



AL500

Automatic Lensometer®

User's Guide

Reichert
TECHNOLOGIES

Introduction

Congratulations on the purchase of your new AL500 Auto Lensometer®.

The AL500 will provide you with fast, accurate and reliable measurements of eyeglass lenses for many years. The instrument has an innovative microprocessor controlled lens measurement system that reduces operator error and provides precise, repetitive measurements for single, multifocal, and progressive lenses.

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.

Note: Words written in all capital letters reference menu choices.

Note: Words written in initial capital letters reference parts shown in the Parts Identification section of this manual. Also initial capitals are used when referencing menu options on the LCD Screen.

Note: Underlined words reference a specific section of this manual.

Please retain this manual for future reference and to share with other users. Additional copies can be obtained from your authorized Reichert, Inc. dealer, or our Customer Service Department which can be contacted directly at:

- Tel: (716) 686-4500
- Toll Free:(888) 849-8955
- Fax: (716) 686-4545
- E-mail: info@reichert.com

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The information contained in this document was accurate at time of publication. Specifications subject to change without notice. Reichert, Inc. reserves the right to make changes in the product described in this manual without notice and without incorporating those changes in any products already sold.

Federal law restricts this device to sale by or on the order of a physician.

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

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Symbols

Symbol Information

The following symbols appear on the instrument:



CAUTION - Indicates that important operating and maintenance instructions are included in this User's Guide.



OFF (Supply) - Indicates the Power Switch is set to OFF.



ON (Supply) - Indicates the Power Switch is set to ON.



Alternating Current - Indicates that this instrument operates on alternating current.



Protective Earth - Indicates that a protective earth ground is connected where the symbol is located.



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



Catalog Number.



Waste of Electrical and Electronic Equipment.

Warnings & Cautions

Reichert, Inc. (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 RISK OF INJURY OR DEATH.

WARNING: ANY REPAIR OR SERVICE TO THE AL500 MUST BE PERFORMED BY EXPERIENCED PERSONNEL OR DEALERS WHO ARE TRAINED BY REICHERT SO THAT CORRECT OPERATION OF THE AL500 IS MAINTAINED.

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



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

CAUTION: DO NOT REMOVE THE OUTSIDE COVERS OF THE UNIT OR ATTEMPT TO REPAIR ANY INTERNAL PARTS. REPAIR AND SERVICE OF THE UNIT MUST BE PERFORMED BY EXPERIENCED PERSONNEL OR DEALERS WHICH ARE TRAINED BY REICHERT .

CAUTION: MAKE SURE THAT THE VOLTAGE APPLIED TO THE UNIT IS THE SAME AS THE VOLTAGE WHICH IS GIVEN ON THE DATA PLATE NEXT TO THE INPUT CORD RECEPTACLE OR DAMAGE TO THE UNIT MAY OCCUR.

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 ALCOHOL ON THE LIQUID CRYSTAL DISPLAY (LCD) MAY CAUSE DAMAGE TO DISPLAY. SEE MAINTENANCE SECTION FOR DETAILED CLEANING INSTRUCTION.

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

CAUTION: THIS INSTRUMENT HAS ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (ESDS) WHICH ARE SENSITIVE TO STATIC HIGH VOLTAGES STORED IN AND TRANSFERRED BY THE HUMAN BODY. OBSERVE CORRECT ESDS PRECAUTIONS OR PREMATURE MALFUNCTION OF THIS INSTRUMENT WILL OCCUR.

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

CAUTION: THE POWER CORD IS THE DISCONNECTING DEVICE FROM THE ELECTRICAL POWER SOURCE. DO NOT POSITION THE INSTRUMENT SO THAT IT IS DIFFICULT TO OPERATE OR DISCONNECT THE POWER CORD FROM THE POWER SOURCE.

Instrument Setup

Great care has been taken to deliver your new AL500 Auto Lensometer safely to you. Please retain the shipping materials if future shipment is necessary.

Unpacking Instructions

This instrument is packaged in a manner to protect it from damage during shipment. Inside the outer box, is an inner box which contains the unit and its accessories. Please take the time to look through the User's Guide before operating the AL500 so that you will be familiar with its operation.

1. Remove the Packaging Straps from the Outer Box and cut the tape to access the inside of the box. Refer to Figure 1. Lift the Inner Box out of the Outer Box and cut the Packaging Straps on the Inner Box.
2. Cut the tape to access the contents of the Inner Box. Refer to Figure 2.
3. Lift out the flat piece of cardboard and the Top Tray and then remove the Packing Form and the Accessory Box from the Inner Box. Refer to Figure 3.
4. Carefully remove the AL500 from the box and remove the plastic cover that protects the unit from dirt, contaminants and cosmetic damage.
5. Remove the accessories from the Accessory Box. The accessories contained in the Accessory Box are the following:
 - Power Cord
 - Dust Cover
 - Printer Paper Roller
 - Spare Printer Paper
 - Contact Lens Holder (used for measuring contact lenses).
 - Lens Cleaning Cloth (used for cleaning off the Nosepiece Lens).

Note: If any of the above accessories are not included with the unit, please call Reichert as indicated in the [Introduction](#) section of this manual.

Note: Place the packaging materials in a safe storage location so that if future transportation is required, the packaging will be available.

AL500 Initialization

Before applying power to the AL500, perform the following checks.

WARNING: DO NOT APPLY INPUT POWER THAT EXCEEDS THE RATINGS GIVEN ON THE DATA PLATE, OR DAMAGE TO THE INSTRUMENT MAY OCCUR.

- Look at the data plate located above the input power panel and ensure that the available input power to this instrument is within the voltage range listed. Connect the power cord to the AL500 and then connect the other end to the power source.
- Set the Power Switch to the ON position (pushed in on the "I" side).
- Check the operation of the Marking Pens and make sure that they are not positioned in the optical path of the measuring system. If the pens occlude the optical path an error will be shown on the LCD Screen.
- Adjust the LCD Screen for the optimum viewing angle.
- Install the Printer Roller and the Printer Paper as indicated in the [Maintenance](#) section of this manual.



