Inami

MANUAL PHOROPTER

MANUAL

L-7040

VIEWLIGHT
POWERED BY INNOVATION

Before use this instrument, be sure to read this manual

EN

ACCESSORIES

- ☐ 1pair 0.12D Cylinders in Cells and 1 pair 2.00D Cylinders in Cells in Accessory Case
- ☐ 3 pairs White Nylon Face Shields
- ☐ Near Point Rotochart with Instructions
- ☐ Reading Rod
- ☐ Reading Rod Card Holder
- ☐ Dust Cover
- ☐ Clinical Manual on Refraction

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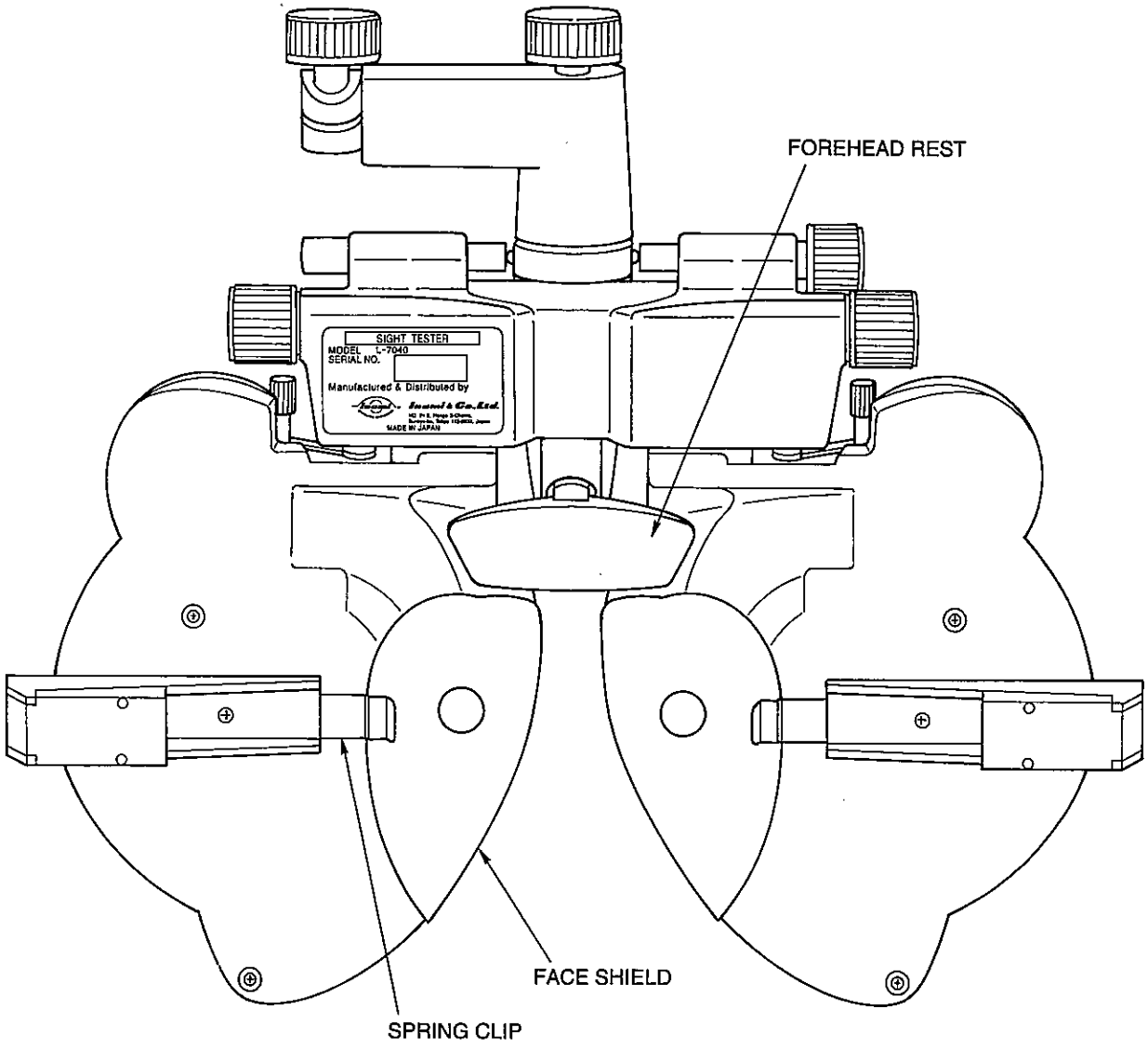
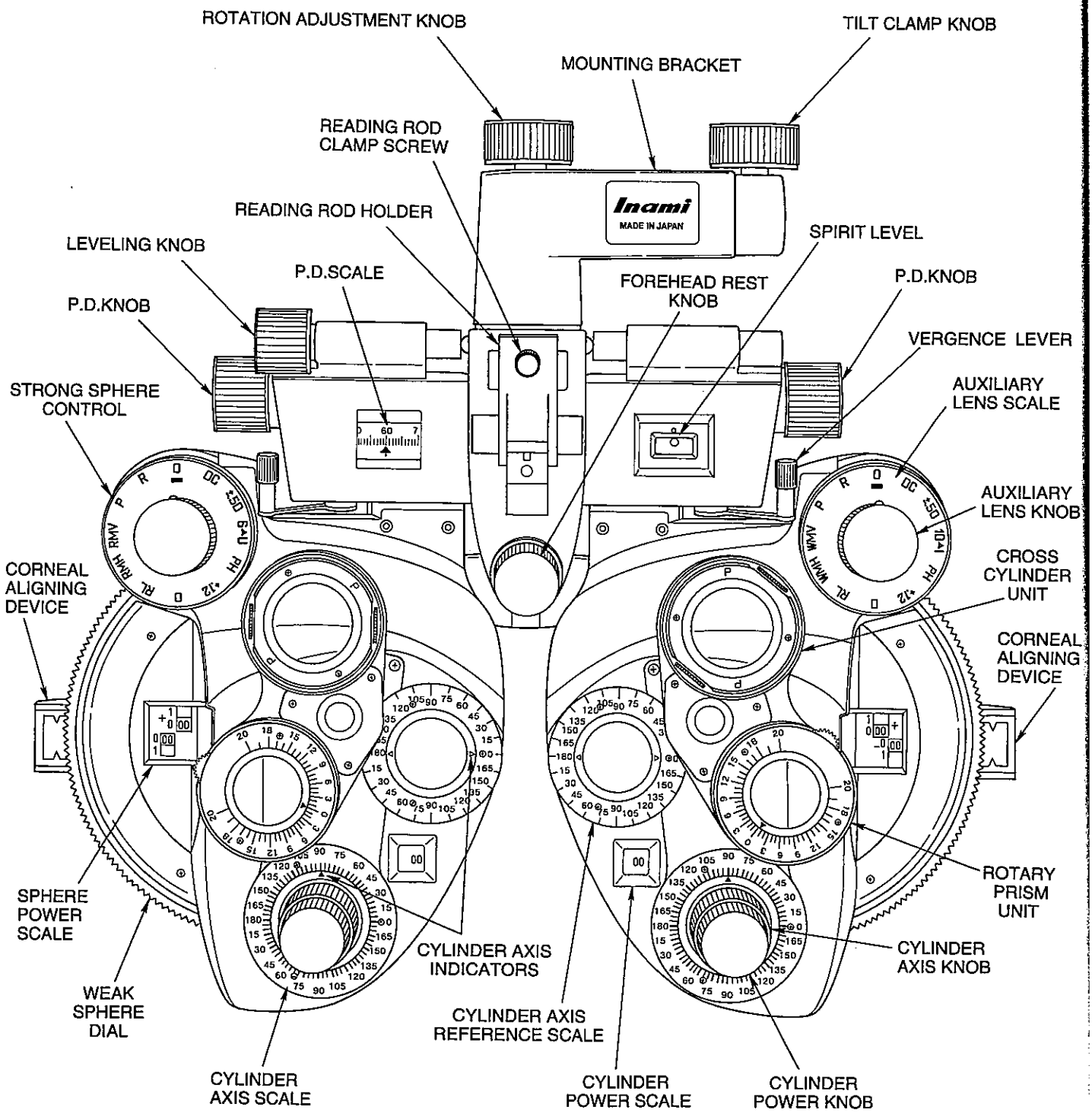
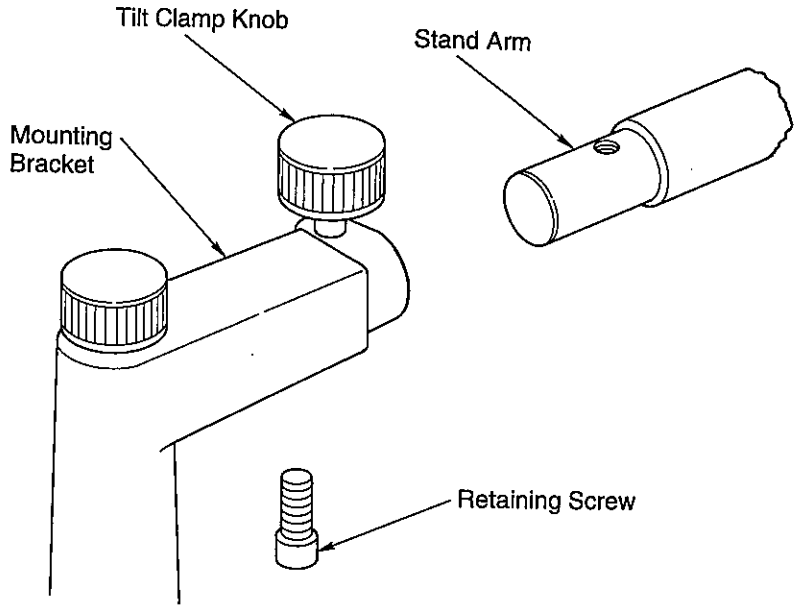
LOCATION OF CONTROLS AND PARTS-BACK VIEW



