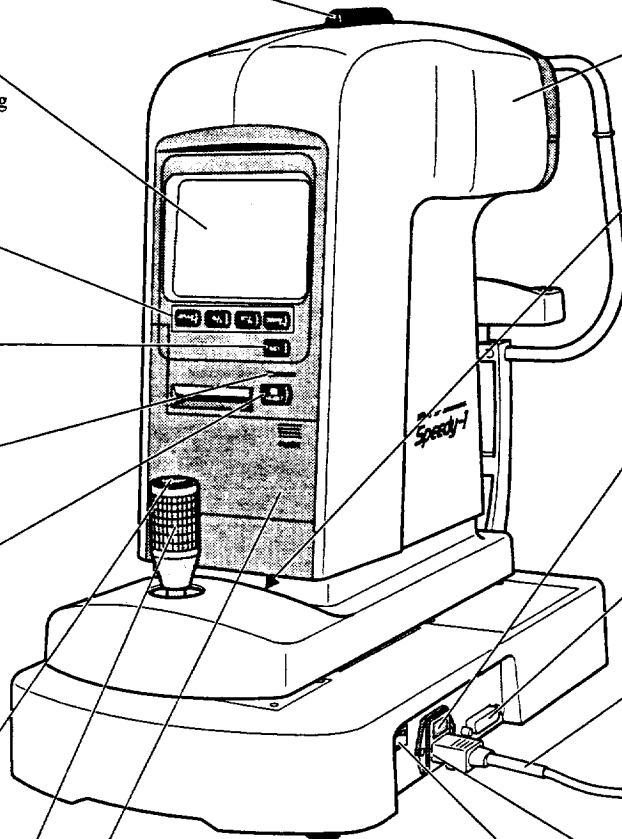
Joystick lever

Used for right/left and forward/backward positioning during measurement.

Printer cover

Open in the following cases:

- To change the printer paper roll
- To adjust the TV monitor's brightness or contrast.



Measuring head

Houses the measuring mechanism.

Transport securing screw 2

Protect the instrument against vibration and shock during transport. Loosen this screw after installing this instrument and re-tighten them whenever moving it. (→ P.8)

Fuse holder

Contains the fuse. (→ P.36)

RS-232C interface connector

Used when connecting to external devices. (→ P.34)

Input power cord

Connect to an AC power outlet.

Input power cord socket

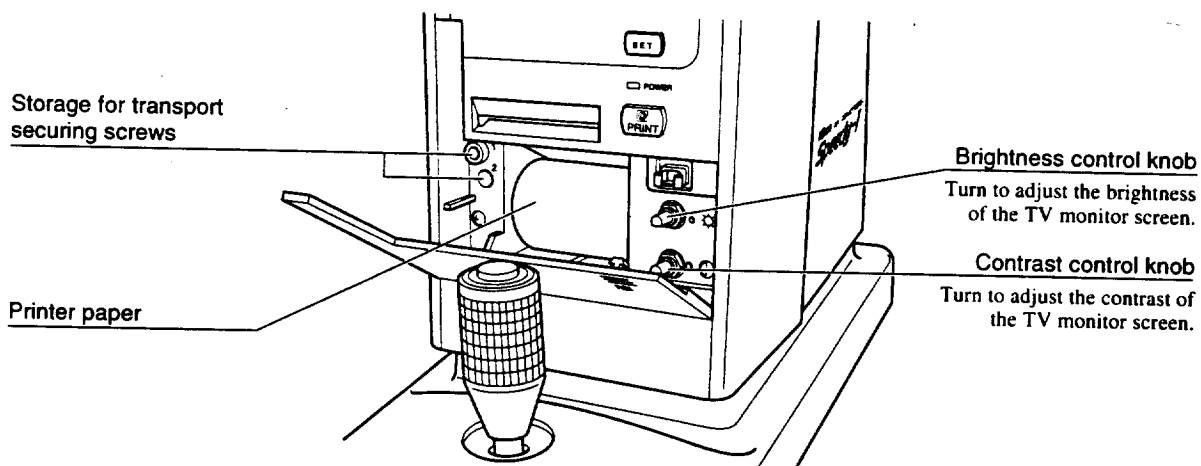
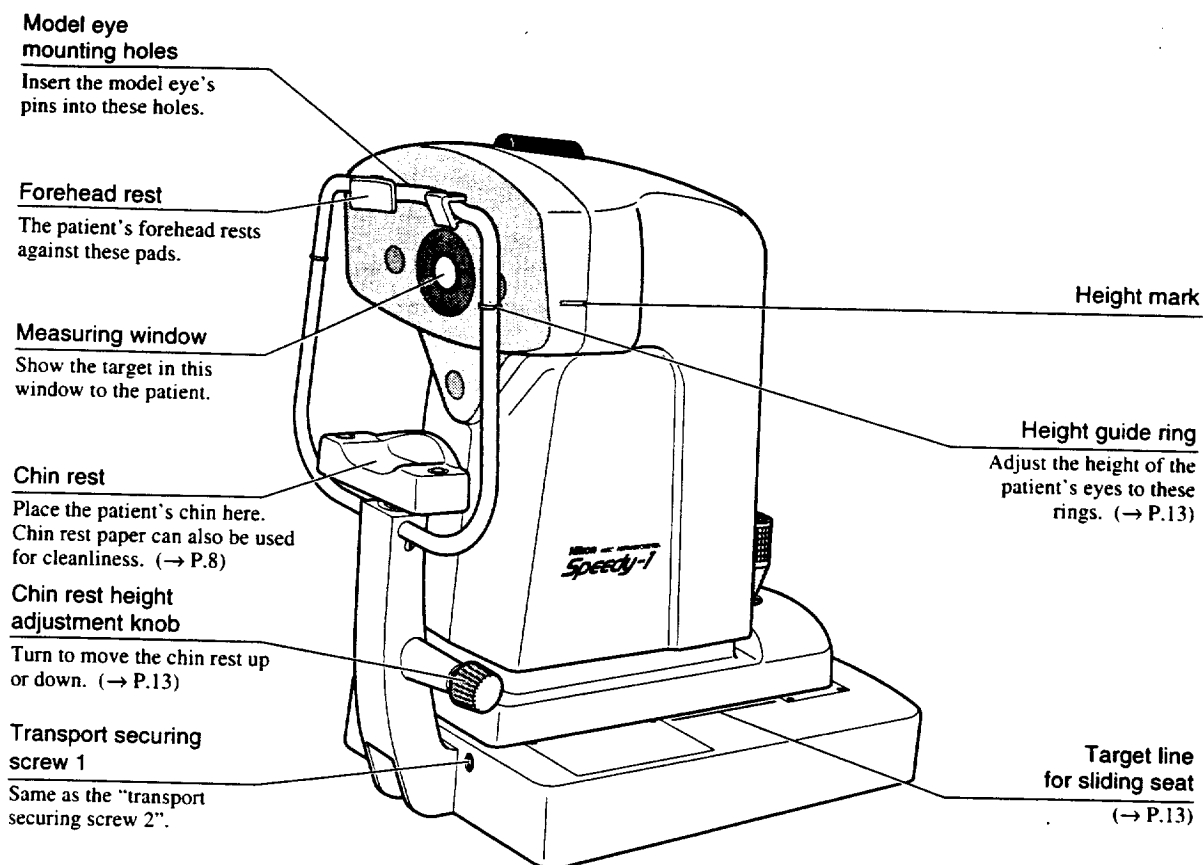
Plug the power cord into this socket.

Power switch

Power is ON when "|" side is pressed and OFF when "○" side is pressed.