Figure 1. Outer Box Open

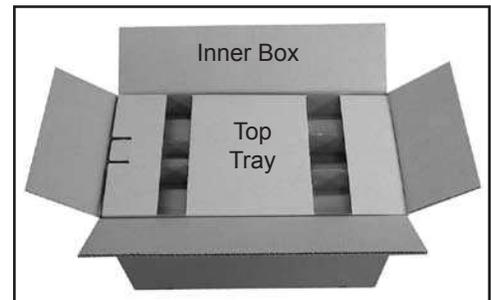


Figure 2. Inner Box Open

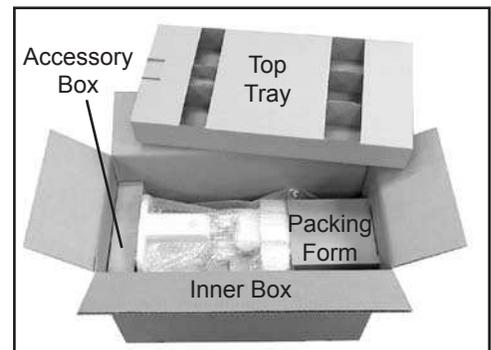


Figure 3. Inner Box Contents

Instrument Setup (Continued)

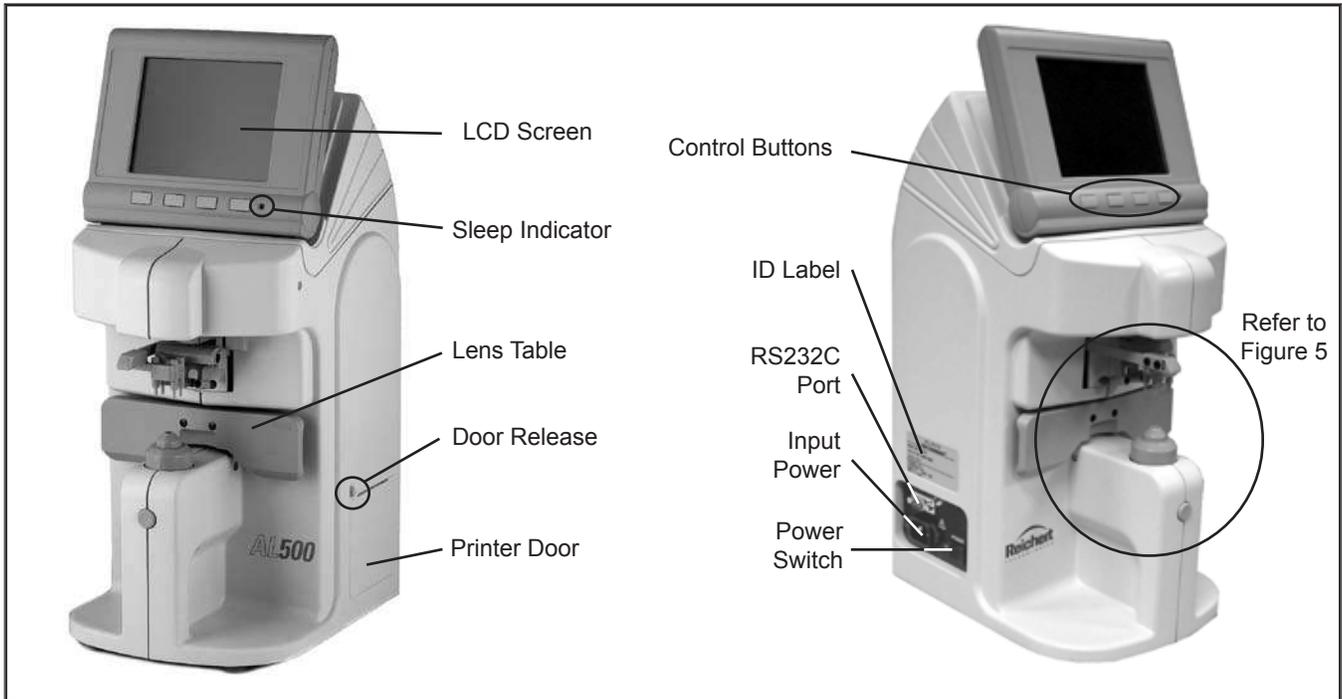


Figure 4. Parts Identification

Parts Identification

LCD Screen:

Operators screen that displays measurement data and system menus for operation and modification of system parameters.

Sleep Indicator:

Green LED that indicates when the instrument has power applied and is in the Sleep Mode.

Lens Table:

Reference surface utilized for eyeglass frames when determining degrees of cylinder axis.

Door Release:

Button, that opens the Printer Door when depressed.

Printer Door:

Access panel for replacement of the Printer Paper.

Control Buttons:

Buttons for selecting options that are shown on the Operator Display.

ID Label:

Label that contains the input power requirements, Model Name and Number, Serial Number, and Reichert address.

RS-232C Port:

Communication port for sending the patient data to a computer or other data interface.

Input Power:

Interface for connecting input power to the unit.

Power Switch:

ON/OFF switch that controls input power to the unit.

Instrument Setup (Continued)

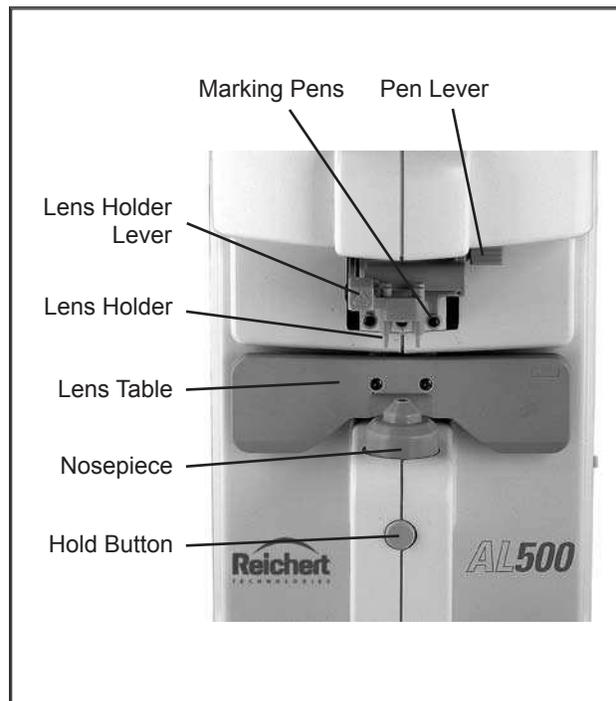


Figure 5. Marker/Holder Parts Identification

Parts Identification (Continued)

Marking Pens:

Pens that are utilized for marking the optical center and an axis reference line on lenses.

Pen Lever:

Handle that is depressed for marking the lens with the Marking Pens.

Lens Holder Lever:

Handle for releasing or securing the Lens Holder assembly.

Lens Holder:

An assembly that secures the measured lens to the Nosepiece.

Nosepiece:

Optical surface that lenses are placed against during measurement.

Hold Button:

Button used to hold (lock) the measurements into memory.

Instrument Setup (Continued)

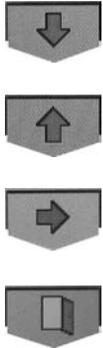
Icon Definition

The AL500 incorporates a user-friendly icon/menu-based operating system which will increase the speed of measurements, training and use. Below are the Icons which are used in this instrument. Press the Control Buttons located below the icons to activate or modify its parameters.