LOCATION OF CONTROLS AND PARTS-FRONT VIEW



PRELIMINARY PROCEDURE



1. Attaching PHOROPTOR® Refractor to Stand

a) Place the Refractor on the Instrument Stand arm by sliding the mounting bracket over the end of the arm until the threaded hole of the Stand arm lines up with the slotted hole in the bottom of the mounting bracket.

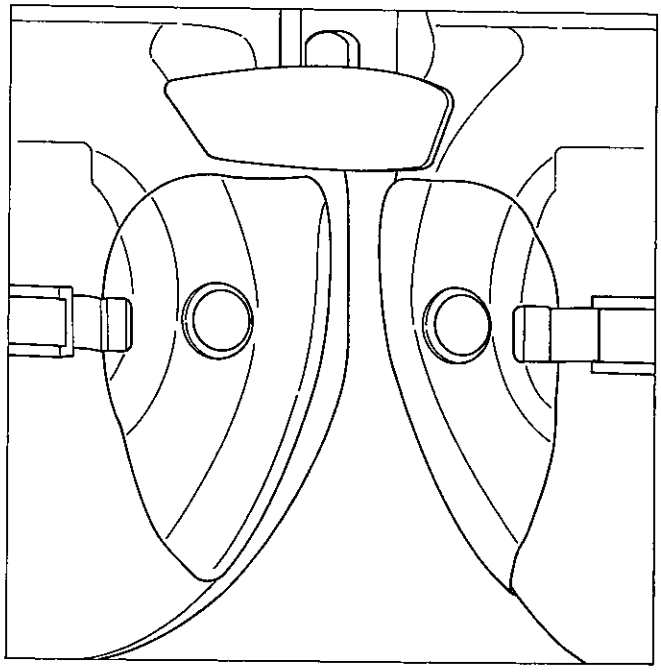
b) A screw has been provided to prevent the Refractor from falling off the Stand. Insert the screw up through the slotted hole and thread it into the Stand arm. Tighten the screw firmly in place.

c) Now the Refractor mounting bracket is securely fastened to the Stand arm. The instrument cannot slide off the arm, but can be tilted forward or back.

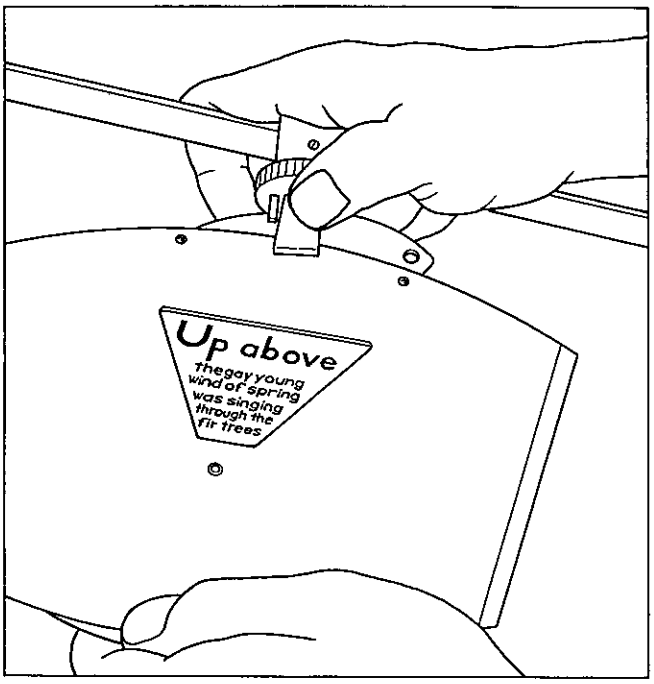
d) Tighten the tilt clamp knob and the PHOROPTOR Refractor will be held firmly in the desired position.

2. Attach Face Shields

Each face shield is held in place by a spring clip. Attach by sliding edge of face shield under the clip matching position of shield aperture to main aperture of the PHOROPTOR Refractor.



Face shields in place.



Attaching Rotochart to reading rod card holder.

3. Mount Rotochart

The card holder on the reading rod is specially designed for the Near Point Rotochart but spring clip will hold other cards. To attach Rotochart, insert one pin into hole; slide edge under clip; and insert other pin into second hole. By means of its knurled ring, the card holder can be rotaled to present the characters on either side of the Rotochart.

4. Attach Reading Rod

Insert reading rod into hinged reading rod holder and tighten reading rod clamp screw. The rod supplied with the PHOROPTOR Refractor is 28 inches long to allow testing for trifocal lenses. The graduations are in inches, centimeters, and diopters.

