AUTO PHOROPTOR RS®

Auto Refraction System

User's Guide



AMETEK®
ULTRA PRECISION TECHNOLOGIES

Reichert®
TECHNOLOGIES

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ISO 9001/13485 Certified – Reichert products are designed and manufactured under quality processes meeting ISO 9001/13485 requirements.

Refer to IEC 60601-1 for system level information.

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Caution: Federal law restricts this device to sale by or on the order of a licensed physician. Rx only.

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Warnings and Cautions

Reichert Technologies (Reichert) is not responsible for the safety and reliability of this instrument when:

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

WARNING: AN INSTRUCTION THAT DRAWS ATTENTION TO THE RISK OF INJURY OR DEATH.



WARNING: UNITED STATES FEDERAL LAW AND EUROPEAN REGULATIONS REQUIRE THAT THIS DEVICE BE PURCHASED ONLY BY A PHYSICIAN OR A PERSON ACTING ON BEHALF OF A PHYSICIAN.

WARNING: THIS INSTRUMENT SHOULD BE USED IN STRICT ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THIS USER'S GUIDE. THE SAFETY OF THE OPERATOR AND THE PERFORMANCE OF THE INSTRUMENT CANNOT BE GUARANTEED IF USED IN A MANNER NOT SPECIFIED BY REICHERT TECHNOLOGIES.

WARNING: DO NOT REPAIR OR SERVICE THIS INSTRUMENT WITHOUT AUTHORIZATION FROM THE MANUFACTURER. ANY REPAIR OR SERVICE TO THIS INSTRUMENT MUST BE PERFORMED BY EXPERIENCED PERSONNEL OR DEALERS WHO ARE TRAINED BY REICHERT OR SERIOUS INJURY TO THE OPERATOR OR PATIENT MAY OCCUR.

WARNING: MODIFICATIONS TO THIS INSTRUMENT ARE NOT ALLOWED. ANY MODIFICATION TO THIS UNIT MUST BE AUTHORIZED BY REICHERT SO THAT CORRECT OPERATION IS MAINTAINED.

WARNING: IF THIS INSTRUMENT IS MODIFIED, APPROPRIATE INSPECTION AND TESTING MUST BE CONDUCTED TO ENSURE CONTINUED SAFE USE OF THIS INSTRUMENT.

WARNING: TO AVOID RISK OF ELECTRIC SHOCK, THIS EQUIPMENT MUST ONLY BE CONNECTED TO A SUPPLY MAINS WITH PROTECTIVE EARTH OR DAMAGE TO THE INSTRUMENT AND/OR INJURY TO THE OPERATOR OR PATIENT MAY OCCUR.

WARNING: ENSURE THAT THE VOLTAGE APPLIED TO THE UNIT IS THE SAME AS THE VOLTAGE THAT IS INDICATED ON THE DATA PLATE OR DAMAGE TO THE INSTRUMENT AND/OR INJURY TO THE OPERATOR OR PATIENT MAY OCCUR.

WARNING: THE INSTRUMENT MUST BE PLUGGED INTO AN OUTLET WITH AN EARTH GROUND. DO NOT REMOVE OR DEFEAT THE EARTH GROUND CONNECTION ON POWER INPUT CONNECTOR OR THE UNIT'S POWER CORD OF THIS INSTRUMENT OR DAMAGE TO IT AND/OR INJURY TO THE OPERATOR OR PATIENT MAY OCCUR.

WARNING: THE EQUIPMENT OR SYSTEM SHOULD NOT BE USED ADJACENT TO OR STACKED WITH OTHER EQUIPMENT AND THAT IF ADJACENT OR STACKED USE IS NECESSARY, THE EQUIPMENT OR SYSTEM SHOULD BE OBSERVED TO VERIFY NORMAL OPERATION IN THE CONFIGURATION IN WHICH IT WILL BE USED.

WARNING: THIS INSTRUMENT IS NOT SUITABLE FOR USE IN THE PRESENCE OF FLAMMABLE ANESTHETIC MIXTURES, SUCH AS OXYGEN OR NITROUS OXIDE.

WARNING: THE USE OF ACCESSORIES OR CABLES OTHER THAN THOSE SPECIFIED, WITH THE EXCEPTION OF THOSE SOLD BY THE MANUFACTURER AS REPLACEMENT PARTS FOR THE INTERNAL COMPONENTS, MAY RESULT IN INCREASED EMISSIONS OR DECREASED IMMUNITY OF THE EQUIPMENT OR SYSTEM.

WARNING: PRIOR TO INSTALLING THE PHOROPTOR HEAD ONTO THE STAND ARM, VERIFY THAT THE ROD ON THE STAND ARM IS SECURE BEFORE ATTEMPTING TO INSTALL THE PHOROPTOR HEAD OR DAMAGE TO THE UNIT AND/OR PATIENT MAY OCCUR.

Warnings and Cautions (continued)

CAUTION: AN INSTRUCTION THAT DRAWS ATTENTION TO THE RISK OF DAMAGE TO THE PRODUCT.

CAUTION: THE INTERNAL CIRCUITRY OF THE INSTRUMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (ESDS) THAT MAY BE SENSITIVE TO STATIC CHARGES PRODUCED BY THE HUMAN BODY. DO NOT REMOVE THE COVERS WITHOUT TAKING PROPER ESDS PRECAUTIONS.

CAUTION: DO NOT USE SOLVENTS OR STRONG CLEANING SOLUTIONS ON ANY PART OF THIS INSTRUMENT AS DAMAGE TO THE UNIT MAY OCCUR. SEE MAINTENANCE SECTION FOR DETAILED CLEANING INSTRUCTION.

CAUTION: USE OF AMMONIA BASED CLEANERS ON THE LIQUID CRYSTAL DISPLAY (LCD) MAY CAUSE DAMAGE TO THE DISPLAY. SEE MAINTENANCE SECTION FOR DETAILED CLEANING INSTRUCTION.

CAUTION: MEDICAL ELECTRONIC EQUIPMENT NEEDS SPECIAL PRECAUTIONS REGARDING EMC AND NEEDS TO BE INSTALLED AND PUT INTO SERVICE ACCORDING TO THE EMC INFORMATION PROVIDED IN THE ACCOMPANYING DOCUMENTS.

CAUTION: PORTABLE AND MOBILE RF COMMUNICATIONS EQUIPMENT CAN AFFECT MEDICAL ELECTRICAL EQUIPMENT.

CAUTION: THIS INSTRUMENT IS NOT TO BE USED NEAR HIGH-FREQUENCY EMITTING SURGICAL EQUIPMENT.

CAUTION: THIS INSTRUMENT IS NOT INTENDED TO BE CONNECTED TO EQUIPMENT OUTSIDE THE CONTROL OF REICHERT TECHNOLOGIES OR MUST BE TESTED TO AN APPLICABLE IEC OR ISO STANDARDS.

CAUTION: DO NOT INSTALL ANY ADDITIONAL SOFTWARE OTHER THAN WHAT WAS SUPPLIED WITH THIS INSTRUMENT. INSTALLATION OF ADDITIONAL SOFTWARE MAY CAUSE UNEXPECTED OPERATION RESULTING IN MALFUNCTION OF THIS INSTRUMENT.

CAUTION: THIS INSTRUMENT MUST BE PLUGGED INTO AN OUTLET WITH AN EARTH GROUND THAT IS CONNECTED TO THE RECEPTACLE OR DAMAGE TO THE UNIT MAY OCCUR. DO NOT DISABLE OR REMOVE THE GROUND PIN.

CAUTION: INGRESS PROTECTION CLASSIFICATION FOR THE PHOROPTOR HEAD, CONTROLLER, AND CENTRAL UNIT IS IXP0. DO NOT SPRAY, SPLASH OR IMMERSE IN CLEANING SOLUTION.

Symbol Information

The following symbols appear on the instrument.



Consult Instructions for Use symbol indicating important operating and maintenance instructions that are included in this User's Guide



Caution Symbol indicating important information and maintenance instructions that are included in the User's Guide



Type B Product Classification
Class 1 Equipment, Continuous Operation



Protective Earth



Alternating current power



ON / OFF



Date of Manufacture

REF Catalog Number

SN Serial Number



Waste of Electrical and Electronic Equipment



Compliance to Medical Device Directive 93/42/EEC



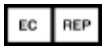
Authorized to mark given by Intertek ETL Semko for conformance with electrical standards



Fragile Contents in Shipping Container - handle with care



Keep Dry - Package shall be kept away from rain



Authorized Representative in European Community



This Way Up - Indicates the correct upright position of package

Introduction

Congratulations on your purchase of the Reichert Technologies® (hereafter referred to as Reichert®) Auto Phoroptor RS®.

This User's Guide is designed as a training and reference manual for operation, maintenance, and troubleshooting. We recommend that you read it carefully prior to use and follow the instructions in the guide to ensure optimum performance of your new instrument. Properly trained eyecare professionals such as ophthalmologists, optometrists, opticians and eye care technicians should operate this instrument. All parts of this ME system are suitable for use within the patient environment.

Please retain this guide for future reference and to share with other users. For additional copies of this manual or questions related to the Auto Phoroptor RS, contact your local authorized Reichert dealer or contact our Customer Service department directly at:

Tel: 716-686-4500
Fax: 716-686-4555
E-mail: reichert.information@ametek.com

Indications for Use

The automatic refractor Auto Phoroptor RS is designed for:

- Subjective refraction.
- Determination of correction data for refraction anomalies and binocular functions as the basis for manufacturing eyeglasses and contact lenses.
- Use in refraction rooms in clinics; and practice's of physicians, optometrist's or optician's.
- Connection to other medical examination equipment or to an office EMR system.
- Operation by physicians, optometrists, opticians, or properly trained clinical personnel.
- Installation under the conditions for medical equipment.

Contraindications

There are none associated with the Auto Phoroptor RS system.

Unpacking Instructions

Great care has been taken to deliver your Auto Phoroptor RS to you safely. Please read this User's Guide before operating the unit.

The instrument is packaged in shipping containers to protect the instrument from damage during shipping. Please remove the Phoroptor Head, Controller, Central Unit and accessories carefully from the packaging material.

Note: Please retain the packaging so that if future transportation is required, the instrument can be sent in its original packaging.



Figure IS-01, Phoroptor Head

The main components of the Auto Phoroptor RS are packed in two separate boxes. Accessories will be packed in separate boxes depending on what additional items have been ordered. The Reading Rod, Rotochart, and Card Holder will be packed together in another box.

1. The Phoroptor Head is packaged in one box. Pull the inner box up and out of the outer box.
2. Separate the foam packaging and remove the Phoroptor Head from its box. Refer to Figure IS-01.
3. Lay the Phoroptor Head on it's side and remove the tape from the bottom that secures the bag.
4. Remove the bag.
5. The Central Unit, Controller, and accessories box are packaged in the second box. Refer to Figure IS-02.
6. Remove the Accessories Box.



Figure IS-02, Packaging - Accessories

Note: The Accessories Box includes a Power Cord, a Phoroptor Cable for connecting the Phoroptor Head to the Central Unit, the Mounting Bracket and Screws, and Dust Covers for the Phoroptor Head and Controller.

7. Remove the foam that is underneath the Accessories Box. Below the foam is the Central Unit. Refer to Figure IS-03.
8. The Near Vision Rod, Card Holder, and Rotochart are packaged in a separate box.



Figure IS-03, Packaging- Central Unit

Note: If any of the above accessories or parts are missing, immediately contact Reichert so that the missing accessories or parts can be shipped.

9. Place the packaging in a safe place so that if transportation is required in the future, it will be available.

Parts Identification

One of the following Auto Phoroptor RS Systems will be found in the shipping container, depending upon which specifications of the system were ordered:

Description	Part Number
Auto Phoroptor RS without Prism, Middle Mount –115V	16210-1-M-0
Includes • Phoroptor Head	16201
• Central Unit	16278
• Controller	16204
Auto Phoroptor RS with Prism, Middle Mount – 115V	16210-2-M-0
Includes • Phoroptor Head	16202
• Central Unit	16278
• Controller	16204
Auto Phoroptor RS without Prism, Middle Mount – 230V	16210-1-M-1
Includes • Phoroptor Head	16201
• Central Unit	16279
• Controller	16204
Auto Phoroptor RS with Prism, Middle Mount –230V	16210-2-M-1
Includes • Phoroptor Head	16202
• Central Unit	16279
• Controller	16204

Accessories

The following accessories are included in all Auto Phoroptor RS Systems:

Item	Part Number
• Dust Cover – Phoroptor Head	559-153
• Dust Cover – Controller	16204-020
• Phoroptor Cable	559-275
• User's Guide	16210-101
• Quick Reference Guide	16210-105
• Instructional DVD	16200-106
• Near Vision Rod with Test Chart – Decimal Notation or Near Vision Rod with Test Chart – Snellen Notation	559-415 16275
• Power Cord 115V or Power Cord 230V	WCBL10018 WCBL10027
• Mounting Bracket	16270-872
• Mounting Screws	X19406

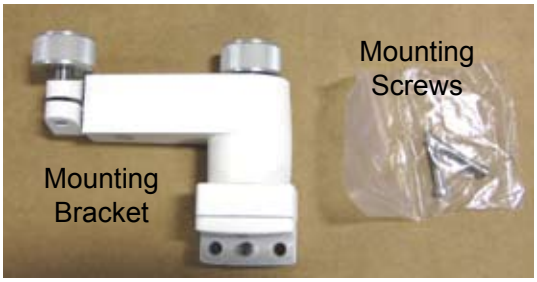


Figure IS-04, Mounting Bracket

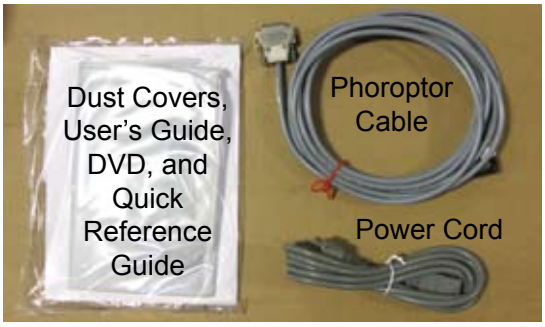


Figure IS-05, Accessories

Parts Identification (continued)

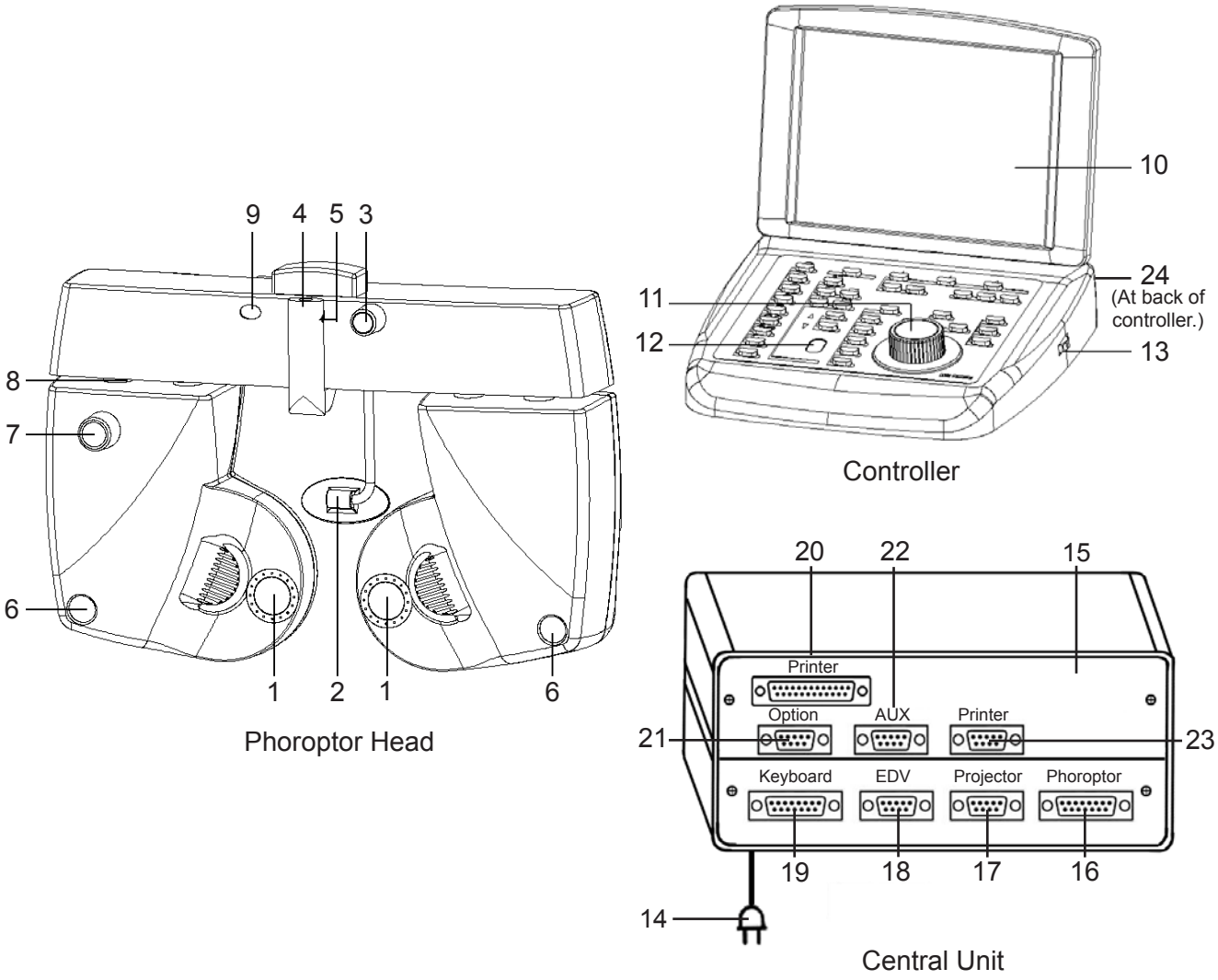


Figure IS-6, Parts Identification

1. Lens Apertures
2. Forehead Rest
3. Forehead Rest Knob
4. Convergence Lever
5. Threaded Pin for Near Vision Rod
6. Target Device Corneal Vertex Distance
7. Height Adjustment Knob
8. Mid Position Height Marking
9. Illuminated Bubble Level
10. Display
11. Control Knob
12. Scroll Wheel for Chart Selection
13. Brightness Setting Wheel
14. Power Cord
15. Central Unit
16. Auto Phoroptor RS Connection
17. Projector Connection Port
18. EDV Connection Port for connecting a computer or auxiliary equipment
19. Controller Connection Port
20. Parallel Printer Port
21. Port configured for connection to another Central Unit
22. Auxiliary Port for connecting Autorefractors or Lensmeters
23. Serial Printer Port
24. USB Port for software updates only.

Note: You can adjust the brightness of the display screen by turning the Brightness Setting Wheel (13).

Parts Identification (continued)

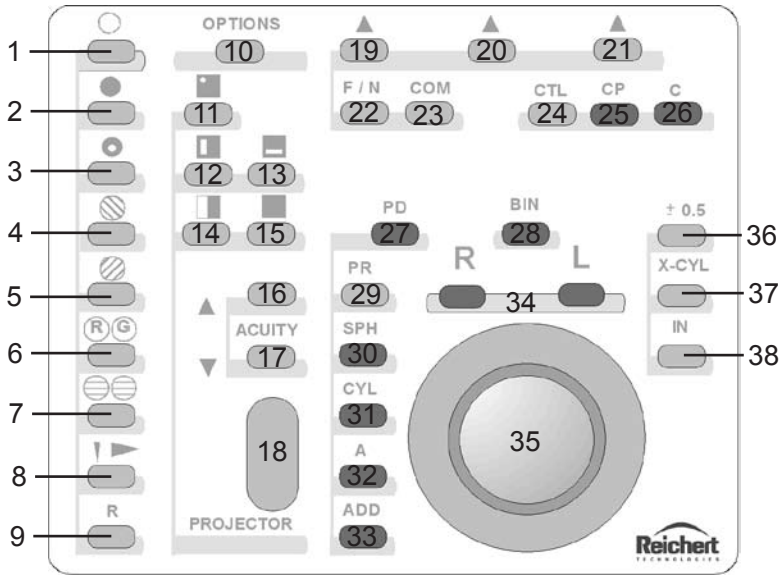


Figure IS-7, Keypad

1. Open Lens Aperture
2. Close Lens Aperture
3. Pinhole Mask
4. Left Polarized Filter
5. Right Polarized Filter
6. Red/Green Filter
7. Maddox Cylinder
8. Dissociation Prisms (Right 6Δ Base Up, Left 10Δ Base In.)
9. Retinoscopy Lens
10. Options Menu
11. Single Optotype Mask
12. Vertical Line Mask
13. Horizontal Line Mask
14. Red/Green Filter
15. No Mask (All lines displayed)
16. Improved Visual Acuity or Increase Optotype Size
17. Decreased Visual Acuity or Decrease Optotype Size
18. Scroll Wheel - Chart Selector
19. Function Button - Left For Autorefraction Data
20. Function Button - Middle For Lensmeter Data
21. Function Button - Right For EMR or Storing Data
22. Far/Near Vision Selection
23. Save/Transmit to EMR System
24. Control Button
25. Clear Partial Data
26. Clear All Data
27. Pupillary Distance Measurement
28. Binocular Vision Measurement
29. Prism Adjustment
30. Sphere Adjustment
31. Cylinder Adjustment
32. Axis Adjustment
33. Near Vision Addition
34. Right Eye/Left Eye Selection Buttons
35. Control Knob
36. Cross Cylinder Value Step Change (±.25 to .5)
37. Cross-Cylinder Adjustment
38. Store Cross Cylinder Value

Note: In this manual, when asked to press a button, the instruction will simply say: Press XXX (with the name of the button in all caps.) Example: Press CTL.