Icon	Icon Description
	Icon that indicates the current measurement steps for lens data. (0.25D for 1/4 diopter, 0.12D for 1/8 diopter.)
	Icon displaying the current cylinder measurement mode. (“-” for minus, “+” for plus and “±” for plus/minus mode.)
	Left eye icon for the left eye data.
	Right eye icon for the right eye data.
	Single lens icon.
	Abbe number icon that indicates the current Abbe number.
Icon	Control Buttons
	Single Lens icon representing the single lens mode.
	Icon that indicates the right side data is active for eyeglasses.
	Icon that indicates the left side data is active for eyeglasses.
	Single/Multifocal icon indicating single, bifocal, and multifocal lenses.
	Progressive icon indicating progressive lenses.
	Erase icon for erasing (deleting) data from either the single, right or left side data.
	Print icon for sending the data on the LCD Screen to the Printer.
	Exit icon for existing the current menu and displaying the preceding menu.
	Cylinder Mode icon for selecting the minus, plus, or plus/minus (-, +, or ± mode) cylinder mode.
	Menu icon for displaying the settings menu.

Instrument Setup (Continued)

Instrument Settings



This instrument has default parameters that may be changed to accommodate user preferences. Refer Figures 6 & 7.

Press the UP or DOWN arrow to select the desired category, then using the RIGHT arrow, change the parameter for the desired category. When all changes are complete, press the EXIT button (door) to exit the setup mode. The following gives an explanation for each setting:

Set up				1/2
Step	0.25	0.12	0.01	
Lens Switch	S/R/L		R/L	
Lens	Normal	H cont	S cont	
Prog Auto	Off		On	
ADD Measure	Auto		Manual	
Prog. Graph	Off		On	
Graph Print	Off		On	
Prism	Off	X-Y	P-B	
Prism(mm)	Off		On	

- STEP** Rounding mode for the refractive measurements. Available options are: 0.25, 0.12 or 0.01 Diopters.
- LENS SWITCH** Choose between Single (S) lens or Right/Left (R/L) of eyeglasses.
- LENS** Parameters are Normal lens (Normal), Hard Contact Lens (H cont), or Soft Contact Lens (S cont).
- PROG AUTO** ON: Automatically changes from the Measuring mode to the Progressive mode if the instrument detects a progressive lens.
OFF: The instrument will NOT automatically change to the Progressive mode if a progressive lens is detected in the Measuring mode.
- ADD MEASURE AUTO:** Automatically records the maximum value of the Add segment when when the maximum value of the segment is positioned over the Nosepiece.
MANUAL: Does not automatically record the maximum value of the Add segment when it is positioned over the Nosepiece. The Add segment data is stored only after the HOLD button is pressed.
- PROG. GRAPH** ON: This parameter when ON, displays the progressive graph on the LCD Screen when measuring.
OFF: This parameter when OFF, does not display the progressive graph on the LCD Screen.
- GRAPH PRINT** ON: Prints the progressive graph when data is sent to the printer.
OFF: The progressive graph is not printed when data is sent to the printer.
- PRISM** OFF: Sets the prism mode off and does not display the prism data on the LCD.
X-Y: Sets the prism mode ON and displays the prism data in Px and Py format (I=in, O=out, U=up, D=down).
P-B: Sets the prism mode ON and displays the prism data in diopters and degrees.
- PRISM(mm)** ON: Displays a box that contains the prism data at the center of the alignment mark (X-Y in millimeters, P-B in diopters).
OFF: Does not display the box that contains prism measurements.

Figure 6. Setup Menu (1 of 2)

Instrument Setup (Continued)

Instrument Settings (Continued)



ABBE Option that sets the instrument to match the abbe value of the lens to enable a higher degree of accuracy in measurement.

RAY Option that sets the instrument to measure the lens at either the d-line or the e-line.

d-line: data measured at a wavelength of 587 nm. (default value)

e-line: data measured at a wavelength of 546 nm.

STAND-BY Time period of inactivity when the sleep mode activates. In the sleep mode the LCD screen is set OFF and the green LED (at the bottom right of the LCD) is set ON. Options are: OFF, 3, 5, or 10 minutes.

LANGUAGE Chooses the operating language for the instrument. Settings include English (EN), French (FR), Spanish (ES), Italian (IT), Portuguese (PT), German (DE), and Chinese (中).

BRIGHTNESS The brightness of the LCD Screen is adjusted using the RIGHT button which increases it from 0 to 100%. To lower the brightness, press the HOLD button and then press the LEFT button.

ID Screen for entering the name of the office (or doctor). Refer to Figure 8.

RS232C Allows modification of the RS232C data bus parameters. When the RETURN button is pressed for this option, a screen appears requesting Baud Rate, Character (7 or 8), Parity, and Stop Bits.

A setting is also available to set the printer to AUTO (prints automatically when all data fields are filled) or to MANUAL (only prints when the PRINT button is pressed). Refer to Appendix A for an illustration of the connection drawing from the AL500 to an RS232C terminal.

DATE/TIME Date form: Format used on the printer paper. YMD, DMY, or MDY. Refer to Figure 9.

Date: Field for changing the current date.

Time: Field for changing the current time.

Note: Typical parameters for the settings on the AL500 are the following:

Step = 0.25	Cyl = “_”	Lens = Normal
Prog Auto = ON	Add Measure = Auto	Prog Graph = ON
Graph Print = OFF	Prism = P-B	Prism(mm) = ON
Abbe = 60	Ray = d	Standby = 10

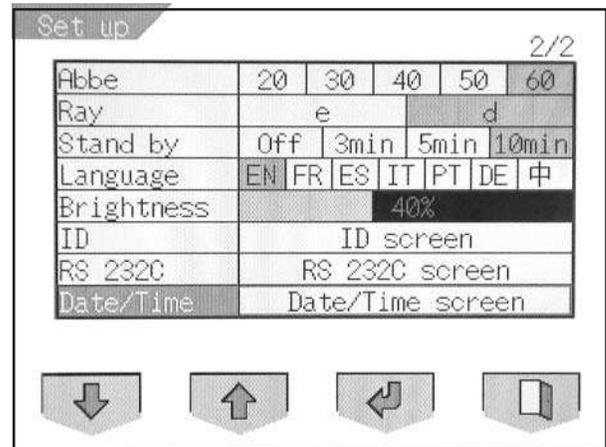


Figure 7. Setup Menu (2 of 2)

Instrument Setup (Continued)

Instrument Settings (Continued)



ID Screen Setup

This instrument has an ID Screen that may be programmed to display the name of the business or practice on the printer paper. To enter a name, follow the steps below. Refer to Figure 8.