1. Nomenclature



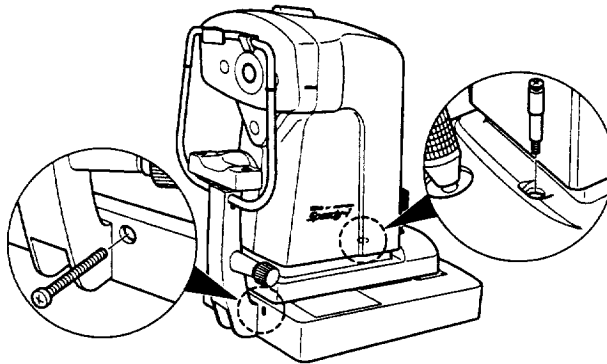
(When the printer's cover is opened)

2

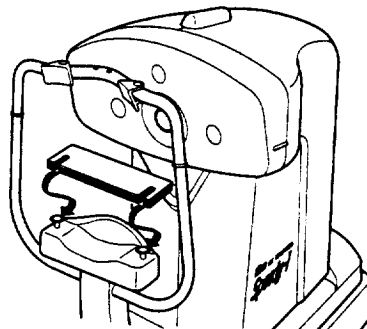
Preparation

2 - 1 Setting Up the Speedy-1

- 1 Place the unit on a stable table (such as a power table).
- 2 Remove the two transport securing screws using the Philips screwdriver.
Cover the screw holes with the caps provided.
Store the two securing screws in the storage compartment to the left of the printer. (→ P.7)
Always be sure to tighten the securing screws when transporting the unit.



- 3 Plug the input power cord into the unit's input power cord socket.
- 4 Plug the other end of the input power cord into an AC power outlet.
- 5 Turn the unit's power switch ON. The POWER lamp will light, the TV monitor screen will brighten, and the unit can now make measurements.
- 6 Insert a printer paper roll. (→ P.35)
- 7 Clean the forehead rests and chin rest with disinfectant alcohol.
When using chin rest paper (sold separately), pull up the two chin rest pins and hook the chin rest paper between them. Use of a thickness of about 5 mm of chin rest paper is appropriate.





2 - 2 Measuring the Model Eye

1 Insert the model eye's two pins into the model eye mounting holes in the forehead rest part.

2 Check that the VD display on the TV monitor is any value of 12.0 to 16.0.

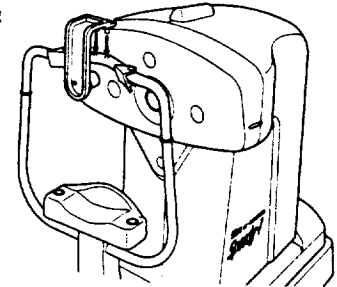
3 Using the joystick lever, align the target with the model eye. (For details on the measurement method, refer to P.10 to 23.)

4 Compare the measured values for the model eye with the value (SPH) listed on the label attached to the model eye and check that the difference in values is within the following range.

SPH: $\pm 0.25D$ CYL: $0 \pm 0.25D$

If either value is not within the above range, refer to "3 Measurement Method" (P.10 to 23) and check that the measurement method is correct and then re-measure.

Next, refer to "7-5 Cleaning the Measurement Window" and "7-6 Cleaning the Model Eye" (P.37) under "7 Maintenance" and clean these parts if they are dirty. If either value still is not within the above range, please contact your nearest Nikon representative.

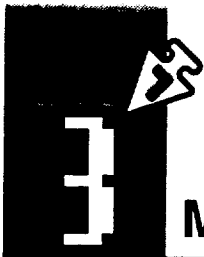


2 - 3 Checking Settings

Factory settings are as follows.

For details on the meaning of settings or on how to change settings, refer to "5 Making Various Settings (Setup)" (P.25 to 33).

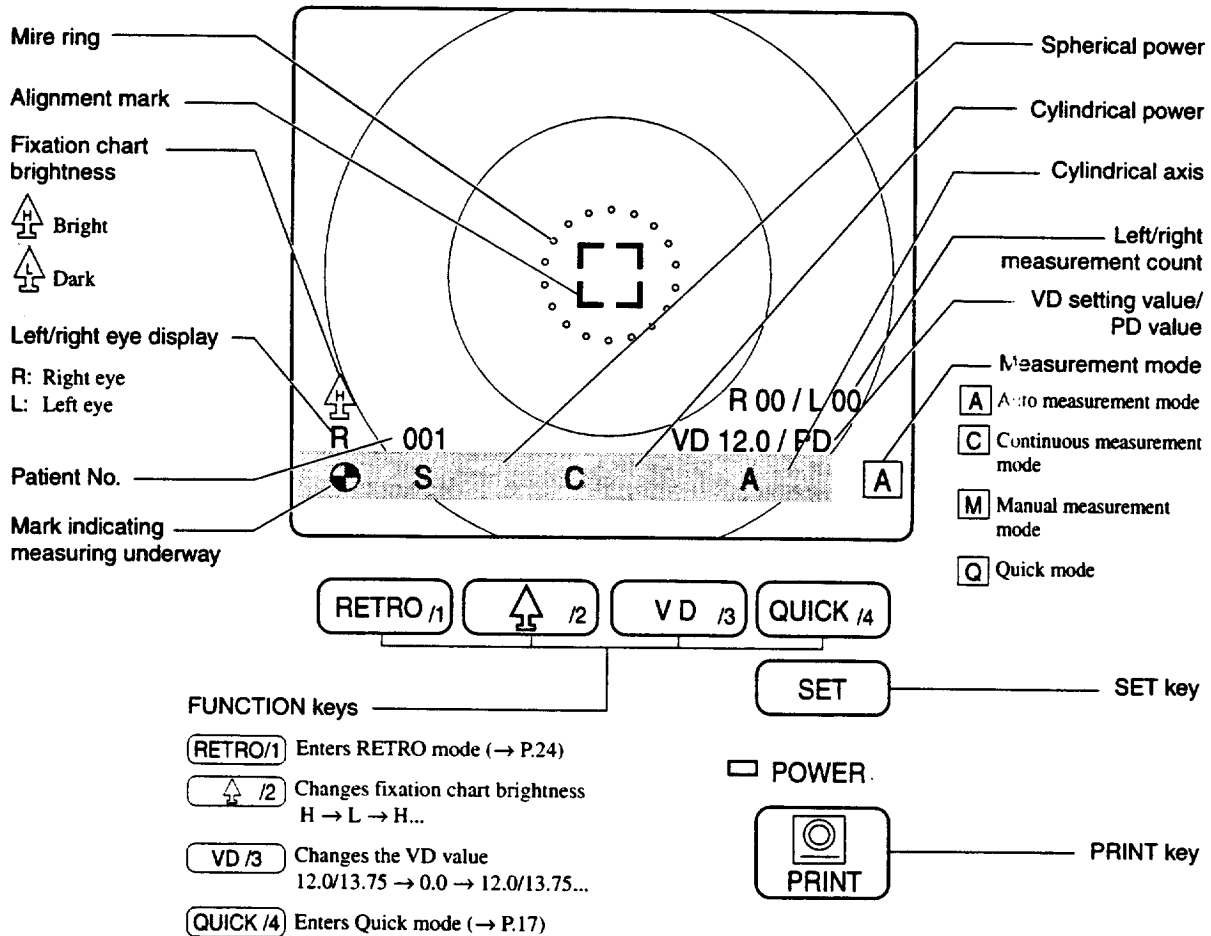
- Fixation chart brightness setting: H
- VD setting: USA: 13.75 mm; EUROPE: 12.0 mm
- Patient No. setting: 00001
- Astigmatism sign setting: - (Minus)
- Measurement mode setting: AUTO
- Minimum unit for measured value: AUTO
- Buzzer setting: ON
- Date display format: USA: Month/day/year; EUROPE: Day/month/year
- Time display format: USA: AM/PM; EUROPE: 24H
- Print message: Blank
- Print output setting: ALL
- RS-232C setting: OFF
- Word setting: EG



Measurement Method

Measurement Screen

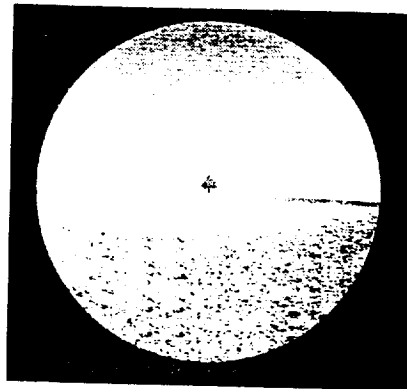
Turn on the power and focus on the model eye, and the TV monitor will be as in the figure below.



■ Description of Test to Patient Before Measuring



Most patients will be rather nervous, so try to put them at ease. Briefly explain the unit's operation and purpose to the patient.

