

Saint-Gobain Crystals & Detectors
Radiation Measurement Products
6801 Cochran Road
Solon, Ohio 44139 USA



Telephone: (440) 248-7400
Toll Free: (800) 472-5656
Fax: (440) 349-6581
<http://www.detectors.saint-gobain.com>

Model 3500 Manual TLD Reader
with WinREMS™

Operator's Manual

Publication No. 3500-W-O-0602-004

* * * Release Date * * *

June 26, 2002

Part No. M-26739
Rev. C

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Written By:	<small>Initials</small> UPW	<small>Date</small> 6/28/02
Technical Content Approved By:	KLS	6/28/02
Edited By:	UPW	6/28/02

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FOREWORD

Introduction

This manual provides you with all the information you need to properly operate the Harshaw Model 3500 Manual TLD Reader, when controlled through WinREMS (Windows[®]-based Radiation Evaluation and Management System). WinREMS is SGCD Radiation Measurement Products' (RMP) proprietary operating system, operating on a personal computer and connected to the Reader via a serial port.

This manual is released concurrently with WinREMS version PL-26732.8.0.0.0. You may confirm the version number of your system on the Help, About screen (Section [7.11.3 About](#)).

This Operator's Manual is structured so that a novice can use it to become acquainted with the instrument at a comfortable pace, yet the more experienced user will find that it is a valuable reference. This manual is not intended, however, to be used to introduce an operator to the equipment without training. This training may come from Saint Gobain Crystals & Detectors or an experienced user.

You also should have the Technical Service Manual (Publication No. 3500-0-S) with your Model 3500 Reader. This manual provides troubleshooting and repair instructions and engineering drawings to help a trained service technician to properly maintain and repair the Reader..

Overview

The manual is structured to give you the information you need to become familiar with the instrument for your initial use and to be a continuing reference as you become more familiar with the instrument and take greater advantage of its capabilities. Depending on your situation with respect to the system, certain sections will be more helpful than others. All users should read Section [1.0 System Overview](#) first.

- If you have just received your Model 3500 Reader and will be installing and starting up the system yourself, you should read Section [2.0 Installation](#) for installation instructions, Section [3.0 General Instructions](#) and [4.0 Tutorial](#) to familiarize yourself with the general operation of the Reader, Section [5.0 Quality Assurance](#) to understand the quality assurance measures available in the system, and Section [6.0 Calibration Procedures](#) to calibrate your Reader and dosimeters for production use.
- If you have received your system completely installed and operational, you may begin with Sections [3.0 General Instructions](#) and [4.0 Tutorial](#) to familiarize yourself with the general operation of the Reader, Section [5.0 Quality Assurance](#) to understand the quality assurance measures available in the system, and Section [6.0 Calibration Procedures](#) to calibrate your Reader for production use.
- If you are a new operator coming into a system that is fully operational, you will initially benefit most from Sections [3.0 General Instructions](#) and [4.0 Tutorial](#).

FOREWORD (cont'd)**Overview (cont'd)**

- If you are familiar with this model Reader, but need occasional reference to specific fields or procedures, then [Section 7.0 WinREMS Reference](#) will serve as a reference for you, possibly in conjunction with [Section 8.0 Index](#) to help you find the exact topic you need.

The following are brief descriptions of each of the sections in this manual:

Section 1.0 System Overview gives a general description of the Model 3500 Reader, its operating principles and optional configurations, the dosimeters it reads, and a summary of its performance specifications.

Section 2.0 Installation describes the necessary environment and procedure for setting up the instrument.

Section 3.0 General Instructions is an introduction to the instrument controls and the WinREMS software and the general principles of its use. This section also describes the proper precautions for handling dosimeters.

Section 4.0 Tutorial is a procedural instruction designed to guide the novice user

through several basic operations of the Reader and WinREMS.

Section 5.0 Quality Assurance collects all the quality assurance features of the system in one place for your convenience. These include daily quality control and online quality checks.

Section 6.0 Calibration Procedures describes in detail the procedures for generating a set of Calibration Dosimeters, calibrating the instrument, and calibrating all the dosimeters in the system. The methodology behind the overall calibration system is also discussed.

Section 7.0 WinREMS Reference is a comprehensive reference source for all screens and field entries in the system.

Section 8.0 Index is an alphabetical listing of the subjects covered in this manual to help you find any information you need.

The **Appendix** contains two documents. The first is a software troubleshooting form; fill the top of this out as part of your initial setup. The second explains the ASCII Export function; which may require some programming expertise to use.

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Writing conventions

To maintain consistency throughout this and all Saint-Gobain Crystals & Detectors manuals, certain writing conventions have been followed. These are listed below for your convenience.

When instructions are given for using DOS or any other operating system, the following conventions are used.

- When a **specific operating system command, file name, directory name or environment variable** is used in the text, it is shown in small caps; for example,

```
C:\NVLAP\NVLAP.EXE
```

- When a **general operating system command, file name, directory name or environment variable** is used in the text, it is shown in italics; for example, *drive:\path\filename.*

- When a **specific example** of an operating system entry is given, it is offset from the paragraph and shown in Courier font; for example,

```
>copy a:*.asc
```

When describing Harshaw software, such as NET-REMS, the following conventions are used.

- **Screen names, Pull-Down Menu Selections, and Field Names** are always capitalized; for example, Main Menu Screen or Input File Field.
- **Data Field Entries and Multiple Choice (pop-up) Field Selections** are enclosed in single quotes; for example, 'neutron'.

Keyboard keys (other than letters, numbers, and punctuation) are shown enclosed in pointed brackets; for example, <Ctrl>.

Safety Warnings

There are also certain conventions for safety warnings. They are divided into three categories and defined as follows:

- **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. ***DANGER NOTICES ALWAYS APPEAR IN BOLD, ITALICIZED UPPER CASE LETTERS.***
- **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. ***WARNING NOTICES ALWAYS APPEAR IN UPPERCASE BOLD LETTERS.***
- **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. ***CAUTION notices always appear in bold, italicized letters.***

The definition of these safety warnings is according to ANSI Z535.4. The style of the warnings (bold, italicized, etc.) is SGCD RMP's.

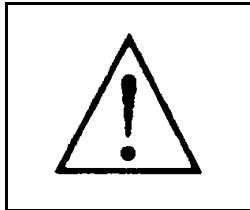
In addition to the above, we have added the following warning:

- **NOTE** indicates a situation which has the potential for erroneous data collection, loss of electronic data, or damage to equipment, but which does not directly affect the safety of the operator with respect to this product. The responsibility for any safety consequences as a result of erroneous data lies solely with the operator. ***NOTE notices always appear in italics.***

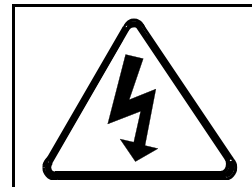
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SAFETY SYMBOLS

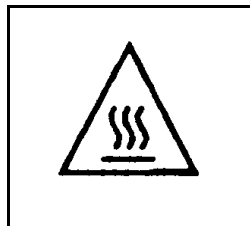
The following symbols may appear on the Reader.



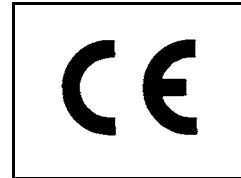
Caution! (ISO 3864, No. B.3.1) This symbol designates possible hazards both mechanical and electrical.



Caution, risk of electric shock (ISO 3864 No. B.3.6) This symbol designates a high voltage connection or an exposure to working voltage.

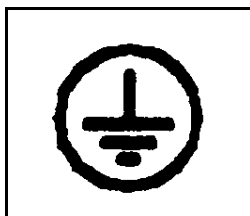


Caution Hot Surface (IEC 417 No. 5041) The above symbol designates an accessible hot surface with which the operator could come in contact.



This symbol designates this instrument as being compliant with the CE standards listed on the European Notice page of this section (page 0-11).

Please follow all safety warnings, both on the Reader and in the manuals. Failure to operate the Reader in the manner specified by the manufacturer may impair the safety protections built into the equipment.



Protective conductor Terminal (IEC 417, No. 5019) This symbol designates the ground terminal for the mains protective ground. The wiring should be green/yellow in color.