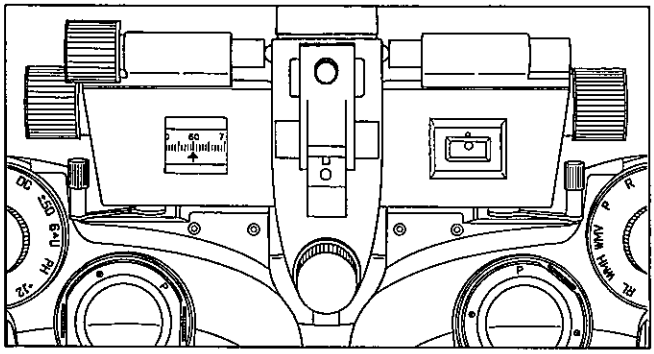
5. Level PHOROPTOR Refractor

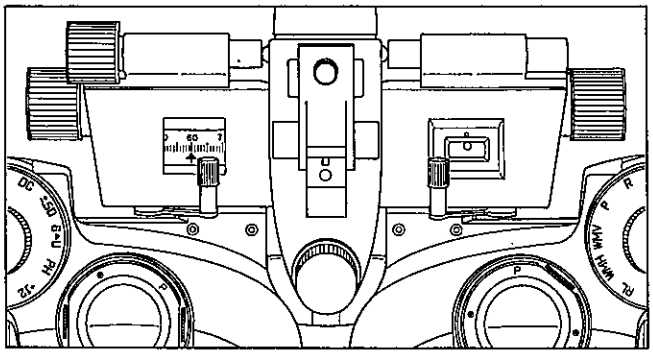
Move the Refractor into working position. Use the leveling adjustment knob, and watch spirit level,until instrument is leveled

6. Adjust Rotation Lock

This is an adjustable frication lock. Designed to hold the instrument in place but permits you to rotate the PHOROPTOR Refractor against a friction load. Knob allows friction adjustment to your preference.

BASIC OPERATING FEATURES


Vergence levers set for distance fests.


Vergence levers converged for near tests.

1. Distance Tests

All tests for distance (static retinoscopy, subjective, phorometry) are generally made with the vergence levers in the extreme outward position as illustrated. At this setting the lens systems are parallel. (For shorter test distances than 20 feet, compensatory adjustments may be made by moving the levers inward.)

2. Near Tests

All tests for near (dynamic retinoscopy, amplitude of accommodation, dynamic cross cylinder, positive and negative relative accommodation, phorometry) are generally made with the vergence levers in the inward (converged) position as illustrated.

With a distance PD of 64mm, moving both levers from the extreme outward position to the extreme inward position converges the instrument apertures for the near test at 16 inches. At the same time, aperture separation is decreased by 4mm.

For PD settings greater than 64mm, the instrument apertures are slightly underconverged; reducing the PD adjustment by 1mm or less compensates for it.For PD settings less than 64mm, the instrument apertures are slightly overconverged; this is corrected by slight outward adjustment of the levers. Do not attempt to fully converge the instrument below 55mm distance PD.

3. Operation of the Sphere Lens Dials

All sphere powers, plus and minus, can be introduced into the lens aperture in steps of 0.25D by rotation of a single lens dial, (+.12D sphere in Auxiliary Dial can be used to refine spherical correction to 1/8th D steps.) The operation is simple. Rotation of the weak sphere dial downward (i.e. clockwise for the battery before the patient's left eye, counterclockwise for that before the right eye) introduces more plus power or less minus. Rotation of the weak sphere dial upward introduces more minus power or less plus. Plus powers

are indicated by black numerals; minus powers, by red numerals.

An automatic pick-up system links the two sphere power dials so that whenever a change in power is required in the strong sphere dial it is automatically moved by the weak sphere dial. Thus, one may dial completely through the +16.75D to −19.00D range in 0.25D steps by rotation of only the weak sphere dial.

However, high power may also be introduced quickly and easily by means of the strong sphere control when desired. This control introduces sphere power in 3.00D steps and can often be used as a time saver.

EXAMPLES:

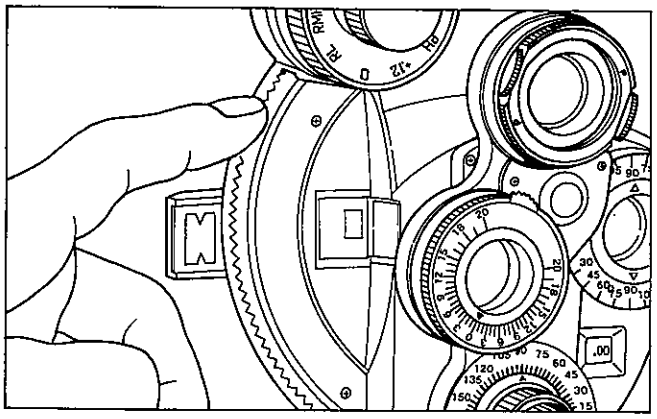
1. To obtain a power of +2.75D (starting from zero), the practitioner could add plus power in quarter diopter steps by rotating the weak sphere dial downward until +2.75D shows on the sphere power scale.

   A quicker way: rotate the strong sphere control nasally one index position to introduce a value of +3.00. Rotate weak sphere dial one index upward to reduce power to +2.75D.
2. To obtain a power of +7.00D (starting from zero) the quickest way: rotate strong sphere control nasally two index positions to introduce a value of +6.00D. Rotate weak sphere dial four index positions downward to increase power to +7.00D.
3. To obtain a power of −3.50D (starting from zero) the quickest way: rotate strong sphere control temporally one index to introduce a value of −3.00D. Rotate weak sphere dial two index positions upward to increase power to −3.50D.

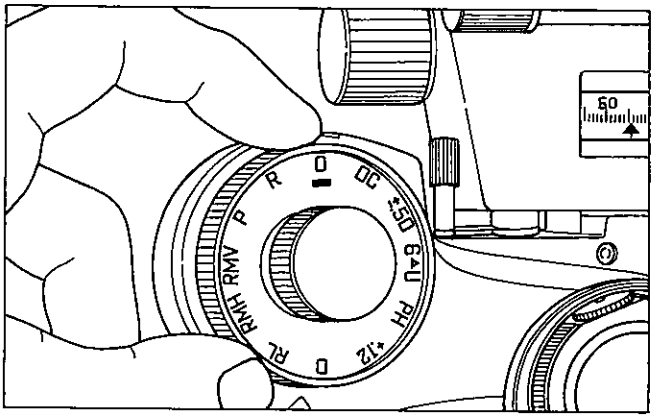
4. Cylinder Power and Axis

In the cylinder lens dials, the powers range from 0.00 to −6.00D for instruments containing minus cylinders, and from 0.00 to +6.00D for instruments containing plus cylinders. Cylinder power can be changed in steps of 0.25D throughout the full range by means of the cylinder power knob. To increase power, knobs are turned clockwise. A pair of 0.12D cylinders in accessory cells permits refinement to 1/8th D steps. A pair of 2.00D cylinders in accessory cells extends cylinder power range to 8.00D.

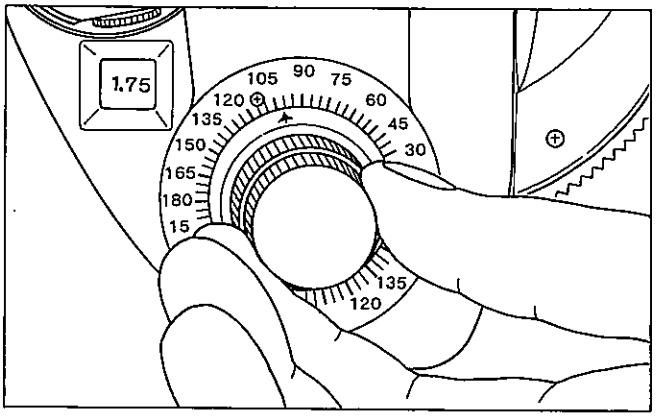
Large 360° protractors around the axis control knobs mark the position of the axis from 0° to 180° in steps of 5°. The Rx axis reading is made from the scale at the control knob. The axis scale around the aperture is provided for reference during retinoscopy. The cylinder axis control knob (concentric with power knob) can be continuously turned clockwise or counterclockwise to set the axis of the cylinder in any meridian from 0° to 180°



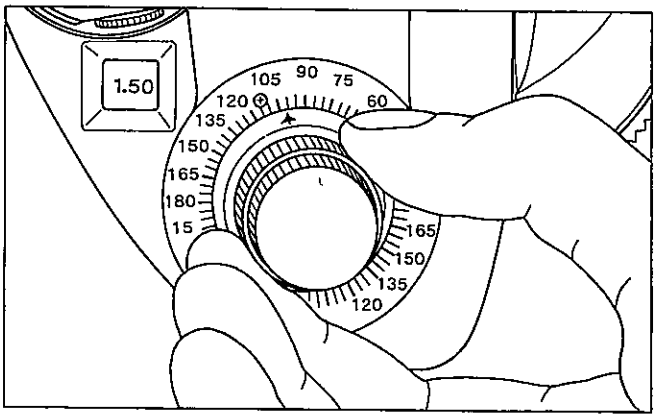
Moving weak sphere dial.