- "This machine determines the power of the spectacle lenses you should use."
- "You will see a green field inside. Please relax and look at the tree target in the center."
- "Try to keep your eye as still as possible."



Measurement Modes of the Unit

Select the measurement mode by performing "5-2. SETUP Screen" (→ P.26) under "5. Making Various Settings (Setup)".

Mode	Description	Start Measurement	End Measurement	Print
Auto measurement mode (→ P.13)	Measurements are made automatically with the unit determining all operations from the beginning of measurement until the printout is made. (This mode is selected under default settings.) When the flickering dot enters the alignment mark, the measurement starts. The unit determines the cause of fluctuations in the measured values and the measurement ends. When measurements for the left and right eyes are completed, a printout is made.	Auto	Auto	Auto
Continuous measurement mode (→ P.15)	Although measurements are started automatically in the same way as auto mode, measurements do not end automatically but are made continuously. Pressing the measurement switch will stop measurement momentarily. Pressing it again will restart measurement. Press the  key when you want to print out measured data.	Auto	Manual	Manual
Manual measurement mode (→ P.16)	Measurement is not performed until the tester presses the measurement switch. When the flickering dot enters the alignment mark and the image comes into focus, press the measurement switch and the unit takes one measurement. Holding the switch down will continue measurement. Press the  key when you want to print out measured data.	Manual	Manual	Manual

* Quick Mode

Quick Mode is available in addition to the above modes. This mode uses a short measurement time to handle occasions when there is rapid eye movement or when measuring a child's eye and accurate measurement is difficult. (→ P.17)

3 - 1 Auto Measurement Mode

- 1 Show the patient where to sit. Ask the patient to rest both hands on the lap.

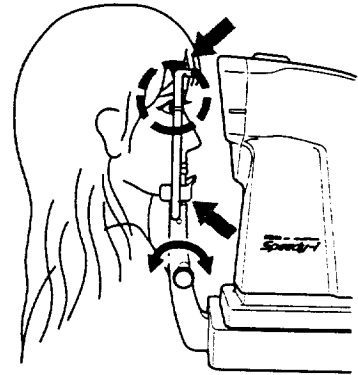
Adjust the height of the table or chair so the patient is comfortable.

- 2 Turn the chin rest height adjustment knob to align the patient's eye parallel with the height guide rings.

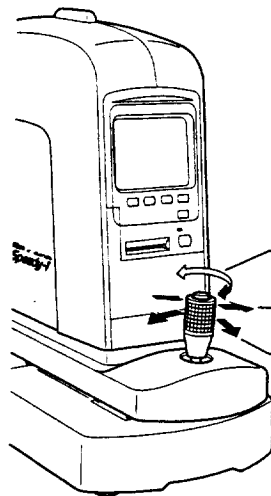
- 3 Fit the patient's forehead to the forehead rest and rest the patient's chin firmly on the chin rest.

- If the chin is not firmly in place, accurate measurement is not possible.

- 4 Move the joystick lever to position the measuring head so that the patient's eye is displayed on the screen. Once the patient's eye first appears on the screen, bring the image of the pupil to the center of the screen. (You may measure either eye first).



The following operations allow you to find the patient's eye easily

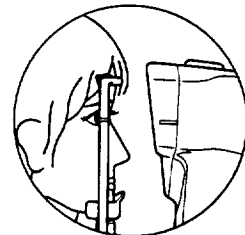


Turn: Moves vertically.

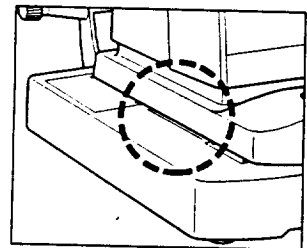
Tilt to left/right:
Moves to left/right.

Tilt to back/forth:
Moves to back/forth.

Movement of the joystick lever
and the measuring head motion

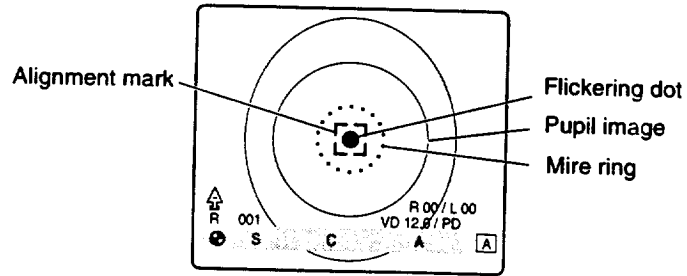


For vertical direction:
Align the head height mark
with the height guide ring
located on the chin rest bar.

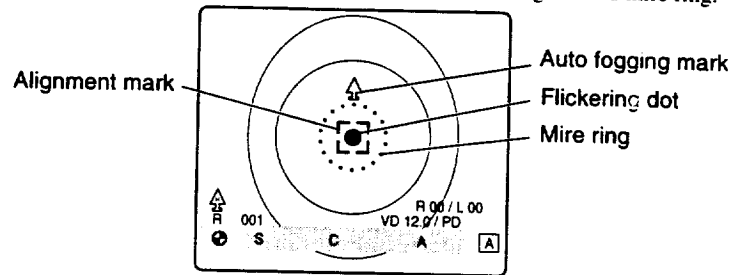


For lateral direction:
Align the edge of the sliding
seat with the target line on
the base.

- 5 Using the joystick lever, fine adjust the vertical and horizontal position to align the flickering dot with the center of the alignment mark.



- 6 When the flickering dot enters the alignment mark, a "△" mark will appear indicating that Auto Fogging is activated. If the flickering dot and mire ring are not clearly in focus, fine adjust the measuring head back and forth to ascertain the focus of the flickering dot and mire ring.

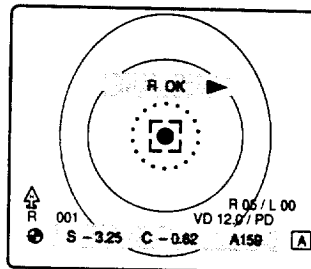


- Be sure to adjust the focus while observing the mire ring.

When the "△" disappears, measurement will start automatically.

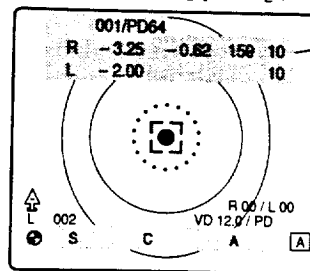
The unit will determine the cause of fluctuations in the measured values and will automatically end the measurement when measured values stabilize. The display on the TV monitor will be as in the figure below. (The figure is an example after the right eye has been measured.)

If you want to re-measure the right eye, press the measurement switch again at this point.



CAUTION Be careful not to bump the measuring head against the patient's nose when moving the unit left or right. (It is safe to move the unit left or right after first pulling it forward.)


- 7 Move the unit left or right and perform steps 4 through 6 for measuring the other eye. When finished measuring the other eye, the unit will automatically print out the measurement results. (→ P.17)
(The figure is an example of the TV screen during printing.)



Representative values for the left and right eyes and confidence values

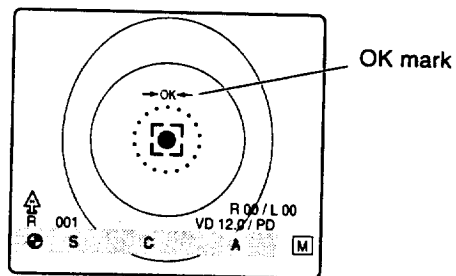
- After both eyes have been measured, the patient's PD value (pupil distance in mm) will be calculated. You may not obtain an accurate PD value in the following cases.
 - The patient's head moved during measurement.
 - The binocular function of the patient is not good.
- If there is any foreign matter (such as opacity in the crystalline lens caused by cataract, other opacity or scratches) obstructing the light from entering the pupil during measurement, it will appear as a black shadow. If there are any black shadows, observe the pupil in retro illumination mode (→ P.24) and proceed to further examination of the eye using the slit lamp.