EUROPEAN NOTICE - Model 3500

Products with the CE Marking comply with the EMC directive (89/336/EEC) issued by the Commission of the European Community.

Compliance with the directive implies conformity to the following European standards:

EN 50011: 1991	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment. (Emission standard)
EN50082-1: 1992	Electromagnetic compatibility - Generic immunity standard. IEC 1000-4-2:1994 IEC 1000-4-3:1994 IEC 1000-4-4:1994
IEC 601010-1: 1990	Safety requirements for electrical equipment for measurement control and laboratory use.

Note:

In order for the instrument to comply with the standards, as tested, the cable lengths (Power and Serial) may not exceed three meters.

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1.0 System Overview

The Harshaw Model 3500 Manual TLD Reader is a PC-driven, manually-operated, tabletop instrument for thermoluminescent dosimetry (TLD) measurement. It economically provides both high performance and high reliability, and it complies with the latest International Standards Organization (ISO) requirements. The 3500 reads one dosimeter per loading and accommodates a variety of TL configurations, including chips, disks, rods, and powder.

The system consists of two major components: the TLD Reader and the Windows Radiation Evaluation and Management System (WinREMS) software resident on a personal computer (PC), which is connected to the Reader via a serial communications port.

1.1 TLD Reader

The Reader's basic external components include a front control panel consisting of three LED status lights and a Read pushbutton, a sample drawer assembly that features an interchangeable planchet and a built-in Reference Light for periodic monitoring of Reader performance, and a drawer for neutral density filters. The rear panel houses a voltage-selectable power input module with fuse access, an instrument Reset button, a fitting for nitrogen gas tubing, an RS-232-C serial communication port, and a recessed pressure sensor adjusting screw.

The Reader uses contact heating with a closed loop feedback system that produces linearly ramped temperatures accurate to within $\pm 1^\circ\text{C}$ to 400°C in the standard Reader, or 600°C with the High Temperature option. The Time Temperature Profile (TTP) is user-

1.0 System Overview (cont'd)

Figure 1.1 Model 3500 Manual TLD Reader

1.1 TLD Reader (cont'd)

defined in three segments: Preheat, Acquire, and Anneal, each with independent times and temperatures.

To improve the accuracy of low-exposure readings and to extend planchet life, the 3500 provides for nitrogen to flow around the planchet. By eliminating oxygen in the planchet area, the nitrogen flow eliminates the unwanted oxygen-induced TL signals. Nitrogen is also routed through the Photomultiplier Tube (PMT) chamber to eliminate moisture caused by condensation.

An electronic Reference Light is built into the PMT Housing for monitoring the performance of the instrument. It is used as a part of a daily QC check and may be read at operator-specified intervals during the normal reading process.

If a supply of nitrogen is not available, clean dry air as produced by the Harshaw Model 4488 Dry Air Generator may be used as the heating medium for the TLD cards.

1.2 WinREMS Application Software

The data architecture of the system includes both a host computer in the Reader and a Windows[®]-based PC connected through an RS-232-C serial communication port. The dosimetry functions are divided between the Reader and the Harshaw WinREMS (Windows Radiation Evaluation and Management) software on the PC. All dosimetric data storage, instrument control, and operator inputs are performed on the PC; transport subsystem control, gas and vacuum controls, and signal acquisition and conditioning are performed in the Reader. Sufficient redundancy is maintained that dosimetric data is never lost in the event of a power failure.

WinREMS controls the operations of the Reader, including storing the operating parameters: Time Temperature Profiles (TTPs), Reader Calibration Factors (RCFs), and Element Correction Coefficients (ECCs).

The flexible design of WinREMS enables the user to automatically calibrate the reader and dosimeters in a wide variety of dosimetric units, or to work directly in nanocoulombs and do his own calibration through a custom spreadsheet program. For example, for radiation therapy and planning, the system can be calibrated in Grays, and the dosimeters tracked primarily by Patient Identification. For personnel radiation protection monitoring, the primary data tracking may be by dosimeter and Employee ID, and the instrument calibration can be in Sieverts. Other calibration units and identification combinations are available.

As the Reader generates TL data, the host computer stores it until a reading is completed. It then transmits the data to WinREMS in the form of 200 response points forming a Glow Curve. WinREMS displays the curve as it is received and then stores the data for future computation and reporting. WinREMS also performs a variety of calibration and Quality Assurance operations.

The user may create, store, and select from any number of Time Temperature Profiles (TTP) and Acquisition Setup Parameters. A separate Reader Calibration Factor (RCF) can be established for each TTP to assure accurate conversion of data from charge to dosimetric units.

This simple architecture allows users the flexibility and economy of using an existing computer, provides for the simple addition of optional functions such as Dose computation algorithms, and for convenient updating of application software. Through WinREMS, any model Harshaw TLD Reader may be installed as part of a network of readers with or without a central server and may be networked with a complete Harshaw Health Physics Record System (HPRS).

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1.0 System Overview (cont'd)**1.3 Dosimeters**

Saint-Gobain Crystals & Detectors RMP produces TL chips in a variety of materials in various sizes of chips, rods, and disks, all of which can be read on the Model 3500. Available materials include TLD-100, TLD-200, TLD-400, TLD-500, TLD-600, TLD-700, TLD-100H, TLD-600H, and TLD-700H. Available sizes include the following:

- Chips: 3.2mm (1/8") square face from 0.15mm (0.006") to 0.89mm (0.035")
- Rods: 1mm dia. x 6mm long
1mm dia. x 3mm long
1mm x 1mm x 6mm
1mm x 1mm x 1mm
- Disks: 5mm (0.20") dia. from 0.38mm (0.015") to 0.89mm (0.035")

The Model 3500 Reader can also read TLD powders.

1.4 Instrument Physical Specifications

The 3500 has the following dimensions and weight excluding any external connections (i.e., power cord, nitrogen tubing, and RS-232 cable):

DIMENSIONS:

Height: 31 cm (12.2 inches)

Width: 32 cm (12.5 inches)

Depth: 47 cm (18.5 inches)

Weight: 25 kg (56 pounds).

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1.0 System Overview (cont'd)**1.5 Instrument Performance Specifications**

This section details the electronic performance specifications of the Reader.

Dynamic Range:

Seven decades.

Warm up Time:

30 minutes.

Reference Light Stability:

Short term - Less than 0.5% variation, based on 1 standard deviation of 10 consecutive readings performed at a constant temperature.

Long term (0.5 to 110 hours) - 2% maximum deviation.

TTP Reproducibility:

$\pm 1^\circ \text{C}$.

Linearity:

Less than 1% deviation.

Dark Current:

Less than 50 μGy , ^{137}Cs equivalent, based on standard sensitivity 3.2mm (1/8") sq. x 0.89mm (0.035") thick TLD 700 chips.

Stability:

Better than 1.0 μGy , based on one standard deviation of ten consecutive measurements using standard sensitivity 3.2mm (1/8") sq. x 0.89mm (0.035") thick TLD 700 chips.

High Voltage Stability (after a warm-up period of at least 30 minutes):

$\pm 0.005\%$ per hour.

± 0.02 over 8 hours.

The **displayed** high voltage may vary by ± 2 volts during acquisition because of the High Voltage A/D Monitor Circuit.

TTP Capabilities:

Preheat temperature: 0¹ to 400² °C

Preheat time: 0 to 999 sec.

Acquire temperature: 0¹ to 400² °C

Acquire time: 10 to 300 sec.

Acquire rate: 1 to 50 °C/sec.

Anneal temperature: 0¹ to 400² °C

Anneal time: 0 to 999 sec.

Cycle Time:

Dependent on TLD material, size, and type and on corresponding TTP. For example, a chip can be processed in about forty seconds using any of the Low Dose Default TTPs (Table 6.3) and no printing.

Planchet Types:

Chip, 6.5mm (1/4") sq. recess.

Use for chips 3.2mm (1/8") sq. x 0.25mm (.010") to 0.89mm (0.035") thick; Cubes 1mm (0.039") per side; and for powders.

Rod, 1.5mm (0.06") x 7.6mm (0.30") recess.

Use for rods 1mm (0.039") dia. and up to 6mm (0.236") long.

Disks, 16mm (5/8") diam. recess.