Shortcuts (Version 3.02)

The following is a list of button combinations that when pressed will activate a shortcut.

BUTTON(S)	SHORTCUT
CTL + C	Clears all data and resets the Phoroptor Head
CTL + 	Backs up one step in a refraction program
CTL + CP	Switches back and forth from Program Mode to Normal Mode
CTL + ACUITY UP ▲	Turns On Projector*
CTL + ACUITY DOWN ▼	Turns Off Projector
CTL + COM	Opens the AR/LM Data List for retrieving autorefractor and lensmeter data for individual patients.
CTL + CYL	Switch between plus (+) and minus (-) cylinder
CTL + Open Lens Aperture	Fills the Autorefractor, Lensmeter, and Data storage boxes with demo values
CTL + R (Retinoscopy)	Records the visual acuity values for both the uncorrected and corrected vision in the active eye
CTL + SPH	Fogs the right eye, left eye, or binocular vision with + Diopter power as selected in the Options menu
CTL + WHEEL	Scrolls through a selection of charts without displaying the image from the Projector
CTL + IN	Undo up to 3 steps for Axis and Cylinder power adjustment in the Cross Cylinder (X-CYL) mode
CTL + R/G + PD	In Options Menu/Settings/Aux Port or EDV Port, this sequence opens the window for selecting auxiliary equipment
CP then BIN	Clears the data for both eyes and resets the values for unaided vision to “0” (Any data in the Autorefractor, Lensmeter, or Data storage boxes will be retained)
BIN then 	Moves both halves of the refractor inward or outward while in PD mode
BIN then  + 	Moves both halves of the refractor in the same direction while in PD mode
 + 	Adjusts the Sphere or Cylinder by 1.00D increments instead of 0.25D, and the axis by 10° instead of 1°
CP + CYL	Clears the Cylinder measurements in the active eye, and in the Autorefractor, Lensmeter, and Data storage boxes when entering data manually
CP + SPH	Clears the Sphere measurements in the active eye, and in the Autorefractor, Lensmeter, and Data storage boxes when entering data manually
CP + A	Clears the Axis measurements in the active eye, and in the Autorefractor, Lensmeter, and Data storage boxes when entering data manually
CTL + RIGHT FUNCTION BUTTON	‘Print’ dialogue box appears
CTL + LEFT FUNCTION BUTTON	Switches print format from F/N to F/ADD when the Print Dialogue Box is open
CP + LEFT FUNCTION BUTTON	Clear Autorefractor data
CP + MIDDLE FUNCTION BUTTON	Clear Lensmeter data
CP + RIGHT FUNCTION BUTTON	Clear data in the “Data” storage box

*Function not available with Polaphor® visual acuity system.

Icon Description

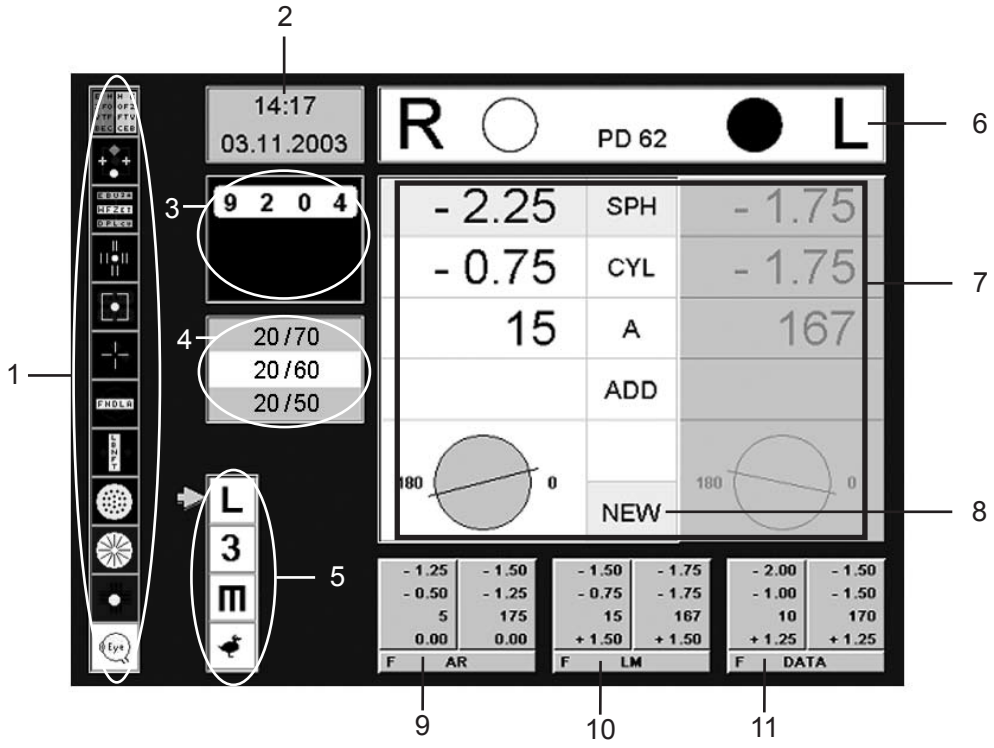


Figure IS-8, Display Screen

1. Acuity Test Charts
2. Date and Time
3. Projected Chart View/Patient Chart View
4. Optotype Size
5. Optotypes
6. Active Lenses/Filters
7. Active Data Field
8. New Data (Appears when data from saved/input data is changed.)
9. Autorefractor Data (Entered manually or electronically.)
10. Lensmeter Data (Entered manually or electronically.)
11. Prescription Data (From EMR System or new prescription to send out.)

Active Data Field

The larger box with data is the current/active prescription that is being adjusted. The individual measurement boxes can be one of four colors. The following indicates what each color means:

White - Active field that can be adjusted.
Yellow - Active field that is currently being adjusted.
Blue - Active field that is currently being adjusted.
Grey - Inactive field that cannot be adjusted.

Icon Description (continued)

Test Icons - Auto Projector Acuity Systems

The following is a list of the icons on the left side of the Controller screen and their description.

The small green arrow indicates the active test type or optotype, and can be moved using the scroll wheel. At the end of a line, the arrow wraps around to the next column. In the refractor, polarization or color filters will automatically be switched in if they are required by a test type.

Note: The figures here are featured on the AP250 projector. If using other projectors, the tests and their order may change but the operating principle is the same.

Shortcut: Press CTL and ▲ to turn the projector ON.
Press CTL and ▼ to turn the projector OFF.
When using the Block Polaphor Acuity System, these buttons will randomize optotypes.

The Controller indicates if the projector lamp is turned ON or OFF. The Projected Test Type window is an accurate reflection of what is being projected. If the projector goes to sleep and turns the lamp OFF, any command to the projector will automatically turn it ON again.

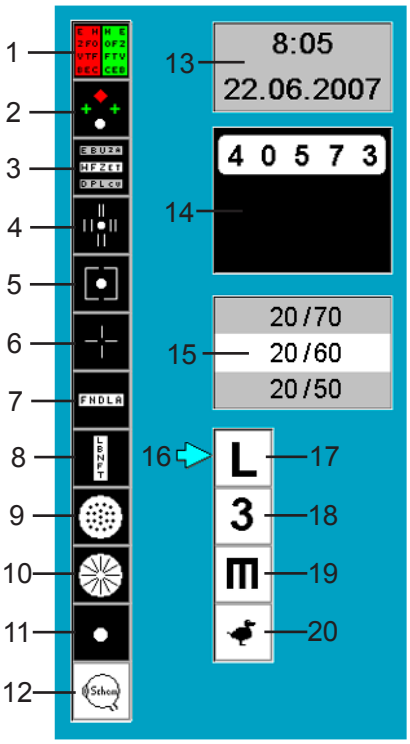


Figure IS-9, Test Icons - Auto Projector Acuity Systems

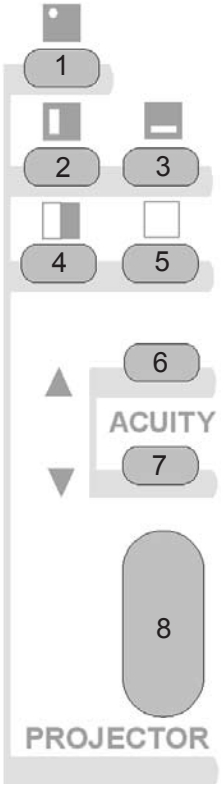
1. Red/Green Test - Shows optotypes in black with two different colored backgrounds. The left half of the background is green, while the right half is red.
2. Worth 4 Test
3. Binocular Balance Test
4. Minute Stereo Test
5. Vertical Coincidence Test
6. Phoria Test
7. Horizontal Phoria Test
8. Vertical Phoria Test
9. Cross Cylinder Test
10. Astigmatic Dial
11. Fixation Target - Shows a dot on the screen for the patient to focus on.
12. Eye Schematic
13. Date and Time - Shows current date and time.
14. Projected Test Type with Mask - Window that shows what is currently being projected/ shown to the patient.
15. Visual Acuity - The number corresponding to the size of the optotypes being projected.
16. Green Arrow - Indicates which test is selected and projected. Can be moved with the Scroll Wheel.
17. Letters - Optotypes consisting of different letters.
18. Numbers - Optotypes consisting of different numbers.
19. Tumbling E's - Optotypes consisting of the upper case letter E shown in different directions.
20. Children's Optotypes - Optotypes consisting of easily identifiable pictures, such as houses, umbrellas, ducks, and cars.

Icon Description (continued)

Mask and Acuity Buttons - Auto Projector Acuity Systems

This is a description of the buttons on the Controller and how they affect the projected optotypes during testing. Any of the following buttons can be pressed at any point during refraction to change the projected image.

Note: This does not change which optotypes are being projected (example, letters or numbers), only the format in which they are being shown.



1. Projects only one single optotype to patient.
2. Vertical Line Mask- Projects a single vertical row of optotypes.
3. Horizontal Line Mask- Projects a single horizontal row of optotypes.
4. Red/Green Mask- Splits the screen with the left side of the chart covered with the red filter and the right side with the green filter.
5. No Mask- Projects the entire optotype field.
6. Acuity Arrow Up- Either increases optotype size or increases visual acuity with each press of the button, depending on the setting entered in the options menu.
7. Acuity Arrow Down- Either decreases optotype size or decreases visual acuity with each press of the button, depending on the setting entered in the options menu.
8. Scroll Wheel- Shifts the small green arrow on the Controller screen to the different tests types and projects the selected test.

Figure IS-10, Mask and Acuity Buttons - Auto Projector Acuity Systems

Icon Description (continued)

Test Icons - ClearChart 2

The following is a list of the icons that appear on the left side of the Controller when the ClearChart 2 Digital Acuity System is connected to the Auto Phoroptor RS. Refer to Figure IS-11.

The small green arrow indicates the active test chart or optotype. The scroll wheel on the control panel is used to select the test chart or optotype. At the end of the end of the column of charts the arrow wraps around to the next column. Color filters will be automatically switched into the Phoroptor Head if they are required by a test.

Note: Press CTL + ACUITY DOWN ▼ to close the test chart window on the Controller LCD and darken the ClearChart 2 screen.

Note: Press CTL + ACUITY UP ▲ to activate the test chart window on the Controller LCD and the ClearChart 2 screen.

Communication between the Auto Phoroptor RS and the ClearChart 2 is bidirectional. If a change is made to the default settings in the ClearChart 2, the test charts on the Controller will reflect that change. If optotypes or test charts are changed using the ClearChart 2 remote, the Auto Phoroptor RS will reflect that change.

Some test charts and chart functions are available only by using the ClearChart 2 remote as indicated in the Test Icon Descriptions below. For example, the line in the astigmatic dial can be rotated using the Up and Down arrow buttons on the ClearChart 2 remote. The Contrast Sensitivity, Suppression and Crowding Bar tests can be accessed through the ClearChart 2 remote only and do not appear on the Auto Phoroptor RS Controller.

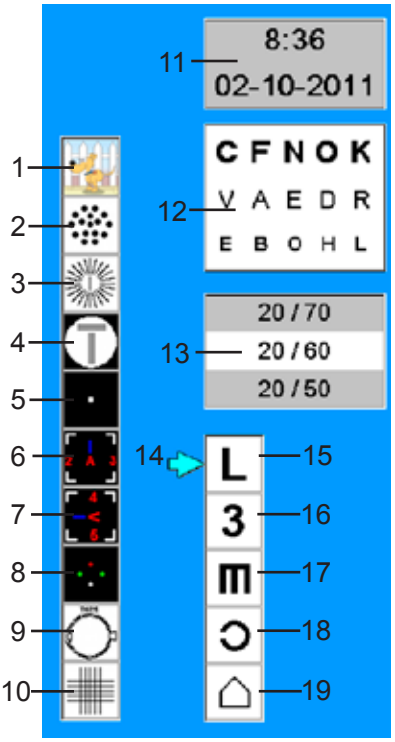


Figure IS-11, Test Icons - ClearChart 2

Test Icon Descriptions - ClearChart 2

1. Children's Movie (Activates the sound and video.)
2. Cross Cylinder Dot Test
3. Astigmatic Dial (Press the up and down arrow buttons on the remote to rotate the dial.)
4. Astigmatic T (Press the up and down arrow buttons on the remote to rotate the T.)
5. Fixation Dot (Dot with lines are nested behind this chart.)
6. Horizontal Disparity Test (Press the Up and Down arrow buttons on the remote to move the fixation line.)
7. Vertical Disparity Test (Press the Up and Down arrow buttons on the remote to move the fixation line.)
8. Worth 4 Test
9. Education Slides (Press the right arrow on the remote to advance through the education slides.)
10. Vertical/Horizontal Line Chart for near vision testing. Selecting this chart brings fixed cross cylinder lenses into the Phoroptor Head. (This chart is not available on the ClearChart 2. A dark screen with the ClearChart 2 logo will be displayed instead.)
11. Date and Time
12. Projected Test Chart with Mask- Window that shows what is currently being displayed to the patient.
13. Visual Acuity – Indicates the size of the optotype projected.
14. Green Arrow – Indicates the chart selected and displayed.
15. Letter Optotypes (4 different letter sets can be selected.)
16. Number Optotypes
17. Tumbling Es
18. Landolt Cs
19. Children's Optotypes (3 different sets of Children's shapes can be selected.)

Icon Description (continued)

Test Icon Descriptions - ClearChart 2 (continued)

There are four different letter sets available in the ClearChart 2: 17 letter set, 8 letters set, Sloan, and HOTV. Any letter set can be selected as the default optotype in the start-up menu of the ClearChart 2 or by pressing the menu button on the remote, selecting “Base Optotype” and choosing the preferred option. The letter set selected as the Default will be available on the Auto Phoroptor RS Controller when the scroll wheel is set to the letter icon.

Children’s Optotypes available in the ClearChart 2 include the shapes and images in Figure IS-12.

The Children’s shapes can be changed in the Auto Phoroptor RS by selecting the preferred set of characters as the Alternate Optotype in either the start-up menu of the ClearChart 2, or by using the menu button on the remote.



Figure IS-12, Children’s Shapes

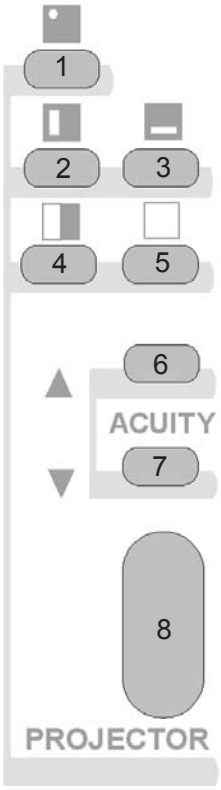
Additional options for optotype presentation can be selected in the ClearChart 2 start-up menu or by using the menu button on the remote. These selections will be displayed on the Auto Phoroptor RS Controller:

- Maximum Number of Characters (up to 6)
- Line Presentation (up to 3 lines)
- Notation (Snellen or Decimal)
- Progression (Standard or Logmar)

Icon Description (continued)

Mask and Acuity Buttons – ClearChart 2

The mask and acuity buttons have additional functions when using the ClearChart 2 digital acuity system. The Single Optotype, Vertical Line, Horizontal Line and No Mask or full window button can be pressed repeatedly to randomize optotypes.



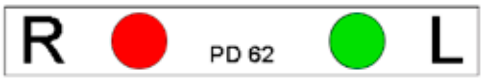
1. Projects a single optotype (press to randomize)
2. Vertical Line Mask – Projects a single vertical line of optotypes. (Press to randomize)
3. Horizontal Line Mask – Projects a single horizontal row of optotypes. (Press to randomize.)
4. Red/Green Mask – Splits the screen with the left side of the chart covered with the red filter and the right side with the green filter. Press the button again to remove the filter.
5. No Mask – Projects all optotypes displayed, up to three lines and six characters. (Press to randomize.)
6. Acuity Arrow Up – Either increases optotype size or increases visual acuity with each press of the button, depending on the setting entered in the options menu.
7. Acuity Arrow Down – Either decreases optotype size or decreases visual acuity with each press of the button, depending on the setting entered in the options menu.
8. Scroll Wheel – Shifts the small green arrow on the Controller screen to the different test charts and projects the selected chart.

Figure IS-13, Mask and Acuity Buttons - ClearChart 2

Icon Description (continued)

Auxiliary Lenses or Filters

The circles adjacent to the R and L above the Active Data Field indicate which filters are in place in the Phoroptor Head apertures. The following is an example of the R/L indication on the Controller monitor for the Red/Green filter with the red filter in the right eye and the green filter in the left eye:



The left column of each button on the Controller will activate the filters and lenses in the Phoroptor Head. The function is always applied to the right eye first (except for the Open and Close Occluder Aperture buttons.) A second press will either switch the filters in the left and right eye or activate the filters in both eyes. The following is a description of the Controller buttons and the effect they have on the Phoroptor Head:

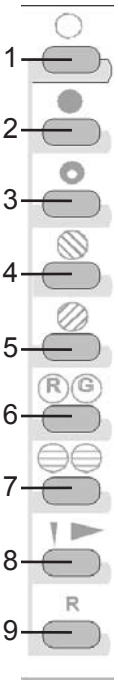
1. Open Occluder Aperture- Press to open the right aperture. Press it again to open both eyes.
2. Close Occluder Aperture- Press to close the right aperture. Press it again to close both eyes.
3. Pinhole Mask - Press to set a pinhole mask in front of the right eye and occlude the left. Press it again to switch, occluding the right eye and placing a pinhole mask in the left eye.
4. Left Polarization Filter - Press to put a left polarized filter in the right eye, and a right polarized filter in the left. Press it again to have left polarization filter set in both eyes.
5. Right Polarization Filter - Press to put a right polarized filter in the right eye, and a left polarized filter in the left. Press it again to have right polarization filter set in both eyes.

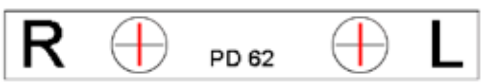
Note: The Polarized filters can be removed by pressing the open occluder button. The Polarization image on the chart window can be removed by pressing the 'no mask' button for optotypes.

6. Red Green Filters - Press to change both filters so that the right eye has a red filter, and the left has a green filter. Press it again and the red filter stays while the green filter goes away. Press it again to switch back.

Note: The Worth 4 Dot Chart will automatically be presented with the Red/Green filters.

7. Maddox Cylinder - Press to place a horizontal maddox cylinder in the right eye. Press it again to place a vertical Maddox cylinder in the left eye. Press it again to switch back.
8. Dissociation Prisms - Press to place a 6Δ base up prism in the right eye. Press it again to place a 10Δ base in prism in the left eye. Press it again to switch back.
9. Retinoscopy Lens - Press to increase the spherical effect in both eyes by +1.5 D or +2.0D. This will NOT be indicated in the main field. Press again and a pinhole mask will be placed in the left lens. Press a third time and the pinhole switches to the right eye and the retinoscopy lens is placed in front of the left eye. Press it a fourth time and the pinholes are removed and both the retinoscopy lenses are in place.





Note: Fixed cross cylinders do not have a button. They will be automatically switched in when necessary, at ±0.5 D minus axis 90°. The icon will be shown on the Controller in the Active Lenses/Filters as shown above. The fixed cross cylinders will be switched in for PD Measurement.

Note: Fixed cross cylinders can be activated by scrolling to the eye schematic chart on the screen and then the chart behind it which is the horizontal and vertical lines. This chart will not be projected on the screen and will not be visible to the patient. The fixed cross cylinders can be used for near vision testing.



Setup

Connecting the Mount to the Phoroptor Head (For Middle Mount Phoroptor Heads Only)

1. Take the Main Mount and line up the Four Allen Screws with the screw holes on the Head Mount. Refer to Figure SU-01.
2. Using a #3 metric Allen Screwdriver, secure the Main Mount to the Head Mount. Be sure that the screws are securely tightened. Refer to Figure SU-01.
3. Align the two Screw Holes on the back side of the Mount to the two screw holes on the back of the Phoroptor Head. Refer to Figure SU-02.
4. Using a #3 metric Allen Screwdriver, secure the Mount to the Phoroptor Head. Refer to Figure SU-02.