Rotating strong sphere control (surrounds auxiliary lens scale).



Turning cylinder power control (inner knob).



Turning cylinder axis control (outer knob).

5. Auxiliary Lens Dial

The Ultramatic Rx MASTER PHOROPTOR Refractor provides a selection of 10 auxiliary lenses plus two open apertures. Beginning at "O" (Open Aperture) at the top of the scale, the lenses will index into position in the following order as you turn the auxiliary dial knob clockwise:

"R"—RETINOSCOPIC LENS*...+1.50D;low reflection coated. Compensates for working distance during retinoscopy. For example, the standard 1.50D lens compensates for the convenient working distance of 26 inches.

"P"—POLARIZING LENS.. for binocular refraction techniques for example, when using the PROJECT-O-CHART® Vectograph Slides. Axis is 45° left eye, 135° right eye.

"WMV" or "RMV"—MADDOX ROD, VERTICAL*... white, left eye... red, right eye.

"WMH"or "RMH"—MADDOX ROD, HORIZONTAL*... white, left eye... red, right eye.

"RL"—RED LENS... for binocular vision tests.

"O"— OPEN APERTURE... second open aperture provided as a convenience feature... never have to turn all the way back.

"+.12"—+.12D SPHERE...refines spherical correction to 1/8thD steps.

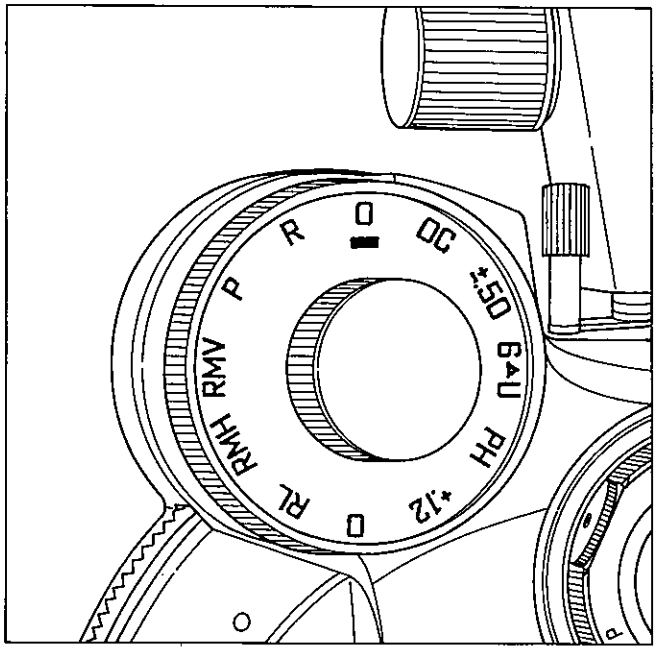
"PH"—PIN HOLE

"10 Δ 1" or "6 Δ U"—10 Δ BASE-IN LEFT EYE... 6 Δ BASE-UP RIGHT EYE... dissociating prisms.

"±.50"—±.50D FIXED CROSS CYLINDER*...Axis preset for dynamic CC and dissociated CC tests (described in Near Point Rotochart Manual)

"OC"—OCCLUDER

*NOTE: Should you wish to substitute special lenses in these positions at some future date, see page 13.



Auxiliary dial scale and control knob.

6. Rotary Prisms

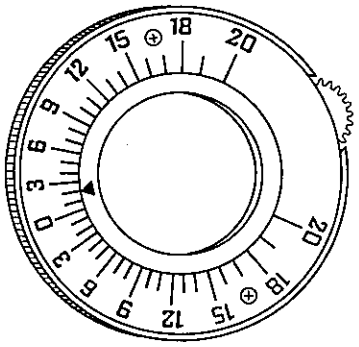
Each rotary prism unit (loupe) has a range of 20 Δ. Paired, prisms give 40 Δ in any base direction. The scale is marked in broad divisions of one prism diopter (Δ).

With turret positioned to place the rotary prism unit before the main aperture, the knurled edge of the unit is used to rotate the prism into position for base up/down or in/out prisms. (Unit indexes at 90° and 180°) Finger roll knob control prism power.

When the finger roll knob is placed up or down (over the 90° graduation on the axis scale), the rotary prism is correctly positioned for introducing base-in or base-out prism. When the finger roll knob is placed in or out (over the 0°/180° graduations on the axis scale), base-up or base-down prism can be introduced. The arrowhead on the moving cell indicates base direction.

EXAMPLE:

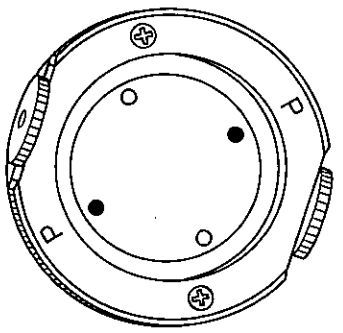
With the rotary prism set for introducing base-in or base-out prism, the arrowhead positioned nasally from 0 Δ denotes base-in prism.



Rotary Prism Unit.

7. Cross Cylinders

The standard cross cylinder cells supplied are ± 0.25D. These cells are removable and ± 0.37D and ± 0.50D are available and may be substituted. The power of the cross cylinder is engraved on the cell. Red dots indicate the minus axis, and white dots the plus axis. A thumb-operated roll knob provides for rapid "flipping" of cross cylinders. The simplified, synchronized action of the cross cylinder unit is described in the manual under "Jackson Cross Cylinder Tests", page 8.



Cross Cylinder Unit.

JACKSON CROSS CYLINDER TESTS

One of the unique features of the Ultramatic Rx Master PHOROPTOR Refractor is that the Cross Cylinder Unit (Loupe) lenses are geared together with the correcting cylinder test lenses so that when a change in axis is made in the latter, a corresponding change will automatically occur in the axis of the Cross Cylinder Lenses.

This feature relieves the practitioner of the necessity of manually changing the Cross Cylinder axis each time the correcting cylinder axis is changed.

NOTE: Because most practitioners prefer to check cylinder axis before checking cylinder power, the procedure is written in this sequence. If you prefer to check power first, reverse the sequence and perform a final power check after the axis check.

PROCEDURE

With the tentative sphere and correcting cylinder (determined by retinoscopy and/or the astigmatic chart) in place, the Cross Cylinder Unit is positioned before the aperture of the eye being tested. The patient fixates the smallest line of letters he can read.