User for disks 3.2mm (1/8") dia. x 0.25mm (0.010") to 0.89mm (0.035") thick.

1 equals room temperature.

2 limited to 60 sec. max when Acquire temperature is 350° C, or higher.

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1.0 System Overview (cont'd)**1.6 Dosimetric Performance**

The following performance characteristics have been experimentally determined using Harshaw standard sensitivity LiF:Mg,Ti chips (TLD-700).

Radiation Types and Energies:

Photon:	Greater than 1 keV
Neutron:	Thermal to 100 MeV
Beta:	Greater than 70 MeV.

Measurement Range:

10 μ Gy (1mrad) to 1 Gy (100 rad):
Linear.

1 Gy (100 rad) to 20 Gy (2,000 rad):
Supralinear.

Tissue Equivalence:

Nearly tissue equivalent.

Batch Uniformity:

$\pm 30\%$ maximum deviation from the batch mean without application of Element Correction Coefficients.

Fading (using total integral):

Without thermal treatments or fading correction: less than 20% in 3 months.

With Harshaw fading correction algorithm, glow curve batch deconvolution, or application of preheat:
less than 5% in 3 months.

Repeatability:

Less than 2% variation (based on one standard deviation for 10 sequential measurements at 1 mGy (100 mrad) ¹³⁷Cs).

Minimum Detectability:

Less than 10 μ Gy (1 mrad) (based on 2.26 x standard deviation of 10 repeated evaluations of an unexposed dosimeter).

Residual TL Signal:

Less than 0.2% of reading over the dose range without annealing.

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1.0 System Overview (cont'd)**1.7 Accessories**

There are numerous accessories available from Saint-Gobain Crystals & Detectors RMP to assist users of the 3500; they include:

- *Personal Computers* to control the 3500 Reader.
- *External Printers* for printing reading results, parameters, etc.
- *Annealing Ovens* - including both single-set point and programmable types.
- *External Irradiators* to prepare dosimeter materials for use in Reader calibration.
- *Powder Dispensers* to aid in dispensing accurate amounts of dosimetric powders.
- *Micro Vacuum Cleaners* to aid in cleaning sample drawers, cleanout drawers, as well as any accidental dosimetric powder spills.
- *Tweezers*, both vacuum and mechanically actuated, to assist with placement of dosimetric materials (chips, rods, cubes, and disks).
- *Dosimeter Holding Trays* that provide excellent storage and staging for dosimetric materials.
- *Neutral Density Filters* to facilitate the reading of highly exposed materials by reducing the intensity of the light arriving at the PMT.
- *Nitrogen Pressure Regulators and Hoses* to feed nitrogen gas into the 3500 Reader unit.
- *Additional Planchets* to accommodate alternate forms of TL materials (e.g., disks and rods).
- *Spare Parts Kits* that contain backup parts for the instrument.
- *Uninterruptible Power Supplies (UPSs)* to ensure the continuity of the power supplied to the 3500 Reader and its controlling PC during a loss of line power.
- *Applications Software* for instrument and dosimeter calibration; Computerized Glow Curve Deconvolution; collecting, storing and manipulating data for dose algorithms; and quality assurance and diagnostics programs.
- *Mettler Balance interface* to record powder sample weight with TLD data.

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2.0 Installation**2.1 Operating Requirements**

To perform as specified in Section 1.4 Performance Specifications, the 3500 Reader must be operated within the following parameters.

2.1.1 Utilities

The Model 3500 Reader requires the following utilities to operate.

Electrical Supply (selectable):

110 or 120 volt AC $\pm 10\%$, 60 Hz.
220 or 240 volt AC $\pm 10\%$, 50 Hz.

Transient voltage, frequency immunity, and leakage current specification per UL 544 for non-patient equipment.

Nitrogen Supply:

Quality: Purified (99.995%), dry.

Pressure: 1.5 to 3 kg/cm²
(20 to 40 psi).

Flow Rate: Regulated to 130 L/H
(5 SCFH).

Use of a needle valve and flowmeter are recommended to achieve this flow rate. Part No. 500002 provides the appropriate valves for this function.

2.1.2 Environment**Transient Voltage:**

Use of commercially available surge protection devices is recommended to protect the sensitive electronics of both the Reader and the controlling PC.

Static Electricity Protection:

Use of an anti-static mat is recommended.

Operating Temperature:

15° C to 40° C.

Storage Temperature:

-10° C to 60° C.

Humidity:

Functions within specification after 24-hour exposure to 90% humidity and subsequent 6-hour recovery with use of the nitrogen supply.

Ambient Light Exposure:

Can withstand up to 1,000 Lux (with cover on Reader).

Electromagnetic Interference:

Will operate satisfactorily in the presence of EMI comparable to that produced by a 5-watt transceiver operating between 130 and 170 MHz and positioned no less than 30 cm (12 inches) from the Reader.

Shock:

Will withstand a 1-cm drop onto a concrete surface.

Installation Category:

Pollution Degree (2) - Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

Overvoltage Category:

Category (II) - Portable equipment with local level voltages.

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2.0 Installation (cont'd)**2.2 PC Requirements**

The minimum requirements for a Personal Computer used for controlling the 3500 Reader and its operating software WinREMS are as follows.

- 100% compatibility with Intel Pentium Personal Computer.
- P5-120 processor
- 32 MB RAM
- 4 Gigabyte Hard Drive.
- 1 Serial Port (COM1) available for the Reader.
- LPT1 Parallel Port available for printer.
- Any PC-compatible keyboard.
- One 3-1/2" diskette drive
- One CD ROM drive
- SVGA Monitor.
- Windows NT[®] 4.0 (with Service pack 4), Windows 95[®], or Windows 98[®]

Note that these are minimum requirements; normally, a pentium-based PC with considerably higher specifications is supplied.

The PC-to-Reader communication architecture is very robust, with error checking, handling, reporting, and a retransmit feature to virtually eliminate data loss.

2.3 Software

If you purchased a PC from Saint-Gobain Crystals & Detectors RMP as part of your system, the computer is delivered with the WinREMS software installed and configured for your system. In this case, upon booting the computer, a WinREMS icon will appear on your desktop, allowing direct access to the WinREMS System. See Section [3.1.4 Initiating WinREMS](#) for startup instructions.

Your shipment will also include a CD-ROM or a set of distribution diskettes for back-up installation, should this ever be necessary. Replacement software for any WinREMS installation may be requested from your Saint-Gobain Crystals & Detectors RMP service representative.

If you are installing WinREMS yourself, insert the CD in the CD ROM drive. Click on the Windows Start Menu, select Settings, Control panel, and click on Add/Remove Programs. Now click on the Install Button in the upper part of the dialog box. An Install Wizard will appear and guide you through the installation process. The instructions on the Install Wizard will guide you through all of the choices you must make.

2.4 Password

A password is necessary for access to some of the dialog boxes in the system. The software is initially configured with a user named 'system' and a password of 'system'. After the system is operating satisfactorily and you have added at least one User ID/Password combination, we recommend that you remove the initial 'system'/'system' combination, since leaving it active would give access to the protected features to anyone who reads this manual. Password addition and removal is discussed in Section [7.9.2 Password Maintenance](#).

Operator's Manual

2.0 Installation (cont'd)**2.5 Hardware**

This section describes procedures for setting up the Reader, installing the software, and operating the system for the first time.

Caution: *It is important that you follow these instructions. If the equipment is installed incorrectly or used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. This unit must be operated by trained personnel only.*



The following procedure will ready the 3500 Reader for use.

1. Establish working location:

The 3500 Reader is designed for bench-top mounting and requires a connection to the controlling PC. Locate a space on a surface that is within a comfortable working distance from the PC. The RS-232 cable provided with the 3500 is 6 feet long. If the PC is to be located more than 6 feet from the 3500, then a longer cable will be required. To avoid any data transfer problems, the cable should be no longer than 50 feet. To maintain CE compliance, this cable should not exceed 3 meters (10 feet).