3 - 2 Continuous Measurement Mode

- 1 Measure the patient's eyes using the same steps 1 through 6 as given in "3-1 Auto Measurement Mode".
 - ➡ In this mode, measurement does not end automatically, rather it is continuous.
 - ➡ Be sure to measure each eye at least five times.
Increase the number of measurements even more if there are fluctuations in the measured values or lots of eye movement.
Up to eight measurement results can be stored per eye.
- 2 Press the measurement switch when you want to end measurement for a given eye.
The alignment mark will blink and measurement will stop temporarily.
- 3 Measure the other eye in the same way.
- 4 Press the  key when you want to print out the measurement results. (→ P.17)

3 - 3 Manual Measurement Mode

- 1 Position the measuring head versus the patient's eye using the same steps 1 through 5 as given in "3-1. Auto Measurement mode".
 - In this mode, Auto Fogging does not activate even when the flickering dot enters the alignment mark.
- 2 If the flickering dot and mire ring are not clearly in focus, fine adjust the measuring head back and forth and stop it to ascertain the focus of the flickering dot and mire ring.
At this time, the fixation chart will automatically move slightly away from the far point of the patient's eye and an OK mark (→ OK ←) will appear.



- 3 Press the measurement switch when the OK mark (→ OK ←) appears.
Auto Fogging will activate at this point and the patient's eye will be measured.
 - Be sure to measure each eye at least five times. Continuous measurement is possible by holding down the measurement switch. Up to eight measurement results can be stored per eye.
- 4 Measure the other eye in the same way.
- 5 Press the **PRINT** key when you want to print out the measurement results. (→ P.17)

3 - 4 Quick Mode

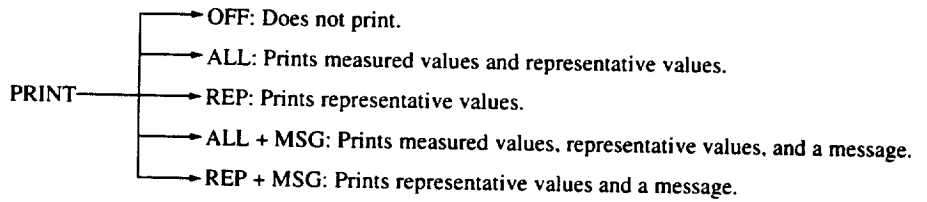
- ☛ Although the measurement time in Quick Mode is reduced to about half of the usual time, fluctuations in measured values may increase greatly.
- ☛ Do not use Quick Mode under normal conditions.
- ☛ A **Q** is printed on the print paper to indicate Quick Mode.

Pressing **QUICK /4** on the Measurement Mode screen will cause the measurement mode indicator on the screen to change to **Q** and the unit to enter Quick Mode. Pressing **QUICK /4** again will cause Quick Mode to be canceled.

- When pressing **QUICK /4** in Auto Measurement Mode or Continuous Measurement Mode, measurement will start from the point when the alignment flickering dot enters the alignment mark.
- Pressing **QUICK /4** in Manual Measurement Mode will cause the alignment mark to flash. Measurement will not start in this case even when the alignment flickering dot enters the alignment mark. When pressing the measurement switch at the point you want to make a measurement, the alignment mark will light and measurement will start.

3 - 5 Printing

- 1 In Auto Measurement Mode, measurement results are printed automatically after measurements are made. In Continuous or Manual Measurement Mode, press the **PRINT** key to obtain a printout. Communications with external devices conform to the communications settings made. (→ P.34)
Data is printed according to user settings. (→ P.27)



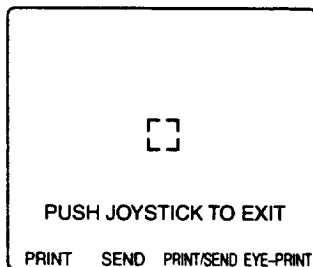
- Only the measured results for the last eight measurement cycles for each eye are printed out. (In Auto Measurement Mode, five measurement results for each eye are printed out.)
 - Measurement cannot be performed during printout.
 - The screen display is as shown on the figure of P.15 during printout.
- 2 The printed paper will come out of the unit. Tear off the paper by pulling upward.

Example of Printed Data

Patient's No.	No. 00113			Date and time of measurement	98. 4. 9 11:27 AM
Cornea vertex distance	Name:			Fixation chart brightness	CHART:H
Pupil distance	VD:12.0	PD:67.0			
Measured values for right eye	[R]	SPH	CYL	AX	
		-2.50	-1.12	114	
		-2.50	-1.12	114	
		-2.50	-1.12	115	
		-2.62	-0.87	113	
		-2.50	-1.00	114	
		-2.62	-1.00	113	
		-2.50	-1.12	114	
Representative values for right eye	*	-2.50	-1.00	114	10
	(S + C / 2 = -3.00)				
Measured values for left eye	[L]	SPH	CYL	AX	
		-1.87	-0.87	52	
		-1.87	-0.87	54	
		-1.87	-0.87	54	
		-1.87	-0.87	53	
		-1.75	-0.87	53	
		-1.75	-0.87	51	
		-1.87	-0.87	53	
Representative values for left eye	*	-1.87	-0.87	53	10
	(S + C / 2 = -2.25)				
	NIKON AUTOREFRACTOMETER				Message area
	SPEEDY - 1				

User settings in the above example: REF PRINT: ALL
 MESSAGE: ON
 TIME SETTING: 12-hour display

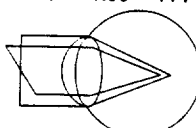
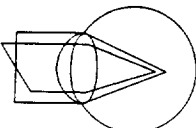
- 3 Press the **PRINT** key again if after printing you want to re-print (or resend) the data or if you want to make an eye print. The following screen will appear.



- Pressing **RETRO/1** will re-print the measured results.
- Pressing **△/2** will resend the data. (→ P.34)
- Pressing **VD/3** will re-print and resend the data. (→ P.34)
- Pressing **QUICK/4** will make an eye print.

Example of Eye Print Data

```

-- No.00113 -----
                        '98.4.9 11:27AM
Name:
VD:12.0  PD:67.0  CHART:H
[R]  SPH  CYL  AX
*   -2.50 -1.00 114 10

[L]  SPH  CYL  AX
*   -1.87 -0.87 53 10

NIKON AUTOREFRACTOMETER
SPEEDY-1
    
```

- 4 After printing, the following screen will appear if the RV IR ID setting (infrared transmission setting when there is more than one Auto Optester) is "SELECT". (→ P.30)

Select the ID number of the Nikon Auto Optester "Remote Vision" you want to send the data.

```

PRESS UNIT No.

PUSH JOYSTICK TO EXIT

1   2   3   4
    
```

- Pressing **RETRO/1** will send data to the Remote Vision with Unit No. "1".
- Pressing **Δ /2** will send data to the Remote Vision with Unit No. "2".
- Pressing **VD/3** will send data to the Remote Vision with Unit No. "3".
- Pressing **QUICK/4** will send data to the Remote Vision Unit with No. "4".

For details on setting the unit number for Nikon Auto Optester "Remote Vision", please refer to the Remote Vision instruction manual.

3 - 6 Miscellaneous

■ Automatic Fogging

The auto fogging mechanism aids measurement by facilitating patient eye fixation and minimizing eye accommodation.

In Auto Measurement or Continuous Measurement Mode, a Δ mark will appear on the monitor screen and auto fogging will be automatically activated when the flickering dot enters the alignment mark. When auto fogging ends, the Δ mark will disappear and measurement will automatically start.

In Manual Measurement Mode, pressing the measurement switch after the OK mark (→ OK ←) appears will activate auto fogging and measurement will be performed.

■ IOL Patients

This unit can measure IOL patient using the same procedure as normal eyes without any switching of switches.



■ Error Messages

The following table summarizes possible causes on the right when "ERR" appears on the screen. Methods of dealing with problems are given below the table.

Error message	Measurement mode	Cause
ERR	Auto Measurement Mode Continuous Measurement Mode	<ul style="list-style-type: none">• When measured values cannot be obtained for some reason even though alignment has been established. This may be due to eyelashes, blinking, irregular astigmatism, cataracts, small pupils, etc.
	Manual Measurement Mode	<ul style="list-style-type: none">• When the measurement switch is pressed when the flickering dot is not in the alignment mark.• When measured values cannot be obtained for some reason even though alignment has been established. This may be due to eyelashes, blinking, irregular astigmatism, cataracts, small pupils, etc.