Axis Check

Visual indication that the Cross Cylinder Unit is in correct position for Axis Check is that the position of the knurled flip knobs (handles) correspond to the axis of the correcting cylinder (just like when using the handheld Cross Cylinder), and the Red and White dots are 45° from the correcting cylinder axis.

If the Cross Cylinder isn't in the proper position (i.e. axis 45° to correcting cylinder axis), all the practitioner has to do is rotate the Cross Cylinder Unit 45° counterclockwise to detent.

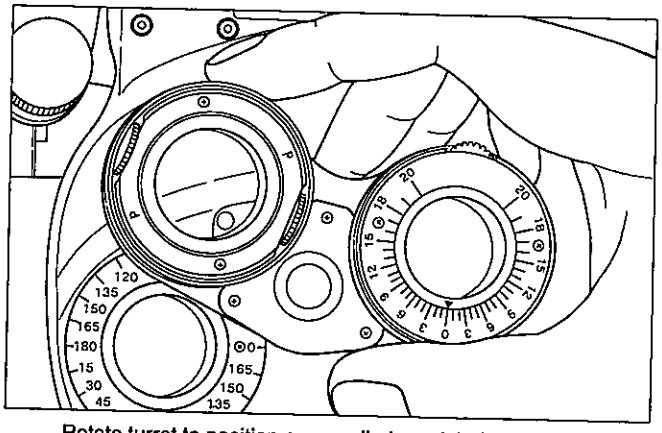
The axis check test is performed in the usual mannar with the Cross Cylinder Lens flipped from Position I to Position II, and:

(a) If vision is improved in one position, but made worse in the other position, the minus* correcting cylinder axis is rotated toward the position of the Red dots in which vision is improved.

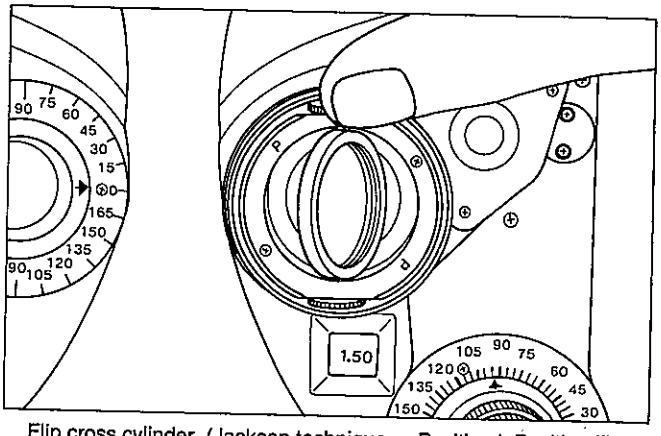
NOTE: As the correcting cylinder axis is rotated, the Cross Cylinder axis is automatically rotated a corresponding amount. Hence, the practitioner does not have to manually rotate the Cross Cylinder the same amount as the correcting cylinder for the subsequent rechecks.

(b) Again recheck for axis following any modification made in the correcting cylinder axis and by following procedure as in (a) until final end-point is reached.

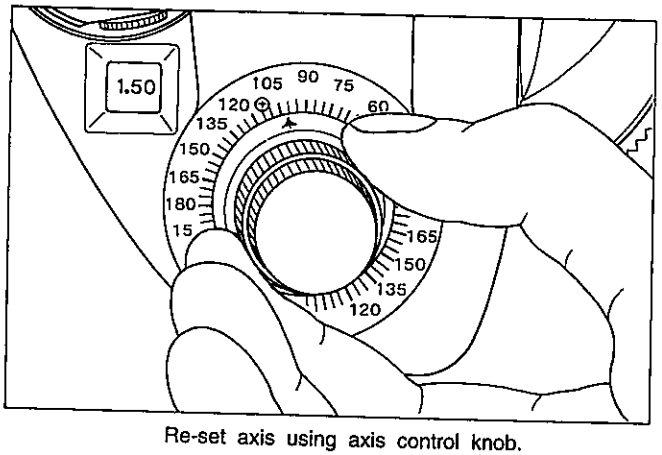
(c) End-point is reached (i.e. correcting cylinder axis is correct) when vision is equally impaired by flipping Cross Cylinder Lens from Position I to Position II.



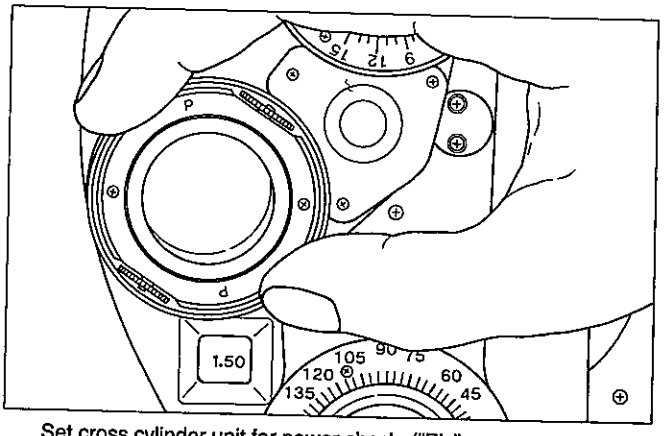
Rotate turret to position cross cylinder unit in front of main aperture. (Flip knobs should correspond to the axis of the correcting cylinder.)



Flip cross cylinder. (Jackson technique — Position I, Position II)



Re-set axis using axis control knob.



Set cross cylinder unit for power check. ("P's" on cross cylinder unit should be parallel to correcting cylinder axis.)

Power Check

The Cross Cylinder axis should correspond to the correcting cylinder axis for Power Check. Visual indications of proper position are that the Red or White dots on the Cross Cylinder Lens and the letters "P" (for power) on the Cross Cylinder Unit are parallel to the correcting cylinder axis.

Since the Cross Cylinder is in the axis check position, the practitioner merely rotates the Unit 45° clockwise to the detent for proper Power Check positioning.

The power check test is performed in the usual manner with the Cross Cylinder Lens flipped from Position I to Position II, and:

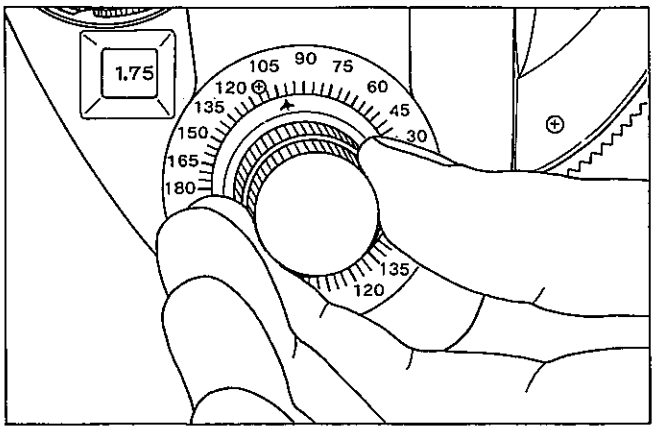
(a) If vision is better with Red dots parallel to correcting minus* cylinder axis, power of correcting cylinder is increased.

(b) If vision is better with Red dots perpendicular to correcting minus* cylinder axis, power of correcting cylinder is reduced.