Caution: *The Reader weighs approximately 25 kg (58 lbs). It should be handled by no less than two persons at all times. The Reader may be lifted by grasping it under the frame at the sides or at the front and rear.*



The Reader, which measures approximately 31 cm (12.2 inches) high by 32 cm (12.5 in-ches) wide and 47 cm (18.5 inches) deep, requires a minimum of 8 cm (3 inches) clearance at the rear

and along the right side for ventilation and accessibility to the On/Off switch and power cord. To maintain CE compliance, this cord should not exceed 3 meters (10 feet).

- 2. Unpack the workstation components:** Carefully remove the 3500 Reader and other items from their shipping containers and check the contents against your order and the shipping papers.
- 3. Inspect parts for any obvious damage:** If damage is evident, contact the carrier for a shipment inspection. Retain all packing materials, waybills, etc., to verify claim. Then contact your RMP field representative for assistance in repair or replacement of damaged items.
- 4. Select line voltage and fuse:** The instrument can be powered by 100 or 120 VAC at 60 Hertz, or 220 or 240 VAC at 50 Hertz. The current line voltage setting is indicated by a white plastic node protruding through one of the four holes (labeled 100, 120, 220, and 240) in the fuse housing cover.
 - Check the existing line voltage setting. If the setting does not match the available AC line voltage, change it according to the following procedure:
 - A. Ensure that the line power cord is not connected to the Reader's power input panel.
 - B. Pry off the fuse holding assembly from the Reader. (There is a small notch on the left end of the assembly where a small flat-bladed instrument can be inserted for prying.) See Figure 2.1.

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2.0 Installation (cont'd)

2.5 Hardware (cont'd)

- C. Using care not to damage the plug-in board, pull it out of the housing with needle-nose pliers. Change the orientation of the white plastic piece and the board to match the required line voltage. The board's arrow for the desired voltage should point towards the center of the Reader when the board is replaced.
- D. Re-insert the board.
- E. Insert a fuse of a rating appropriate for the supplied voltage according to the following table.

<u>Voltage</u>	<u>Fuse Rating & Type</u>
100/120	2 amp, slow-blow, Type 3AG
220/240	1 amp, slow-blow, Type 3AG

- F. Push the fuse holding assembly back into place. The white plastic node should now indicate the proper input voltage.
- G. Note: This unit is rated 140 VA

5. Place the Reader in its operating location.

6. Change Neutral Density Filter:

If you intend to use a Neutral Density Filter, you should install it in place of the standard clear glass filter delivered in the instrument. For detailed instructions, see [Section 4.3.2.1 Cleanout/Neutral Density Filter Drawer](#) in your Model 3500 Technical Service Manual (Publication No. 3500-0-S).

7. Connect Reader to PC:

Attach the RS-232 cable to the 25-pin connector on the rear panel (Figure 2.1) of the 3500 and to the COM1 port on the controlling PC. Be sure to use the connector's captive screws to ensure the integrity of data communications.

You should check the setting of the PC's clock/calendar at this time; it should always be set correctly as all TLD records are date/time stamped.

8. Connect nitrogen supply:

Attach one end of the 3mm (1/8") flexible tubing to the nitrogen inlet port (Figure 2.1) on the 3500 and the other end to the nitrogen supply regulator assembly.

The supply should provide a pressure of 2 kg/cm² (30 psig) \pm 20%. The flow rate capability must be at least 2.5 liters/min. (5.0 scfh), which equates to 30 on the Brooks Sho Rate® Flow Meter (optionally available with the instrument).



Figure 2.1 Back Panel

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2.0 Installation (cont'd)**2.5 Hardware (cont'd)**

Note: This requirement is different for different Harshaw RMP instruments.

Nitrogen should remain flowing through the system at all times. This is because nitrogen is used to purge the PMT Assembly, keeping moisture out of this area. The flow rate may be reduced to 10 on the Flow Meter to minimize nitrogen usage.

9. Connect to line power:

After ensuring that the On/Off switch (on the back panel) is in the **OFF** position, connect the three-prong power cord to the back panel (Figure 2.1). Insert the other end of the power cord into the line power supply, or uninterruptible power supply (UPS), if used.

10. Turn on power:

Push the On/Off switch into the **ON** position. The instrument should start and the green **POWER ON** status lamp on the front panel should come on and remain lit. (All lights will light briefly during power-up or reset.)

The initial hardware setup is now complete. If WinREMS has been installed on the controlling PC, the Model 3500 Manual Reader is ready to run. If WinREMS has not been installed, see Section [2.3 Software](#) for installation instructions. For initial operating instructions, see Section [2.7 Initial Operation](#).

11. Fill out Troubleshooting Form

Take a moment now to fill out the top portion of the Troubleshooting Documentation Form in Appendix A.

The initial hardware setup is now complete. If WinREMS has been installed on the controlling PC, the Model 3500 Reader is ready to run. If you wish to install a Powder Dispenser, proceed to Section [2.6 Powder Dispenser Installation](#); if not, you may proceed to Section [2.7 Initial Operation](#) for initial operating instructions.

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2.0 Installation (cont'd)

2.6 Powder Dispenser Installation

The optional Powder Dispenser provides consistent delivery of a set amount (15 mg) of TL powder to the planchet of the 3500.

If the Dispenser was ordered with your Model 3500 Reader, the installation is essentially complete, requiring only adjustment. Proceed to Step 4. If the Powder Dispenser was purchased separately from the 3500 Reader, it will come as a kit. The installation procedure is as follows. (See Figure 2.2.)

1. Open the kit and verify the contents.
2. Fasten the Clamp Block Assembly to the bottom of the 3500 Reader using the buttonhead cap screws and the lock washers. Use a 1/8" Allen wrench to tighten the screws, leaving a little play between the Clamp Block Assembly and the 3500.
3. Insert the Thumb Screw Assembly, leaving it very loose.
4. Attach the Powder Dispenser Stand by sliding the stand into the slot provided by the Clamp Block Assembly attached to the bottom of the instrument. Tighten the Thumb Screw Assembly.
5. Set the Powder Dispenser Assembly onto the Stand Pin.
6. Align Powder Dispenser Trough with the center of the planchet depression.
7. Adjust alignment, if necessary, using either the Thumb Screw Assembly or the stand adjustment Set Screw found at the back of the Clamp Block Assembly. When aligned, the Powder Dispenser Trough will clear the drawer by 1/16" to 1/8".

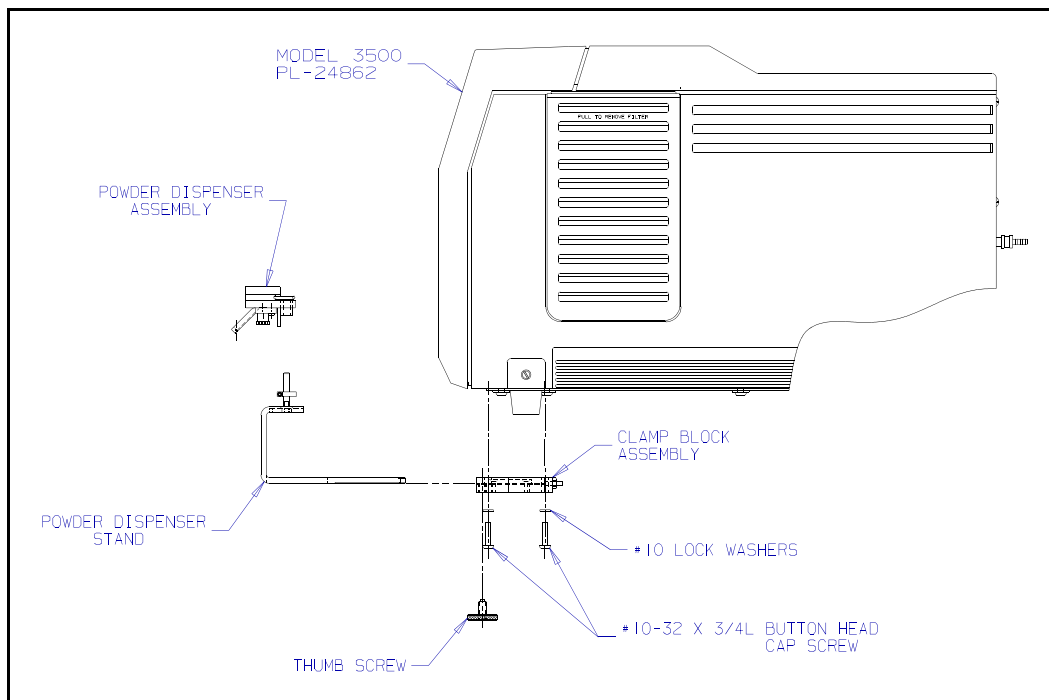


Figure 2.2 Powder Dispenser Installation

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2.0 Installation (cont'd)**2.7 Initial Operation**

This section will guide you through the initial operation of the system. In order to avoid redundancy in detail, this section will reference other sections which provide detailed information for various circumstances.