1. At the main menu screen press the two middle buttons to enter the SETUP screen, then press the UP button until ID is highlighted. Press the RETURN button.
2. Press the LEFT or Right button until the colored box is over the selected letter, number, or symbol that is desired.
3. Press the HOLD button and the RIGHT button to move to the next character position.
4. Release the HOLD button and then press the LEFT or Right button until the colored box is over the selected letter, number, or symbol that is desired.
5. Repeat steps 2 and 3 above until the correct name or information is entered in the text box.
6. Press the EXIT button (door icon) to return to the main menu screen.

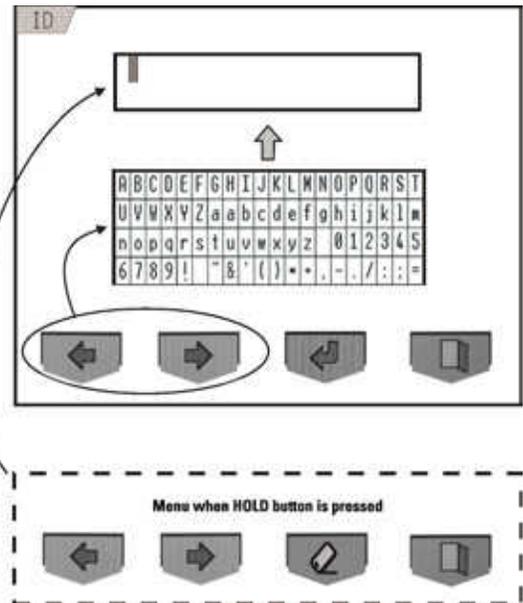


Figure 8. ID Screen Setup

Date Screen Setup

This instrument has a date screen for modification of the date/time. To modify the date or time, follow the steps below. Refer to Figure 9.

1. At the main menu screen press the two middle buttons to enter the SETUP screen, then press the UP button until DATE/TIME is highlighted. Press the RETURN button.
2. Press the UP or DOWN arrow to select the Date form, Date, or Time format option.
3. Press the RIGHT button until the colored box is over the number or format that you want to change.
4. To modify numbers, press the HOLD button and then the button below the plus (+) or minus (-) as necessary.
5. Release the HOLD button and then press the RIGHT button until the colored box is over the next number or format that you want to change. Repeat steps 3 and 4 as necessary.
6. Press the EXIT button (door icon) to return to the main menu screen.

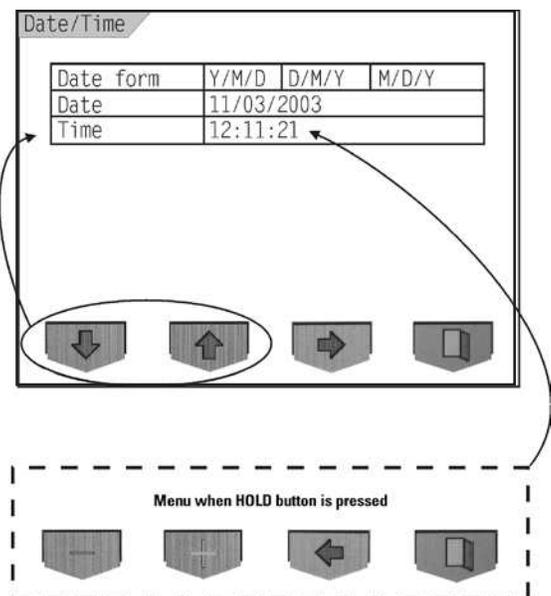


Figure 9. Date Screen Setup

Operation

Lens Mode



The AL500 displays the lens measurement data in either single or eyeglass lens mode.

Single Lens Mode

This is the default mode that the AL500 displays when power is initially applied. In this mode the AL500 displays data for one lens only. After the lens data is acquired, the data must be erased (and printed if desired) before a different lens is measured.

Data displayed is sphere, cylinder, and cylinder axis. Prism and multifocal add are also available options.

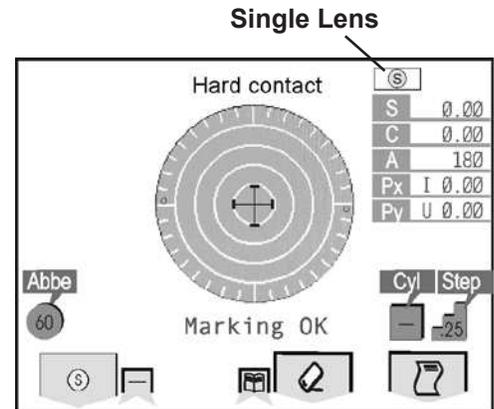


Figure 10. Lens Mode - Single Lens

Eyeglass Lens Mode

The eyeglass lens mode displays data for a left and a right lens. To enter this mode, press the button below the Single vision lens icon (left button of the LCD screen).

Data displayed is sphere, cylinder, and cylinder axis for both the left and right lenses. Prism and multifocal add are also available options.

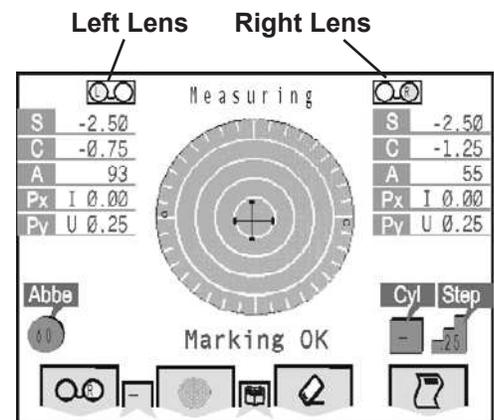


Figure 11. Lens Mode - Eyeglass Lens

Note: If the instrument is set to the S/R/L (SETUP, Lens Switch option) mode, it is necessary to press the erase button to return to the Single Lens mode.

Note: If the Single Lens mode (refer to [Control Buttons](#) in the [Instrument Setup](#) section of this manual) is desired and will not display, change the Lens Switch option in the SETUP menu from R/L to S/R/L.

Note: If the Prism option is set to ON, the AL500 will display a box that indicates distances from optical center (X-Y in millimeters, P-B in diopters).

Operation (Continued)

Measurement Mode



The AL500 has three measurement modes.

- Measuring:** Measures single, bifocal, and multifocal lenses only and will not auto detect for a progressive lens (Prog Auto option set to OFF).
- Prog Auto:** Measures single, bifocal, and multifocal lenses unless a progressive lens is detected (Prog Auto option is set to ON) and will then automatically switch to the Progressive mode.
- Progressive:** Measures progressive lenses only.

Measure Mode

1. Place the lens (oriented up) on top of the Nosepiece with the bottom of the lens toward the Lens Table. Raise and then lower the Lens Holder Lever to hold the lens still for measurement. Refer to Figure 12.

Note: When using the Lens Table, push on it where it is marked “PUSH” and then position the lens table so that it touches the bottom of the eyeglasses so that correct axis orientation is maintained.

