

# **INSTALLATION & CONFIGURATION**





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# **Table of Contents**

Chapter 1	Introduction
1.1 I	Limitations of Product Scope2
1.2 0	Conventions and Standards2
Chapter 2	Hardware Shipment4
2.1 H	Parts List
2.2 U	Unpacking & Handling6
Chapter 3	Reader Hardware Specifications & Design
Chapter 4	Hardware Installation
4.1 I	nstallation Requirements9
4.1.1	Environmental9
4.1.2	Electrical9
4.2 H	Physical Setup: Computer9
4.3 H	Physical Setup: Reader10
4.3.1	Install the Drawer10
4.3.2	Connecting to Power Source11
4.3.3	Connecting the Reader to the Computer
4.3.4	Verifying Connectivity11
4.3.5	Connections Example12
Chapter 5	Software Configuration13
5.1 I	Logging In13
5.2 0	Changing Admin Account Password13
5.3 0	Connecting Reader15
5.4 0	Creating User Accounts
Chapter 6	System Configuration
Chapter 7	Testing & Calibration21
7.1 F	Performance Testing
7.1.1	Intrinsic Test: Reader QC Test23
7.1.2	Reader Daily QC Test



27	Reader Calibration	7.2 F
27	Initial Calibration	7.2.1
29	Post-Calibration Quality Control Check	7.2.2
	Custom Calibration	7.2.3
	Troubleshooting	Chapter 8
32	Technical Support	8.1 T

# CHAPTER 1 INTRODUCTION

The microSTAR®ii Medical Dosimetry System is used as an independent secondary dose verification system that performs comprehensive measurement readings of the nanoDot<sup>™</sup> Optically-Stimulated Luminescence (OSL) dosimeter. The system reads the dosimeter, performs analysis using calibration parameters and customer-specific configurations, and provides in-depth reporting for review. The system stores the data for reference and cumulative dosage records. It uses a compact Optical Engine with a high-powered Light-Emitting Diode (LED) and Pulsed Optically-Stimulated Luminescence (POSL) to provide a precise radiation dose measurement.



Figure 1-1: Optical Engine Components

The microSTARii Medical Dosimetry System includes both hardware and software components. The hardware is used to scan and read the nanoDot dosimeter. The software provides the tools necessary to manage the reader, view stored measurement data, generate reports, manage patient assignment, and manage inventory.

This guide contains detailed instructions on how to install and configure the microSTARii Medical Dosimetry System, including but not limited to:

- Reader Specifications & Design
- Reader and Computer Physical Setup
- Software Configuration
- Reader Verification
- Reader Calibration

This guide is for use with the standard system configuration (reader and LANDAUER-provided computer). For assistance with custom configurations, contact LANDAUER Technical Support (8.1 Technical Support).

Related documentation can be found at http://landauer.com/microstarii. This includes:

- **microSTARii User Manual** for detailed instructions on operations, advanced configuration, maintenance, and troubleshooting.
- **Frequently Asked Questions** for information about the system design, operations, and term definitions.
- microSTARii<sup>TM</sup> A new system for medical dosimetry: Part I: Technology & Initial **Performance** a white paper that provides information on the design and performance.

# **1.1** Limitations of Product Scope

The microSTARii Medical Dosimetry System has been designed as a secondary dose verification system. The system should therefore only be employed as one of a number of tools in a program of quality assurance for the primary dose verification systems being used.

The results obtained with the microSTARii should not be used to guide direct patient care decisions. However, under certain specific conditions results obtained using the microSTARii Medical Dosimetry System can be cited and reported as a secondary verification of the primary systems in place used to predict or assess the radiation dose to patients resulting from diagnostic or therapeutic procedures.

The nanoDot dosimeter used in the microSTARii Medical Dosimetry System is manufactured as a singleuse device. Due to the potential for changes in dosimeter performance with accumulating life-time dose, LANDAUER and its affiliates do not support reuse of the nanoDot dosimeter.

Customers who intentionally disregard these stated limitations of product scope assume full responsibility for any negative consequences resulting from any such use.