After completing Installation Sections [2.5 Hardware](#) and [2.3 Software](#), perform the following steps to start the system for the first time.

1. Power-up

If you have not already done so, turn on the Reader and the PC. Double click on the WinREMS icon.

2. Initiate Workspace

The Main Menu will appear with only three items on it. Click on File, Open Workspace to view the Open Workspace Dialog Box. If a file name appears with a .WRW extension, this is a workspace; click on it to open the workspace.

If you did not create a workspace in the installation process, you will need to establish a workspace. To create a new

workspace, from the Main Menu click on File, New Workspace, and follow the instructions on the New Workspace Wizard. Then open the workspace as describe in the previous paragraph.

3. PMT Charge

When the Reader is first turned on, the sensitive input to the I/F Converter may be charged positively. This would be indicated by a value of "0 pA" in the PMT tube current display on the Results Screen (Figure 3.1). Only after a sufficient negative charge is collected (from the PMT output) will the Reader be ready for operation. Since the negative charge collected is very small when the Read Drawer is closed, this may take several minutes. To decrease the waiting time, pull the drawer out to the Reference Light Position for a few seconds, until the PMT value is a positive number. If a reading is attempted before the PMT is properly charged, the operator is prompted to pull the Drawer out to the Reference Light Position. When the Reader is ready, the PMT current display will show a positive value.

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3.0 General Instructions

This section describes how to operate the WinREMS software, how to load TL materials into the Reader, and provides general instructions in the use of the Model 3500 TLD Reader with WinREMS, including initiating and exiting from the system.

3.1 WinREMS Operation

The Windows Radiation Evaluation and Management System (WinREMS) consists of a series of programs and databases that direct the operation of the Reader through the 3500 Host computer, receive dosimetry records from the reader, then stores, retrieves, and processes them, and presents the data in meaningful forms. These processes are directed through a series of menus and dialog boxes, which are described in detail in Section [7.0 WinREMS Reference](#).

This section provides you with the information necessary to start the system, navigate through the screens, enter data, get help, and exit the WinREMS software.

3.1.1 Mouse Support

WinREMS supports the use of a Microsoft (or compatible) mouse. Terms used commonly in this manual in describing the operation of a mouse are as follows:

"Click" means to push down on the left mouse button and release it immediately without moving the mouse pointer.

"Double Click" means to push down on the left mouse button and release it immediately twice in quick succession, without moving the pointer.

"Drag" means to click and hold the left mouse button down while moving the pointer across the screen to a new location and release the button.

"Right Click" means to push down on the right mouse button and release it immediately without moving the pointer.

"Hover" means to hold the pointer in one place on the screen. In a field designed to respond to hovering, additional data will appear.

3.1.2 Highlighting Records

On many screens which list records (for example, Figures 7.12 and 7.13), the records can be selectively highlighted for additional processing by clicking on them. Clicking to select records requires that the cursor be in the extreme left column, at which time the normal pointer will turn into a black horizontal arrow. You may then use <Control> click and <Shift> click as you would in any Windows function that shows lists of files. Clicking on the box at the very top of the column will select all records.

You may also use the arrow keys to move the pointer and use the space bar as a toggle to select/deselect individual records.

3.1.3 Password

A password is necessary to perform certain functions in WinREMS. There are two levels of password protection. An Administrator has access to all functions of WinREMS. An Operator has access to all functions except Password Maintenance. An Operator without a password can read dosimeters and perform most functions, but cannot edit the Acquisition Setup, the TTP Setup, or the Workspace Properties. Changes to the operator/ password list are discussed in Section [7.9.2 Password Maintenance](#).

3.1.4 Initiating WinREMS

A WinREMS icon has been installed on the desktop screen. Simply double click on the WinREMS icon (or use the Windows Start Menu) to bring up the WinREMS Main Screen. This screen will have only three items on the Main Menu. Click on File and open a workspace, either new or existing, to bring up the complete Main Menu.

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3.0 General Instructions (cont'd)

3.1 WinREMS Operation (cont'd)

3.1.5 Exiting WinREMS

To exit from WinREMS, simply click on the X Box in the upper right corner or go to the Main Menu and click on File, Exit. Be sure to save your current workspace.

3.1.6 Unit Scaling

The Harshaw TLD Readers are capable of operating over a dynamic range of seven decades, although it is seldom that one installation will use all this capability. Because of the many environments in which these Readers are operated, it is also necessary to report in a variety of dosimetric units. It is also generally desirable to report data in numbers ranging from 1 to 1,000. In order to accomplish these three objectives simultaneously, it is necessary to perform scale changes within the software.

There are a number of standard prefixes which are used to scale units. The following table details the prefixes in most common usage.

prefix	Abbreviation	Scale
pico	p	10 ⁻¹²
nano	n	10 ⁻⁹
micro	u	10 ⁻⁶
milli	m	10 ⁻³
Kilo	k	10 ³
Mega	M	10 ⁶

Note that there is a potential for confusion with the use of 'M'. Lower case 'm' is 'milli', while upper case 'M' is 'Mega'.

Given this understanding of these prefixes and scale factors, the following table defines the appropriate scaling over a very wide range of values for a hypothetical response value (to four significant digits) calibrated in generic units (gU).

Value (gU)	Displayed
0.123456789	.1234 gU
1.23456789	1.234 gU
12.3456789	12.34 gU
123.456789	123.4 gU
1234.56789	1.234 kgU
12345.6789	12.34 kgU
123456.789	123.4 kgU
1234567.89	1.234 MgU
12345678.9	12.34 MgU
123456789.	123.4 MgU
1234567890	1234. MgU

In any given unit, three ranges are defined: base unit, base unit x1,000, and base unit x1,000,000. The displayed value is adjusted so that it is greater than one and less than one thousand, if possible. However, if the range reaches the x1,000,000 level, a value greater than or equal to one thousand will be displayed up to the five character limit of 99999 (note that the trailing decimal point will be dropped and five digits will be displayed for values greater than 9999). Similarly, if the value is less than 1 at the base unit level, it will be displayed as a decimal value less than one. Both these conditions are shown in the above table.

The following table details the unit labels for the three different scaling ranges given various calibration units, as well as for the uncalibrated response unit of nanoCoulombs

Base unit	x1	x1000	x1000000
nanoCoulombs	nC	uC	mC
generic units	gU	kgU	MgU
milliRoentgens	mR	R	kR
millirads	mrad	rad	krad
millirems	mrem	rem	krem
microSieverts	uSv	mSv	Sv
microGrays	uGy	mGy	Gy
milliSieverts	mSv	Sv	kSv
milliGrays	mGy	Gy	kGy
Sieverts	Sv	kSv	MSv
Grays	Gy	kGy	MGy
Roentgens	R	kR	MR

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3.0 General Instructions (cont'd)

3.2 Results Screen

The results screen (Figure 3.1) displays the results of the TLD Reading as it is being generated. The information on this screen is described in the following paragraphs.

This center portion of this screen displays the full glow curve in solid blue, with a red line to indicate the temperature of each point. If Regions of Interest have been defined, they are identified by color-coded vertical lines.

Above the glow curve area is a line of information about the dosimeter record (examples from Figure 3.1): Date and time of the reading (05/11/00 13:08:55); TTP Number (1); Acquisition Mode (A); Dosimeter ID (123456); and Group ID (DemoCurve).

In a box to the left of the curve, the dosimetric information is displayed. The first value is the total integral (98.94) expressed in the units generated by the RCF, if applied. If no RCF was applied, the integral is expressed

in nanocoulombs (nC). If the ECC, Quality Factor, or Background were applied in the Reading, they will also be incorporated in the total integral.