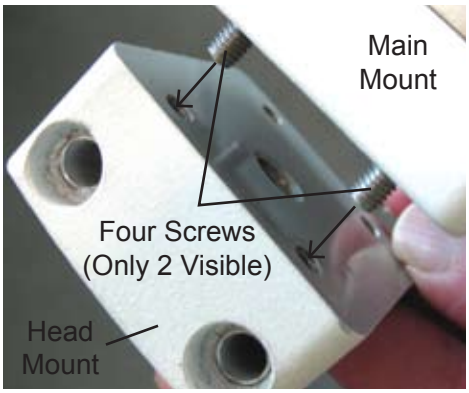


Figure SU-01, Connect Mount

Attaching the Phoroptor Head to the Stand

WARNING: PRIOR TO INSTALLING THE PHOROPTOR HEAD ONTO THE STAND ARM, VERIFY THAT THE ROD ON THE STAND ARM IS SECURE BEFORE ATTEMPTING TO INSTALL THE PHOROPTOR HEAD OR DAMAGE TO THE UNIT AND/OR PATIENT MAY OCCUR.

1. Place the Phoroptor Head 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. Refer to Figures SU-3 and SU-04.
2. A Retaining Screw has been provided to prevent the Phoroptor Head 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. Refer to Figure SU-5.

Note: Use the proper Retaining Screw for the stand. A Retaining Screw should have been included with the Stand.

Note: The instrument cannot slide off the arm at this point, but can be tilted forward or back.

3. Tighten the Tilt Clamp Knob. The Phoroptor Head will be held firmly in the desired position. Refer to Figure SU-3.

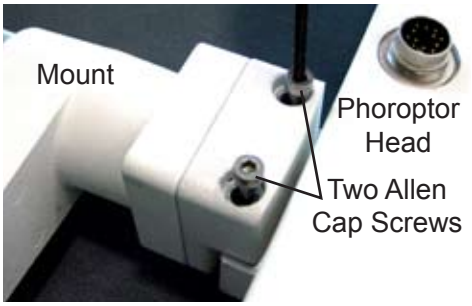


Figure SU-02, Connect Phoroptor Head to Mount

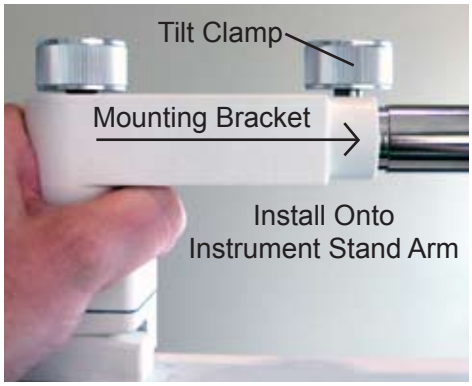


Figure SU-03, Install Onto Instrument Stand Arm

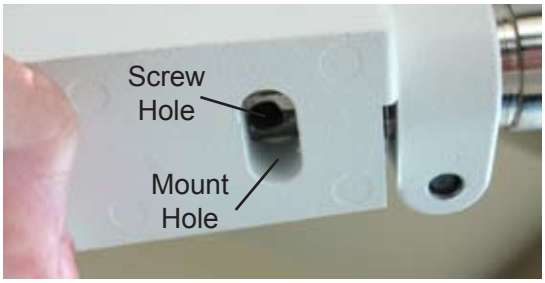


Figure SU-04, Align Screw Hole

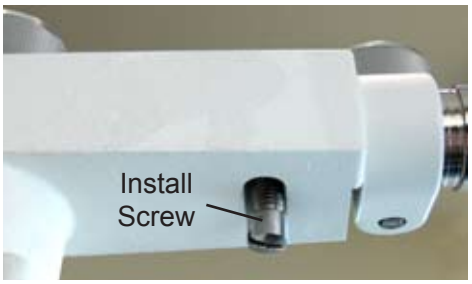


Figure SU-05, Install Safety Screw

Setup (continued)

Attaching the Phoroptor Head to the Stand (continued)

4. Install the Reading Rod into the Reading Rod Holder on the Phoroptor Head. Refer to Figure SU-06.
5. Using a flat head screwdriver, secure the Reading Rod by tightening the screw on the side of the Reading Rod Holder. Refer to Figure SU-06.

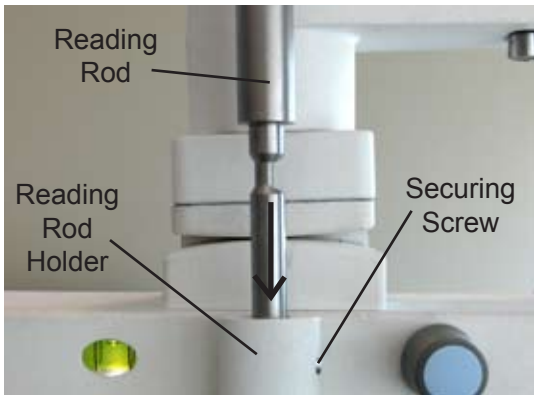


Figure SU-06, Install Reading Rod

Connecting the Auto Phoroptor RS System Components

WARNING: ENSURE THAT THE VOLTAGE APPLIED TO THE UNIT IS THE SAME AS THE VOLTAGE THAT IS INDICATED ON THE DATA PLATE OR DAMAGE TO THE UNIT MAY OCCUR.

WARNING: CARE MUST BE TAKEN TO ARRANGE THE CABLES FOR THE UNIT AND ACCESSORIES SUCH THAT THEY DO NOT PRESENT A TRIPPING HAZARD TO THE EXAMINER OR A DANGER TO THE PATIENT.

WARNING: POSITION THIS INSTRUMENT SO THAT IT IS NOT DIFFICULT TO OPERATE THE DISCONNECTION DEVICE (PLUG).

WARNING: DO NOT PLUG IN THE UNIT UNTIL THE COMPUTER SYSTEM IS SET UP.

1. Connect the Phoroptor Cable (P/N 559-275) to the Phoroptor Head by aligning the cable to the Pins in the Phoroptor Head and securely attach the Cable. Refer to Figure SU-07.
2. Secure the metal Collar on the Phoroptor Cable by turning it clockwise until the cord is fully secured and properly seated to the back of the Phoroptor Head. Refer to Figure SU-08.
3. Connect the Auto Phoroptor RS head to the Central Unit using the Phoroptor Cable (P/N 559-275) and connect the cable to the Phoroptor port. Refer to Figure SU-09.
4. Connect the Controller to the Central Unit by attaching the built-in cable to the keyboard port. Refer to Figure SU-09.

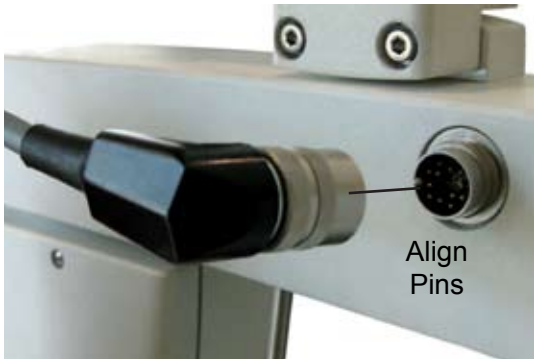


Figure SU-07, Install Phoroptor Cord

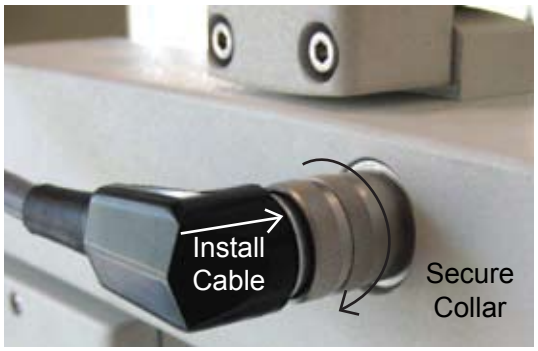


Figure SU-08, Install Phoroptor Cord

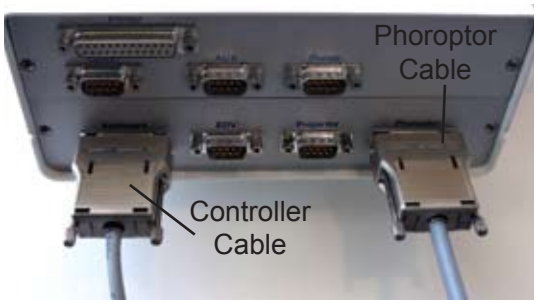


Figure SU-09, Cables

-continued-

Setup (continued)

Connecting the Auto Phoroptor RS System Components (continued)

5. Connect the Projector or other compatible instrument to the Central Unit using the cables provided and connect it to the Projector port. Refer to Figure SU-10.

Note: You may connect the Central Unit to a computer with a cable to the EDV port.

6. Connect additional equipment to the Central Unit (such as Lensmeters, Autorefractors, etc.) through the Aux or EDV port, as needed.

Note: Connection cables for the Phoroptor Head, the Controller, the Central Unit, and the Projector are provided with the instrument. Cables for connecting Lensmeters, Autorefractors and Keratometers need to be purchased separately.

7. Plug in the power cord to an appropriately volted outlet.
8. Connect the Auto Phoroptor RS to another through the Options Output port as an EDV or AUX Port to receive data.
9. Refer to the Connection Diagram in Figure SU-10 for plug and cable layout.

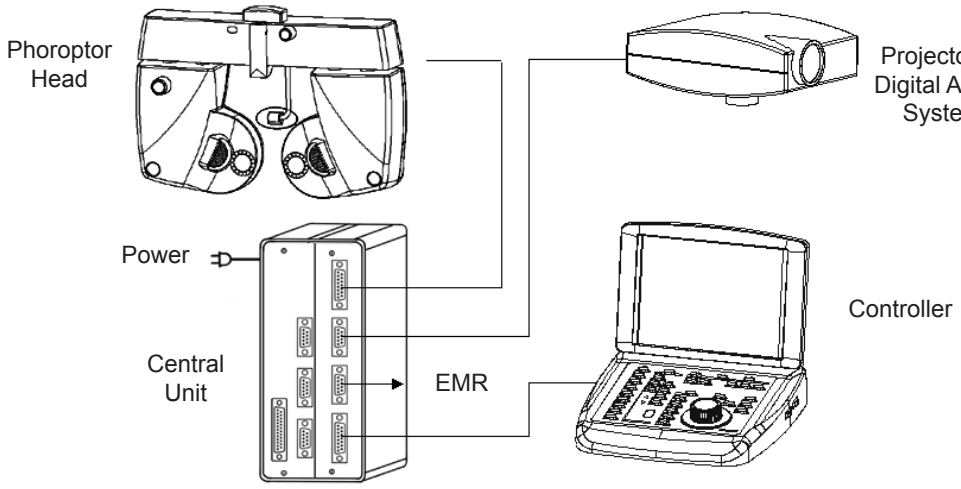


Figure SU-10, Connection Diagram

Setup (continued)

Leveling the Phoroptor Head

Once the Phoroptor Head is installed onto the stand and all the wires have been connected, check to see if the Phoroptor Head requires leveling. If the Phoroptor Head is not level, it can be adjusted by adjusting the Two Allen Cap Screws that secure the Mount to the Phoroptor Head on the patient's side of the Phoroptor Head.

1. Check the bubble inside the level on the Phoroptor Head. Refer to Figure SU-11.

Note: It is easiest to see the bubble with the Phoroptor Head powered on. The Level is illuminated when the Phoroptor Head is on.

2. Slowly back out the Allen Cap Screws until the Phoroptor Head is able to be adjusted, and adjust the Head until it is level. Refer to Figure SU-12.
3. Tighten the Screws and ensure that the Head remains Level. Refer to Figure SU-12.
4. Readjust the Screws until the Phoroptor Head is Level and both Screws are securely tightened.

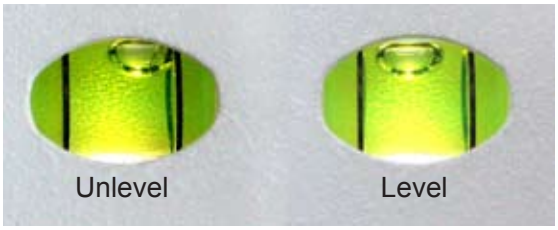


Figure SU-11, Level



Figure SU-12, Leveling Phoroptor Head

Turning the Unit On and Off

An ON/OFF switch for the Auto Phoroptor RS is located on the Central Unit. As a standard, the entire system (Phoroptor Head, Controller, and Projector), is connected to the Central Unit and turned ON/OFF from this unit.

The initialization time of the computer in the Auto Phoroptor RS is approximately 50 seconds. When the Phoroptor Head is turned ON, it automatically starts to check all lenses and settings, cycling through all possible lens changes and moving the PD back and forth to check for any malfunctions.

To shut down the computer, set the ON/OFF switch to OFF.

Default Settings

The Auto Phoroptor RS is an Auto Refraction System that is customized at the factory to interact with accessories and equipment purchased in combination with the unit. The default factory settings are determined by the particular setup of each order, so that the equipment is ready to use and should require no software updates. Software packages that allow connecting to different auxiliary instruments can be ordered after delivery of the auto refraction system by providing the serial number of the Controller to the manufacturer.

The basic setup contains three items which are programmed to interact with each other: the Phoroptor Head, the Central Unit, and the Controller. The Central Unit directs communication between the Phoroptor Head, Controller, and other equipment, while the Controller acts as the user interface and controls the Phoroptor Head and the Input/Output of data.

The Auto Phoroptor RS is designed to communicate with auto projectors and digital acuity systems available from Reichert and a few other manufacturers. These acuity systems are configured to communicate with the Auto Phoroptor RS. Refer to Appendix A for a complete list of acuity systems that interface with the Auto Phoroptor RS.

Note: Ensure the instrument you are interfacing with is compatible with the Auto Phoroptor RS. A list of instruments that can be connected to the Auto Phoroptor RS can be found in Appendix A.

Connecting Acuity Systems to the Auto Phoroptor RS

Auto Projector Systems can be connected to the “Projector” port on the Central Unit using a DB9 M/F serial cable (P/N 559-262).

Wired communication between the ClearChart 2 and the Auto Phoroptor RS requires connection of a NULL Modem DB9 M/F serial cable. The cable should be connected to the serial port on the ClearChart 2 and the “Projector” port on the Central Unit.

The ClearChart 2 can also communicate wirelessly with the Auto Phoroptor RS using a set of Bluetooth® serial adapters. One serial adapter needs to be connected to the serial port on the bottom of the ClearChart 2 and can be powered through the USB connection on the side of the device or with a separate AC adapter. Use of a M/F serial adapter may be needed to connect the Bluetooth adapter to the ClearChart 2. Refer to Figure SU-13.

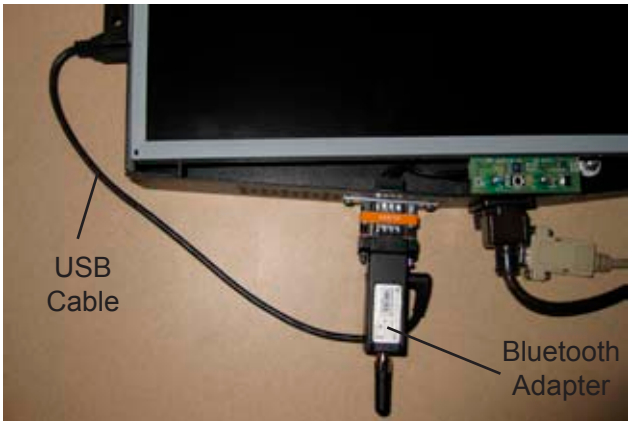


Figure SU-13, Bluetooth Adapter Set-up - ClearChart 2

The second serial adapter should be connected to the “Projector” port on the Auto Phoroptor RS Central Unit and powered with an adapter plugged into an outlet. Refer to Figure SU-14.

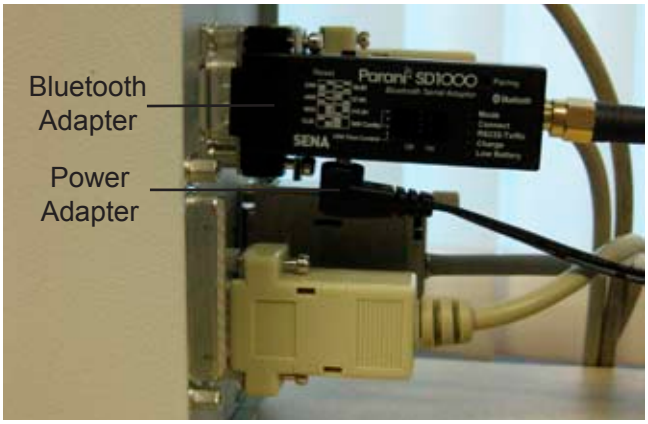


Figure SU-14, Bluetooth Adapter Set-up - Central Unit

Follow the instructions provided by the manufacturer of the wireless serial adapters to set the devices for the serial port configuration.

Connecting Auxiliary Equipment to the Auto Phoroptor RS

Lensmeters and Autorefractors can be connected to either the AUX port or EDV port on the Central Unit using a serial cable designated for use with a specific manufacturer's equipment. Please refer to Appendix A for a list of different manufacturers' equipment that will communicate with the Auto Phoroptor RS and the specifications of serial cables that can be used to connect these instruments.

Auxiliary equipment can also communicate wirelessly with the Auto Phoroptor RS. Bluetooth serial adapters can be connected to the serial ports of the individual equipment and paired with wireless adapters in the AUX and EDV ports. Follow the instructions provided by the manufacturer of the wireless serial adapters to set the devices for the serial port configuration.

The AUX port and EDV port need to be configured to communicate with specific instruments. Refer to the section on Options/Set-up Menu to determine how to configure those settings.

Connecting Multiple Auto Phoroptor RS Instruments

Multiple Auto Phoroptor RS can be set up to communicate with each other as a means of transferring data from one set of pre-test equipment (autorefractor and lensmeter) to multiple exam rooms. Refer to the section on Options/Set-Up Menu for the necessary menu settings to establish connectivity with multiple Auto Phoroptor RS units.

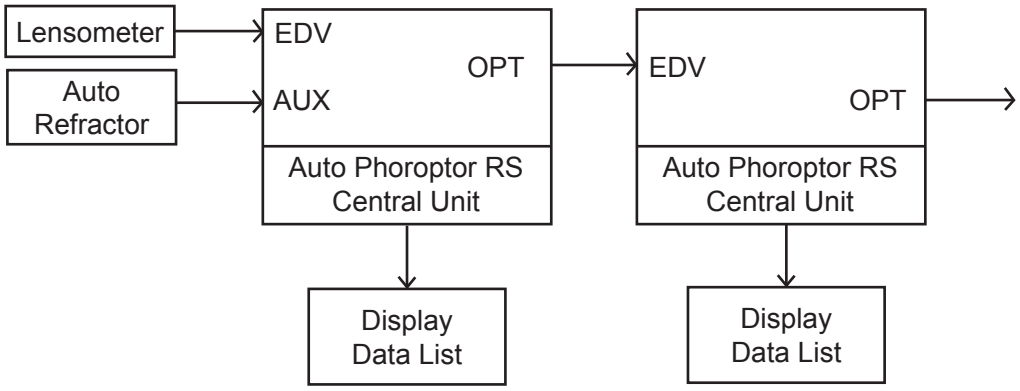


Figure SU-15, Connecting Multiple Units

(continued)

Connecting Multiple Auto Phoroptor RS Instruments (continued)

1. Set-up the Autorefractor and Lensmeter in the pre-test area to communicate with the Auto Phoroptor RS closest to that location, via wired or wireless connections to the AUX port and EDV port.
2. Connect the Central Unit of the first Auto Phoroptor RS to the Central Unit of the Auto Phoroptor RS next in line via cable (DB9 F/F Serial Cable P/N 559-261 plus extension DB9 M/F serial cable of appropriate length) or Bluetooth wireless serial adapters. The Options port on the first Auto Phoroptor RS is the data output port and the AUX port or EDV port on the next Auto Phoroptor RS can receive the data. Continue with this process until all exam rooms with Auto Phoroptor RS systems are connected.

Note: There is no limit to the number of Auto Phoroptor RS units that can be linked together.

Note: If using version 3.02, when both the Aux port and the EDV port are used for connection of a lensmeter and autorefractor to the first Auto Phoroptor RS in the chain, the serial printer port can be used to connect to a computer and send data to an EMR system.