2. Position the distance segment of the lens so that it is centered and then press the HOLD button. Refer to Figures 13 and 14.

- In the Measure mode, align the “+” to the center of the target.
- In the Progressive mode, align the “+” with the vertical line in the blue area. If the “+” does not align with the vertical line, then measure the lens approximately 5 mm from the top of the lens and centered horizontally, then press the HOLD button.

Note: If the Prism option is set to ON, the AL500 will display a box that indicates distances from optical center (X-Y in millimeters, P-B in diopters).

Note: When measurement data is displayed in red, the data is stored; if it is displayed in black, it is active (not stored).

Note: The following steps are performed with the ADD Measure option set to Manual. If the ADD Measure option is set to AUTO, it will not be necessary to press the HOLD button as many times as indicated below.

3. If measuring the add segment, press the HOLD button to display the Ad1 field. Position the add segment of the lens so that it is centered and then press the HOLD button. Refer to Figure 15.



Figure 12. Correct Lens Orientation

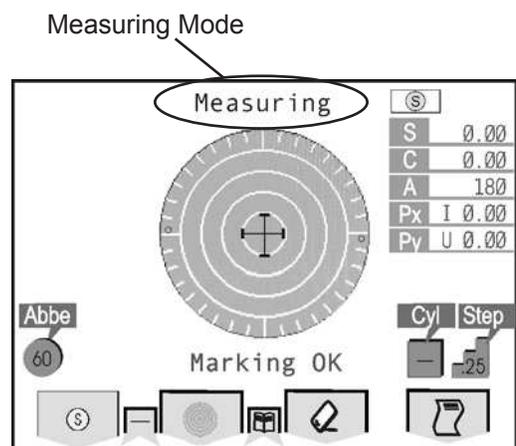


Figure 13. Single/Multifocal Lens

Operation (Continued)

Measurement Mode (Continued)



- In the Measure mode, align the “+” to the center of the target.
 - In the Progressive mode, align the “+” with the vertical line in the clear area.
4. If there is a second add segment (multifocal lens), press the HOLD button to display the Ad2 field. Position the add segment of the lens so that it is centered and then press the HOLD button.
 5. For measuring the left lens, press the left Control Button until the icon for the left side is showing and repeat the above steps.
 6. When all readings are acquired, Press the PRINT button and the data on the LCD screen will be sent to the thermal printer.
 7. Press the ERASE button to clear the measurement data so that the AL500 will be ready for subsequent lenses.

Prism Measurement

Note: Measurements for prism are displayed in either the X-Y (X, Y displacement in mm), or P-B (prism in diopters) as indicated in the SETUP mode (Prism option).

Prism measurements for a marked lens are obtained by measuring at the indicated measurement point on the lens.

Prism measurements in an unmarked lens are obtained by: (Refer to Figure 16).

- First applying a non-permanent ink dot on the lens where the patient’s distance vision is focused (aligned with the center of the pupil). If an add segment is present, a second dot may be applied to facilitate the add reading.
- Prism (and Sphere, Cylinder, and Axis) measurements are obtained by measuring at the ink dot on the lens.

Measuring Mode

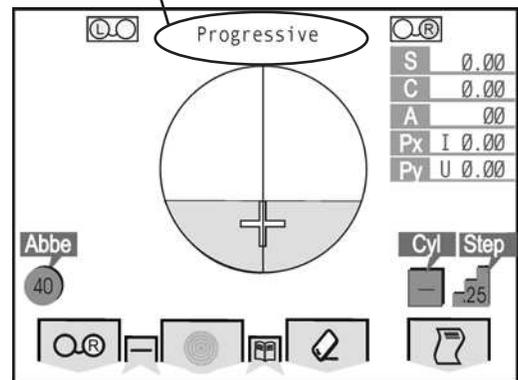


Figure 14. Progressive Lens

Measuring Mode

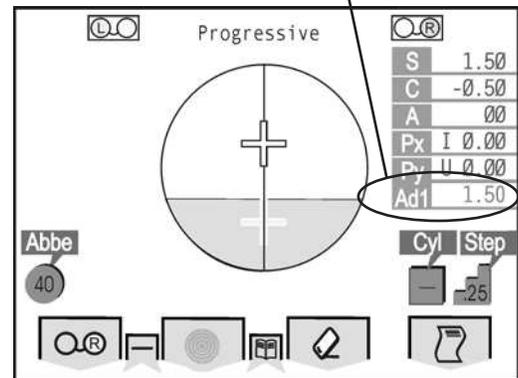


Figure 15. Progressive Add Section



Figure 16. Non-permanent Ink Dot

Operation (Continued)

Measurement Mode (Continued)



Contact Lens Measurement

Perform the following steps to measure contact lenses. The screen is shown in Figure 17.

CAUTION: BEFORE MEASURING LENSES ENSURE THAT THE NOSEPIECE LENS IS CLEAN AS INDICATED IN THE MAINTENANCE SECTION OF THIS MANUAL OR INCORRECT READINGS MAY OCCUR.

Note: After power is applied to the AL500 it will perform an internal calibration and display the main menu screen shown in Figure 17.

The contact lens measuring mode will measure either hard or soft contact lenses. The SETUP menu choice contains a choice for hard or soft contact lenses.

1. Remove the Nosepiece Cover from the Nosepiece. Refer to Figure 24.
2. Go to the SETUP mode and change the Lens option to either the hard contact lens (H cont) or the soft contact lens (S cont) mode. Refer to Figure 17.

Note: The soft contact lens mode displays prescription data using the spherical equivalent format (SPH EQU = Sphere + Cyl / 2). The hard contact lens mode displays prescription data in sphere, cylinder and axis format.

3. Install the the Contact Lens Holder on top of the nosepiece as indicated in Figure 18.
4. Place and center the contact lens into the concave section of the Contact Lens. Center the lens in the Lens Holder and move the Lens Holder until the optical center of the lens is indicated. Press the HOLD button.

Note: When the measurement data is displayed in red, the data is stored; if it is displayed in black, it is active (not stored).

5. Press the PRINT button if a printout is desired and the data will be sent to the thermal printer.
6. Press the ERASE button to clear the measurement data so that the AL500 will be ready for the next lens.
7. When measurement of the contact lens is complete, remove the Contact Lens Holder from the Nosepiece and clean the lens on the instrument with a soft, clean, dry, cotton cloth. Clean and sanitize the Contact Lens Holder.
8. Install the the Nosepiece Cover onto the Nosepiece. Refer to Figure 24.
9. Go to the SETUP mode and switch the Lens mode back to "Normal."