Immediately below the total integral are the integrals for as many Regions of Interest (ROI) as were selected (2.371, etc), expressed in the same units as the total integral.

Immediately below the ROIs are the ECC and RCF values if they were applied. The next line shows the Intensity of the peak channel in nanoamperes (14).

The last four lines in the lower box show the current status of four reading parameters: TTP Phase (Cooling), gas temperature (129° C), high voltage (85), and current in the last channel read (8).

Instrument status information is displayed in the bottom left corner: Gas flow status (Off), Cooler Temperature (15° C), Drawer position (closed), Status (Reading Dosimeter 123456).

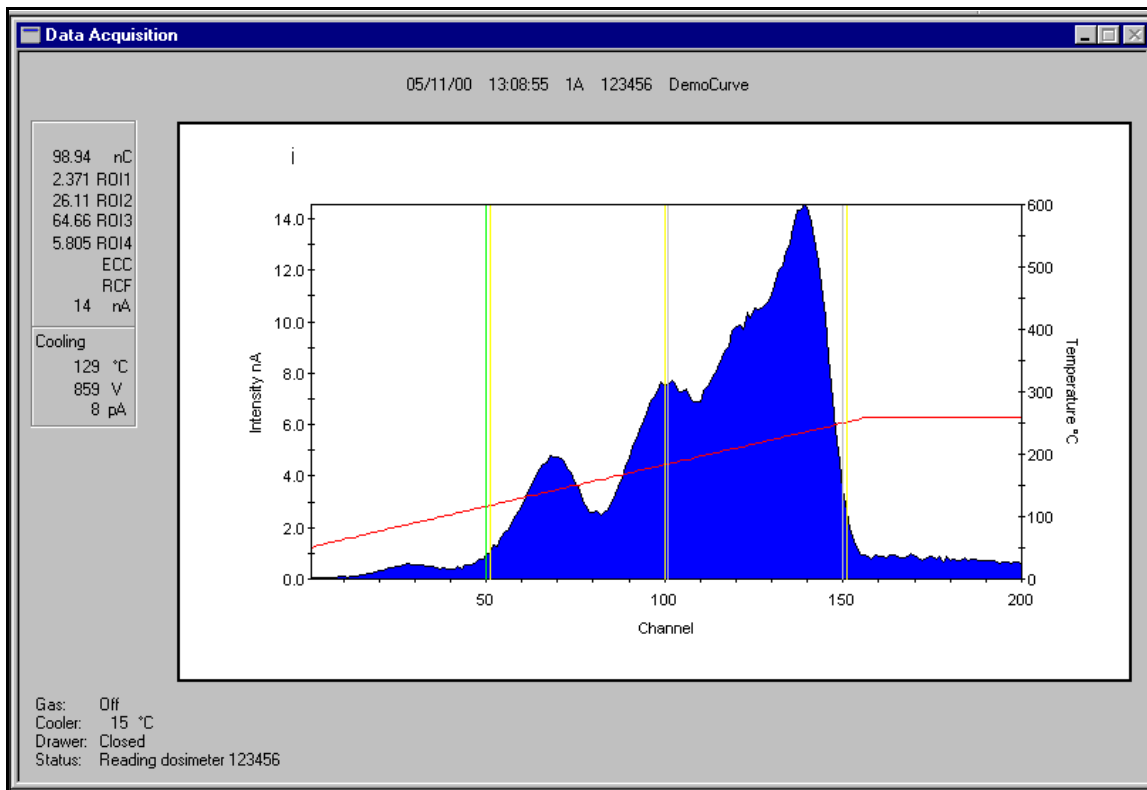


Figure 3.1 Results Screen

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3.0 General Instructions (cont'd)**3.3 TL Materials****3.3.1 Handling**

TL elements in solid form, e.g., chips, rods, cubes, and disks, can be transferred to and from the planchet with manual or vacuum tweezers. For powder, a dispenser is available that allows you to dispense 15 mg. of powder (LiF) onto the planchet.

Caution: *The TL element will remain hot for a short time after it has been read. Do not remove the element from the planchet until the temperature is below 50° C. Do not touch the TL element while it is being removed from the planchet.*



The loading procedure for the chips, rods, cubes, and disks is the same, while the procedure for the powder differs.

Chips, Rods, Cubes, and Disks - Pull the Drawer open so that the planchet is accessible. As shipped in its standard configuration, the 3500 includes a planchet with a 6mm (1/4") square depression. This planchet is suitable for most chip, powder, and cube TL elements. If disks or rods are to be used, special optional planchets should be installed in the Reader. Using vacuum tweezers, place the chip or rod in the center of the planchet depression. Verify that the chip or rod is lying flat; otherwise, an artificially low TL reading will result due to uneven element heating. Close the sample drawer slowly to avoid shifting of the element.

Powder - Clear the planchet depression using a vacuum tool. Ensure sufficient powder is loaded in the dispenser. Pull the drawer open and swing the dispenser into position to locate the dispenser channel directly over the center of the planchet depression. Hold the dispenser steady, transfer the powder onto the planchet, and gently close the sample drawer. This will put 15 mg of powder in the planchet depression.

3.3.2 Identification

Because dosimeters are not visually labeled, maintaining Dosimeter ID becomes the responsibility of the user, and requires caution in handling the Dosimeters. Similarly, there is no way for the instrument to distinguish between dosimeters; thus it is also the user's responsibility to identify the dosimeter for the Reader.

The user must first establish a unique identification code for each dosimeter in the system. This identification code is maintained in the Dosimeter ID Field of the Chipset File (See Section [7.5.5 Chipset Setup](#).) When TL elements are calibrated (ECCs generated for either Calibration or Field dosimeters), the calibration value is indexed in the ECC File by Dosimeter ID. Also, when a dosimeter is read with ECC applied, the ECC is determined by Dosimeter ID.

One convenient way to identify the dosimeters is to store them in serially numbered disks, and create a Dosimeter Identification that includes the disk number and position number on the disk (e.g., D07C10 to indicate Disk 7 Position 10). In addition, Chipset File may be created and retained for each disk, thus eliminating the need for entering the Dosimeter ID each time a dosimeter is read.

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4.0 Tutorial

This tutorial takes a new user through a typical series of daily activities on an established system. It is thorough in its procedural instructions, but not comprehensive in scope. You should be familiar with Section [3.0 General Instructions](#) before you attempt to perform the operations in this section.

This tutorial leads you step by step through the process of reading a group of dosimeters. Although the 3500 reads several different shapes of materials, the procedure is the same for all materials, so this section will refer to chips, but the steps are the same for rods, micro-cubes, disks, and powders. This section will guide you through the complete process of reading a set of TL Dosimeters, including reviewing the Time Temperature Profile (TTP), establishing the Acquisition Setup, creating a Chipset File, establishing a patient record, and acquiring data.

A TTP defines the temperature to which the TL material is heated as a function of time (Figure 4.1). It is defined in three segments:

Preheat, Acquisition, and Anneal. Preheat establishes a common starting point for all dosimeters in a group and may be used to eliminate the faster-fading low temperature peaks. Acquisition is the segment during which the dosimetric data is acquired and the glow curve is generated. The Anneal segment is used to hold the dosimeter at a high temperature to ensure that all the TL signal is removed. Each TTP may be calibrated by generating a Reader Calibration Factor (RCF) to convert the raw data (in nanocoulombs) to meaningful dosimetric units (seiverts, rads, etc.).

The Acquisition Setup defines several other parameters used in reading dosimeters.

The Chipset File is an index that identifies each dosimeter by its position in the disk, while defining the TTP to be used and connecting the dosimeters to patient information, if desired.

After you have mastered this section, you will need to read Section [7.0 WinREMS Reference](#) to gain a complete understanding of all the capabilities of WinREMS.