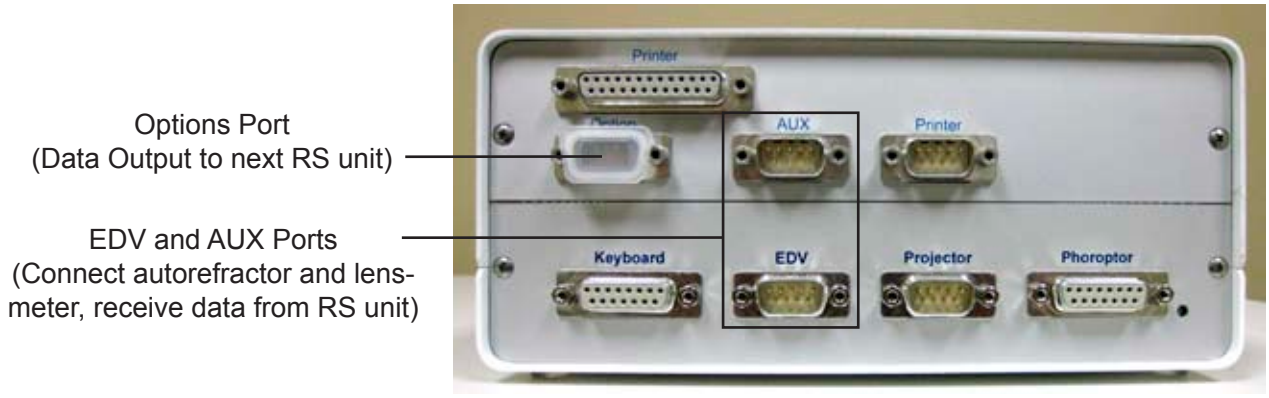


Figure SU-16, Multiple Auto Phoroptor RS Systems Set-up

Operating Principle

All known refraction methods can be performed on the Auto Phoroptor RS. The order of the examination steps is freely selectable by the user.

The operating system of the Auto Phoroptor RS is Windows® CE. The functions are activated using the buttons and Control Knob on the Controller of the Auto Phoroptor RS.

In this operating manual, the Control Knob is shown as the following two images:  and  .

When there are arrows above the knob, you are directed to turn the knob either clockwise or counterclockwise. Turning the knob changes the numerical values and selection of fields as follows:



- Clockwise rotation means '+' (increases the value) or 'to the right side' or increase (+) sphere power.
- Counterclockwise rotation means '-' (decreases the value) or 'to the left side' or increases (-) sphere power.

Note: If the knob is pressed during rotation, the changes are performed in larger steps.

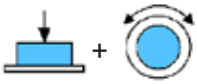
When you see the side view of the button with the arrow pointing down (pressed), you are directed to press the button. This does the following:



- Enters the data.
- Moves on to the next step.
- Finishes the operation.

Note: Generally, to adjust a specific measurement, simply press the corresponding button to activate it, and turn the knob to adjust the value, then press the knob to enter it.

When you see the side view of the button with the arrow pointing down (pressed), followed by the top view of the button with arrows above the knob, you are directed to press the button and turn the knob either clockwise or counterclockwise at the same time. This does the following:



- Adjusts the Sphere by 1.00D increments
- Adjusts the Cylinder by 1.00D increments
- Adjusts the Axis by 10° increments

Options/Set-Up Menus

The following is a summary of the options menu and all of the corresponding drop down menus that coincide with each selection in the options menu. To access the Options Menu press OPTIONS (the button on the top left of the Controller). To exit out of the options menu, press OPTIONS again.

1. Press OPTIONS and the options menu appears in the upper left part of the display. The settings on the unit and auxiliary functions can be changed in this screen.
2. Turn  to select the field you wish to edit and press  to move on to the next menu.

Note: Turn the Control Knob to the left to move the menu selection from the top down, and to the right to move the menu selections from the bottom up. To return back to the main options menu after opening a sub menu, press OPTIONS.

3. Press  to enter a setting.
4. Once you enter a setting by pressing  your setting is saved and the Options menu closes.
5. To set other options, just press OPTIONS again.
6. The following callouts are valid:
   - ▶ - There is another menu that will appear.
   - ... - There will be an instruction box that pops up.
   - Black Writing- Setting is active/selected.
   - Gray Writing- Setting is either not selected or unavailable in the software version.
   - ✓ - The specific setting is selected/active.

Settings

The following screen appears when you press OPTIONS and select Settings. The categories are broken down in the following pages.

Note: Refer to Appendix B, page 78 for the Options Menu and Settings in software version 3.02.

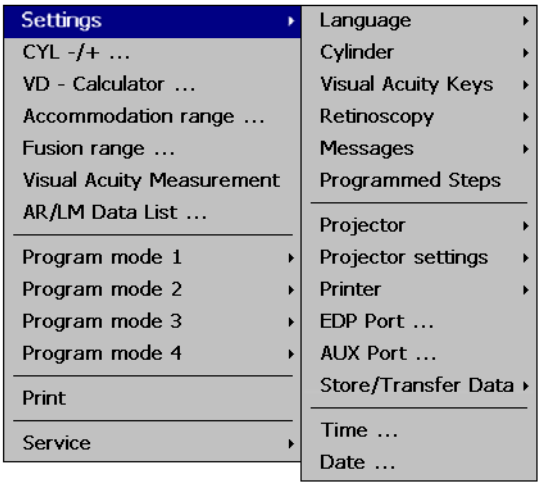


Figure SU-17, Settings Menu

Options/Set-Up Menus (continued)

Settings (continued)

Language

Use this option to change the language of the operating system. Turn the control knob to scroll through the different languages and press it to enter the selection. The date format may change based on the language selected.

Cylinder

Use this option to change the default to either:

- Prefer Plus Cylinder
- Prefer Minus Cylinder

Turn the control knob to scroll through the cylinder options and press it to enter the selection. This selection sets the printed data output to either + or - cylinder.

Visual Acuity Key

Use this option to set the Visual Acuity button preferences. Options are:

- UP - Increase Size
- UP - Increase VA (Visual Acuity)
- Down - Decreases Optotype Size
- Down - Decreases VA (Visual Acuity)

If you select Increase Size, when you press the Visual Acuity Up button, it will increase the size of the optotypes being displayed. If you select Increase Visual Acuity, when you press the Visual Acuity Up button, it will decrease the size of the optotypes.

Retinoscopy

Use this option to set the default Retinoscopy lens preferences. Options are:

- Sphere +1.5 D
- Sphere +2.0 D

When the gray R button among the lens selection is pressed, the Phoroptor Head will automatically bring in your default sphere preferences.

Messages

Use this option to set the Error Messages preferences. Options are:

- Error Messages Off
- Info Forehead Rest Fully Off
- Only Forehead Rest Beep Off (Beep will not sound when the patient's forehead is not against the head rest.)

Programmed Steps

Use this option to enable a program that was previously created. If this option is checked, the Auto Phoroptor RS will boot up with the refraction program activated. Refer to Program Mode 1-4.

Projector

Use this to select which compatible projector is connected to the unit. You can only chose from the compatible options listed in the menu. Refer to Appendix A for a detailed list of all compatible projectors.

Options/Set-Up Menus (continued)

Settings (continued)

Projector Settings

This option allows you to select which settings to enable for the connected projector. You can select certain tests charts to be presented automatically when starting the refraction and performing the cross cylinder test. Press the blue knob to save the preferred settings. The options are:

- Autom. set to defaults
- Set Defaults
- Select Charts
- XCYL 6/9 automatic check
- XCYL 6/9 automatic A
- XCYL 6/9 automatic CYL
- XCYL 6/9 automatic fine
- XCYL Dots automatic check
- XCYL Dots automatic A
- XCYL Dots automatic CYL
- XCYL Dots automatic fine

Autom. set to defaults - When this setting is selected, the chart selection will automatically return to the default setting when the data are cleared after completing a refraction.

Set Defaults - Select a chart and use this setting to set it as the default chart. This chart will be the starting point of the refraction, will appear when the data are cleared after completing a refraction, and when the Auto Phoroptor RS is turned off and on again.

XCYL 6/9 - These settings refer to the X Cylinder test. An isolated number chart will be activated when visual acuity is 20/40 or better if the XCYL 6/9 is selected for any or all of the steps of the cross cylinder test.

XCYL Dots - The X Cylinder dot chart can be selected for any or all of the steps of the X Cylinder Test.

“Select Chart” - is only available when certain European digital acuity systems are selected.

Note: The projector starts out with the default settings on. Once a setting has been changed, you can select SET DEFAULTS to restore the default settings.

Printer

Use this option to select the printer that is connected to the Central Unit. The printer will not print unless it is selected in this menu. If no printer is connected to the Central Unit or installed, the only option will be None.

Note: Refer to Appendix B, page 80 for XCYL Chart Selections in software version 3.02.

Options/Set-Up Menus (continued)

Settings (continued)

EDP Port

Use this option to view the port configuration information. The auxiliary device (such as a Lensmeter, Autorefractor, or computer) and EDP communication protocol can be set using this menu setting. Press the CTL, R/G, and PD buttons in sequence and hold them down to open up the Device/Protocol box and select the instrument you want to connect. The Port settings in this dialogue box must match the input settings in the instrument you are trying to connect. Refer to Figure SU-18.

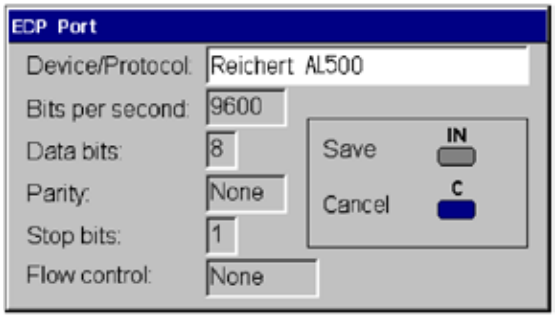


Figure SU-18, EDP Port

Aux Port

Select either a Lensometer or Autorefractor auxiliary device to communicate through this port using the same procedure as for the EDP port above.

Store/Transfer Data

These menu setting allow patient data from the autorefractor and lensmeter to be stored in the Auto Phoroptor RS and transferred to another Auto Phoroptor RS.

Select “Store” and press the control knob if autorefractor and lensmeter data for each patient need to be stored and accessed later in the exam room.

Select Transfer also if the data need to be stored and transferred to multiple Auto Phoroptor RS instruments.

Time

Use this option to set the time. Follow the instructions on the screen to set the hours and minutes.

Date

Use this option to set the date. Follow the instructions on the screen to set the month, day, and year.

Options/Set-Up Menus (continued)

Cylinder +/-

The +/- cross cylinder setting allows the provider to select a preference for plus (+) or minus (-) cylinder. Use this option to change the default to either plus or minus cylinder. Use the Control Knob to select and go back to the measurement screen. This is the same option as in Settings-Cylinder, but is slightly faster to get to. Refer to Figure SU-19.

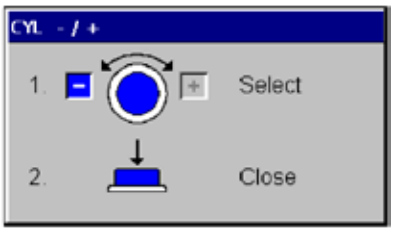


Figure SU-19 CYL +/-

Note: Press CTL and CYL together during refraction and the setting will be switched to plus or minus cylinder. Press again to switch back.

VD-Calculator

This tool will calculate the refraction value and spherical equivalent at various vertex distances. As you turn the knob selecting different conversion values, the values for sphere, cylinder, and axis will change on the pop up screen. This allows you to see the numerical conversion only; it does not store or save the values. It is for reference only. The Phoroptor Head and the active data field are not changed or affected by the conversion. To the right is an example of the VD-Calculator screen. Refer to Figure SU-20.

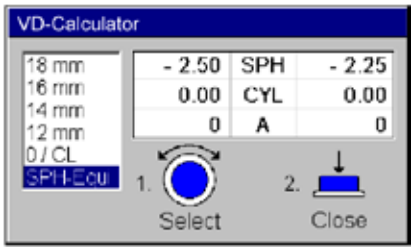


Figure SU-20 VD-Calculator

Note: In version 3.02, if any vertex distance other than 16 is selected, the displayed sphere, cylinder and axis values are adjusted before sending the data to the printer or EMR.

Accommodation Range

This allows you to change the accommodation range (ACC) of the sphere value of the right and left eye. Adjust the sphere power to determine the point at which the patient's vision begins to blur in the right and left eyes. Refer to Figure SU-21.

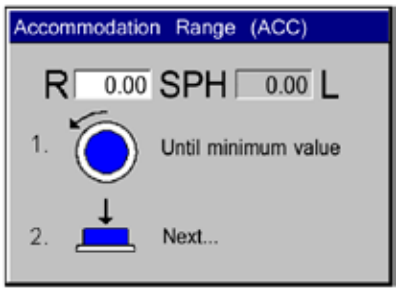


Figure SU-21 Accommodation Range

1. Turn the control knob to set the desired minimum value.
2. Press the control knob in to set the right eye and move to the left eye.
3. Press the control knob again to save the accommodation range data and exit.

Note: If you go back and reset these values, you will be asked to press C to clear the old values and enter new ones.

Fusion Range

The fusion range option allows vergences to be measured: blur, break and recovery. This function is also available by pressing the PR button to access prism test operation. (Refer to the section on prism compensators.)

Options/Set-Up Menus (continued)

Visual Acuity Measurement

The visual acuity measurement option allows for recording visual acuity in the right eye, left eye and for binocular vision, with or without correction. The visual acuity can be changed by using the up and down acuity arrows to increase or decrease acuity, or by turning the control knob.
Refer to Figure SU-22.

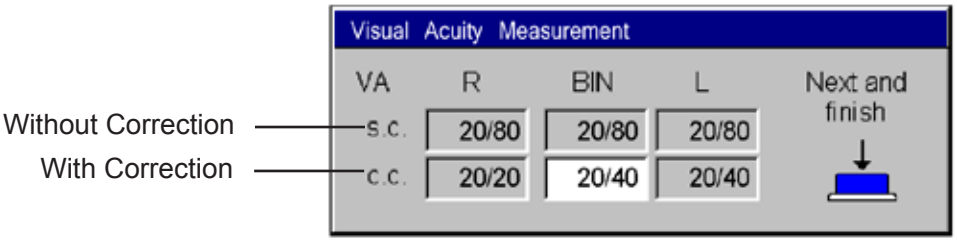


Figure SU-22, Visual Acuity Measurement

Note: A projector must be connected to record visual acuity.

Note: It is recommended to set the chart mask to the single optotype or single line of optotypes when measuring and recording visual acuity.

1. The visual acuity on the projector can also be set in this mode by turning  .
2. Visual acuity can be performed at any time.
3. If visual acuity is measured before entering any lensmeter or autorefractor data, and before beginning the exam, the visual acuity can be measured without correction by turning the control knob to the right or left and pressing the control knob to enter the acuity level for the right eye, then the left eye, and finally binocular vision.
4. When the exam is complete, corrected visual acuity can be measured by opening up the visual acuity measurement option, turning the control knob to select visual acuity, and pressing the knob to enter the value for right eye, left eye, and binocular vision.
5. Both uncorrected and corrected visual acuity can be measured during the exam by opening up the visual acuity option. If there are no stored values for uncorrected visual acuity, the lenses will automatically clear to 0.00. Enter the values for unaided visual acuity by turning and pressing the control knob for the right eye, left eye and binocular vision. After unaided visual acuity is entered, the values and lenses for the most recent refraction data will be restored and aided visual acuity can be measured by turning and pressing the control knob.
6. After completing measurement of visual acuity the values are saved but the data are not visible.
7. In the event that further changes to the refraction data are made, visual acuity can be measured and stored again. The current saved visual acuity can be removed in the visual acuity measurement option by pressing the CP (clear partial) button to clear corrected values and acuity can be measured again.
8. Another way to save corrected visual acuity (if no acuity values have been measured yet) is to press CTL and R. The data will be saved automatically. CTL and R can be pressed to measure acuity in the right eye, again to measure the left eye, and again for binocular vision. Visual acuity can be recorded this way at any point during the exam without having to open the options menu.

Note: In version 3.02, pressing CTL and R at anytime will save either unaided or aided visual acuity in the right eye, left eye, or binocularly.

Options/Set-Up Menus (continued)

AR/LM Data List

The AR/LM Data List options opens up a list of lensmeter and autorefractor readings that are identified by patient number and organized by the time the measurements were taken. This function allows the operator to select a specific set of patient data to be imported into the Auto Phoroptor RS in any exam room. Patients can be screened in the pre-test room, and their lensmeter and autorefractor data can be transferred and accessed in one or more Auto Phoroptor RS instruments.

The Data List is created from data output from the lensmeter and autorefractor that are connected to one Auto Phoroptor RS or the first Auto Phoroptor RS in a series. The Store Data option must be selected in the Settings Menu in order for the data to be stored in the list.

Selecting this option will bring up the following window on the Controller screen:

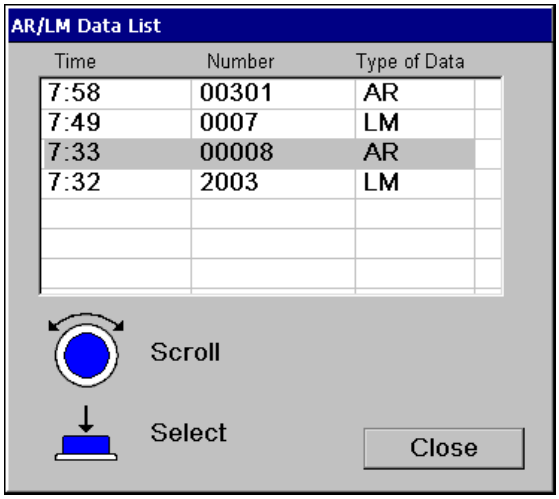


Figure SU-23, AR/LM Data List

The most recent lensmeter and autorefractor measurements taken appear at the top. Individual patient data can be identified by the time and the patient number which is assigned by the lensmeter and autorefractor. Turn the Control Knob and then press it to select the data you want to import into the Auto Phoroptor RS as the starting point of a refraction. Two sets of data (lensmeter and autorefractor) can be selected to transfer. Use the function key to the right (right arrow key) to close the window. The imported data will appear in the lensmeter and autorefractor boxes at the bottom of the Controller screen.

The storage capacity of the Data List is more than adequate to capture data for all the patients seen at a practice in a particular day. The Data List will automatically be cleared at the beginning of the following day.

Options/Set-Up Menus (continued)

Program Mode 1-4

In program mode, the sequence of the examination steps can be set. Options are:

- Play
- Record
- Delete
- Edit
- Print

Note: If no program has been recorded, the only available option will be Record. The other options can only be accessible with a program already saved in memory.

Play

Press  under the Play option to begin the program, or press CTL and  .

1. A box appears indicating the current step. Example:
2. To advance through the steps of the program, press the Control Knob.



Note: When the unit is turned ON, if a Program Step box is displayed, the unit is already running an individual program and the options menu will be limited.

Shortcut: To close the program, press CTL and  .

Record

In the Record option under Program Mode, you can set the refraction steps in the order of your choosing. Up to four different programs can be recorded. Specific charts can be brought in when you play the program and move through the steps, or can be included in the programmed steps.



Figure SU-24, Record

1. Enter the order of the refraction steps by pressing the corresponding buttons on the Controller. The items will automatically appear on the screen. Insert a knob hit to separate refraction steps. Refer to Figure SU-24.

Note: It is recommended to set a default test chart before recording a program. The program will begin with the default chart when the refraction program is initiated, and when isolating the left eye.

2. If you wish to delete a step, press the Function Button corresponding with the Delete button.

Note: You can only delete the last step and the steps above in order. The Control Knob does not scroll through the steps when you turn it.

3. Finish by pressing the Function Button corresponding with the Save option.
4. If you don't want to save the program, simply press the Function Button corresponding with Cancel.

Options/Set-Up Menus (continued)

Program Mode 1-4 (continued)

Edit

Programmed steps can be added or deleted in this menu. Select Options, Program Mode 1, 2 ,3 or 4 and Edit.

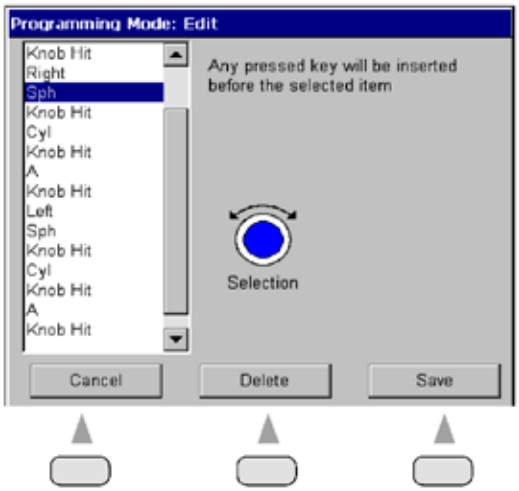


Figure SU-25, Edit

1. If you want to delete a step, turn  until you highlight the step you wish to delete.
2. Press the Function Button corresponding to the delete key to remove the highlighted step. Refer to Figure SU-25.
3. If you want to add a step, highlight a step where you want to insert another step above it.
4. Press the button of the step you want to add. The step will be added above the highlighted step.
5. Press the Function Button corresponding to the Save key to save the program.
6. Press the Function Button corresponding to the Cancel key to exit and not save any changes.

Turn Program On and Off

1. Press CTL and  at the same time to switch from the recorded program to the default program.

Note: If using version 3.02, press CTL and CP in sequence to turn a program on and off.

2. Press the same buttons to switch back again.
3. The individual program is indicated on the step counter in the bottom left corner of the screen: 

Print

This option is only available when you have a printer set up and connected to the Central Unit. A compatible printer can be selected in the settings menu.

Options/Set-Up Menus (continued)

Service

This selection provides access to all the service settings and information. Refer to Figure SU-26.