- If "ERR" appears, align the flickering dot inside the alignment mark once more and press the measurement switch again.
- If a patient has drooped eyelashes, it will be necessary to make the eyelashes stay out of the outer line on the alignment mark on the TV monitor screen. If necessary, have the patient or an assistant gently lift the eyelid with their fingertip.
- In Manual Measurement Mode, it is good practice to press the measurement switch immediately after the patient blinks.
- The unit automatically re-measures if the patient blinks during measurement.
- The measurement may not be made if the patient is suffering from an eye disease such as a cataract, abnormal retina, opaque condition of the cornea, crystalline lens or vitreous body.
- If the patient's pupil is highly reactive to brightness, the fixation chart brightness setting should be reduced and then the eye measured. (→ P.26) The inner diameter of the mire ring is about 2.5 mm.
- When <S+C> is outside the range -18 to +23D, or when <C> is outside the range -12 to +12D, measurement cannot be made.
- Measurement with a contact lens on: Measurement is usually possible. However, if the contact lens is not properly fitted, the correct values may not be obtained. Any dirt or scratches on the contact lens surface may result in measurement failure.
- Measurement with glasses on: Measurement is possible if the lens is tilted slightly. If the lens is tilted at too large an angle, correct values will not be obtained. Measurement may not be possible if light is reflected from the lens surface into the measuring window, or if the glasses have a colored lens of low transmission.

■ Representative Values

Representative values are a guide to help you choose which one of the several measured values for one eye to choose. An asterisk (*) indicates the representative values on a printout.

-- No. 00113 -----			
98. 4. 9 11:27 AM			
Name:			
VD:12.0	PD:67.0	CHART:H	
[R]	SPH	CYL	AX
	-2.50	-1.12	114
	-2.50	-1.12	114
	-2.50	-1.12	115
	-2.62	-0.87	113
	-2.50	-1.00	114
	-2.62	-1.00	113
	-2.50	-1.12	114
	-2.50	-1.00	114
	* -2.50	-1.00	114 10
	(S + C / 2 = -3.00)		
[L]	SPH	CYL	AX
	-1.87	-0.87	52
	-1.87	-0.87	54
	-1.87	-0.87	54
	-1.87	-0.87	53
	-1.75	-0.87	53
	-1.75	-0.87	51
	-1.87	-0.87	53
	-1.75	-0.87	53
	* -1.87	-0.87	53 10
	(S + C / 2 = -2.25)		
NIKON AUTOREFRACTOMETER			
SPEEDY - 1			

Representative values
for right eye

Representative values
for left eye

When selecting from measured refraction values that vary widely, consider the following.

- Substantial variance of SPH values

The patient's eye may be accommodating. Re-measure the eye.

- Substantial variance of CYL and AX values

AX will tend to be somewhat unstable when the eye is weak astigmatically (CYL value of less than 0.5D). Other causes may include the following.

- Eyelashes are occluding the pupil.
- The pupil diameter is less than the minimum measurable diameter of ϕ 2.5 mm.
- Part of the eye is opaque or irregular astigmatically.

Normally a low confidence value will be reported in the above situations.

If the eyelashes or pupil diameter affect the measurement, you should re-measure the eye paying close attention to these factors.

■ Confidence Value

A confidence value indicates how widely measured results vary. It is only displayed when measurements are made three or more times and is printed at the right of printed results.

- 8 or higher: Variance is low
- 7 or less: There is variance. Care is required in the handling of these measured results.

-- No.00113 -----				98.4.9 11.27 AM	
Name:					
VD:12.0	PD:67.0	CHART:H			
[R]	SPH	CYL	AX		
	-2.50	-1.12	114		
	-2.50	-1.12	114		
	-2.50	-1.12	115		
	-2.62	-0.87	113		
	-2.50	-1.00	114		
	-2.62	-1.00	113		
	-2.50	-1.12	114		
	-2.50	-1.00	114		
	* -2.50	-1.00	114	10	Confidence value for right eye
	(S + C / 2 = -3.00)				
[L]	SPH	CYL	AX		
	-1.87	-0.87	52		
	-1.87	-0.87	54		
	-1.87	-0.87	54		
	-1.87	-0.87	53		
	-1.75	-0.87	53		
	-1.75	-0.87	51		
	-1.87	-0.87	53		
	-1.75	-0.87	53		
	* -1.87	-0.87	53	10	Confidence value for left eye
	(S + C / 2 = -2.25)				
NIKON AUTOREFRACTOMETER					
SPEEDY - 1					

■ Storing Measured Values

This unit can only store the representative values of refraction measurements for up to 300 patients. If an excess of representative values are stored, the older data will be deleted.

- In Auto Measurement Mode:

Data is automatically stored after measurements for right and left eyes are complete.

Press the **PRINT** key after completing one eye, if you want to store data for one eye only.

- In Continuous or Manual Measurement Mode:

Data is stored when the **PRINT** key is pressed after measurements for one or both eyes have been completed.

Data will be automatically stored after printing if the print setting PRINT = ALL or PRINT = REP is set. If PRINT = OFF is set, data will be stored without making a printout. The next measurement is possible after data has been stored. The patient No. will increase by one at this time.

■ Automatic Power Conservation

The unit will automatically enter power conservation mode if no switches or keys have been operated for three or more minutes. Press any key when you need to make measurements again.

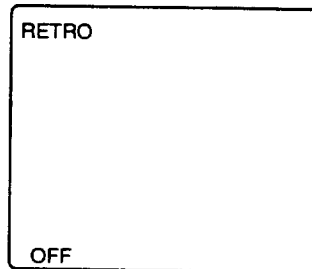


Retro Mode allows you to observe the inside of a pupil more easily and to more readily understand measurement status when the measured values vary or when the confidence value is low.

- 1 Press the **RETRO/1** key on the Measurement Mode screen.

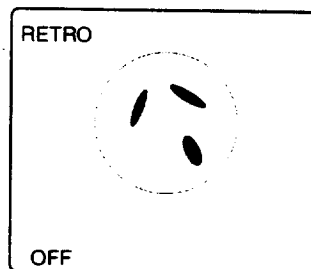
The unit will enter Retro Mode.

In Retro Mode, fixation chart brightness is automatically switched to "L".



- 2 Align the position of the measuring head with the patient's eye and focus the image if not already focused.

If there is foreign matter obstructing the measuring light such as opacity in the crystalline lens, it will appear as a black shadow on the screen.



- Foreign matter in the pupil may be more clearly seen if the image of the patient's eye is decentered slightly. In particular, an opacity at the center may not be visible. Direct the measuring light so that it is not obstructed by an opacity.
- If an external illumination such as a fluorescent room lamp enters the patient's eye, foreign matter in the pupil may not be visible. Be sure that no external light enters the patient's eye.

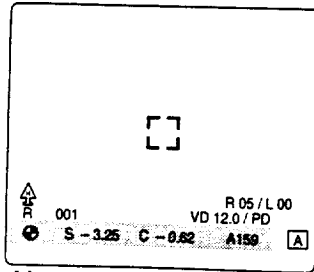
- 3 Pressing the **RETRO/1** key will cancel Retro Mode and resume the previous measurement mode.



Making Various Settings (Setup)

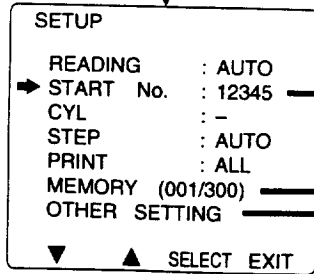


The following settings can be made for this unit.