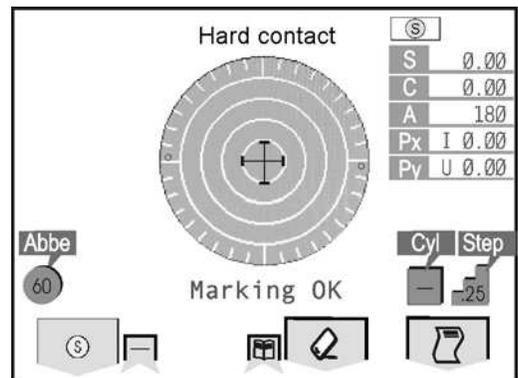


Figure 17. Contact Lenses



Figure 18. Contact Lens Holder

Operation (Continued)

Printing Measurement Data



The print function in this instrument has two options. Refer to Figure 19.

- Automatic mode - This option automatically prints out the data after all data fields for both the right and left eye are completed.
- Manual mode - This option prints out data only when the print button is depressed.
- Additionally, the printer can be set to the OFF mode. In this mode the printer does not print even if the print button is pressed. However, in this mode, when the print button is pressed, the data is sent to the serial port and not to the printer.

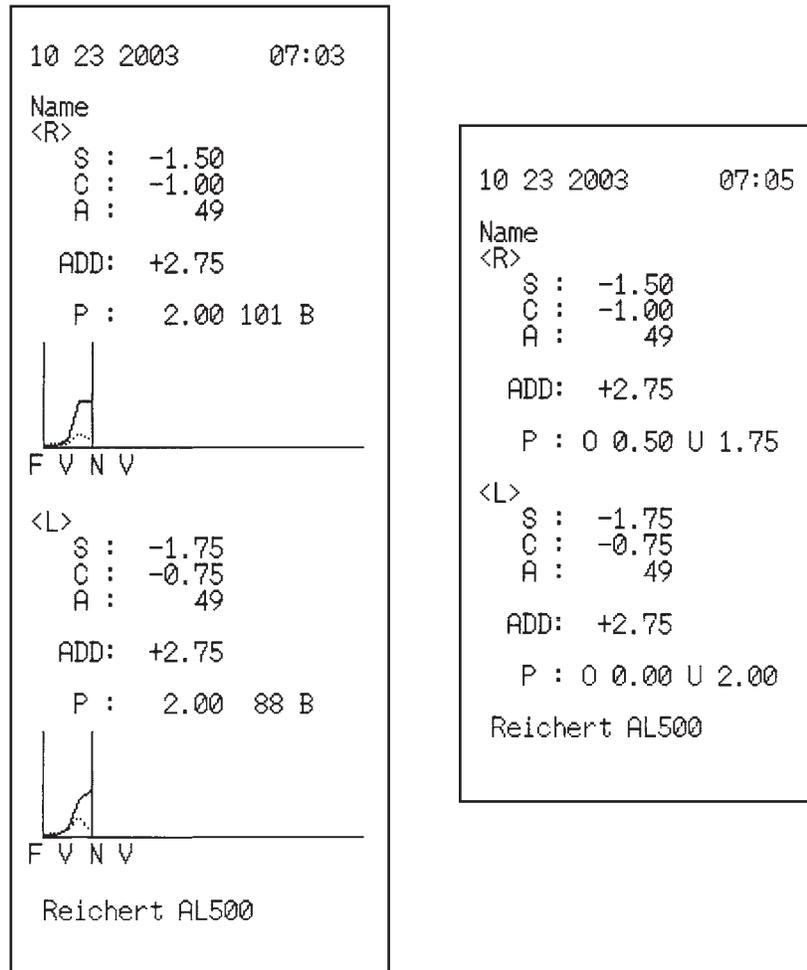


Figure 19. Sample Printouts

Maintenance

Introduction

The AL500 requires very little routine maintenance due to its advanced design. For instance, there are no bulbs or lamps to change.

If you have questions relating to maintenance, contact your local dealer or our Customer Service Department as indicated in the [Introduction](#) section of this manual.



CAUTION: ANY REPAIR OR SERVICE TO THE AL500 MUST BE PERFORMED BY EXPERIENCED PERSONNEL OR DEALERS WHICH ARE TRAINED BY REICHERT SO THAT CORRECT OPERATION OF THE AL500 IS MAINTAINED.

Cleaning



CAUTION: DO NOT USE ALCOHOL OR ANY SOLVENTS ON ANY EXTERNAL SURFACE OF THE INSTRUMENT OR DAMAGE TO THE PAINTED OR COATED SURFACE MAY OCCUR.

Operator Display

Clean the Operator Display using a clean, soft cloth that is only lightly dampened with a mild detergent solution (1 cc of liquid dish soap to one liter of clean filtered water (e.g., filtered below 5 microns)).

Instrument Covers

Clean external surfaces of Instrument Covers using a clean, soft cloth that is only lightly dampened with a mild detergent solution (1 cc of liquid dish soap to one liter of clean filtered water (e.g., filtered below 5 microns)).

Printer Paper Replacement

Installation of the printer paper is quick and easy.

1. Open the Printer Door by depressing the Door Release button. Refer to Figure 20.
2. Install the Printer Paper onto the Printer Rod.
3. Unroll a small amount of paper and install the Printer Paper into the printer compartment. Refer to Figure 21.
4. Close the Printer Door and tear off the excess Printer Paper.

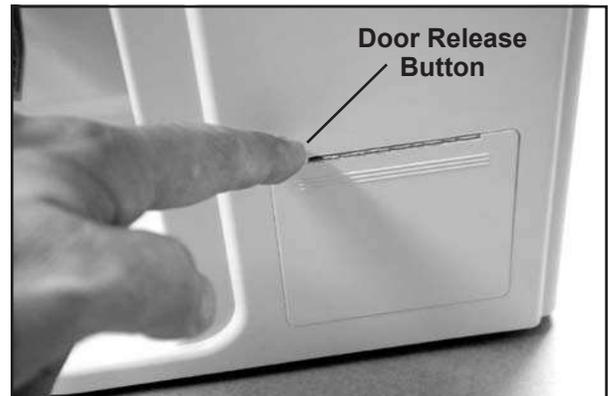


Figure 20. Open Printer Door



Figure 21. Lift Printer Cutter

Maintenance (Continued)



Marking Pen Replacement

Replacing the Marking Pens is completed by the following instructions.

CAUTION: USE CARE NOT TO LOSE THE SPRING BETWEEN THE MARKING PEN AND THE PEN MOUNT WHEN REMOVING THE SCREW.

Note: Only use a Marking Pen that is designed for use with the AL500.

1. Loosen and remove the Screw (M2 x 5L) and the flat washer at the top of the Marking Pen. Refer to Figure 22.
2. Remove the Marking Pen and the Spring from inside the Pen Mount. Refer to Figure 23.
3. Install the Spring onto the new Marking Pen with the flat end toward the Screw. Install the new Marking Pen and Spring into the Pen Mount.