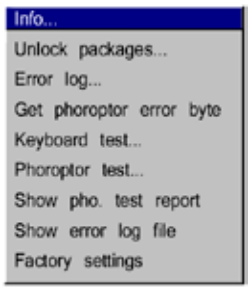


Figure SU-26 Service Menu

System Info

This option provides the system information for the unit. The serial number, Software version, projector, printer, etc. are listed. Refer to Figure SU-27.

Unlock Packages

Use this option to unlock packages for other instruments and software packages from Reichert. Please refer to Finding and Entering Software Package Keys, under Software Update.

Error Log

This is a log of all the errors that have occurred in the Controller. You can press the corresponding keys to Refresh, Delete, or go on to the Next page. If you press CTL, the Print and Send options are activated. Press the control knob to close this window.

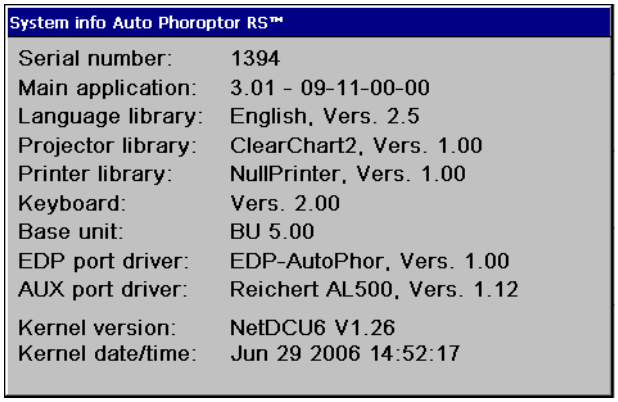


Figure SU-27, System Info

Get Phoroptor Error Byte

This is a log of all the errors that have occurred in the Phoroptor Head.

Keyboard Test

Use this to perform a self test of the Controller. A screen with a keyboard layout will pop up. As you press a key, it will turn from blue to green, indicating that it is functioning properly. Test all the keys, the scroll wheel, and knob, and make sure everything is functional. To exit, press CTL and  . If there is any malfunction of any of the keys, please contact Reichert. (Contact information is on the last page.)

Note: Open up this test only if you need to test the keys. All of the keys will need to be pressed and the scroll wheel and knob turned before you can end it.

Phoroptor Test

This will test the lens movement in the Phoroptor Head and all other functions of the Phoroptor Head. Hit the arrow key corresponding to “stop” to interrupt the test process and the arrow key corresponding to “close” to close the window.

Show Pho. Test Report

This is a log of all the errors that have occurred in the Phoroptor Head. You can press the corresponding keys to Refresh, Delete, or go on to the Next page. If you press CTL, the Print and Send options are activated. Press the multi function knob to close all windows.

Options/Set-Up Menus (continued)

Service (continued)

Show Error Log File
This is a log of all the errors that have occurred in the entire system. You can press the corresponding keys to Refresh, Delete, or go on to the Next page. If you press CTL, the Print and Send options are activated. Press the control knob to close this window.

Factory Settings
This option prompts you with a screen that asks if you want to reset all options to factory settings. Press either IN for yes, or C for no.

Introduction

The Phoroptor Head needs to be aligned with the patient before reliable measurements can be taken. Once the Phoroptor Head has booted up, it is ready to be aligned and measurements can be taken immediately afterward.

Alignment of Phoroptor Head

Initial Alignment

The first alignment that needs to be made is the general alignment of the Phoroptor Head to the patient.

1. Place the back side of the Phoroptor Head in front of the patient and center it in front of the patients eyes. Refer to Figures SU-28 and SU-29.

Note: The Forehead Rest is an applied part that will make contact with the patient. Refer to Figure SU-28.

2. Use the Illuminated Bubble on the Phoroptor Head to make sure that the Phoroptor Head is level. Refer to Figure SU-30.

Note: If the Phoroptor Head is not level, the screws at the back of the Phoroptor Head mount may need to be loosened. To adjust the Phoroptor Head position, use a #3 metric Allen wrench to loosen the Phoroptor Head and then tighten the screws to set it in place.

3. Once the Phoroptor Head is level, physically adjust the Phoroptor Head to line up the left side with the patient's eye. Refer to Figure SU-31.

Note: Do not worry about the alignment of the right side of the Phoroptor Head to the patient's other eye. This will be adjusted later.



Figure SU-28, Back Side of Phoroptor Head



Figure SU-29, Placement



Figure SU-30, Level



Figure SU-31, Adjust Phoroptor Head

Alignment of Phoroptor Head (continued)

Pupillary Distance

The next adjustment that needs to be done is the pupillary distance (PD). Using the Controller, adjust the pupillary distance between the right and left apertures on the Phoroptor Head. The PD can be adjusted either monocularly or binocularly.

Note: If PD measurements are transmitted from the auto refractor or lensmeter data, when the data is brought in as a starting point for the refraction, the Phoroptor Head will automatically move to adjust to the PD.

1. Press PD. Both apertures will display fixed cross cylinder lenses.
2. Use the crosses in the lenses to line up the center of the patient's eye.
3. The Illumination for Corneal Vertex will light up to help with alignment.
4. The left refractor half is active first, indicated by this image on the Controller display screen:



5. Turn  to change the pupil distance.
6. Press  to set the distance and move to the right eye.
7. Press  to save the right eye measurement and exit.

Shortcut: When turning the Multifunction Knob:
Press BIN, and both refractor halves simultaneously move together or apart.
Press BIN and the multifunction knob, both halves move in the same direction.

Corneal Vertex Distance

The next measurement that must be taken is the corneal vertex distance, to make sure that the refractor's lenses are at the proper distance from the patient's eyes.

Note: The default vertex distance is 16mm.

1. Look into the Corneal Vertex Distance Windows and line up the corneas so that the target line and the target mark superimpose. Refer to Figure SU-32.
2. Turn the Forehead Rest Knob so that the patients forehead is resting against the Forehead Rest.



Figure SU-32, Corneal Sights

Alignment of Phoroptor Head (continued)

Corneal Vertex Distance (continued)

3. If the Forehead Rest is not pressed against the patient's head, the following warning signs appear:
   - POS or POSITION will appear in red on the screen and blink.
   - User Information : Attention : Forehead Rest
   - A beep will sound intermittently.

Note: The warning beep and User Information warning can be inactivated by changing the settings in the Options Menu. Follow these steps:

OPTIONS → Settings → Messages → Info Forehead Rest Fully Off
Only Forehead Rest Beep Off

Height Level of Eyes

Next, it is necessary to adjust the refractor so that the height of each side is level with the patient's eyes.

1. Center the left aperture in front of the patient's left eye.
2. Center the other half of the refractor with the patient's right eye by turning the Height Adjustment Knob. Refer to Figure SU-33.



Figure SU-33, Level With Eyes

Operator Positioning

Once the Phoroptor Head is in place in front of the patient, the operator can position himself for the examination.

The operator can sit or stand, and should be positioned so that the Controller can be accessed easily.
Refer to Figure SU-34.

Note: The instrument is operated the same way whether the operator is sitting or standing, positioned on the left or right side of the patient.

Note: The operator should be positioned so that the patient's view of the eye chart during the examination is not obstructed.



Figure SU-34, Operator Positioning

Inputting Data

Now that the refractor is aligned, you may begin to take measurements. You have the option to import previous measurements as a starting point for a refraction. To do so, a basic understanding of the storing and importing of data is necessary.

Data Storage Boxes

On the bottom right of the Controller display screen are 3 gray Storage Boxes. Storage Boxes can be used to store:

- Data transferred from an EMR system.
- Data transferred from connected equipment such as Lensmeters or Autorefractors.
- Data from refraction.
- Data entered manually. Data can be entered manually by pressing the function button (arrow key) under the box corresponding to the data that you wish to enter. The values for sphere, cylinder and axis and add can be entered by turning the control knob and pressing enter to save the value.



Figure IU-1, Storage Boxes

Under each Storage Box is a small field labeling the boxes. The fields are labeled:

- **AR** - Autorefractor
- **LM** - Lensmeter
- **DATA** - Refraction data from EMR.

Data can be transferred from any of these boxes to the Phoroptor Head using the function keys below each box so that refractions may begin from this starting point. New refraction measurements can be saved and stored in these boxes, and measurements may be switched back and forth from the storage boxes to the active field at any point. Refer to Figure IU-1.

Data Transfer From Online EMR or Directly Connected External Equipment

Transferred data is assigned to the corresponding storage places:

- **AR** - Autorefractor
- **LM** - Lensmeter
- **DATA** - Refraction data from EMR

To import data, you must make sure the settings are set up for data import.

Note: The instrument must be connected to the Main Unit using the appropriate cable.

1. Press OPTIONS and turn  to select Settings and press  .
2. Turn  to select AUX Port and press  .

Inputting Data (continued)

Data Storage Boxes (continued)

Data Transfer From Online EMR or Directly Connected External Equipment (continued)

3. The following screen will appear. Refer to Figure IU-2.

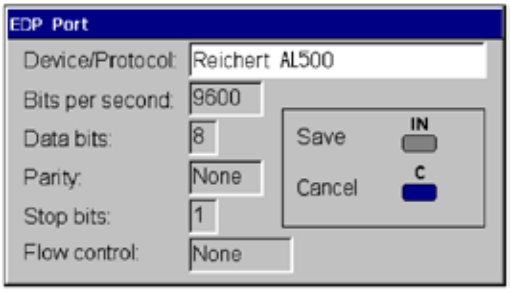


Figure IU-2, EMR Port

Note: When you first access the box, the data are highlighted in gray, meaning you cannot edit them. You must press several buttons together to access the fields.

4. Press CTL+R/G+PD (in sequence and hold them down) to activate the AUX or EDP Port fields.
5. Use the control knob to enter the information for the device. Turn the control knob to select the settings and press the control knob to advance through each selection.
6. When all the data are correct, press IN to save and exit the screen.

Note: You must set the correct data settings for output/export on the instrument you are transferring the data FROM. You must make sure the Baud Rate and other data match the settings in the Auto Phoroptor RS. If the settings are not correct, data will not transfer.

7. Press the data output button on the instrument you want to import data from. Example, on the AL500, it is the far right button used for printing or electronic transmission of data. This would be a data output function button on the instrument.
8. Data will export to the Controller and appear in the corresponding box.

Note: The EDP port can also be used for importing auto refractor and lensmeter data.

Adjusting Values

Now that the patient is aligned you may start the refraction.

Adjusting a Refraction From Previously Saved, Transferred or Input Data

1. Press the Function Button on the Controller corresponding with the storage box measurements you want to send to the Phoroptor Head (i.e., Lensmeter, Autorefractor, EMR.).
2. The data in the box are transferred to the refraction data fields above and become active.
3. The data are labeled the same way as in the data storage area. Example, LM.
4. The Phoroptor Head automatically switches in the lenses to reflect the information in the active field.
5. Measurements can be adjusted from this starting point.
6. Once new measurements are taken, the label changes from the previous label (LM, AR, etc) to NEW.



Figure IU-3, Storage Boxes

Shortcut: Press CTL and Open Lens Aperture to fill the memory with demo values.

Eye Selection

Press R, L, or BIN (binocular) to open the apertures for the right eye, left eye, or both eyes.

Note: The aperture for the inactive eye will automatically be closed during refraction.

Note: The default setting after turning the unit on is to have the right eye active and both viewing apertures open.

Sphere

1. Press SPH to activate the sphere value field or scroll through the options until you reach sphere by turning  .
2. The sphere box will be highlighted, indicating it is the active data field.
3. Turn  to adjust the sphere value by ±0.25 D each.

Note: Move the knob to the right to increase plus (+) sphere power and to the left to increase minus (-) sphere.

Note: Press in and turn the knob together to adjust the sphere value by ±1.00 D per click stop.

4. Press  to enter the value and to move on to the next step.

Adjusting Values (continued)

Cylinder

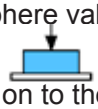
1. Press CYL to activate the cylinder value.
2. The cylinder box will be highlighted, indicating it is selected. Refer to Figure IU-4.
3. Turn  to adjust the cylinder value by ±0.25 D each.

Note: Press in and turn the knob together to adjust the cylinder value by ±1.00 D per click stop.

4. Press  to enter the value and to move on to the next step.

Sphere and Cylinder

You can adjust both the sphere and cylinder values simultaneously by activating this function.

1. Double-click CYL.
2. Both the Cylinder and Sphere values will be highlighted, indicating they are both active.
3. Turn  to change the sphere and cylinder value together.
4. The first click stop will adjust the cylinder power by ±0.25D.
5. The next click stop will adjust the cylinder power by another ±0.25 D, while the sphere value will adjust by ±0.25 D.
6. Press  to enter the value and to move on to the next step.

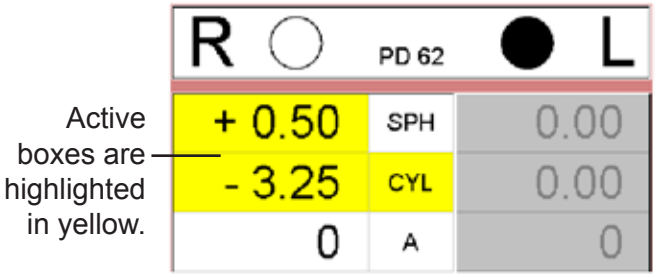


Figure IU-4, Active Boxes

Note: Once you move on to another value, for example A or ADD, the combination cylinder and axis alteration will be deactivated and you will have to double click on CYL again to enter the mode where both Cylinder and Sphere values are adjusted simultaneously.

Adjusting Values (continued)

Axis

1. Press A to activate the Axis or press  until you reach axis.
2. The axis box will be highlighted, indicating it is selected.
3. Turn  to change the axis value by 1°.

Note: Press in and turn the knob together to adjust the axis value by ±10° per click stop.

Note: The actual position of the axis is graphically shown on the display.

4. Press  to enter the value and to move on to the next step.

Near Vision Addition

1. Press ADD to change the Near Vision Addition value.
2. The ADD box will be highlighted, indicating it is selected.
3. Turn  to change the near vision addition value.

Note: Press in and turn the knob together to adjust the near vision addition value by larger steps.

4. Press  to enter the value and to move on to the next step.

Cross Cylinder

The Auto Phoroptor RS has a cross cylinder function activated by the X-CYL button that allows for:

- Examination for astigmatism.
- Axis adjustment.
- Cylinder power adjustment.
- Cylinder fine adjustment.

Taking into account the already set correction values and the visual acuity set on the projector, the next logical examination steps are presented automatically.

Changing the Cross Cylinder Power Step

1. The default setting is ±0.25D. Refer to Figure IU-5.
2. Press the ±0.5 button once to change the cross cylinder step from ±0.25 D to ±0.5 D.
3. Press the ±0.5 button a second time, and the cross cylinder step goes back to ±0.25.
4. From visual acuity of 20/60 or worse, the cross cylinder step is switched to ±0.5 D automatically.
5. This can be reset any time by pressing the ±0.5 button.

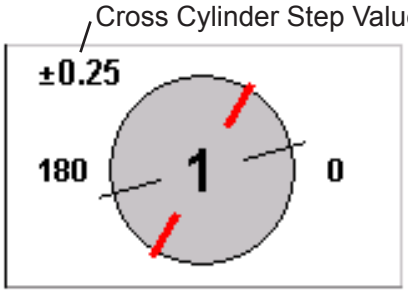


Figure IU-5, Step Value

Changing the Spherical Effect in Cross Cylinder Mode

1. Press and hold SPH and turn  to change the spherical value.

Cross Cylinder (continued)

Examination for Astigmatism

If the cross cylinder mode (X-CYL) is activated and a cylinder value is not present, you will be prompted to perform an astigmatism check.

1. Press X-CYL and the Astigmatism Check screen will appear. Refer to Figure IU-6.
2. Turn  to change the cross cylinders in 0° and 90°, or in a second round in 45° and 135°.
3. Press IN to save the cross cylinder value and add it to the spherical value.
4. Press A once to delete the cross cylinder value.
5. Press A again to reset it to the previous axis position.
6. Continue on with the Axis adjustment and Cross Cylinder adjustment.

Note: Refer to Appendix B for a description of the function of the Cross Cylinder test in version 3.02. The function of the knob and IN button are switched. Smart and Manual Cross Cylinder test modes are available.

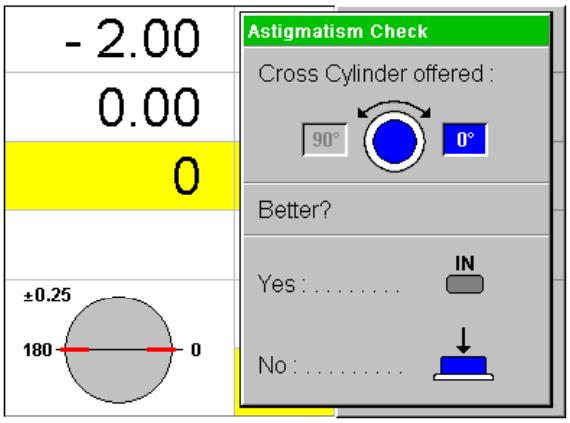


Figure IU-6, Astigmatism Check

Cross Cylinder (continued)

Axis Adjustment

1. Press X-CYL to set the Auto Phoroptor RS to cross cylinder mode. Refer to Figure IU-7.

Note: Axis Adjustment will automatically be the next step if the astigmatism check is done first.

2. If both eyes are open, one eye will be covered.
3. If a cylinder value is already selected, the axis adjustment will be performed first.

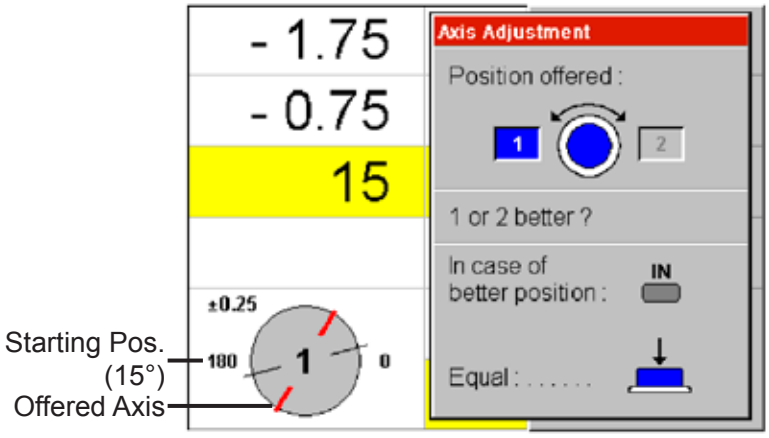


Figure IU-7, Axis Adjustment

4. Turn  to change the position of the conventional cross cylinder.
5. If the patient prefers a position, the cylinder axis must be changed to this preferred direction. To do this, you have 2 options:

Shortcut: Press CTL and IN to undo up to three adjustments.

Programmed Axis Adjustment

1. Press IN to change the axis value in pre-programmed steps.
2. The degree of the first change depends on the cylinder power. The higher the cylinder power, the smaller the change:

Cylinder Power	First Alteration
0.25 to 0.75 D	20°
1.00 to 2.75 D	10°
3.00 to 8.00 D	5°

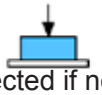
3. Once axis adjustment is determined, the next step is cylinder power adjustment.
4. Press CTL and IN to return to the previous setting.

Freely Selectable Axis Adjustment

1. Turn  to adjust an individual axis measurement.
2. Axis adjustment in a single degree starts after turning the knob in the direction preferred by the patient until the Controller beeps. Then move the knob two more click stops until the axis changes.
3. By this procedure, the user determines the amount of adjustment.
4. Press  to save the axis settings.

Cross Cylinder (continued)

Cylinder Power Adjustment

1. Press  and Cylinder Power Adjustment is selected if not done automatically. Refer to Figure IU-8.
2. If minus cylinder is selected in the Options menu, turning the knob left increases the value (axis on axis), and turning the knob right decreases the value (axis against axis).
3. Conversely, if plus cylinder is selected in the preprogrammed menu, turning the knob left will decrease the cylinder value, and turning the knob right will increase the value.

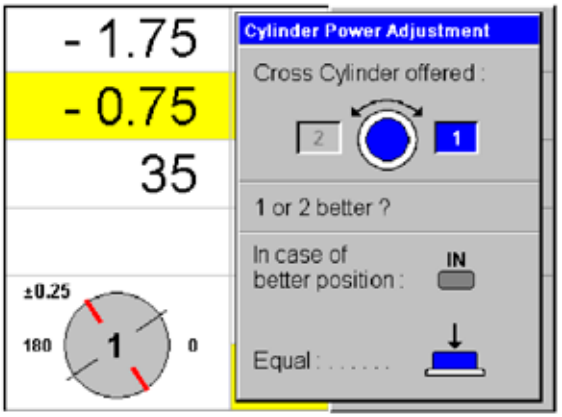


Figure IU-8, Cylinder Power Adjustment

Note: The plus axis of the cross cylinder is marked white.

Note: The minus axis of the cross cylinder is marked red.

To adjust the cylinder power you have 2 options :

Programmed Cylinder Power Adjustment

1. Offer position one and two to the patient and press  when the preferred position is stated. Cylinder power adjustment will be done in pre-programmed steps.
2. The cylinder power and sphere will both be changed, according to the entire cross cylinder value.

Note: The instructions in the pop up window will assist you during this procedure.