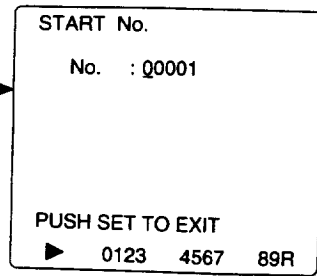


Measurement mode screen (see P.26)

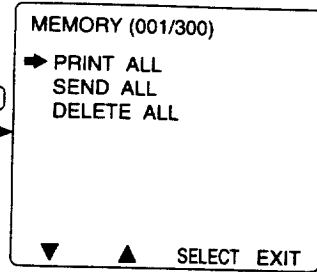
SET



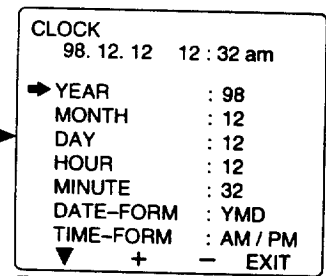
SETUP screen (see P.26)



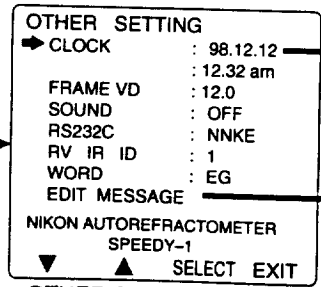
Patient No. input screen (see P.28)



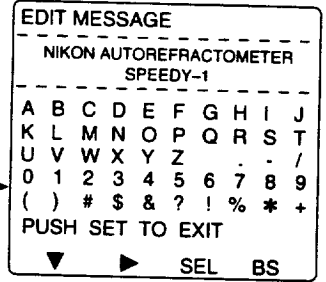
Memory output screen (see P.29)



Time and date setting screen (see P.32)



OTHER SETTING screen (see P.30)



EDIT MESSAGE screen (see P.33)

VD/3

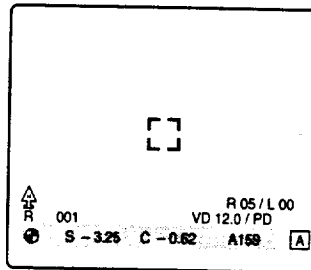
VD/3

VD/3

VD/3

VD/3

5 - 1 Measurement Mode Screen



"Fixation chart brightness" and "VD value" settings are made on this screen.

RETRO/1: Enters Retro Mode (→ P.24)

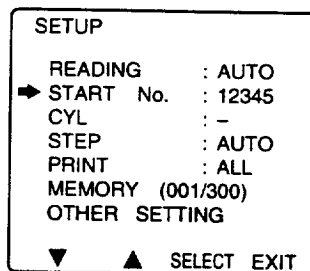
△/2: Changes fixation chart brightness: H (bright) → L (dark) → H (bright).....

VD/3: Changes corneal vertex distance: 12.0/13.75 → 0.0 → 12.0/13.75.....

QUICK/4: Enters Quick Mode (→ P.17)

SET: Enters "SETUP Screen" (below)

5 - 2 SETUP Screen



The following settings can be made on the "SETUP screen".

Use the **RETRO/1** and **△/2** key to move the cursor to the item you want to set, and use the **VD/3** key to select that item. Use the **QUICK/4** key to store the setting data and return to measurement mode.

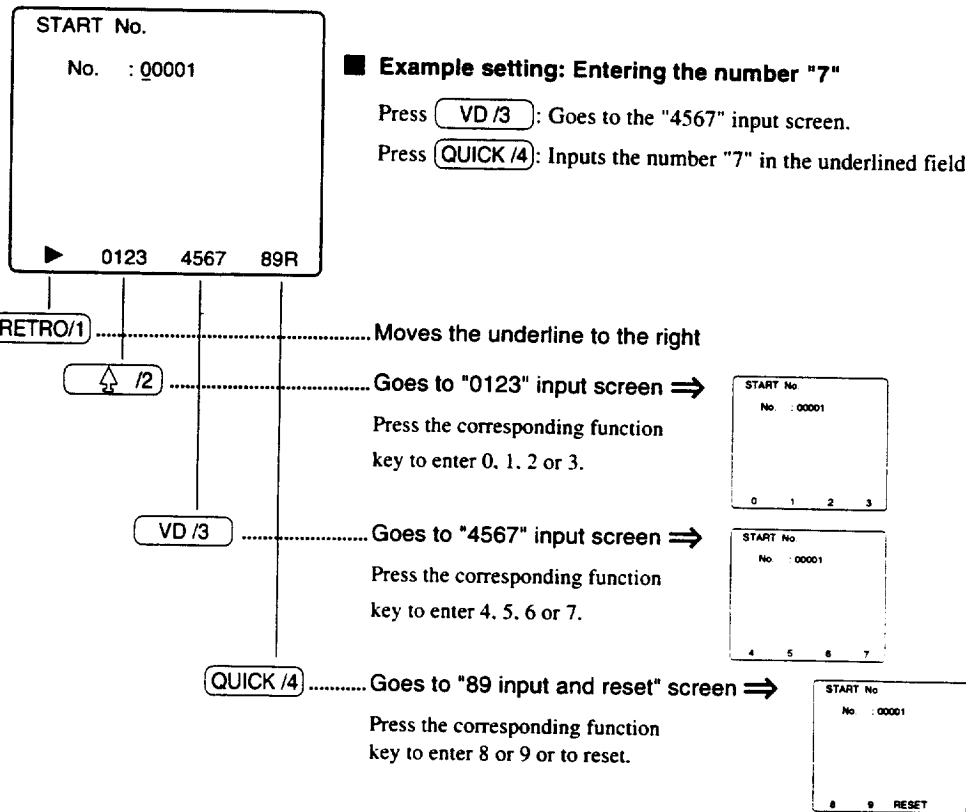
5. Making Various Settings (Setup)

Item	Setting Description	Available Selections
READING	Changes the measurement mode. <ul style="list-style-type: none"> • AUTO: Auto measurement mode (P.13) • CONTINUOUS: Continuous measurement mode (P.15) • MANUAL: Manual measurement mode (P.16) 	AUTO → CONTINUOUS → MANUAL
START No.	Pressing $\text{VD}/3$ when the cursor is at this item position will bring up the "Patient No. input screen".	—
CYL	Changes the sign of the cylindrical power. <ul style="list-style-type: none"> • - : Displays a minus sign for the cylindrical power • ± : Displays mixed signs for the cylindrical power • + : Displays a plus sign for the cylindrical power 	- → ± → +
STEP	Changes the minimum unit used for measured values. <ul style="list-style-type: none"> • AUTO: <ul style="list-style-type: none"> S: 0.12D steps for values within ±3D C: 0.12D steps for values within ±3D S: 0.25D steps for values above ±3D C: 0.25D steps for values above ±3D • 0.12: 0.12D steps for all values • 0.25: 0.25D steps for all values 	AUTO → 0.25 → 0.12
PRINT	Changes the data to be printed. <ul style="list-style-type: none"> • OFF: No printout. • ALL: Prints measured values and representative values. • REP: Prints only representative values. • ALL+MSG: Prints measured values, representative values, and a message. • REP+MSG: Prints representative values and a message. 	OFF → ALL → REP → ALL+MSG → REP+MSG
MEMORY	Pressing $\text{VD}/3$ when the cursor is at this item position will bring up the "Memory output screen".	—
OTHER SETTING	Pressing $\text{VD}/3$ when the cursor is at this item position will bring up the "OTHER SETTING screen".	—

5 - 3 Patient No. Input Screen

Pressing **VD /3** on the "SETUP screen" when the cursor is at "START No." will bring up the "Patient No. input screen".

Pressing a function key on this screen will display a "number input screen". Press the function key corresponding to the desired number to enter that number in the underlined field.



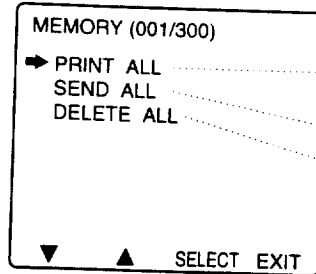
- The underline will go down one digit each time a number is input.
- To reset the patient No. to 00001, press the **VD /3** key on the "89 input and reset" screen.
- Pressing the **SET** key after setting all digits will return to the "SETUP screen".
- Once a patient No. is set, all patient numbers will be automatically increased by "1" for subsequent measurements.
- This screen is designed to enter the highest order digit first.

5 - 4 Memory Output Screen

Pressing **VD /3** on the "SETUP screen" when the cursor is at "MEMORY" will bring up the "memory output screen". From this screen, it is possible to print, delete or send via RS-232C all past measured value data (for up to 300 patients) stored by the unit.