Figure 22. Marking Pen Removal

Note: The middle marking pen is shorter and a different color than the other two pens.

4. Secure the Marking Pen(s) with the Screw and tighten it to 3 in•lbs (0.34 N•m).
5. Repeat the above steps for each Marking Pen that is replaced.

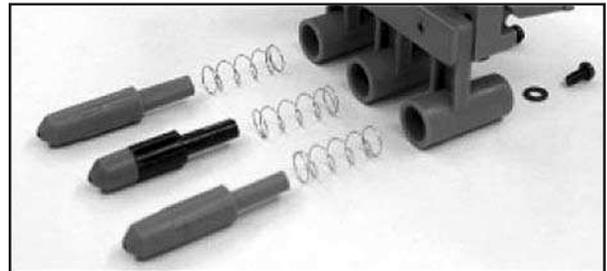


Figure 23. Marking Pen Disassembly

Nosepiece Cover Replacement

Replace the Nosepiece Cover using the following instructions.

Note: If you have difficulty removing the Nosepiece Cover, you may use a wooden stick (e.g., tongue depressor) to pry it off.

1. Pull the Nosepiece Cover straight up and off the instrument. Refer to Figure 24.
2. Install a new Nosepiece Cover onto the instrument and ensure that it is fully seated down onto its metal support.

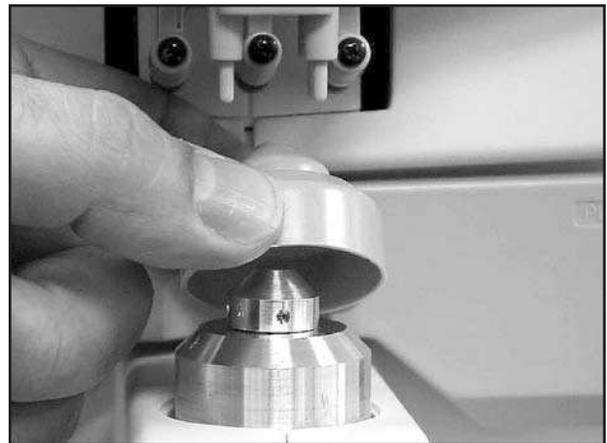


Figure 24. Nosepiece Cover Replacement

Troubleshooting

Troubleshooting Chart

The following chart provides details of common difficulties and solutions for the AL500.

ERROR	MESSAGE	REMEDY
SYSTEM	No Power / LCD Screen blank.	Apply power to the unit. Press any button on the LCD Screen. (Unit is in sleep mode).
		Damaged internal fuse or circuits. Note: Fuses are not user replaceable. Contact Reichert for Service on this product.
	Printer will not feed paper.	Out of paper. Printer not turned on in setup.
	Data does not print on the paper.	Paper installed upside down. Non-thermal paper is used. Use thermal paper.
	Pens do not mark lenses.	Replace Marking Pens (Refer to Maintenance section in this manual).
	Buttons do not respond.	The buttons are depressed too quickly.
MESSAGES	Measure Error.	Remove obstruction in optical path.
	Paper Empty.	Replace the Printer Paper.
	Printer Cover Open.	Close the Printer Cover.
	SPH/CYL/Prism/ADD Over.	Measurement Range Exceeded.
	Retry Error.	Inconsistent light beam to the camera. Clean lens on eyeglasses or on the instrument nose-piece assembly, remove obstruction in optical path, or reset power to the instrument.
	No Target Error	Inconsistent light beam to the camera. Clean lens on eyeglasses or on the instrument nose-piece assembly, remove obstruction in optical path, or reset power to the instrument.

Note: If problems still persist, contact Reichert as indicated in the [Introduction](#) section of this manual.

Note: Circuit diagrams, component parts, list descriptions and calibration instructions are available only to qualified personnel trained by Reichert.

Specifications

Sphere	-25D to +25.00D (0.01D, 0.12D, 0.25D steps)
Cylinder	0D to $\pm 10.00D$ (0.01D, 0.12D, 0.25D steps)
Axis	0° thru 180° (1° steps)
Addition	0D to $\pm 10.00D$ (0.01D, 0.12D, 0.25D steps)
Prism	0 to 10 Δ
Lens Power Measuring Wavelength	650 nm

Measurable Lens

Frame lens	Single Lens, multifocal lens, progressive lens
Hard contact lens and soft contact lens	A special accessory is required

Measurement Accuracy

Sphere	0D to $\pm 10.00D = \pm 0.25D$, else 0.50D
Cylinder	$\pm 0.25D$

Physical Data

Height	17.4 in. (443mm)
Depth	10.2 in. (260mm)
Width	7.9 in. (200mm)
Weight, unpacked	12.15 lbs. (5.5 kg)
Printer	Thermal printer - paper width 2.3 in. (58mm)
Monitor	Color LCD monitor - 4.75 in. x 3.5 in. (121mm x 89mm)

Electrical Data

Voltage (nominal)	100 - 240 VAC
Consumption	40 VAC
Current	1.0 Amp
Frequency	50/60 Hz
Fuses	3 Amp, 250VAC (T3A, L 250V), Not User Replaceable

Transportation & Storage

This instrument can withstand the following conditions while packed for transportation or storage:

- An atmospheric pressure range of 760 mmHg (101 kPa) thru 528 mmHg (70.4 kPa).
- An ambient temperature range from, -10 °C thru +60 °C (+14 °F thru 140 °F).
- A relative humidity range of 30% thru 85%.

Note: Operating conditions are recommended from +10 °C thru +40 °C (+50 °F thru +104 °F) at a relative humidity of 40% thru 70%.

Note: The above extreme high or low storage conditions should not exceed 15 weeks.

Disposal

This product does not generate any environmentally hazardous residues. At the end of product life, follow local laws and ordinances regarding proper disposal of this equipment.