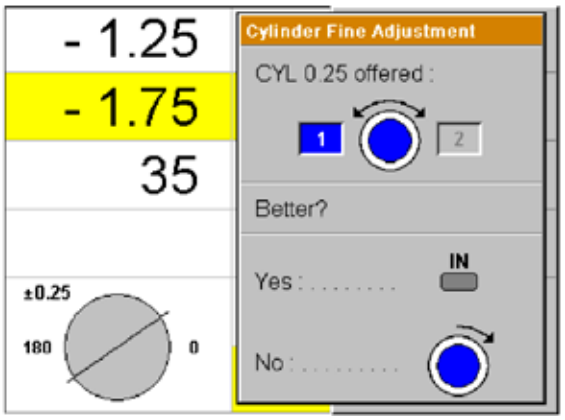


Figure IU-9, Cylinder Fine Adjustment

Freely Selectable Cylinder Power Adjustment

1. Starting with the position preferred by the patient, the cylinder power can be adjusted by turning the knob in the direction preferred by the patient until a beep sounds, and then turn the knob two more click stops.
2. The first click stop adjusts the cylinder power by ±0.25 D.
3. The next click stop adjusts the cylinder power by ±0.25 D, and the sphere value ±0.25 D with the reverse sign.

   Press  to save and exit cylinder power adjustment.
4. To move on to the next eye, press either R or L.
5. Press A to go back to the Axis Adjustment and make further changes if necessary.

Cylinder Fine Adjustment

After finishing the pre-programmed cylinder power adjustment, a correction of ±0.25 D may be required. The patient will choose a preferred position. Press IN and the cross cylinder test will be completed. Refer to Figure IU-9.

Near Vision Test

If required, a near vision test can be performed with a test chart on a near vision rod. In order to complete the near vision test the Near Vision Rod and Test Chart need to be inserted into the Convergence Lever on the bridge of the Phoroptor Head. A small metric Allen screwdriver may be needed to loosen the threaded pin in the Convergence Lever, and then tighten the pin to secure the Nearpoint Rod.

1. Lower the near vision rod.
2. The following fields and the settings will be highlighted:
   - The functions ADD and BIN.
   - Both refractor halves will converge to 15.75 in. When you raise the near vision rod, the add fields will no longer be active and the near vision lenses will be removed.
3. This function allows you to calculate comfortable near vision.

Comfortable Near Vision Addition

1. Press ADD. The Comfortable Near Vision Determination box will appear. Refer to Figure IU-10.
2. Turn the knob to the left until the patient can no longer see comfortably.
3. Press the ADD again- turn the knob to the right until the patient's near vision is no longer clear.
4. Press ADD a third time to calculate the near vision addition based on the lower and upper limit values.

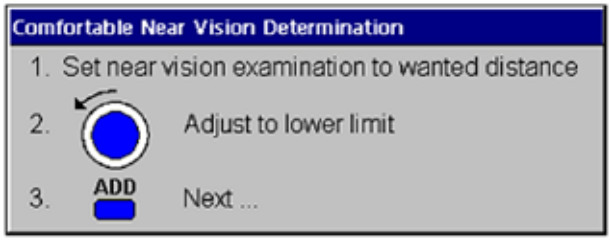


Figure IU-10, Near Vision Addition

Note: The patient's forehead must be positioned against the forehead rest.

Prism Testing

Prism lenses are built separately into the Auto Phoroptor RS and they must be brought in manually to place them in front of the lens apertures. Refer to Figure IU-11.

Note: Yellow caution symbols will flash as a reminder to bring in the prism compensators.

Note: Not all models of the Auto Phoroptor RS come with prism compensators.

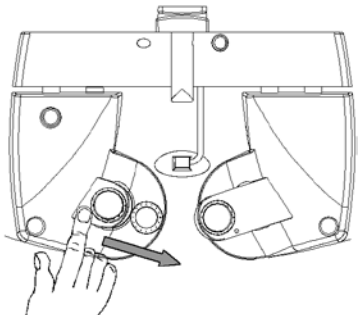


Figure IU-11, Place Prisms

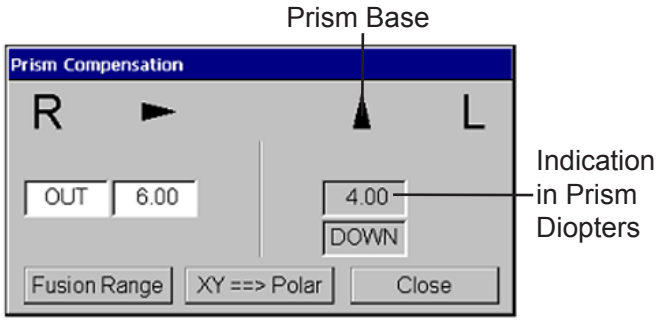


Figure IU-12, Prism Compensation Window

1. Press the PR button to open up the Prism dialog box on the Controller screen. Refer to Figure IU-12.

Note: It may be more comfortable for the patient to dial in prism first and then slide in the prism lenses.

Note: In 'Prism Compensation' mode, the buttons work as follows:

PR	Open or close the Prism dialogue box.	**R**	Prism Effect - Right Eye horizontal (OUT – IN) Left Eye vertical (UP - DOWN)
	Changes the Prism Values.	**L**	Prism Effect - Left Eye horizontal (IN – OUT) Right Eye vertical (UP - DOWN)
	Switches from right eye to left eye.	**BIN**	Apply the Prism Effect to Both Eyes. Change the prism orientation by pressing R or L.

Note: Press and turn  to change the base of the prism (IN-OUT or UP-DOWN) in each eye.

2. Turn  to dial in prism in either the right or left eye.

Horizontal Prism

Turn  left to bring in Base Out prism in 0.25D increments.

Turn  right to bring in Base In prism in 0.25D increments.

-continued-

Prism Testing (continued)

Vertical Prism

Turn right to bring in Base Up prism in 0.25D increments.

Turn left to bring in Base Down prism in 0.25D increments.

Note: Press and turn to bring in prism in 1.00D increments.

Note: Turn in either direction to change the direction of the base of the prism.

Note: To switch from right eye to left eye, press .

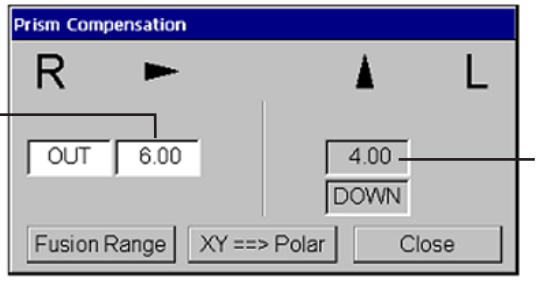
Note: To change direction of the prism in either eye, press the L or R button on the control panel. For example, if base In-Out prism is in the right eye, pressing the L button for the left eye will bring horizontal prism into the left eye and vertical prism in the right eye. To bring horizontal prism back to the right eye, press the R button for the right eye.

Binocular Balance with Prisms

Use binocular balance with prism to determine if the monocular VAs are the same.

1. Select a single line of letters slightly better than best visual acuity for the patient, or a single optotype (20/30 or 20/40 target).
2. Fog the patient by adding +0.50D of sphere in each eye.
3. Press the PR button.
4. Dial in 6 base down prism in the left eye and then split the prism by pressing the BIN button on the keypad for binocular. Ref Figure IU-13 and IU-14.

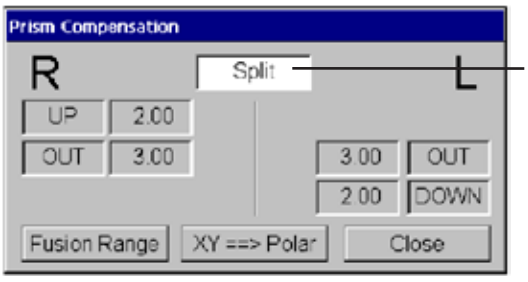
Note: This will split the prism equally between both eyes.



Zero out any prism in the right eye.

Make sure there is no prism in the right eye. Press the knob to move to the left eye. Dial in at least 6 base down prism in the left eye. Press the BIN button on the keypad to split the prism equally in each eye. Close the prism window by pressing the right arrow key pointing to the “Close” box. Leave the prism lenses in front of the patient.

Figure IU-13, Prism Compensation Window



Split the prism by pressing the BIN button. If you have 6 base down prism in the left eye to start with, there should be 3 base up in the right eye and 3 base down in the left.

Figure IU-14, Split Prism Compensation Window

Prism Testing (continued)

Binocular Balance with Prisms (continued)

5. Slide in the Prism lenses.

Note: The patient should see two lines of letters. If the patient does not see two lines of letters, press the L button again for the left eye and add more prism.

6. Press BIN to split the prism and make sure the patient can see two targets. Close the prism dialogue box.

Note: The eye with base up prism will see the bottom line and the eye with base down prism will see the top line.

7. Ask the patient to compare both lines and indicate which one is clearer.

Note: The eye in which the patient sees better is the one you want to adjust.

8. If the right eye is clearer, press the R button.

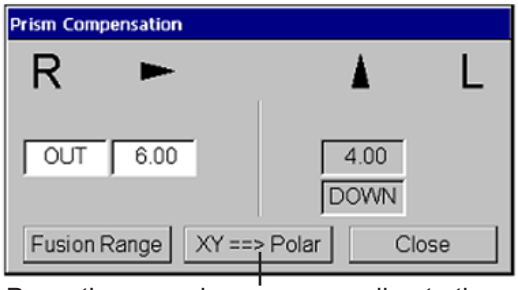
Note: The left side of the screen will turn gray, but both apertures will remain open. Make sure the sphere on the right side is active and can be adjusted.

9. Add +0.25 D to the right eye until both lines look equal.
10. Once the patient reports them equally clear, or if they report the other is now clearer, decide which you will make slightly clearer (Typically the dominant eye).
11. Remove the prism lenses and press the BIN button to control the spheres together.
12. Decrease the plus to best visual acuity and the binocular balance will be maintained.
13. To clear out the prism values from memory, press the PR button and then the L button. That will clear out the prism automatically.

Note: This works only after splitting the prism, closing the dialog box for binocular balance testing, and opening up the prism box again to remove the prism.

Phoria Testing

1. Press the PR button. Refer to Figure IU-15.
2. Bring in 6D of Base In prism in the right eye.
3. Press  .
4. Dial in 6D Base Down prism in the left eye.
5. Slide in the prism lenses.
6. Press  to return to the right eye and adjust the lateral prism of the right eye until the two targets are vertically aligned.
7. Tell the patient to indicate when the two lines of letters pass, one above the other, like buttons on a shirt.



Press the arrow key corresponding to the fusion range button to open the fusion range measurement window.

Figure IU-15, Prism Compensation

Note: The magnitude of the lateral phoria is the power of the prism when the images are aligned.

8. To measure the vertical phoria, bring in more Base In prism so the patient retains diplopia.

-continued-

Prism Testing (continued)

Phoria Testing (continued)

9. Bring in Base Down prism until the patient indicates the letters are aligned horizontally, like headlights on a car.

Note: The magnitude of the vertical phoria is the power of the prism when the images are aligned.

10. The saved prism values will be displayed on the screen in the box below the ADD line of data.

Note: The top value indicates the prism in the right eye: base in or out, up or down. The bottom value indicates prism in the left eye: base up or down, in or out.

Note: Remove any prism values that do not need to be saved for the patient's final refraction data.

Vergence Testing or Fusion Range Measurement

1. Press the PR button to open the prism dialog box.
2. Select Fusion Range by pressing the left function key at the top of the keypad.
3. Slide in the prism lenses.
4. Set the acuity chart to a single vertical line of optotypes at or near the patient's visual acuity.
5. Starting from zero prism power, slowly dial in Base In prism in both eyes until the patient indicates the letters have blurred and then doubled. Refer to Figure IU-16.

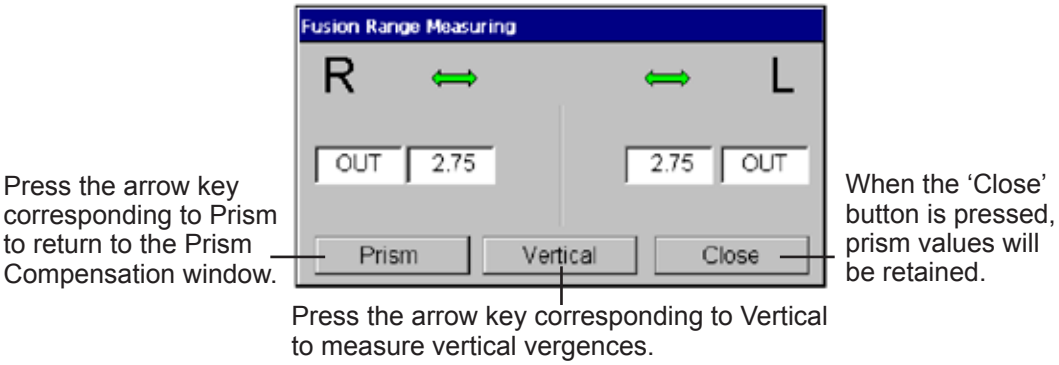


Figure IU-16, Fusion Range Window

6. Press  to save the break point.
7. Reverse the direction of the prism and ask the patient to indicate when a single line of letters appears again.
8. Press  to save the recovery point.

Note: The combined powers of the two prisms correspond to the blur, break and recovery. This is reported as the Blur Point in the data output from the Auto Phoroptor RS or the midpoint of the fusion range. The Blur point will be saved into memory but the value will not be displayed on the screen of the Controller where prism values are stored for phoria testing.

Prism Testing (continued)

Prism Indication in Polar Coordinates or in X-Y Coordinates

1. Press the Polar==>XY Function Button on the Controller to display prism values in polar or X-Y coordinates. Refer to Figures IU-17.

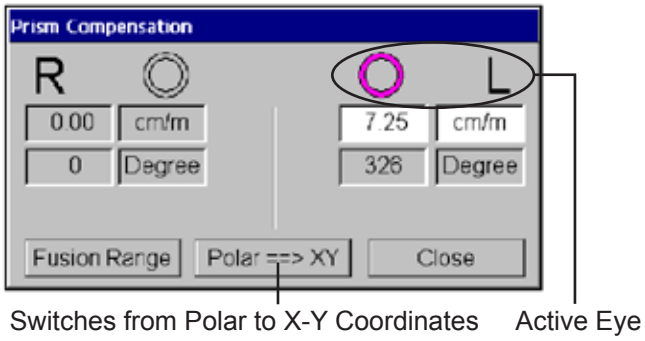


Figure IU-17, Polar Coordinates

Saving Refraction Data

Once the values for a refraction are completed, you can transfer the values to a storage box to save temporarily to compare with different refraction results. The storage areas are located at the bottom of the screen.

1. Press the Function Button on the Controller corresponding with the storage box you want to transfer the refraction data to.

Note: You must select an empty box or data will not transfer.

2. The data is transferred to the storage box.
3. Saved refraction values will be labeled. For example: MEM3.

Comparing Refraction Data

One of the advantages of a digital refractor is having the ability to easily and quickly compare different refractions with the push of a button. This allows patients to see the difference between their old and new prescriptions, or the difference between two possible prescriptions.

After completing a refraction, measurements in the storage boxes and the current measurements can be switched as needed so different prescriptions can be compared. Once data are transferred to the large active data field, the Phoroptor Head switches the lenses to reflect that data. This is what allows for easy comparison.

1. Push the corresponding storage box Function Button for the data you wish to make active, and the data and corresponding lenses will be switched in. For example, you can switch in the lensmeter data and compare it with the new refraction data.
2. Push the button again to switch back.

Note: When switching the data from current to stored, your current readings will NOT be deleted. Readings are just stored and can be recalled at any time by pressing the corresponding button.

3. Stored measurements are highlighted in red and cannot be changed.
4. Press F/N to select the data to transfer:
   - **F** Far Distance Value Only
   - **N** Reading Glasses
   - **F/N** With Addition (Bifocals)

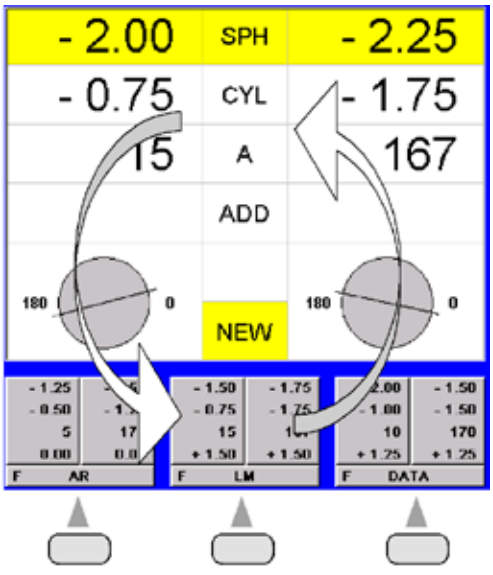


Figure IU-18, Switching Data

Note: The example in Figure IU-18 illustrates the switching of values between Lensmeter data and actual refraction data.

Clearing Data

Different clearing procedures are accomplished with the following buttons:

C -	Clear
CP -	Clear Partial
CTL -	Control

Clearing All Data

1. Press C and a message comes up to make sure you want to clear all the data.
2. Press C once more to clear all the data.
3. All the data will be cleared in both the active refraction and all the storage boxes.
4. PD will move back to 62 mm.

Clearing Individual Data

1. Press CP and either the SPH, CYL, or A buttons, depending on the data you want to clear.

Clearing Data for One Eye

1. Press CP and the R or L button.

Clearing Active Refraction Data

1. Press CP and BIN.
2. The data for both eyes in all rows in the active refraction box will be cleared.

Resetting the Phoroptor Head

1. Press CTL and C and a message comes up to make sure you want to reset the Phoroptor Head to the default position.
2. Press C once more to have the refractor go back to it's standard position.

Note: Manually entered data can be cleared as well.

Note: Saved values are not affected by the above clearing procedures.

Data Transfer

Data output options for refraction results include sending data electronically to an EMR system, printing the data, and manually recording it.

1. Press COM to transfer the new refraction information to the EMR (Electronic Medical Records) system.
2. The window in Figure IU-19 will appear.
3. The volume of the transferred data depends on the actual EMR software.

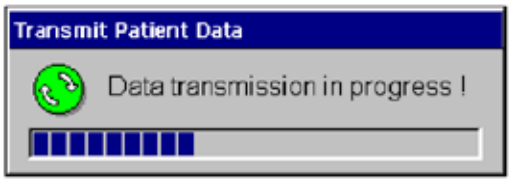


Figure IU-19, Transmit Patient Data

Note: The actual software version can be found in 'Options- Service- Info'.

4. Press  to access the settings menu and select the EDP Port from the scroll down menu. The device protocol for the EDP port should be set to EDP-Autophoroptor. Refer to Figures IU-20 and IU-21.

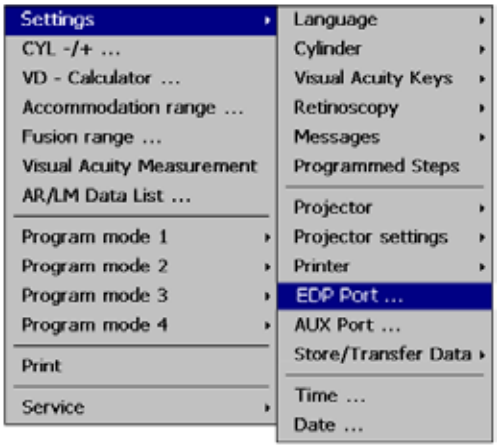


Figure IU-20, EDP Port Settings

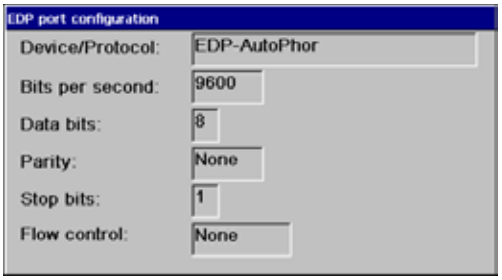


Figure IU-21, EDP Port Screen

Note: In software version 3.02, if the Auto Phoroptor RS is connected to a computer by the serial printer port, all Auto Phoroptor RS data, and (if connected) autorefractor and lensmeter data will be sent to the EMR system. This port does not need to be configured for data output to EMR systems.

Data Output

Each patient data record can include:

- Sphere (Right and Left Eye, Far and Near)
- Cylinder (Right and Left Eye)
- Axis (Right and Left Eye)
- Prism (Right and Left Eye)
- Visual Acuity Unaided and Aided (Right Eye, Left Eye, Binocular)
- Vertex Distance
- Pupillary Distance
- Accommodation Range
- Blur Point

Printing

To print data, the Auto Phoroptor RS must be configured as follows:

- A compatible printer must be connected to the Central Unit.
- Under ‘settings’ the printer must be selected.

1. Press OPTIONS to enable the options menu.
   Refer to Figure IU-22.
2. Select Print.
3. Press the corresponding Function Button on the Controller to select which data to print. Refer to Figure IU-23.
   - F/N – Both distance and near vision values.
   - N – Near vision values.
   - F – Distance vision values.