The user assumes full responsibility for implementing site-specific procedures to ensure correct patient identification, HIPAA-compliant management of patient Personally Identifiable Information (PII), dosimeter verification, and proper usage including: transport, handling, placement, and timely readout. It is strongly recommended that site-specific written Standard Operating Procedures be implemented prior to launching a Medical Dosimetry Program.

## **1.2** Conventions and Standards

The following symbols are used within this documentation to mark risks, warnings, and other information.



ISO 3864, No. B.3.6 Caution – Risk of Electrical Shock



ISO 3864, No. B.3.1 Caution – This symbol denotes information that could affect the equipment operation.

IEC 417, NO. 5019

Protective Conductor Terminal

IEC 417, NO. 5007 On (Supply)

IEC 417, No. 5008 Off (Supply)

### **Prevention of Personal Injury**

To prevent eye damage and personal injury, please adhere to the following:

- Do not attempt to remove portions of the enclosure or otherwise disassemble • the reader. The Reader contains a high-power LED, which under specific conditions could cause damage to the eye. Please refer service to an approved technician.
- Do not alter the Reader and use only as specified or the protection provided by • the Reader can be compromised.
- Use only a LANDAUER-approved power supply to power the Reader. •
- Use the Reader indoors only. •
- Do not use the Reader if it has been altered or is damaged. •



# **CHAPTER 2 HARDWARE SHIPMENT**

## 2.1 Parts List

The following items are included in the microSTARii shipment.

## PARTS & MATERIALS

#### microSTARii Reader

#### microSTARii Reader Accessories

- Drawer
- Power Supply
- USB Cable

#### Standalone Computer (All-in-One or Laptop) with microSTARii Software Pre-Installed

#### **Computer Accessories**

- Power Cord
- Keyboard (if All-in-One)
- Mouse (if All-in-One)

### **Barcode Scanner**

#### nanoDot Dosimeters

- 1 NIST-Traceable 80 kVp, Cs137, or Non-Standard Calibration Set (Calset) with Certificate
- 1 NIST-Traceable 80 kVp, Cs137, or Non-Standard Quality Control (QC) Set with Certificate
- 2 Consistency nanoDots
- Additional unexposed nanoDot dosimeters (Screened or General Purpose), if ordered

#### **Related Documentation**

- Factory Test Results Sheet
- Installation & Configuration Guide
- User Guide
- Related Field Service Bulletins
- Computer Support Documentation





Figure 2-1: microSTARii Reader – Front



Figure 2-2: microSTARii Reader – Back



Figure 2-3: Sample microSTARii Reader Manufacturing QA Test Report

**NOTE:** If your reader is operating correctly and has not been damaged during shipment, its performance at installation should be comparable to that measured during manufacturing QA Testing. Note in particular the Low and High Dose calibration factors and the PMT and P-Diode average baseline values from your test sheet and compare with the results obtained during installation testing.

## 2.2 Unpacking & Handling

The parts should be unpacked in the lab or office where the microSTARii system will be operated. Unpack the system carefully as small parts, cables and nanoDot dosimeters are included with the shipment. Inspect the box for loose parts before beginning installation.

**NOTE:** It is strongly recommended that you save the packing material and boxes in the event that a reader needs to be returned for preventive maintenance or service at a later date.

microSTARii is carefully packed at the factory to minimize the possibility of damage during shipping. However, to ensure there has not been damage in transit, inspect the exterior and contents of the box for signs of damage or mishandling. If there is visible damage to the reader, computer, or accessories upon receipt, inform the shipping company and LANDAUER, Inc. immediately.

# CHAPTER 3 READER HARDWARE SPECIFICATIONS & DESIGN

The following subsections contain specification information for the microSTARii reader hardware.