Applicable Laws and Standards

Law	Electromagnetic Compatibility Directive 89/336/EEC Low Voltage Directive 72/23/EEC
Standard	Safety of a device - EN 61010-1: 2001 Electromagnetic Compatibility - EN 61326-1: 1997, Amendment A2: 2001 Class A

RS232C Interface

Connections from the AL500 to a computer are possible using the following settings:

- Baud Rate: 384000, 9600, or 2400 bps (bits per second)
- Character (word): 8, or 7
- Parity: Odd, Even, or None
- Stop Bits: 2, or 1

Note: After S/N: 00861 use settings:
 Baud Rate: 384000, 9600, or 2400 bps (bits per second)
 Character (word): (Fixed)
 Parity: (Fixed)
 Stop Bits: (Fixed)

The connections from the AL500 to the computer are shown in the following diagram:

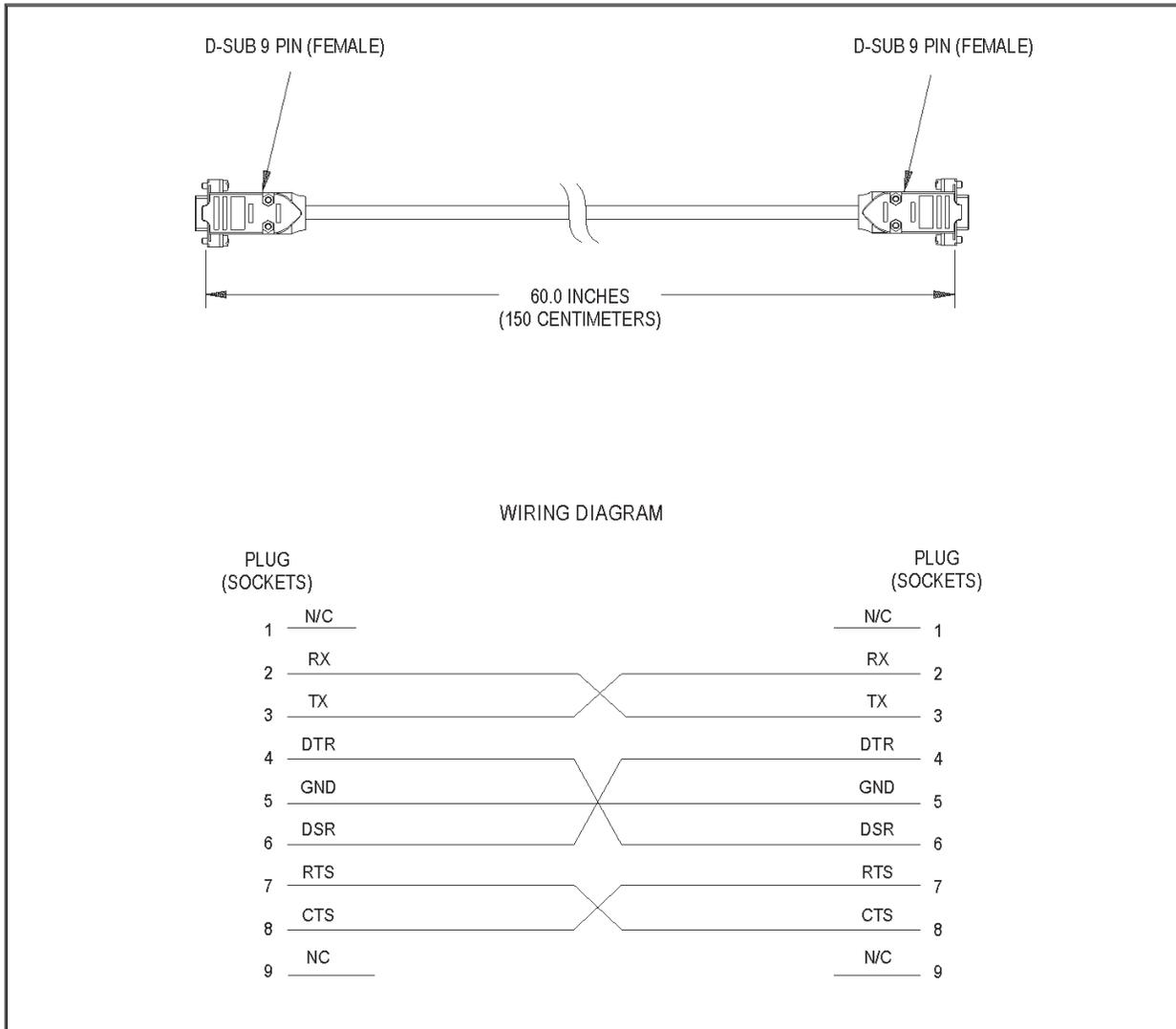


Figure A1. RS232C Interface

Warranty

This product is warranted by Reichert, Inc. (Reichert) against defective material and workmanship under normal use for a period of one year from the date of invoice to the original purchaser. (An authorized dealer shall not be considered an original purchaser.) Under this warranty, Reichert's sole obligation is to repair or replace the defective part or product at Reichert's discretion.

This warranty applies to new products and does not apply to a product which has been tampered with, altered in any way, misused, damaged by accident or negligence, or which has the serial number removed, altered or effaced. Nor shall this warranty be extended to a product installed or operated in a manner not in accordance with the applicable Reichert instruction manual, nor to a product which has been sold, serviced, installed or repaired other than by a Reichert factory, Technical Service Center, or authorized Reichert, Inc. Dealer.

Lamps, bulbs, charts, cards and other expendable items are not covered by this warranty.

All claims under this warranty must be in writing directed to the Reichert factory, Technical Service Center, or authorized instrument dealer making the original sale and must be accompanied by a copy of the purchaser's invoice with serial numbers. Any product returned for service must have a Return Material Authorization (RMA) and be packed in factory packaging.

This warranty is in lieu of all other warranties implied or expressed. All implied warranties of merchantability or fitness for a particular use are hereby disclaimed. No representative or other person is authorized to make any other obligations for Reichert. Reichert shall not be liable for any special, incidental, or consequent damages for any negligence, breach of warranty, strict liability or any other damages resulting from or relating to design, manufacture, sale, use or handling of the product.

PATENT WARRANTY

If notified promptly in writing of any action brought against the purchaser based on a claim that the instrument infringes a U.S. Patent, Reichert will defend such action at its expense and will pay costs and damages awarded in any such action, provided that Reichert shall have sole control of the defense of any such action with information and assistance (at Reichert's expense) for such defense, and of all negotiation for the settlement and compromise thereof.

PRODUCT CHANGES

Reichert reserves the right to make changes in design or to make additions to or improvements in its products without obligation to add such to products previously manufactured.

CLAIMS FOR SHORTAGES

We use extreme care in selection, checking, rechecking and packing to eliminate the possibility of error. If any shipping errors are discovered:

1. Carefully go through the packing materials to be sure nothing was inadvertently overlooked when the unit was unpacked.
2. Call the dealer you purchased the product from and report the shortage. The materials are packed at the factory and none should be missing if the box has never been opened.
3. Claims should be filed within 30 days.

CLAIMS FOR DAMAGES IN TRANSIT

Our shipping responsibility ceases with the safe delivery in good condition to the transportation company. Claims for loss or damage in transit should be made promptly and directly to the transportation company.

If, upon delivery, the outside of the packing case shows evidence of rough handling or damage, the transportation company's agent should be requested to make a "Received in Bad Order" notation on the delivery receipt. If within 48 hours of delivery, concealed damage is noted upon unpacking the shipment and no exterior evidence of rough handling is apparent, the transportation company should be requested to make out a "Bad Order" report. This procedure is necessary in order for the dealer to maintain the right of recovery from the carrier.

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