- Data cannot be selected.
- The number in parentheses next to "MEMORY" indicates the number of data entries currently stored.

Position the cursor next to the desired item and press the **VD /3** key to execute that function.



Prints all stored data including representative values, dates, ID Nos. and so on in a list format.

Sends all stored data to another device.

Deletes all stored data.

RETRO/1: Moves the cursor down.

▲ /2: Moves the cursor up.

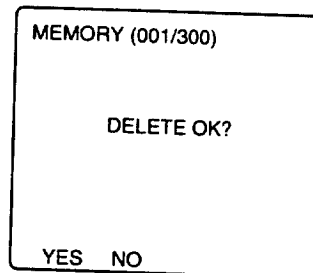
VD /3: Executes the item at the cursor position.

QUICK /4: Returns to "SETUP screen".

- A confirmation screen such as the following will appear if you attempt to execute "DELETE ALL".

Press **RETRO/1** (YES) to delete all data. Press **▲ /2** (NO) if you do not wish to delete all data.

After this screen, the unit will return to "memory output screen".



5 - 5 OTHER SETTING Screen

Pressing **VD/3** on the "SETUP screen" when the cursor is at "OTHER SETTING" will bring up the "OTHER SETTING screen".

From this screen, the following settings can be made.

Move the cursor to the item you want to set using the **RETRO/1** and **△/2** keys and select settings using the **VD/3** key.

Use the **QUICK/4** key to store setting data and return to the "SETUP screen".

OTHER SETTING	
➔ CLOCK	: 98.12.12 : 12.32 am
FRAME VD	: 12.0
SOUND	: OFF
RS232C	: NNKE
RV IR ID	: 1
WORD	: EG
EDIT MESSAGE	
NIKON AUTOREFRACTOMETER SPEEDY-1	
▼	▲ SELECT EXIT

Item	Setting Description	Available Selections
CLOCK	Pressing VD/3 when the cursor is at this item position will bring up the "time and date setting screen". (→ P.32)	—
FRAME VD	Sets the corneal vertex distance.	12.0 → 13.5 → 13.75 → 15.0 → 16.0 → 0
SOUND	Turns the sound ON/OFF.	ON → OFF
RS-232C	Sets the data to transmit on the RS-232C port. • OFF: Select this when nothing is connected to the RS-232C. • NNKE: Select this when connected to an Auto Optester "Remote Vision". • NK: Select this when connected to an Auto Optester "0T3A", "7A" or "8A". • PC: Select this when connected to a PC.	OFF → NNKE → NK → PC
RV IR ID	Sets the infrared communications destination when there is more than one Auto Optester "Remote Vision". • OFF: Select this when there are no infrared communications with a Remote Vision. • 1 to 4: Select the number of the Remote Vision with which you want to communicate. • SELECT: Select this when you want to select from more than one Remote Vision.	OFF → 1 → 2 → 3 → 4 → SELECT
WORD	Sets the language to use in on-screen displays and printouts. (See table on next page.)	EG → DN → DU → FR → GR → HN → IN → IT → NR → PL → PR → SP → SW → TR → JP
EDIT MESSAGE	Pressing VD/3 when the cursor is at this item position will bring up the "EDIT MESSAGE screen". (→ P.33)	—

Available Settings for WORD

	RIGHT	LEFT	SPH		CYL		AXIS		PD	VD
EG (ENGLISH)	R	L	S	SPH	C	CYL	A	AX	PD	VD
DN (DANISH)	H	V	S	SPH	C	CYL	A	AX	PD	VD
DU (DUTCH)	R	L	S	SPH	C	CYL	A	AS	PD	VD
FR (FRENCH)	D	G	S	SPH	C	CYL	A	AXS	PD	VD
GR (GERMAN)	R	L	S	SPH	C	CYL	A	ACH	PD	VD
HN (HUNGARIAN)	J	B	S	SZF	C	CYL	T	TEN	PT	VT
IN (INDONESIAN)	KN	KR	S	SPH	C	CYL	A	AX	PD	VD
IT (ITALIAN)	D	S	S	SF	C	CYL	A	AS	PD	VD
NR (NORWEGIAN)	H	V	S	SPH	C	CYL	A	AXS	PD	VD
PL (POLISH)	P	L	S	SF	C	CYL	O	OS	RZ	VO
PR (PORTUGUESE)	D	E	E	ESF	C	CIL	E	EIXO	DP	DV
SP (SPANISH)	D	I	S	SPH	C	CIL	A	AXE	PD	VD
SW (SWEDISH)	H	V	S	SF	C	CYL	A	AX	PD	TA
TR (TURKISH)	R	L	S	SPH	C	CYL	A	AXS	PM	VM
JP (JAPANESE)	R	L	S	SPH	C	CYL	A	AX	PD	VD

↑ ↑ ↑
Indication in printouts

5 - 6 Time and Date Setting Screen

Pressing **VD /3** on the "OTHER SETTING screen" when the cursor is at "CLOCK" will bring up the "time and date setting screen". From this screen, the time, date, time display format, and date display format can be set.

CLOCK		
98. 12. 12 12 : 32 am		
▶ YEAR	: 98	Year: 00 to 99
MONTH	: 12	Month: 1 to 12 or Jan to Dec
DAY	: 12	Day: 1 to 31
HOUR	: 12	Hour: 0 to 12 or 0 to 24
MINUTE	: 32	Minute: 00 to 60
DATE-FORM	: YMD	Date display format:
TIME-FORM	: AM / PM	YMD (year/month/day), MDY (month/day/year),
▼ + - EXIT		DMY (day/month/year), YMND (year/month name/day), MNDY (month name/day/year),
		DMNY (day/month name/year)
		Time display format: AM/PM, 24H

RETRO /1: Moves the cursor down.

▲ /2: Changes the contents of the selected item.

VD /3: Changes the contents of the selected item.

QUICK /4: Makes the settings and returns to the "OTHER SETTING screen".

5 - 7 EDIT MESSAGE Screen

Pressing **VD /3** on the "OTHER SETTING screen" when the cursor is at "EDIT MESSAGE" will bring up the "EDIT MESSAGE screen".

From this screen, messages up to 24 characters by 2 lines (48 total characters) can be input.

Pressing the **SET** key will store the message and return to the "OTHER SETTING screen".

EDIT MESSAGE									

NIKON AUTOREFRACTOMETER									
SPEEDY-1									

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	.	-	/	
0	1	2	3	4	5	6	7	8	9
()	#	\$	&	?	!	%	*	+
PUSH SET TO EXIT									
▼		▶		SEL		BS			

RETRO /1: Moves the cursor down.

▲ /2: Moves the cursor to the right.

VD /3: Selects the character at the cursor position.

QUICK /4: Goes back one space.



Connecting to External Devices



The power supply includes a connector for connecting to external devices. This connector is for interfaces which conform to the EIA RS-232C standard. It is possible to send measured results to external devices such as a Nikon Auto Optester or commercially available PC via this connector.

When a Nikon Auto Optester (such as OT3A, OT7A, OT8A or Remote Vision) is connected, the lens power data measured by Auto Refractometer is automatically transferred to the Auto Optester, allowing a speedier subjective examination.

If you create and run an appropriate software program on a PC, it is also possible to store data and statistically process it more efficiently.

For details on this interface, please contact your nearest Nikon representative.



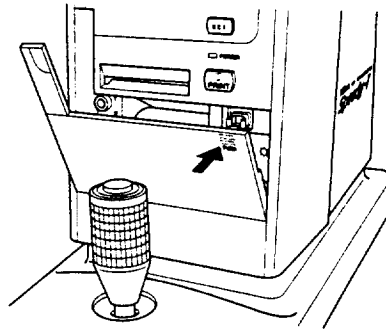
7 - 1 Checking Measurement Accuracy

Before using this unit check its measurement accuracy using the model eye provided.
For details on how to measure using the model eye and checking accuracy, refer to "2. Preparation".