PHYSICAL SPECIFICATIONS				
Dimensions	- <b>Depth:</b> 6.01 in (152.7mm)			
	- Width: 8.13 in (206.7mm)			
	- <b>Height:</b> 4.06 in (103.3mm)			
Weight	5.14 lbs. (2.33 kg)			
<b>Enclosure Material</b>	Metal case, powder coated			
Connections	USB			
Power	6V DC, 1.0A, 100-240V +/- 10% 50-60Hz.			
	Note: Use only the power supply provided by LANDAUER for use with microSTARii with this system.			
Operating Environment	$5^{\circ}$ C to $40^{\circ}$ C; < 70% Relative Humidity non-condensing; in stable conditions.			
	<b>NOTE:</b> Extreme temperature fluctuations may impact performance. Shifts in altitude greater than 2000 meters may also impact performance.			
Storage Environment	-20°C to 60°C; < 90% Relative Humidity non-condensing			
Use Location	Indoor use only			

PERFORMANCE SPECIFICATIONS								
METRIC SPECIFICATION NOTES								
Accuracy	$\pm 5.5\%$	Using screened nanoDots (k=2)						
Repeatability	< 1.0%	Coefficient of Variation; n=10, dose >50+						
	$\leq 1.070$	cGy						
Lower Limit of Detection (LLD)								
Strong Beam (Low Dose)	$\leq$ 3 mrad	Lower limits with freshly annealed blanks						
Weak Beam (High Dose)	$\leq$ 20 mrad	Lower limits with freshly annealed blanks						

PERFORMANCE SPECIFICATIONS									
METRIC SPECIFICATION NOTES									
Depletion									
Strong Beam (Low Dose)	$\leq 0.60\%$	Percent depletion per read							
Weak Beam (High Dose)	$\leq 0.07\%$	Percent depletion per read							
Intrinsic Stability									
Dark	$\leq 20$	Counts/Second							
LED with Photodiode	≤ 3.0%	Coefficient of variation computed across 10							
LED with Photomultiplier Tube	≤ 3.0%	consecutive measurement cycles							
Light Leakage	$\leq 20$	Counts/Second							

## STATEMENT OF COMPLIANCE

### Safety... IEC 61010-1; Pollution Degree 2

*Electromagnetic Compliance... International ... IEC 61326-1: Basic Electromagnetic Environment; CISPR 11: Group 1, Class A* 

Group 1: Equipment has intentionally generated and/or use conductively coupled radio frequency energy which is necessary for the internal functioning of the equipment itself.

Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted and radiated disturbances.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments. USA (FCC) ... 47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.

# CHAPTER 4 HARDWARE INSTALLATION

Use the information and instructions in the subsections to set up the computer and install the microSTARii reader and peripherals.

- ✓ Set up Computer & Connect Peripherals (4.2)
- $\checkmark$  Plug In Reader (4.3.1)
- ✓ Connect Reader (4.3.3)
- ✓ Verify Connectivity (4.3.4)

# 4.1 Installation Requirements

### 4.1.1 Environmental

microSTARii may be operated in most clinical environments that have a stable ambient temperature. For best results, it is recommended that the system be installed in a dedicated location on a stable surface away from direct sunlight.

**NOTE:** It is recommended that the nanoDot dosimeters be stored away from direct sunlight and fluorescent light when not in use.

### 4.1.2 Electrical



Before attempting to install the system, verify the wall socket that will be used is properly polarized and properly grounded. If possible, connect both the reader and the computer into a surge protection power strip and connect the power strip to the wall outlet.

# 4.2 Physical Setup: Computer

### **Equipment Needed**

• Computer

- Barcode Scanner
- Accessories (if all-in-one): Mouse and Keyboard

Refer to the manufacturer's User manual for PC setup and Operation.



- **STEP 1:** After setting up the PC according to the instructions provided by the manufacturer, turn on the PC.
- **STEP 2:** Connect accessories to the PC (i.e., mouse and keyboard)
- **STEP 3:** Connect the barcode scanner USB connector to any available USB port on the computer.
- **STEP 4:** Log on to the computer using the default logon credentials.

Default	Logon	USERNAME: admin
Credentials		PASSWORD: system

**Note:** The Windows password should be changed after initial log on. Ensure the updated credentials comply with organizational security policies.

## 4.3 Physical Setup: Reader

### **Equipment Needed**

- Drawer
- Reader

- Power Supply
- USB Cord

### 4.3.1 Install the Drawer

To install the reader drawer follow the steps below:

	STEP 1:	Position the drawer with the nanoDot and ejector facing up (Figure 4-1).					
AND ALLOP A	STEP 2:	Slide the drawer into the reader.					
	WARNING Improper insertion	of the drawer can cause					
	serious damage to the reader. Always insert the drawer						
	using the orientation shown. N	ever force the drawer into					
Figure 4.1. Correct Drower	the reader. To avoid damage	to the optical engine, the					
Arientation	drawer must be fully inserted before connecting the						
onentation	reader to a power source and to	urning the reader ON.					