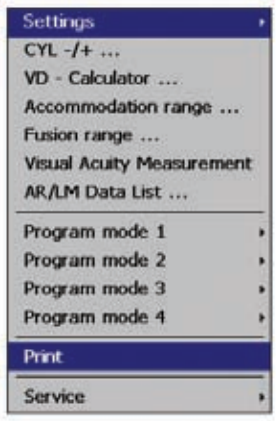


Figure IU-22, Print Menu

4. When the Print window is open, press CTL and the F/N button to switch the F/N button to F/ADD.

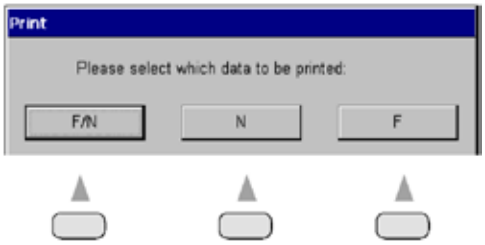


Figure IU-23, Print Screen

Shortcut: Press CTL and the right function button together and the ‘Print’ window will automatically pop up.

Printer Data Output

The following information can be sent to the printer:

- Date and Time
- Sphere (Right and Left Eye)
- Cylinder (Right and Left Eye)
- Axis (Right and Left Eye)
- Prism (Right and Left Eye)
- Vertex Distance
- Pupillary Distance
- ADD
- Visual Acuity (Unaided and Aided), Right Eye, Left Eye, Binocular

Note: In software version 3.02, all Auto Phoroptor RS, Lensmeter, and Auto Refractor /Keratometer data will be printed if those instruments are connected to the Auto Phoroptor RS.

Software Update

Updating Software: USB stick

If a software update is required, please contact Reichert as indicated in the Introduction section of this manual to obtain the software, which can be imported to a USB drive.

1. Turn the unit ON.
2. Insert the USB drive. Refer to Figure IU-24.
3. The window in Figure IU-25 appears.
4. Follow the instructions shown in the window.

Note: The update will take several minutes to complete.

5. When the update is complete, the update window will disappear.
6. Remove the USB drive.

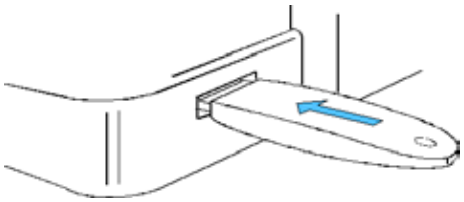


Figure IU-24, USB Stick

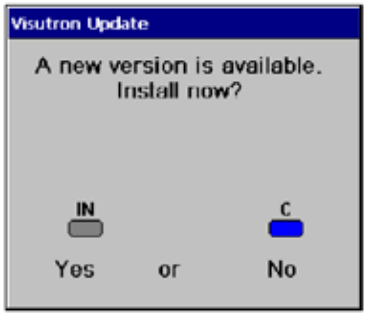


Figure IU-25, Update

Software Update (continued)

Package Keys

If one or more auxiliary instruments are directly connected to the Auto Phoroptor RS, the corresponding software packages have to be activated.

The keys to enable the software consist of numerical codes corresponding to the Controller. These keys can be obtained from Reichert and their representatives by providing the serial number and software version of the Controller. If the software is going to be updated, refer to the version number of the software update. The serial number and software version of the Controller can be found in the Options menu under “Service”, then the sub menu “System Info”. “Main application” indicates the software version.

Software Versions 3.0 and 3.01		
Software Package	**Instruments**	**Activation Code**
Standard Software	+EDV/VP +EDV 900 Projectors AP250 ClearChart 2 M2000 M3000	Included with Auto Phoroptor RS
Package 1	Lensmeters Projector CSO 2047	Key 1
Package 2	Auto Refractors Projector CSO 2047	Key 2
Package 3	Printers Epson® TM L60 Star SP700	Key 3
Package 4	Package 1 + 2 + 3	Key 1 + Key 2 + Key 3
Package 5	Acuity Systems Block Polaphor® DOMS Polastar	

Software Update (continued)

Package Keys (continued)

Software Version 3.02		
Software Package	**Instruments**	**Activation Code**
Standard Software	+EDV/VP +EDV 900 Projectors AP250 ClearChart 2 M2000 M3000 Reichert AL200, AL500, AL700 Reichert RK600, RK700 Printers Epson TM L60 Star SP700	Included with Auto Phoroptor RS
Package 1	Non-Reichert lensmeters and auto refractors	Key 1
Package 2	Acuity Systems CSO 2047 Block Polaphor DOMS Polastar M&S® Smart System® 20/20	Key 2

Software Update (continued)

Finding and Entering Package Keys

1. Press OPTIONS to access the Settings menu and turn  to scroll down to Service.
2. Press  and move on to the next scroll down menu. Refer to Figure IU-26.
3. Press  to select Info. The System Info screen pops up. Refer to Figure IU-27.

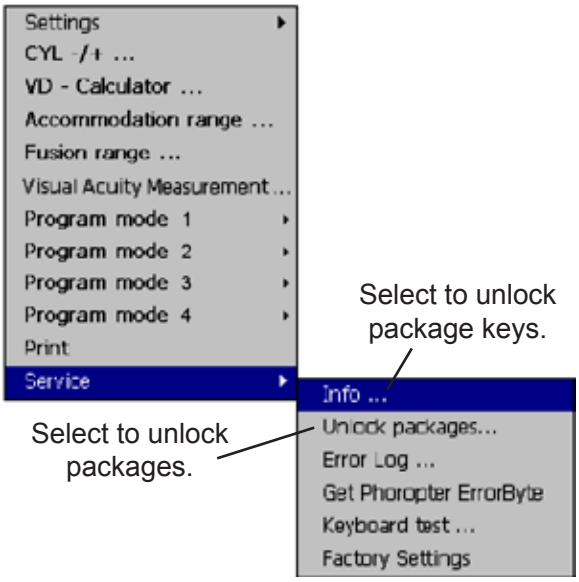


Figure IU-26, System Info

4. The Auto Phoroptor RS Controller Serial Number is required to unlock the software packages. Contact Reichert to order the software package and obtain the key code to open the package.
5. Go to Unlock Packages under Service.
6. Use the Scroll Wheel to enter the corresponding numbers into the packages, and press  to enter. Refer to Figure IU-27.
7. Press IN to enter the data and save it.
8. Once the above is completed, the software is available on your unit.

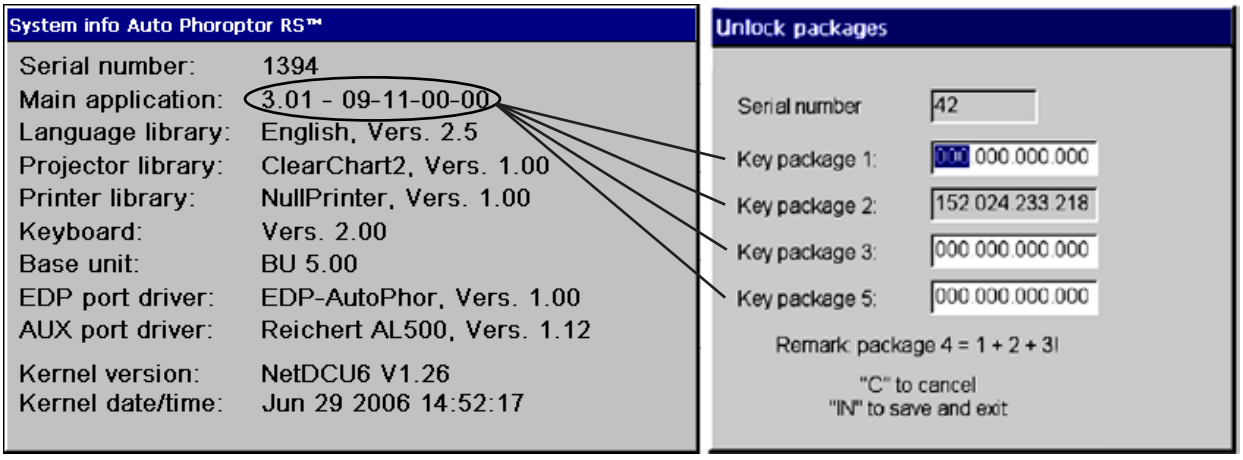


Figure IU-27, Package Keys

Cleaning

WARNING: ANY REPAIR OR SERVICE TO THIS INSTRUMENT MUST BE PERFORMED BY EXPERIENCED PERSONNEL OR DEALERS THAT ARE TRAINED BY REICHERT SO THAT CORRECT OPERATION OF THIS INSTRUMENT IS MAINTAINED.

WARNING: ALWAYS UNPLUG THE POWER CORD TO THE INSTRUMENT BEFORE CLEANING ANY SURFACE ON THE INSTRUMENT.

CAUTION: INGRESS PROTECTION CLASSIFICATION FOR THE AUTO PHOROPTOR HEAD, CONTROLLER, AND CENTRAL UNIT IS IXP0. DO NOT SPRAY, SPLASH OR IMMERSE IN CLEANING SOLUTION.

The Auto Phoroptor RS is an enclosed unit with an ingress protection classification of IPX0. The lenses and other internal parts cannot be accessed by the operator for cleaning.

It is recommended that you send in your Phoroptor Head for routine cleaning by Reichert.

To ensure that your Phoroptor Head remains clean, cover your Phoroptor Head with the dust cover when not in use. Consistent use of the dust cover will help keep dust and other contaminants off of the unit and from getting inside and possibly affecting operation.

Note: Make sure the power to the Auto Phoroptor RS is OFF before you cover the instrument.

External Cleaning

CAUTION: DO NOT USE SOLVENTS OR STRONG CLEANING SOLUTIONS ON ANY PART OF THIS INSTRUMENT OR DAMAGE TO THE UNIT MAY OCCUR.

CAUTION: USE OF AMMONIA BASED CLEANERS ON THE LIQUID CRYSTAL DISPLAY (LCD) OR ANY PLASTIC SURFACE MAY CAUSE DAMAGE TO THE INSTRUMENT.

Clean the external surfaces of this instrument using a clean, soft cloth moistened with a mild detergent solution (1 cc of liquid dish soap to one liter of clean, filtered water (filtered below 5 microns)).

Forehead Rest Cleaning

For hygienic reasons, the Forehead Rest may be cleaned with a clean cloth moistened with a mild detergent solution (1 cc of liquid dish soap to one liter of clean, filtered water (filtered below 5 microns)).

Note: If the Forehead Rest must be sanitized, a sterile wipe may be used occasionally.

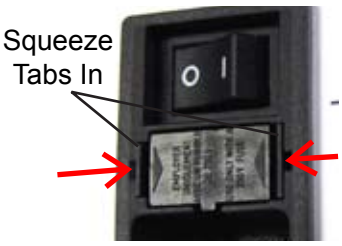


Figure CM-01, Fuse Holder

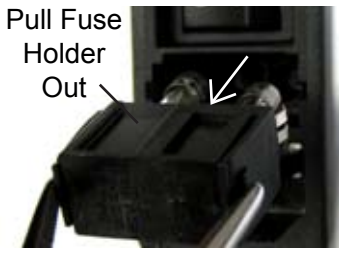


Figure CM-02, Remove Fuses

Fuse Replacement

1. Squeeze in the tabs on the Fuse Holder and pull the Fuse Holder out. Refer to Figures CM-01 and CM-02.

Note: Tweezers or a similar tool can be used to remove the fuse holder.

2. Remove the fuses that require replacement, and install new fuses.

Note: Refer to the Specifications section of this manual for fuse specifications.

3. Install the Fuse Holder into the Central Unit until it snaps into place.



Figure CM-03, Fuses

Troubleshooting

Only those errors indicated on the display are directly important to the user and are listed below. In case of support requests, please refer to the Error Log File (OPTIONS - Service - Show Error Log File) where you will find a detailed listing of all errors, warnings, and status messages.



Error Source [identification code]; Necessary for all support requests.
Brief Description.

Error Source	Probable Cause	Solution
Refractor [PH:yy]	• Cable to refractor defective, damaged, or loose. • Incorrect initiation. • Defective refractor electronics.	• Button combination CTL + C. • Turn the unit on and off. • Check the cable to the refractor.
EMR-Port [Dxx.yy]	• Wrong unit driver. • Wrong interface parameters. • Connection cable defective, damaged, or loose.	• Set the correct unit driver and interface parameters by pressing the button combination CTL+R/G+PD in the EMR port dialogue (Options-Settings-EMR Port). • Check the connection cable.
AUX-Port [Dxx:yy]	• Wrong unit driver. • Wrong interface parameters. • Connection cable defective, damaged, or loose.	• Set the correct unit driver and interface parameters by pressing the button combination CTL+R/G+PD in the Aux-Port dialogue. • Check the connection cable.
Projector [Pxx:yy]	• Projector not connected. • Projector turned off. • Wrong projector driver. • Projector cable defective, damaged, or loose.	• Connect the projector to the central unit and turn on. • Select a suitable projector driver. • Check the connection cable.
Base-Unit [BU:yy]	• Incorrect power supply. • Defective central unit.	• Check the power supply.
Application [MA:yy]	• Defective software. • Defective Controller. • Cable to central unit defective, damaged, loose, or positioned near an interfering source. • Defective power supply.	• Perform a software-update. • Check the cable to the central unit. • Check the power supply.
Green LED on the central unit not lit.	• Cable not connected. • Switch set to OFF.	• Connect the cable. • Set the switch to ON.
No image in the display despite switched-on unit.	• Defective fuses on the cable plug of the central unit.	• Exchange the fuses on the cable plug of the central unit.
Time and date do not work.	• Time and date do not work. • Long-life battery empty or defective.	• The service technician should insert a new battery.

xx = Driver identification code.
yy = Identification code for error, warning, or status messages.

If failures cannot be remedied by one of these measures, please contact Reichert Customer Service as indicated on the back of this manual.

Specifications

Catalog Number 16210

Physical Dimensions

Phoroptor Head

Spherical Effects	17.75 to 22.25 D
Steps	0.25 and 1.0 D
Cylinder Power	-8.0 to +8.0 D
Steps	0.25 and 1.0 D
Axis Adjustment	0° to 179°
Steps	1° and 10°
Cross Cylinder Test	±0.25 and ±0.5 D
Prismatic Effects (Optional)	+ 0.20Δ per eye
Steps	0.50Δ per eye
	0.25Δ per eye
Corneal Vertex Distance	16 mm
Pupil Distance	50 to 80 mm
Steps	1 mm binocular
Convergence	400 mm
Height Level of Eyes, adjustment	±3 mm
Leveling	via bubble level
Free Aperture	19 mm
Thickness of Housing at the Viewing Aperture	26 mm
W x H x D (at PD = 64 mm)	12.2 x 8 x 2.8 in (31 x 20.3 x 7.1cm)
Weight With Mount & Without Prism Compensator	9.15 lb (4.15 kg)
Weight With Mount & With Prism Compensator	9.75 lb (4.42 kg)
Weight Without Mount & Without Prism Compensator	8.05 lb (3.65 kg)
Weight Without Mount & With Prism Compensator	8.65 lb (3.92 kg)

Controller With Display

Controller (W x H x D)	9.2 x 1.8 x 6.6 in (23.4 x 4.6 x 16.8 cm)
Display (W x H x D)	8.8 x 6.2 x 0.6 in (22.4 x 15.7 x 1.5 cm)
Weight	4.2 lb (1.9 kg)

Note: A unit-specific software is required for each instrument.

Central Unit

Physical Dimensions

Width	8.0 in (20 cm)
Height	3.5 in (8.9 cm)
Depth	10.8 in (27.4 cm)

Electrical

Model	16210-x-x-0	16210-x-x-1
Input Voltage	115 VAC	230 VAC
Frequency	50/60 Hz	50/60 Hz
Current (max.)	160 VA	160 VA
Fuses (5x20 mm)	Time-Lag (1.6A, 250V) RoHS	Time-Lag (0.8A, 250V) RoHS

Ports: (1 each)

Phoroptor, Keyboard, Projector, Printer - Serial, Printer - Parallel, AUX I/O, EDV I//O, Optional Data Output

Note: In case of any system extension, the requirements according to EN 60601-1-1 have to be observed.

Operational Conditions

Environmental:
The environmental conditions are as follows:

Operating:

Temperature: 10° to 35° C (50° to 95° F)

Relative Air Humidity: 30 to 75%

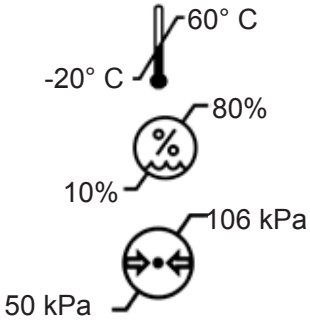
Air Pressure: 80 kPa to 106 kPa

Transportation & Storage:

Temperature: -20° to 60° C (-4° to 140° F)

Relative Air Humidity: 10 to 80% (non-condensing)

Air Pressure: 50 kPa to 106 kPa



Exposure to extreme temperature conditions indicated above must not exceed 15 weeks.
Operation permitted in explosion proof atmosphere only.

Due to continuous technical improvements, the figures shown in this manual may not be identical with the equipment delivered to you.

Disposal

For proper disposal or recycling purposes, Reichert will take back the Auto Phoroptor RS. Please contact Reichert.

The Auto Phoroptor RS must not be disposed of with residential waste.

Software Revision

The software can be obtained by contacting Reichert Technologies.
The serial number identifies the manufacture date and will provide access to the software version.

Classifications

The Auto Phoroptor RS is classified as Class I Equipment.

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

The Auto Phoroptor RS is classified as Type A Equipment.

According to the mode of operation, the Auto Phoroptor RS is a Continuous Operation instrument. Refer to the following applicable standards for associated ME requirements:

- MDD 93/42/EEC: Class I
- EN 60601-1: Class I Type A

Table 201 – Guidance and Manufacturer's Declaration

Electromagnetic Emissions

All Equipment and Systems

Guidance and Manufacturer's Declaration – Electromagnetic Emissions

The Auto Phoroptor RS is intended for use in the electromagnetic environment specified below. The customer or user of the Auto Phoroptor RS should ensure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment - Guidance -
RF Emissions CISPR 11	Group 1 Class B	The Auto Phoroptor RS uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Harmonics IEC 61000-3-2	Class A	The Auto Phoroptor RS is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies building for domestic power.
Flicker IEC 61000-3-3	Complies	

Table 202 – Guidance and Manufacturer's Declaration

Electromagnetic Immunity

All Equipment and Systems

Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The Auto Phoroptor RS is suitable for use in electromagnetic environment specified below. The customer or user of the Auto Phoroptor RS should ensure that it is used in such an environment.

Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment** - Guidance
ESD IEC 61000-4-2	±6kV Contact ±8kV Air	±6kV Contact ±8kV Air	Floors should be wood, concrete or ceramic tile. If floors are synthetic, the R/H should be at least 30%.
EFT IEC 61000-4-4	±2kV Mains ±1kV I/Os	±2kV Mains ±1kV I/Os	Mains power quality should be that of a typical residential, commercial or hospital environment.
Surge IEC 61000-4-5	±1kV Differential ±2kV Common	±1kV Differential ±2kV Common	Mains power quality should be that of a typical residential, commercial or hospital environment.
Voltage Dips/Dropout IEC 61000-4-11	>95% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25 Cycles >95% Dip for 5 Seconds	>95% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25 Cycles >95% Dip for 5 Seconds	Mains power quality should be that of a typical residential, commercial or hospital environment. If the user of the Auto Phoroptor RS requires continued operation during power mains interruptions, it is recommended that the Auto Phoroptor RS be powered from an uninterruptible power supply or battery.
Power Frequency 50/60Hz Magnetic Field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be that of a typical residential, commercial or hospital environment.

Table 204 – Guidance and Manufacturer's Declaration

Electromagnetic Immunity

Equipment and Systems that are NOT Life-supporting

Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The Auto Phoroptor RS is intended for use in the electromagnetic environment specified below. The customer or user of the Auto Phoroptor RS should ensure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	(V1)=3V/m	Portable and mobile RF communications equipment should be no closer to any part of the Auto Phoroptor RS, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended Separation Distance: d=(3.5/V1)(Sqrt P) d=(3.5/V1)(Sqrt P) 80 to 800 MHz d=(7/E1)(Sqrt P) 800 MHz to 2.5 GHz Where P is the max output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed transmitters, as determined by an electromagnetic site survey, should be less than the compliance levels in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol. 
Radiated RF IEC 61000-4-3	80 MHz to 2.5 GHz @ 3V/m	(E1)=3V/m	

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

* Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. The measured field strength in the location in which the ME Equipment or ME System should be observed to verify normal operation. If abnormal performance is observed, additional measures many be necessary, such as re-orienting or relocating the ME Equipment or ME System.

* Over the frequency range 150 kHz to 80 MHz, field strengths should be less then [V1] V/m.

Table 206 – Recommended Separation Distances between Portable and Mobile RF Communications Equipment and the Auto Phoroptor RS for ME Equipment and ME Systems that are NOT Life-supporting.

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

Recommended Separation Distances for between Portable and Mobile RF Communications Equipment and the Auto Phoroptor RS

The Auto Phoroptor RS is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or user of the Auto Phoroptor RS can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF Communications Equipment and the Auto Phoroptor RS as recommended below, according to the maximum output power of the communications equipment.