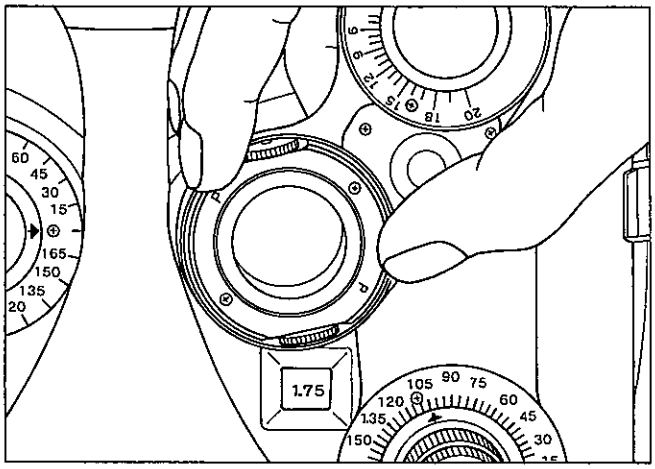
(c) End-point is obtained (i.e. correcting cylinder power is correct) when vision is equally impaired by flipping Cross Cylinder Lens from Position I to Position II.

At the end of each refraction, the Cross Cylinder Unit should be rotated 45° counterclockwise to the detent so that for the next refraction the Cross Cylinder axis will be positioned 45° from the correcting cylinder axis (i.e. thumb roll knobs parallel to arrows on axis knobs). This presets the instrument for the Axis Check during the next refraction.

*** When plus, instead of minus, correcting cylinders are used, attention is given to the White dots, instead of the Red dots on the Cross Cylinder Lens.**



Adjust power using power control knob.



Rotate cross cylinder unit 45° counterclockwise to preset for axis check in the next refraction.

USE OF OPTICAL CORNEAL ALIGNING DEVICE

PHOROPTOR Refractor provides an optically additive lens system and an optical corneal aligning device ... both essential for a true additive effective power determination.

The additive lens system, pioneered by Reichert Scientific Instruments, refers to the addivity of lens powers. The effective power combination of two or more lenses can not be obtained accurately by simple addition of their individual powers. Allowances must be made which depend in an intricate way on the powers, the curves, the thicknesses, the index of glass, and the air space separating the lenses. Accordingly, in the PHOROPTOR Refractor, two essential features have been incorporated to insure the accuracy of the lens prescription.

1. Specially computed lenses and lens separations such that their designated powers can simply be added together to give the effective power of any possible combination.

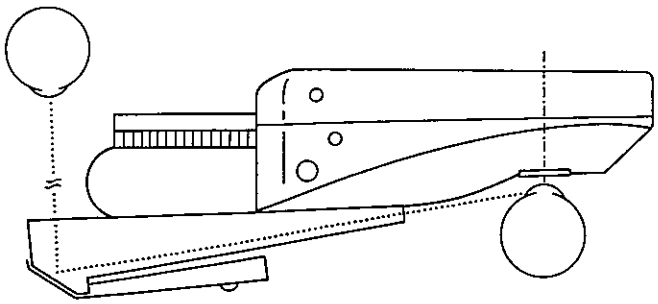
2. A means for placing this additive lens power system at a specified distance from the eye.

When either of these elements is neglected, the corrective accuracy of the lens system is impaired, particularly with regard to combinations of high power lenses.

The distance at which the spectacle lens is generally worn is considered to be 13.75 mm from the apex of the cornea to the ocular surface of the lens. With this as the standard, the posterior lens surface of the Refractor must be placed at a distance of 13.75mm if the Refractor reading is to be directly applied to spectacle lens power. In the PHOROPTOR Refractor, this condition is obtained when the zero setting of the sight in the corneal aligning device is lined up with the apex of the cornea.

To establish proper distance between the patient's eyes and the instrument, adjust the position of the forehead rest using the knurled forehead rest knob. Make certain that the patient's forehead is resting firmly against the headrest. This adjustment will move the patient's eyes nearer to or farther from the instrument.

From the front of the instrument look into the corneal aligning device. The upper and lower pointers should be



in exact alignment with the solid black line visible on the mirror. This is the zero point indicating a 13.75mm distance from the apex of the patient's cornea. Also visible are three hash marks, each representing 2 mm additive distance.

With the patient's forehead positioned against the headrest, adjust the headrest to position the apex of the cornea at the zero line (13.75mm from the lenses). If with the headrest retracted, the apex of the cornea appears nasally from the zero line, simply add the distance to 13.75mm. (This figure is the total distance from the cornea to the strong sphere or the refracting distance.)

The scale reading of the corneal aligning device is used with the Correction Factor Table to determine the correction factor for the power reading. The correction factor is always added to the PHOROPTOR Refractor reading as a plus quantity.

Examples:

a) If the refractor reading is +8.00D and the cornecal aligning device scale indicates an additional 4mm, the correction factor according to the table is +0.27. Therefore, the power of the correcting lens is obtained by adding +0.27 to +8.00 diopters, which equals +8.27 diopters, when the spectacle lens is worn at 13.75mm from the cornea.

b) If the refractor reading is –11.50D, and the corneal aligning device indicates an additional 5mm, it is necessary to interpolate to obtain the correction factor. Interpolating between –11.00 and –12.00, the correction factor according to the table is +0.62; Therefore, the power of the correction lens is obtained by adding +0.62 to –11.50, which equals –10.88 diopters, when the spectacle lens is worn at 13.75mm.

The tables can also be applied in the case where the spectacle lenses are to be worn at one distance, the test is made at another distance, and neither distance is at 13.75mm.

For example: First assume the corneal aligning device indicates an additional 4 mm; that the spectacle lenses are to be worn at 12mm instead of 13.75mm:and that the refractor reading is +13.00 diopters. In this case, fitting distance of 12mm is subtracted from the refracting distance of 17.75mm (13.75mm plus 4mm), the result being 5.75mm. In the table for plus refractor readings at the horizontal row corresponding with +13.00 diopters, the value of 5.75 falls between the 5mm and 6mm columus. By interpolation, the addition is found to be 1.05D. Hence, the power of the spectacle lens should be +13.00 plus +1.05 for a total of +14.05 diopters.

CORRECTION FACTOR TABLE
PLUS

Refractor Power Readings	1 mm	2 mms	3 mms	4 mms	5 mms	6 mms
+ 1.00	.001	.002	.003	.004	.005	.006
+ 2.00	.004	.008	.01	.02	.02	.02
+ 3.00	.01	.02	.03	.04	.05	.06
+ 4.00	.02	.03	.05	.07	.08	.10
+ 5.00	.03	.05	.07	.11	.12	.15
+ 6.00	.04	.07	.10	.16	.18	.21
+ 7.00	.05	.10	.14	.21	.25	.29
+ 8.00	.06	.13	.19	.27	.33	.39
+ 9.00	.08	.16	.24	.34	.42	.51
+10.00	.10	.20	.30	.42	.52	.64
+11.00	.12	.25	.37	.51	.64	.78
+12.00	.15	.30	.45	.61	.77	.93
+13.00	.18	.35	.53	.72	.91	1.10
+14.00	.21	.41	.62	.84	1.06	1.29
+15.00	.24	.47	.71	.97	1.22	1.49
+16.00	.27	.53	.81	1.11	1.39	1.71
+17.00	.30	.60	.92	1.26	1.58	1.94
+18.00	.33	.67	1.03	1.41	1.78	2.19
+19.00	.37	.75	1.15	1.57	1.99	2.47
+20.00	.41	.83	1.28	1.74	2.22	2.78

CORRECTION FACTOR TABLE
MINUS

Refractor Power Readings	1 mm	2 mms	3 mms	4 mms	5 mms	6 mms
- 1.00	.001	.002	.003	.004	.005	.006
- 2.00	.01	.01	.02	.02	.02	.03
- 3.00	.01	.02	.03	.04	.04	.05
- 4.00	.02	.03	.05	.06	.08	.09
- 5.00	.03	.05	.07	.10	.12	.15
- 6.00	.04	.07	.10	.15	.17	.22
- 7.00	.05	.10	.14	.20	.24	.30
- 8.00	.06	.13	.19	.25	.31	.38
- 9.00	.08	.16	.24	.31	.39	.47
-10.00	.10	.20	.30	.38	.48	.57
-11.00	.12	.24	.36	.46	.57	.68
-12.00	.14	.28	.42	.55	.67	.80
-13.00	.16	.33	.48	.64	.78	.94
-14.00	.19	.38	.55	.74	.90	1.08
-15.00	.22	.43	.63	.85	1.03	1.23
-16.00	.25	.49	.72	.96	1.17	1.39
-17.00	.28	.55	.81	1.08	1.32	1.56
-18.00	.31	.62	.91	1.21	1.48	1.74
-19.00	.35	.69	1.02	1.34	1.65	1.93
-20.00	.39	.77	1.13	1.48	1.82	2.14

SUGGESTED PREPARATION FOR REFRACTION

Techniques in preparing for refraction vary considerably. The points covered here are offered as suggestions which can be arranged and modified to comply with your own particular technique.