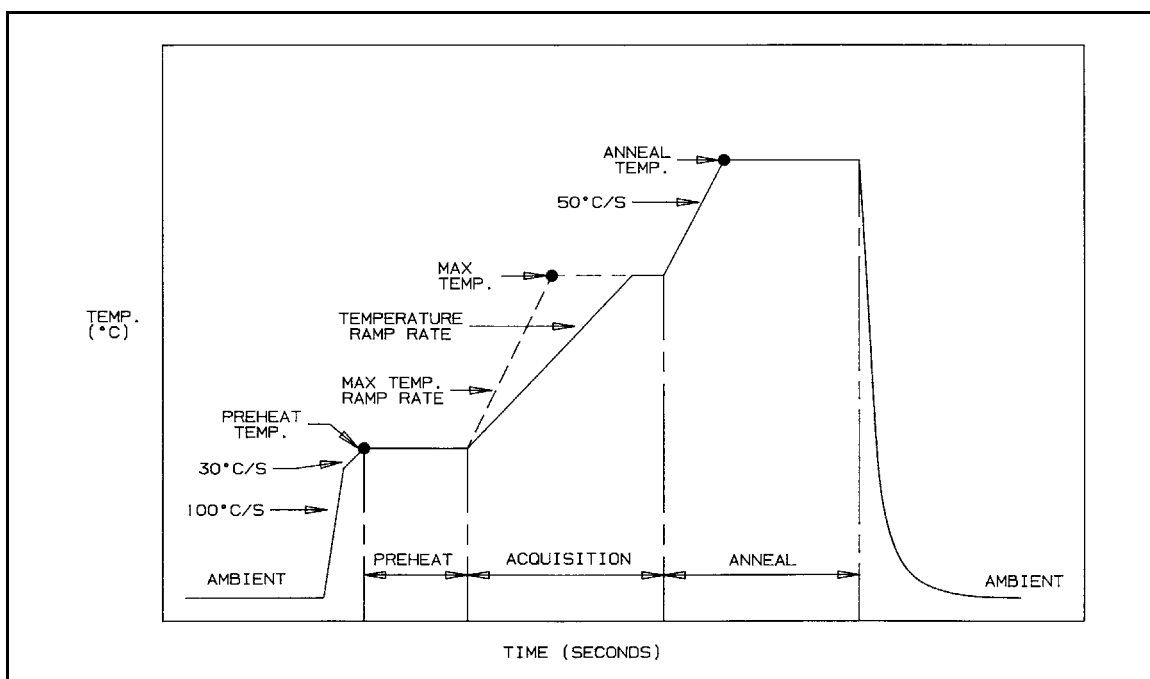


Figure 4.1 Typical Time Temperature Profile

4.0 Tutorial (cont'd)

4.1 Time Temperature Profile Setup

This section describes the procedure for editing a TTP. *Note: Before editing a TTP, remember that modifying certain fields on a calibrated TTP will change it to an uncalibrated state.*

1. Get Time Temperature Profile Setup Dialog Box

From the WinREMS Main Menu, select Read, TTP Setup, or click on the TTP Button on the toolbar. This will bring the Enter Password Dialog Box into view. Entering a valid User Name and Password will allow you access to the Time Temperature Profile Setup Dialog Box in edit mode view (Figure 7.25). The settings in this box will determine how long and to what temperature your dosimeters will be heated.

2. Select TTP

Click on the arrow in the Title Field to review a list of available TTPs; select the one appropriate for your needs.

3. Edit TTP

Review the TTP to confirm that it is appropriate for the dosimeters you have to read. Remember that any changes to the Preheat and Acquire segments will change a calibrated TTP to uncalibrated, as will changing the Gain Setting. Those fields which you may change without affecting the calibration are the Title, Regions of Interest (roi1, roi2, etc.), Anneal Temperature, and Anneal Time. See Section [7.5.3 TTP Setup](#) for a detailed description of each field on this screen.

At any time before exiting from a TTP, you may remove any changes made during the current editing session by clicking on the Cancel Button.

4. Save and Return

After reviewing the TTP and making any necessary changes, click on OK to save the changes.

4.2 Acquisition Setup

1. Get Acquisition Setup Dialog Box

From the WinREMS Main Menu, select Read, Acquisition Setup, or click on the ACQ Button on the tool bar. This will bring the Enter Password Dialog Box into view. Entering a valid User Name and Password will allow you access to the Acquisition Setup Dialog Box in edit mode (Figure 7.24).

The parameters on this screen control many aspects of the operation of the Reader as it reads the dosimeters. You may change any of these fields without affecting the TTP calibration values.

2. Select Acquisition Setup

If you intend to use an existing setup, click on the arrow in the Title Field and select the setup you wish to use. If you wish to create a new setup, select 'new Setup' and edit the Title to a new name. This will be the identification of the setup that you will create.

The Date Edited and Edited by Fields will be filled automatically, using the computer's internal clock and the name entered in the Username Field of the Enter Password Dialog Box.

3. Select Acquisition Mode

The Mode field defines the purpose for which the dosimeters will be read. It is important to set this correctly, as the data cannot be used for any purpose other than what is set in this field. For purposes of this tutorial, select 'Read Dosimeters.'

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4.0 Tutorial (cont'd)**4.2 Acquisition Setup (cont'd)****4. Set Apply Factors**

In this box you may set any of four Calibration Factors to be applied. Setting the ECC (Element Correction Coefficient) requires that your dosimeters have been calibrated; setting the RCF (Reader Calibration Factor) requires that your TTP has been calibrated. If you set either calibration factor to be applied and the required calibration is not present, an error message will be sent and the dosimeter will not be read.

For specific information about how these factors are applied, see Section [7.5.3 TTP Setup](#).

Field Dosimeters may be read with or without either calibration factor. For purposes of this tutorial, do not check Background or Quality Factor.

5. Set Export

The fields in this box enable you to export a data file in ASCII format as data is being acquired. For purposes of this example, set Format to 'None.'

6. Set Print

You may print the results data as it is generated. Click on the arrow to view the selections, which are: 'None', 'Glow Curves', 'Regions of Interest' and 'Computed Exposure.'

7. Set PMT Noise and Reference Light

These two groups of Fields are available for the purpose of checking the consistency and accuracy of the readings. Each type of reading has an Interval and a Range. The Interval Field sets the number of dosimeters that will be read between a successive PMT or Reference Light readings. The system will also take

a PMT Noise and a Reference Light Reading at the beginning and end of each group of dosimeters, as defined by the Group ID. The Range Field sets the range of acceptable values for the reading. If a reading falls outside of this range, the reader sends a warning message to the screen.

The **PMT Noise**, or Dark Current, is a reading taken with no dosimeter or any other light source under the PMT Assembly. Its purpose is to measure electronic noise in the system and determine if there are any light leaks in the system.

The **Ref Light** reading is taken with the Reference Light directly in view of the PMTs. This light provides a consistent light source to detect any drift in the system or accumulation of dirt on the PMT Lenses.

A setting of '0' in either the PMT Noise or Ref Light Interval Field will result in the system not taking any readings of that type. For this tutorial, enter 10 in both Interval Fields.

8. Set Reading Limits

The parameters in this group box define three actions that can be taken at unusually high reading levels. How you set these will depend on the level of readings you anticipate. Each limit will set a flag in the database that can be viewed using the Search Function (Section [7.3.1 Response Database](#)). These fields and the corresponding flags are defined as follows.

Halt instrument sets a level beyond anything that would normally be expected; if this level is ever exceeded, the reader will sound an audible alarm

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4.0 Tutorial (cont'd)**4.2 Acquisition Setup**

and immediately stop taking readings. This alarm indicates either a problem with the Reader or a dose level which may demand immediate attention. The record is flagged with an "h".

Reread dosimeter sets a level at which the dosimeter is reread. The purpose of this alarm is to ensure that all TL signal is removed from the dosimeter. WinREMS creates a new record for each read, and flags it with an "r".

Mark with warning flag sets a level which, if exceeded, will flag the record with an "m" on the database so that it may be recalled for further analysis. The Reader will continue to take Readings after this alarm is triggered.

9. Accept and Exit

Click on OK to accept the values you have entered. At any time before exiting from this dialog box, you may remove all changes made during the current editing session by clicking on the Cancel Button.

4.3 Patient File Setup

The section describes the procedure for establishing patient records. This feature is optional; the primary key for tracking all dosimeter readings is Dosimeter ID.

Procedure**1. Get Patient Setup Dialog Box**

From the Main Menu, select Read, Patient Setup, to bring the Patient Setup Dialog Box into view (Figure 7.26).