Max Output Power of Transmitter (W)	Separation (m) 150kHz to 80 MHz d=(3.5/V1)(Sqrt P)	Separation (m) 80 to 800 MHz d=(3.5/E1)(Sqrt P)	Separation (m) 800MHz to 2.5GHz d=(7/E1)(Sqrt P)
0.01	0.1166	0.1166	0.2333
0.1	0.3689	0.3689	0.7378
1	1.1666	1.1666	2.3333
10	3.6893	3.6893	7.3786
100	11.6666	11.6666	23.3333

For transmitters rated at a maximum output power not listed above, the recommended separation distance (d) in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (w) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Appendix A

Compatibility Chart

WARNING: ANY NON-MEDICAL ELECTRICAL EQUIPMENT USED WITH THE AUTO PHOROPTOR RS MUST BE COMPLIANT WITH APPLICABLE IEC OR ISO SAFETY STANDARDS.

Autorefractors

Canon RF-10 (Select canonrf10)
Canon RK-F1/F2 (Select canonrf10)
Canon RK-5 (Select canonrf10)
Humphrey HARK 599
Luneau L62
Nidek ARK-530A (Select nidek_ar2)
Nidek ARK-710A
Nidek AR-800/900
Nidek RKT-7700 (Select nidek_ar800)
Nidek TonoRef II (Software Version 3.02)
Reichert RK600*
Reichert RK700*
Righton/Nikon Speedy 1
Righton/Nikon Speedy K
Righton/Nikon Retinomax
Rodenstock CX1000
Tomey TR-4000
Tomey RC-5000
Topcon KR-8x00 (up to KR8900)
Topcon RMA6500
Unicos URK800 (Software Version 3.02)
Visionix L79/L80 (software Version 3.02)

Lensmeters

Humphrey LA 350
Luneau L70
Nidek LM-970 (Select Nidek LM1)
Nidek LM-770 (Select Nidek LM1)
Reichert AL200*
Reichert AL500*
Reichert AL700*
Rodenstock AL4500
Tomey TL-2000 (Select Tomey TL3000)
Tomey TL-3000
Topcon CL100 (Select CL2000)
Topcon CL200 (Select CL2000)
Topcon CL2000 (Select CL2000)
Topcon CL2500 (Select CL2000)

Projectors

ClearChart 2 (Snellen and Decimal Notation)*
AP250 (Snellen Notation)*
M3000 (Decimal Notation)*
Block Polaphor (Digital Acuity System for the European Market)
DOMS Polastar (Digital Acuity System for the European Market)
M&S Smart System 20/20

Printers

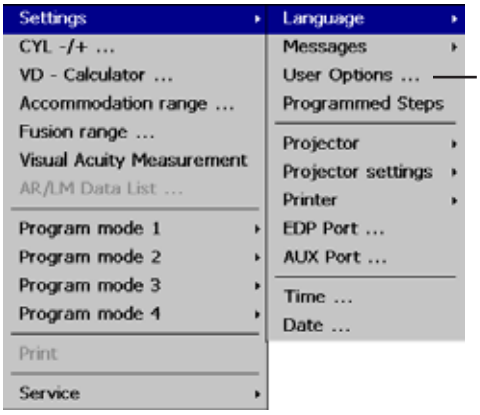
SP700*
Epson TM-L60

*Available from Reichert

Appendix B

Software Changes - Version 3.02

The following modifications have been incorporated into Auto Phoroptor RS software version 3.02. Please read this information carefully to understand the changes in settings and functions of the instrument compared with previous software versions.



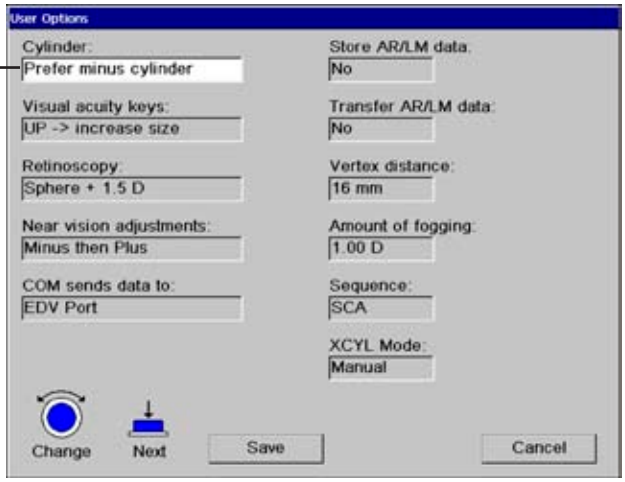
Appendix B, Figure 1

User's Options

User Options have been consolidated into one window where user preferences can be selected.

Turn the blue control knob to highlight "User Options" and press the knob to open the following window:

The Option with a white background is active and can be changed. Turn the blue knob to select your preference. Press the knob to advance to the next option to open it and change your preference.



Appendix B, Figure 2

Cylinder
Select Minus or Plus Cylinder

Visual Acuity Keys
Increase/decrease size of optotype or increase/decrease acuity level

Retinoscopy
Select +1.50 D or +2.00 D lenses

Near Vision Adjustments (NRA/PRA)
Find lower limit (add minus) then upper limit (add plus) or find upper limit (add plus), then lower limit (add minus).

COM sends data to
Select EDV port or the serial Printer port to send data from the Auto Phoroptor RS to a computer (EMR). Data output from the printer port will include Auto Phoroptor RS, lensmeter, and auto refractor/keratometer data.

Store AR/LM data: Yes or No
Store Auto Refractor and Lensmeter data to import into the Auto Phoroptor RS as the starting point of refraction.

Transfer AR/LM data: Yes or No
Transfer Auto Refractor and Lensmeter data from one Auto Phoroptor RS to another

Vertex distance
Select a vertex distance and the refraction data that is sent to a printer or EMR will be calculated for that distance. Options are 0mm, 12mm, 13.5mm, 16mm and 18mm.

Software Changes - Version 3.02 (continued)

User's Options (continued)

Amount of fogging
Select the amount of auto fogging preferred: +0.50, +0.75, +1.00, +1.50

Sequence
Select the preferred refraction step sequence: SCA (sphere, cylinder, axis), SAC (sphere, axis, cylinder), SCAS (sphere, cylinder, axis, sphere), SACS (sphere, axis, cylinder, sphere). Pressing the blue control knob after each step of refining sphere, axis and cylinder will advance the refraction steps in the preferred sequence.

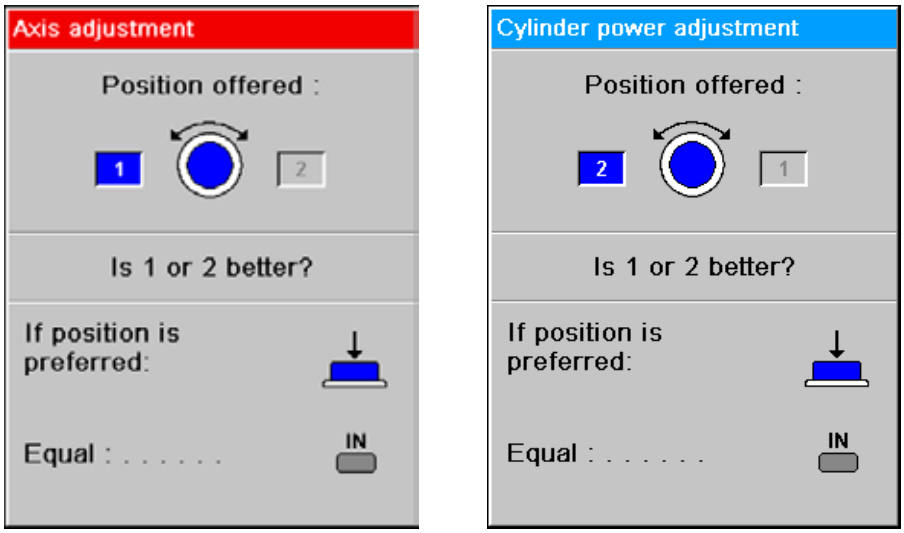
XCYL Mode
Choose between Smart and Manual Modes. The Smart mode will bracket and refine the axis and cylinder power based on how much cylinder power is present in the lensmeter or auto refractor data. The manual mode allows axis adjustments of 1º or 5º and cylinder power increments of 0.25 D or 0.50 D to refine axis and cylinder more quickly.

Cross Cylinder (XCYL) Function

The XCYL test has been modified to allow the selection of a Smart or Manual Mode. The Smart Mode will automatically refine the axis and cylinder power based on how much cylinder power is present in the lensmeter of auto refractor data. The spherical equivalent is changed during the cylinder power adjustment.

Cylinder Power	Axis Change
0.25 D to 0.75 D	20º
1.00 D to 2.75 D	10º
3.00 D to 8.00 D	5º

The functions of the blue control knob and the IN button have been reversed. Press the blue control knob when the patient indicates a preferred position. Press the IN button when the images are seen equally clearly. The XCYL test otherwise functions in the same way as indicated in the Cross Cylinder section of the User's Guide.

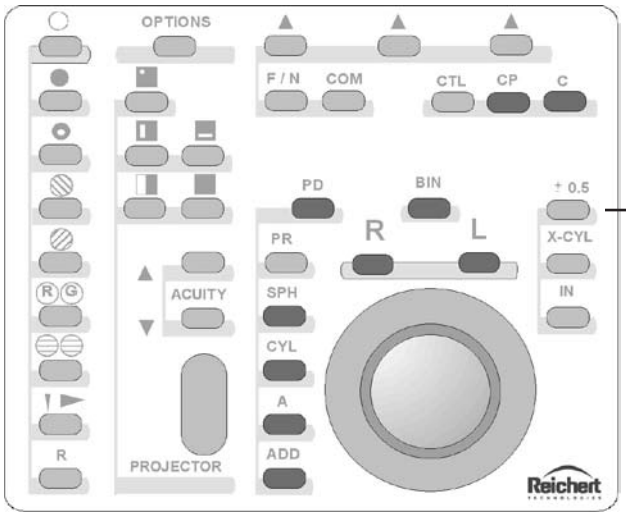


Appendix B, Figure 3

Software Changes - Version 3.02 (continued)

Cross Cylinder (XCYL) Function (continued)

The Manual mode allows smaller increments in axis and cylinder power changes. The +/- 0.50 button can be used to alternate between 5º and 1º changes in Axis and 0.25 D and 0.50 D changes in Cylinder power. The blue control knob is pressed to indicate the patient's preferred position and the IN button is pressed when the patient sees no difference in the two positions presented.

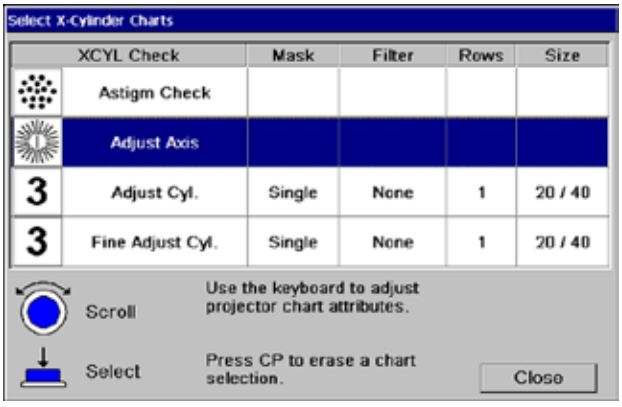


Manual Mode
The +/- 0.5 button switches from 5º and 1º when adjusting axis, and 0.25D and 0.50 D when adjusting cylinder power.

Appendix B, Figure 4

Selectable Cross Cylinder Test Charts

Select specific charts for each step of the XCYL test. Any test chart or optotype chosen will be displayed for each step. Select the preferred chart or optotypes using the scroll wheel or acuity keys and press the blue control knob to save that selection. Turn the knob to select the chart for the next step. Erase a chart selection by pressing the CP button when highlighting a specific step.



Appendix B, Figure 5

Software Changes - Version 3.02 (continued)

Visual Acuity Save Short Cut

The CTL + R key combination can be used to save aided or unaided visual acuity in the right eye, left eye, and binocularly. If sphere and cylinder are zero for the selected eye, the selected visual acuity will be saved as the unaided value. Otherwise, the selected visual acuity will be saved as the aided value. Press CTL + R (each time) when saving visual acuity for the right eye, left eye, and binocular vision.

Auto Fogging Short Cut

Press the CTL + SPH keys in sequence to apply a specific amount of plus power to the eye being tested. When fogging is active, the text FOG appears on the display in the box below ADD. Pressing CTL + SPH removes the text. The optional fogging increments are: +0.50 D, +0.75 D, +1.00 D, +1.50 D.

Program Macro Changes

The programming function has been modified significantly in order to increase flexibility in adding charts to each step and using the programs.

- The program no longer depends on the state of the Auto Phoroptor RS and projector when the program was initiated (for example, the chart position is no longer dependent on its location relative to other charts). Charts and/or step sequences that were recorded in the program file are restored each time the program is played.
- The Auto Phoroptor RS and projector state are maintained while program recording and editing even when steps are deleted or inserted.
- When playing the program, the user can now back up to previous program steps by pressing and holding the CTL button and the Blue Control Knob in sequence.
- Closing and opening the program can be done by using the CTL + CP key sequence.
- Export and import options have been added to the Program Mode menu. A program file can be read from a USB stick inserted into the USB port at the back of the controller. This allows the refraction program steps to be saved and imported into another Auto Phoroptor RS.

Vertex Distance Calculation

A vertex distance calculation is now applied to sphere and cylinder values when required. The default vertex distance in the Phoroptor Head is 16 mm. The vertex distance options are 0mm, 12mm, 13.5 mm, 16mm and 18mm. If a vertex distance other than 16 mm is selected, the displayed sphere and cylinder values are adjusted for the selected value before printing or sending the refraction data to EMR.

Sphere, Cylinder and Axis Sequence Options

When no refraction program is running, pressing the blue control knob advances through the sphere, cylinder and axis measurement steps in one eye, and then the other. An option has been added to the User Option dialog box to allow the user to select one of four sequences of refraction steps when pressing the knob:

S, C, A
S, A, C
S, C, A, S
S, A, C, S

Software Changes - Version 3.02 (continued)

Near Vision NRA/PRA Measurement

The ADD measurement function now includes the following options:

- Set the near vision measurement feature to find the upper limit first by pressing the ADD button and turning the blue control knob to the right, then the lower limit by pressing the ADD button again and turning the blue control knob to the left, and then the average between the two by pressing the ADD button a final time.
- Set the near vision measurement feature to find the lower limit first by pressing the ADD button and turning the blue control knob to the left, then the upper limit by pressing the ADD button again and turning the blue control knob to the right, and then the average between the two by pressing the ADD button a final time.

Serial Printer Port Configured to Send Data to a Computer

Auto Phoroptor RS data can now be sent to EMR by the serial printer port or the EDV port. Data sent through the serial printer port always will include the final subjective refraction data from the Auto Phoroptor RS, and lensmeter and auto refractor/keratometer data if it has been imported into the Auto Phoroptor RS. The EDV port will send subjective refraction data only from the Auto Phoroptor RS.



The Serial Printer port sends final refraction data from the RS, lensmeter and auto refractor data to EMR.

The EDV port sends final refraction data from the RS only.

Appendix B, Figure 6

The serial printer port will be used for data output when lensmeter data and/or auto refractor data need to be sent along with final subjective refraction data from the Auto Phoroptor RS to EMR.
The EDV port can be used to send Auto Phoroptor RS data to EMR when two-way communication is possible between the EMR interface and the RS, that is auto refractor and lensmeter data are first sent to the EMR system, then imported into the RS from the EMR system.

Software Changes - Version 3.02 (continued)

Lensmeter and Auto Refractor Data Added to Printer Output

Data output from the printer will now always include final subjective refraction data from the Auto Phoroptor RS and auto refractor and lensmeter data if they were sent to the Auto Phoroptor RS. This is a sample of the printer data output.

```
7-09-2012                    14:19

<<< <<< Autophoroptor RS Data >>> >>>
        CVD: 12.00            PD: 63

      FAR     [R]                [L]
        +12.25      [SPH]     +12.25
         -11.00      [CYL]     -11.00
           137°      [AXS]       67°
      11.50 IN   [PRISM]     11.50 UP

        +11.00      [ADD]     -11.00

     NEAR     [R]                [L]
        +12.25      [SPH]     +12.25
         -11.00      [CYL]     -11.00
           137°      [AXS]       67°
   11.50 OUT  [PRISM]     11.50 DOWN

      VA      [R]        [B]       [L]
  s.c.   20/250      20/100     20/30
   c.c.   20/30       20/30      20/20

        <<< <<< RK Data >>> >>>
        CVD: 13.50            PD: 63

              [R]                [L]
        +12.25      [SPH]     +12.25
         -11.00      [CYL]     -11.00
           137°      [AXS]       67°

     K-R1     [R]                [L]
           7.73      [MM]       7.73
          43.66       [D]      43.66
           138°      [AX]        55°

     K-R2     [R]                [L]
           7.53      [MM]       7.73
          44.82       [D]      43.66
            88°      [AX]       105°

          -1.16      [CYL]       0.00

        <<< <<< LM Data >>> >>>

      FAR     [R]                [L]
        +12.25      [SPH]     +12.25
         -11.00      [CYL]     -11.00
           137°      [AXS]       67°
      11.50 IN   [PRISM]     11.50 UP

        +11.00      [ADD]     -11.00

     NEAR     [R]                [L]
        +12.25      [SPH]     +12.25
         -11.00      [CYL]     -11.00
           137°      [AXS]       67°
   11.50 OUT  [PRISM]     11.50 DOWN

              Autophoroptor RS
```

Software Changes - Version 3.02 (continued)

Consolidated Software Package Options

All non-Reichert auxiliary instruments are consolidated into software packages 1 and 2. Package 1 contains drivers for non-Reichert auto refractors and lensmeters. Package 2 has drivers for non-Reichert acuity systems. Packages 1 and 2 are to be ordered and purchased separately from the Auto Phoroptor RS system. A complete listing of the instruments that communicate with the Auto Phoroptor RS can be found in Appendix A of the User's Guide. New instruments may be added as needed by customer request.

Software Version 3.02		
Software Package	**Instruments**	**Activation Code**
Standard Software	+EDP/VP +EDP V900 Projectors AP250 ClearChart 2 L29D M2000 M3000 Reichert AL200, AL500, AL700 Reichert RK600, RK700 Printers Epson TM L60 Star SP700	Included with Auto Phoroptor RS
Package 1	Non-Reichert lensmeters and auto refractors	Key 1
Package 2	Acuity Systems CSO 2047 Block Polaphor DOMS Polastar M&S Smart System 20/20	Key 2

New Visionix L79/L80 Driver

A new driver is available for the Visionix L79/L80 ARK topographer. These instruments must be configured to emulate a Huvitz auto refractor in order to be compatible with this new driver.

New drivers have also been added for the following instruments:

- Nidek/Marco Tono Ref II Auto Refractor/Keratometer/Non-Contact Tonometer
- Unicos URK 800 Auto Refractor/Keratometer

Warranty

WARRANTY AND LIMITATION OF LIABILITY
Reichert warrants that the equipment is free from manufacturer defects in material or workmanship for a period of one year from the date of original purchase when used in accordance with manufacturer's manual. In case of any defect during the warranty period, customer shall give Reichert prompt notice and Reichert will repair or replace the equipment at its option. This warranty shall be void if the equipment is modified or serviced by persons not authorized by Reichert, in case of improper maintenance (in the case of maintenance not carried out by Reichert), or in the case of improper handling of the equipment.

THE FOREGOING IS A LIMITED WARRANTY AND REICHERT MAKES AND CUSTOMER RECEIVES NO OTHER WARRANTY EXPRESSED OR IMPLIED AND ALL WARRANTIES OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

This express warranty is in lieu of all other liabilities and obligations of Reichert with respect to the equipment. In no event shall Reichert be liable to customer for any claims for damages whether direct, indirect, incidental, special, or consequential, including but not limited to lost business and lost profits whether foreseeable or not, even if Reichert has been advised of the possibility of such damage.

Special Important Information for Technical Services
All installations, repairs, modifications, maintenance, or other technical services must be carried out by personnel who are trained and explicitly authorized by Reichert for such work. Only original parts from Reichert must be used for maintenance or repairs.
Installations, maintenance, and repairs must be carried out according to technical manuals provided by Reichert. Modifications must be approved by the factory. After all technical services the equipment must be tested and re-adjusted according to Reichert´s technical instructions.
For technical inquiries the part number should be indicated. When parts are replaced, added, or removed, the laws or regulations concerning medical equipment (e.g. traceability, approvals for added parts, electrical safety, etc.) have to be considered. In any case of doubt, please contact Reichert for clarification.

Notes
Year of manufacturing and serial number of the unit: See the identification label. Keep the operating manual for later use.

Safety Notes
This unit is only permitted to be operated according to this operating manual also including the destined use. For user's and patient's safety the maintenance instructions according to this operating manual should be followed, the minutes of which have to be written down and stored. Although no regular maintenances are required we recommend to perform a yearly preventive inspection.
Under all circumstances, the manufacturer or a person or a company authorized by the manufacturer should be addressed at least once within 3 years for information concerning safety measures.

Declaration
Medical electrical equipment are subject to special precautions according to the electromagnetic compatibility (EMC) and must be installed and started up according to the EMC notes in this operating manual.
Portable and mobile RF communication equipment can disturb medical electrical equipment.

EMC Notes
The accessories used with this system must properly be mounted according to the corresponding directions. The connection lines must safely be tightened to secure proper shield connection and EMC protection.

Warning Note
Only accessories described in this operating manual are permitted to be used with this equipment. Other combinations have to be approved by Reichert. Unsuitable accessories may cause a higher emission or reduce the noise immunity of the system.

Notes

Notes

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