Room illumination should be adequate for the practitioner to see both patient and PHOROPTOR Refractor. If room and instrument stand light are not sufficient, it may be necessary to use the light from the retinoscope, transilluminator, or pen pocket flashlight to see cornea and pupils in the center of the aperture.

To assure that the patient's eyes are fixating properly, a distant target, such as a (muscle) light or single large letter from the PROJECT-O-CHART Projector, may be used.

The importance of properly adjusting the PHOROPTOR Refractor to the patient at the start of the examination cannot be overemphasized. To avoid fatigue, make certain that the patient is seated in a comfortable position so that, without undue effort, he will keep his eyes centered with the apertures of the Refractor. The features of a modern Reichert Chair contribute appreciably to the ease in which the patient can be made comfortable.

If the Chair has been lowered to its lowest position for seating of the patient, the Chair should be raised until the patient's eyes are on a level with the practitioner's eyes in his normal working position.

The PHOROPTOR Refractor should be moved close to the patient's face and positioned so that his eyes and the Refractor apertures are on the same level. The top line of the test chart should be level with or slightly below the lens apertures. With the above accomplished, lock arm motion.

Adjust Refractor forehead rest so that the patient's cornea are approximately 13.75mm from the lenses.

Note: When it is known or suspected that the patient has a significant refractive error, use the Corneal Aligning Device rather than visually judging distance. For use of Corneal Aligning Device, see page 9.

When using the Chair headrest, it should be brought forward until the pads rest against the patient's head. The patient should not be allowed to move his head backward to meet the headrest as this will invariably cause him to tilt his head.

After the headrest is locked into position, the inter-pupillary adjustment is made by turning either P.D. adjustment knob until the pupil of each eye is centered behind its respective aperture while the patient is looking straight ahead.

If the patient's head is held level in the headrest, and the spirit level shows the bubble in the center, both eyes should appear on the same horizontal level in the apertures. If one eye is higher than the other, it will be observed by noting the position of the pupils in the apertures.*

***When this occurs, the question of tilting the PHOROPTOR Refractor arises. The patient may have inadvertently tilted his head or he may have an anatomical anomaly. Depending upon whether the patient's glasses are to be adjusted to center the lenses before his eyes or decentered vertically to compensate for the vertical imbalance of the eyes, the Refractor may or may not be tilted to center the patient's eyes in the apertures.**

CARE, CLEANING, ADJUSTMENTS AND LENS REPLACEMENT

INTRODUCTION

To keep your PHOROPTOR Refractor in perfect operational condition and add to instrument life, review this section of the instruction manual carefully. It will aid you in perfomning a few basic servicing tasks and help you derive full value from your instrument.

KEEP YOUR INSTRUMENT CLEAN

Make it a habit to always keep your PHOROPTOR Refractor covered when it is not in use. The dust cover provided will aid in keeping lenses clean and keep dust from working inside the instrument and eventually contaminating the lubricant.

Keep the exterior surfaces free of dust and dirt by periodically wiping with a soft cloth. All lens disc apertures are "open" when the sphere power scale and cylinder power scale read zero and the auxiliary lens dial knob is set at "0". Do not test for an open aperture by inserting fingers in the aperture as lens surfaces contacted will be soiled.

SANITARY FACE SHIELDS

The semi-permanent face shields furnished with the Refractor are made of white nylon. This material can be washed with soap and water, soaked in alcohol, or boiled in water.

CLEANING THE LENSES

All lenses should be kept clean and free of dust, fingerprints, etc. How rapidly lenses become soiled depends on many factors: whether the office has air conditioning or windows are opened for ventilation; adjacency of industry; humidity; the amount of smoking in the office, etc.

Suggestions are offered here for the self cleaning of lenses. It is advisable, however, to have the lenses cleaned approximately once a year by a competent, experienced service man. It is generally good preventative maintenance to have mechanical assemblies cleaned and relubricated at the same time.

In a thorough cleaning procedure, there are a total of 168 lens surfaces to be cleaned. Lens surfaces can be reached for cleaning through the front or rear instrument apertures and it should not be necessary to separate the batteries. A common rubber ear syringe will be found useful in blowing dust from lens surfaces.

Use caution to keep the syringe clean so that it will not soil lens surfaces which it may accidentally touch. If dust persists, then a careful, light brushing of the lens surface with a camel's hair brush followed by syringe action will often prove helpful.

For complete cleaning of lenses, a soft surfaced cleaning tool is desirable. An efficient cleaner can be fashioned by rolling a strip of soft, lint-free linen around a slim, soft-wood stick so that a roll of cloth about 3/16″ -1/4″ in diameter with a flat end is formed. The cloth should project beyond the end of the supporting stick. As the cleaning end of this tool becomes soiled, clip the soiled end with scissors to expose a new clean surface or reroll with fresh cloth. Slightly moistening the tip of this tool with lens cleaning solution is desirable.

Indirect illumination from a standard lamp bulb through the instrument apertures will help identify soiled lenses. Lenses may be cleaned with the PHOROPTOR Refractor in place on the Instrument Stand for easiest handling or the instrument may be removed and supported on a sturdy, padded table.

PROCEED AS FOLLOWS

1. Rotate Turret so no loupes are in front of viewing apertures.
2. Set all scales at zero or open.
3. Adjust PD to its extreme position (75mm).
4. Set the instrument for distance (unconverged).
5. Clean lenses by dialing into position consecutively the following lens powers and cleaning both front and back lens surface as each one is brought to the aperture —

   a. Cylinder powers

.25,	.50,	.75,	1.00,
1.25,	2.50,	3.75,	5.00

   b. Return cylinder power scale to zero.

   c. Sphere powers (by rotating the knurled dial)

+1.75,	+1.50,	+1.25,	+1.00,
+ .75,	+ .50,	+ .25,	– .25,
– .50,	– .75,	–1.00	

   d. Return sphere power scale to zero.

   e. Sphere powers by(rotating the strong sphere control)

+ 3.00,	+ 6.00,	+ 9.00,	+12.00,
+15.00,	–18.00,	–15.00,	–12.00,
– 9.00,	– 6.00,	– 3.00	

   f. Return sphere power scale to zero.

   g. Auxiliary lens dial (by positioning auxiliary selector knob)

Retinoscopic	Polarizing	Maddox Rod,
Maddox Rod, Horizontal	Red Lens	Vertical
Dissociating Prism	Fixed Cross Cylinder	+0.12 Sphere