2. Identify Patient

To work with an established patient, click on the arrow in the Patient ID Field and select from the list. To create a new patient record, click on the New Button. Enter the patient's ID and name. Select Gender.

3. Enter Physicist's Information

Enter any relevant information about the patient's condition in the Comment Field and the name of the responsible Physicist in the Physicist Field.

4. Save and Return

Click on the OK Button to record the information.

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4.0 Tutorial (cont'd)**4.4 Chipset File Setup**

This section defines the procedure for setting a Chipset File. The Chipset File identifies the TTP to be used to read each dosimeter, enables the operator to enter the Dosimeter ID for each chip, and links the response record with the Patient File. For a more detailed description of any item, see Section [7.5.5 Chipset Setup](#).

Note that establishing a Chipset File is optional for Model 3500. You can enter the Dosimeter ID and TTP manually as you are reading dosimeters. (See Section [7.5.1 Start](#).) For purposes of this tutorial, continue with establishing the Chipset File.

Procedure:**1. Get Chipset Setup Dialog Box**

From the Main Menu select Read, Chipset Setup, to bring the Chipset Setup Dialog Box (Figure 7.27) into view.

2. Establish Chipset File

The Title Field displays the name of the Chipset file as set on the Files Tab of the Workspace Properties Dialog Box. (Section [7.9.1.3 Files](#)).

To edit a line in the Chipset File, click on the extreme left column (gray) on any line. This will place a "pencil" icon in that spot, indicating that line is editable. Add, delete, and edit lines as necessary to ensure that there is a line for every dosimeter you will be reading.

3. Enter Patient Information

If you are using a Patient Information File, when you click on the Patient ID block, an arrow will appear. Click on this arrow to see a list of established Patient IDs and select one .

Enter any relevant information in the Treatment and Location blocks.

Note that all three fields described in this step are optional.

4. Enter Dosimeter and TTP Information

Move to the Dosimeter ID Column and enter the Identification Code of each dosimeter you will read. This ID is vital if you are applying ECCs, and must be the same as was used when the dosimeters were calibrated. If you are not using ECCs, you may enter any temporary identification you wish.

Move to the TTP Column and select the TTP that you wish to use by clicking on the down arrow.

5. Edit Additional Lines

Repeat Steps 3 through 5 for each position on the disk which will contain a TL chip.

6. Accept and Exit

When you have completed all the necessary editing, click on the asterisk (*) in the extreme left column to indicate that you have completed editing the last line. Click on the OK Button to close the dialog box and record the data.

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4.0 Tutorial (cont'd)**4.5 Reading TL Materials**

The following is the procedure used to read a TL element.

1. Start Reader

Be sure that the Reader has been turned on with nitrogen flowing for 30 minutes to bring the PMT temperature down to its operating level.

2. Edit the Read Dosimeters Dialog Box

From the Main Menu, select Read, Start, or click on the GO Button on the tool bar. This will bring up the Read Dosimeters Dialog Box (Figure 4.2) with the Response Screen in the background.

Enter a Group ID. This may be up to sixteen characters (ASCII letters, numbers, or the underscore character) that will be a name that will uniquely identify the group of readings that will be produced.

Select the Acquisition Setup created in Section [4.2 Acquisition Setup](#) by clicking on the arrow to view the list of available setup profiles.

The Control Mode box offers you two choices for how to control the Reader. In Chipset Mode, the dosimeter ID and the TTP are determined from the Chipset File. In the Manual Mode, no Chipset File is used, and you enter the Dosimeter ID and TTP manually. For purposes of this tutorial, select Chipset.

The file name in the Chipset Field reflects the name in the Chipset File Field on the Files Tab in the Workspace

Properties Dialog Box (Figure 7.32). No other files can be selected from this field. To change Chipset Files you must first change the Workspace Properties.

3. Start Read Process

Click on the Start Button to start the Read process. The plot area of the computer screen will clear and the Read Dosimeters Dialog Box will automatically minimize.

You may bring the Read Dosimeters Dialog Box back at any time by clicking on the Go Button. You would do this, for example, to insert a comment or stop the readings before the Chipset File is completed.

4. Take PMT and Reference Light Readings

A message box will appear with the message "Perform PMT noise reading" (Figure 7.21). To take a PMT Noise Reading, pull the Drawer open until the Drawer Field on the screen (near the

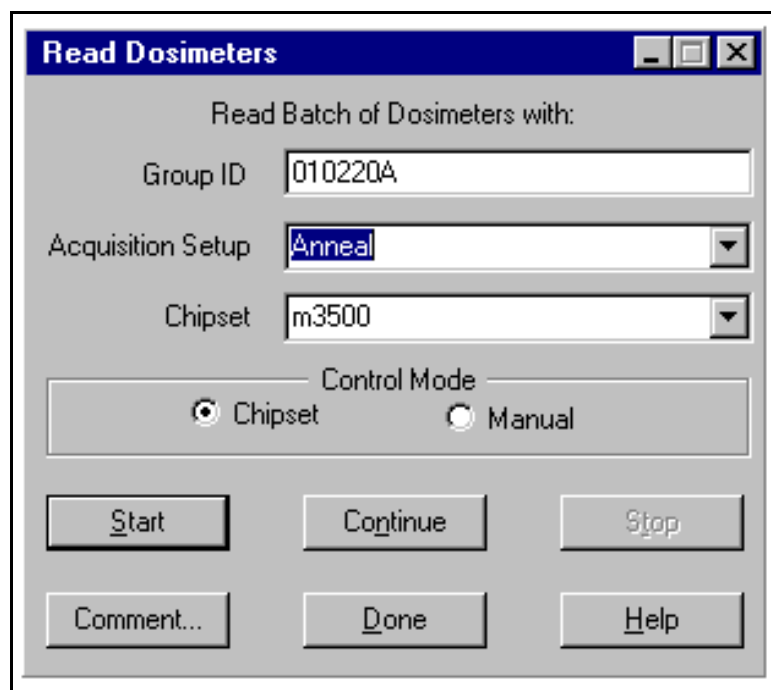


Figure 4.2 Read Dosimeters Dialog Box

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4.0 Tutorial (cont'd)**4.5 Reading TL Materials (cont'd)**

bottom left corner) displays 'between'. Note that this message will remain until the Drawer is almost all the way out; however, for good PMT Noise readings, the Drawer should be in far enough that the Planchet is not visible. Press the READ Button on the Reader.

After the PMT Noise Reading is complete, a message box will appear reminding you to take a Reference Light Reading. Pull the Drawer all the way out so the Drawer Field reads 'Open'. This is the position for the Reference Light Reading. Press the READ Button on the front of the Reader.

5. Read a Dosimeter

Note that after initiating the read process with the Start Button on WinREMS, all subsequent reads are started by pressing the READ Button on the instrument. This is because the WinREMS Start Button initiates the process at the top of the Chipset File; the READ Button continues the readings with the next line on the Dosimeter Chipset File.

Place a TL sample in the recess in the planchet and close the Sample Drawer. Press the READ Button to start the TL data acquisition. The glow curve will be plotted on the screen as it is acquired. When the cycle has been completed, the curve on the computer screen will be re-plotted to full scale, and the numeric results will appear on the left side of the screen.

The screen will look similar to that shown in Figure 3.1. For a detailed explanation of the data on the screen, see Section [3.2 Results Screen](#).

6. Continue Readings

After a reading is completed, a message box will appear with the message "Instrument is cooling." When the Planchet temperature drops to the higher of 50° C or the Preheat Temperature, the message box will disappear. You may then pull the Drawer out and remove the TL sample.

Note that it is important to wait until the message box disappears for the following reasons:

- a. *to avoid burns to the operator;*
- b. *to prevent putting the next chip on a hot planchet, which would remove a portion of the glow curve;*
- c. *pressing the READ button before the temperature is below the required level will result in an error condition and a warning message.*

To continue reading TL samples, repeat Steps 5 and 6.

If the message "Please read PMT noise and Test Light now" appears, return to Step 4.

7. Complete Read Process

When all the readings in the Chipset File are completed, the message "Perform PMT noise and Test Light Readings" will appear again. After taking these readings, bring up the Read Dosimeters Dialog Box and Click on the Done Button to complete the read process.

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