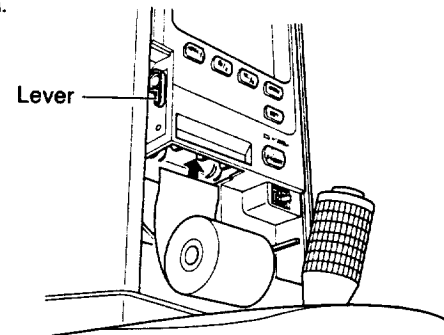
7 - 2 Replacing a Printer Paper Roll

When printer paper is about to run out, a red line will appear on the paper. In this case, replace the paper roll.

- 1 Turn the unit's power ON.
- 2 Push the "PUSH" part of the printer's cover, remove the cover, and remove the old roll.



- 3 Pull out the paper of the new roll past the location of the adhesive and crease it. Gently tear the paper along the crease. Tearing the paper in this way avoids printing on the part with adhesive. Also, if the sharp corners have been cut after tearing the paper, you can insert the paper more easily.
- 4 Insert the printer paper into the printer as shown in the figure.
 - ⚠ Do not insert the printer paper upside down.



- 5 Once the printer paper has been inserted into the printer, it will be automatically fed.
 - If the printer paper jams or is inserted at an angle, raise the lever and adjust the position of the printer paper.
 - The paper will not feed when the lever is raised.
 - If the printer paper is used up during printing, the message "PAPER END" will appear. If this happens, insert a new paper roll as previously described. Printing will start again from the beginning of the data. No key operations are accepted when the message "PAPER END" appears.
 - ⓘ Do not turn the unit's power OFF while the message "PAPER END" is displayed.
- 6 Replace the printer's cover.

7 - 3 Changing the Fuses



CAUTION Always turn the power switch OFF and unplug the power cord from the outlet before inspecting or changing fuses.

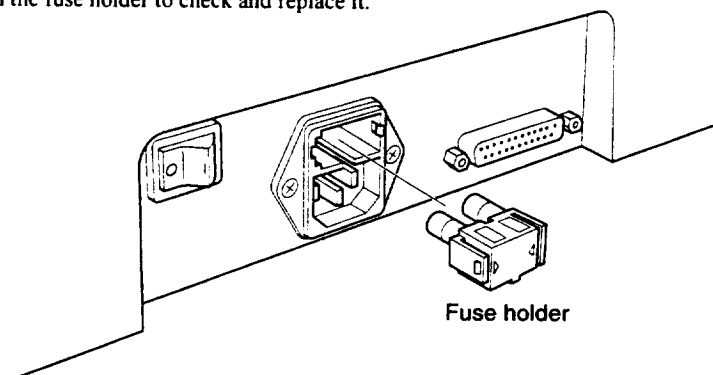
Use the following type of fuse for both fuses. Do not use any other type of fuse. Spare fuses may be ordered from your nearest Nikon representative.

"Time lag fuse T1AL/250V"

SCHURTER 0034.3117

A fuse may be blown if the POWER lamp and/or fixation chart do not light or the TV screen does not brighten even though the power switch is ON.

Unfasten the tabs on both sides of the fuse holder with the tip of a small flat-top screwdriver. Remove the fuse from the fuse holder to check and replace it.





7 - 4 Cleaning the Chin and Forehead Rests

Be sure to clean the chin and forehead rests periodically. Wipe these surfaces with a soft cloth or tissue paper moistened with lens cleaning liquid or absolute alcohol (commercially available).

7 - 5 Cleaning the Measurement Window

The measurement window is dust-resistant glass. If any dust on the glass is visible from the patient side, use the blower provided to powerfully blow air several times to remove the dust. If the dust cannot be removed, wipe the glass with a lens cleaning liquid or absolute alcohol (commercially available).

- ⚠ Because the dust-resistant glass is thin and fragile, do not press it too hard.

7 - 6 Cleaning the Model Eye

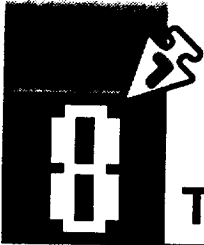
Sometimes correct values cannot be obtained when measuring the model eye due to dust or fingerprints on the model eye's lens surface. If this occurs, gently wipe the lens surface with a clean and soft cotton cloth (such as gauze) moistened with a little cleaning solution or absolute alcohol (commercially available) taking care not to scratch the lens surface. (Never use a handkerchief or degreased cotton wool.)

- ⚠ A microscopic scratch on the lens surface of the model eye may reduce the accuracy of measurement.

Be careful not to bump the model eye against a hard object or drop it on the floor.

7 - 7 Cleaning the Painted Components

Do not use organic solvents (such as alcohol, ether, or paint thinner) on painted components, plastic components, or printed labels. Doing so could result in discoloration or in the peeling of printed characters. If the dirt is hard to remove, dampen a piece of gauze with a small amount of neutral detergent thinned with water, then wipe the dirty surface gently.



Troubleshooting

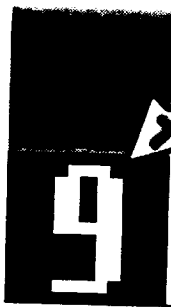


- Check the following items before requesting repairs.

Symptom	Check Point	Cause and Solution
POWER lamp does not light even though power is on.	Is the input power cord connected securely?	Securely connect the input power cord.
	Are the fuses blown?	If the fuses are blown, replace them. (→ P.36)
Cannot make measurements. Measured values are not stable.	Is foreign matter obstructing light inside the pupil?	Check the eye in Retro Mode. (→ P.24)
Does not print anything.	Are you using the specified paper?	Use the specified printer paper.
	Is the printer's lever released?	Lower the printer's lever toward you.
	Is the printer paper loaded upside down?	Insert the printer paper correctly. (→ P.35)
Paper is jammed. Paper does not come out easily.	Is the printer paper loaded correctly?	Insert the printer paper correctly. (→ P.35)
	Is the cover pressing on the printer paper?	Attach the cover correctly. (→ P.36)

- If any of the following errors appear on the screen, please contact your nearest Nikon representative as this indicates internal malfunction of the unit.

- ERR01
- ERR02
- ERR03
- BACKUP ERR



Specifications



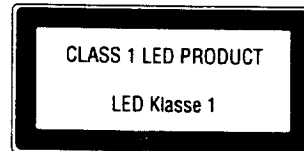
9 - 1 Measurements

Measurement range:	S + C: -18 to +28 Dp (measurement range for a VD value of 12) C: 0 to ±12 Dp AX: 1 to 180°
Minimum unit:	S, C: AUTO/0.25D/0.12D (switchable) AX: 1°
Corneal vertex distance:	0, 12, 13.5, 13.75, 15, 16 mm
Minimum pupil diameter:	φ 2.5 mm
Mire ring:	φ 22-mm, 18-dot LED for alignment
Measurement time:	Time to acquire one piece of data: 0.01 sec Time from measurement to display (shortest time during continuous measurement): approx. 0.2 sec/cycle
Measurement modes:	Auto measurement: Allows automatic start, stop and print all without any key operations Continuous measurement: Continuous measurement after automatic start Manual measurement: One measurement each time measurement switch is pressed, continuous measurement if held down
Fixation chart:	Picture target
Fixation chart illumination:	2-level switchable illumination
Retro illumination:	Pressing the RETRO/1 key allows retro illumination of the patient's eye.
PD measurement:	Up to 80 mm (depending on the sliding seat distance between left and right eyes) Minimum unit: 1 mm



9 - 2 Main Body and Miscellaneous

Main unit dimensions:	254 (W) x 480 (D) x 473 (H) mm
Weight:	Approx. 17 kg
Input voltage:	AC 100 V, 120 V or 230 V (50/60 Hz common) Voltage set by voltage switcher
Power consumption:	0.5 A, 0.4 A or 0.2 A
Real-time clock:	Built-in real-time clock for printing the year, month, day, hour and minute
Interface:	RS-232C standard interface x 1 Infrared communications with Remote Vision
Printer:	58-mm wide line printer
Monitor:	5.5-inch black and white monitor
Power saving system:	Enters sleep mode if no keys are pressed for three minutes
Eye diagram printout:	Yes
Eye data memory:	Up to 300 patients
Classification of device (EN60825-1:1994):	Class I LED product
Wavelength of LED:	855 to 870 nm
Radiation power:	245 μ Wmax
Chopped frequency:	600 Hz





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