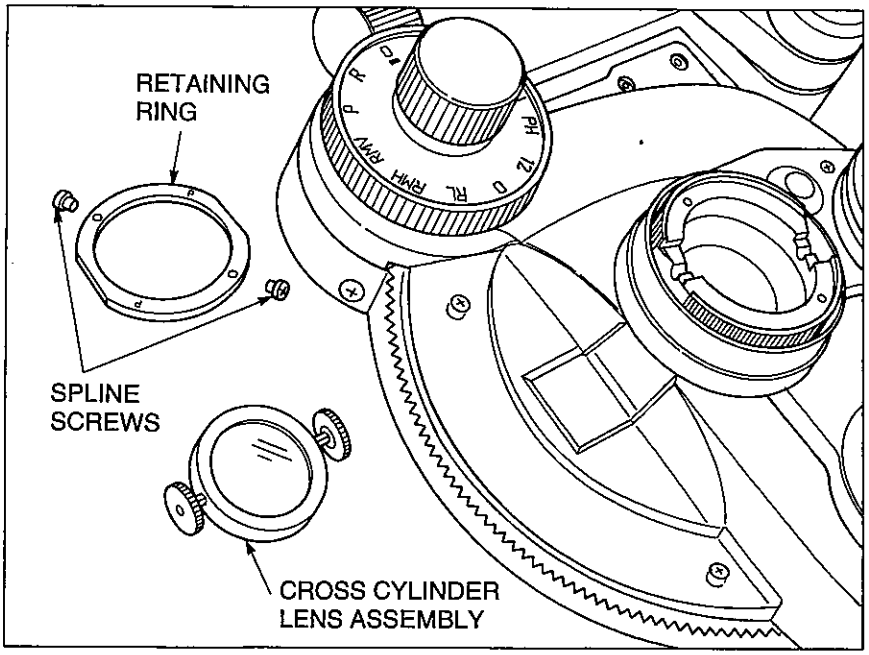
   h. Now clean front and rear surfaces (exposed surfaces only) of the rotary prism loupe, cross cylinder loupe, and lenses in the accessory case.

CHANGING CROSS CYLINDER LENS ASSEMBLY

The Cross Cylinder is changed as a complete assembly following this procedure:

1. Remove the two spline screws.
2. Lift off retaining ring.
3. Lift out complete Cross Cylinder lens assembly.
4. Reverse procedure to install new Cross Cylinder.

NOTE: Assembly is symmetrical so either side can face outward.

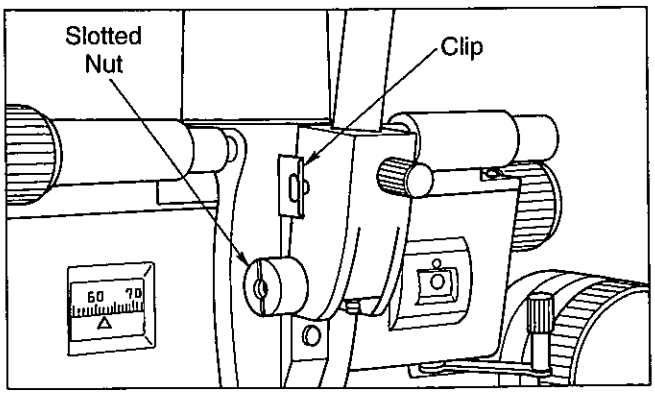


ADJUSTING TENSION OF HINGED READING ROD HOLDER

The reading rod is held in the stored position by a spring clip. The reading rod hinge contains two pins which engage into the clip when moved to the vertical position.

The reading rod hinge is under tension ... Occasionally you may wish to re-adjust this tension. To do so, hold one of the slot head nuts with a screwdriver. With a second screwdriver tighten the other nut.

Periodically the bearing which secures the reading rod holder requires lubrication. Move the holder to the down position for accessibility to oil hole and add a drop or two of light oil.



ADJUSTMENT OF DIAL ROTATION TENSION

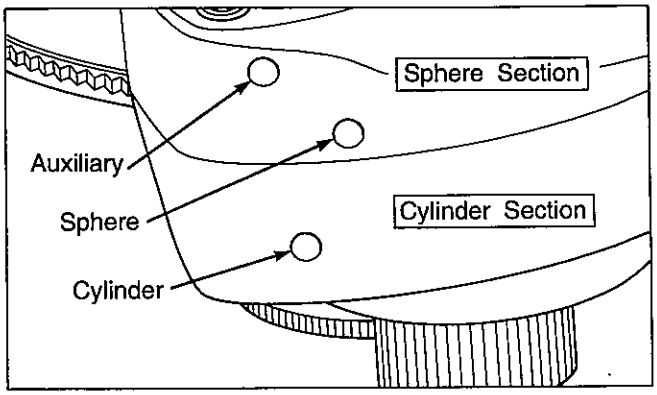
The sphere lens system, cylinder lens system, and axuxiliary lens system all have rolling index wheels. The pressure of the wheel in the dial index determines, to a considerable degree, the "feel" of the dial rotation and indexing.

Each may be adjusted from the outside of the instrument with no dismantling required. The illustration shows the adjusting screws positioned at the bottom of the lens housings.

The screw in the front, or cylinder section, controls indexing tension of the cylinder power mechanism.

The center screw of the three which is in the forward portion of the rear, or sphere section, controls indexing tension of the sphere power mechanism.

The screw in the back portion of the rear, or sphere section, controls indexing tension of the auxiliary lens mechanism.

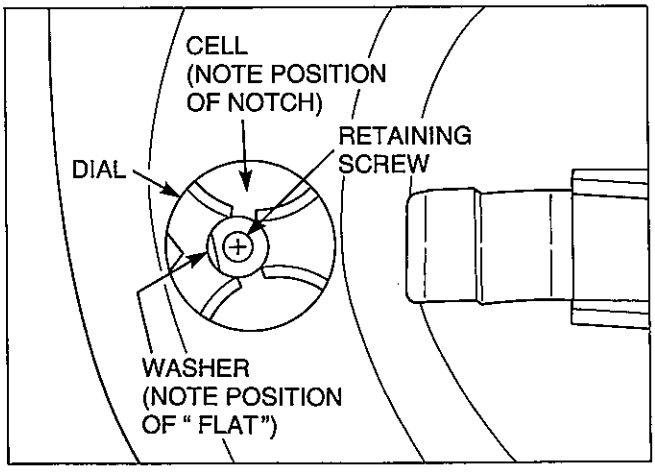


A 5/64″ Allen wrench is used. In each case, clockwise rotation of the adjusting screw increases indexing tension, and counterclockwise rotation lessens indexing tension.

REPLACING LENSES IN AUXILIARY DIAL

Five lenses in each dial are cell mounted: the Retinoscopic, Polarizing, both Maddox Rods, and Fixed Cross Cylinder Lenses are in individual cells permitting substitution of special lenses. Two washers and screws retain each cell. To remove cell from dial:

1. Turn auxiliary dial knob until one of the two retaining screws is visible in the rear of the main aperture.
2. Loosen screw — do not remove —until the washer can be rotated to place the flat side of washer toward the cell. Gently re-tighten screw.
3. Turn the knob until the other screw and washer are visible in the aperture. Repeat the preceding step.
4. Next, turn the knob to center the cell in the aperture. Gently press cell out of the auxiliary dial thru the rear of the aperture.
5. The procedure is reversed to install new cell mounted auxiliary lens. Make certain that the "notches" in the cell are positioned to permit entry of retaining washres.



Auxiliary dial removable cell viewed thru rear of main aperture

6. To lock new cell into position: loosen screw; rotate washer so that flat side is 90° away from cell; tighten screw firmly. Repeat for other screw and washer.

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