## 4.3.2 Connecting to Power Source



- **STEP 1:** Plug the reader power supply cord into the reader and screw down the connector.
- **STEP 2:** Plug the other end of the power supply cord into the power outlet. (The outlet must meet electrical requirements in 4.1.2.)

Figure 4-2: Connecting Reader Power

## 4.3.3 Connecting the Reader to the Computer

NOTE: The USB cable has two connectors: square (USB Type B) and rectangular (USB Type A).



Connect the USB Type B connector to the reader USB port.

Connect the USB Type A connector to any available USB port on the computer.

Figure 4-3: Reader USB Connection

### 4.3.4 Verifying Connectivity



Figure 4-4: Reader On Button

STEP 1:Turn on the computer.STEP 2:Turn on the reader using the Power Button.

The Power LED should illuminate.

## 4.3.5 Connections Example

The connections for the all-in-one computer will similar to Figure 4-5 below.



Figure 4-5: All-in-One Fully Connected

# CHAPTER 5 SOFTWARE CONFIGURATION

Use the information and instructions in the subsections to configure the software to prepare for system configuration and update system access.

- $\checkmark$  Logging Into the System (5.1)
- ✓ Changing the Default Account Password (5.2)
- $\checkmark$  Connecting the Reader (5.3)
- ✓ Setting Up Unique User Accounts (5.4)

### **Information Needed**

• User Account Information (user names, passwords and profile information for Advanced Operator and other system users)

**Note:** At a minimum an Advanced Operator account must be created to complete system configuration. Other accounts can be created post-installation.

# 5.1 Logging In

Complete the following steps to log on to the microSTARii system for the first time:

**STEP 1:** From the desktop double-click the microSTARii reader application icon to launch the microSTARii Medical Dosimetry System software.



**STEP 2:** Log on to the system using the default Administrator logon credentials.

Username	Default USERNAME: admin
admin Password starii	microSTARii Logon Credentials PASSWORD: starii
OK Cancel	
5.2 Ch BBSWET	Account Password

To protect system data, the default password must be changed after you have logged in for the first time. To change the default password, complete the steps below:

**STEP 1:** Navigate to the *Security* tab.

Back	Ips N	NICTOST/	ARII mec	lical dosim	netry syst	tem Configuration		A	bout
		Us	ers					Profiles	
Status	Username	First Name	Last Name	Employee ID	Profile			Name	
Active	admin				Administrator		Administrator		
							Advanced Ope	rator	
							Operator		

Figure 5-2: Security Tab

**STEP 2:** In the Users table, double-click on the admin account row to launch the Edit User window. **OR** 

Click the row to select it, and click the Edit button to launch the Edit User window.

- **STEP 3:** Type in a new password, and type it again in the Confirm Password field.
- **STEP 4:** Click OK to save the new password.
- **STEP 5:** Log out of the microSTARii application. (Click the [X] on the upper-right of the screen.) Log back on to confirm the password change was successful.

## 5.3 Connecting Reader

After you have logged into the system and changed the default account, complete the following steps to confirm your reader settings and assign a reader name:

- **STEP 1:** Navigate to the *Configuration* tab.
- **STEP 2:** Click the Manage Readers button. (Outlined in Figure 5-3 below.)

m	ICTOSTAR	ii medical dosimetr	ry systen	n	
Backups	Security	Event Log	Co	onfiguration	About
Backups         Dosimetry Category         © Patient       Generic         Dosimetry Use Type         ○ Therapy       Diagnostic       Other         Dose Reading Mode         ⓒ Average       Individual         Beam Use Mode       Force         ⓒ Automatic       Force         Reading Parameters       Reading Repetitions         Reading Repetitions       _4         Verification Threshold (strong beam)       _500         Onon Linear Calibration	Security Dose Unit O mrad O mGy O cQy Manage Databases	Event Log Organization Organization Department Division Location Daily QC Control Limits Dark Lower Dark Upper PMT Lower PMT Upper PDiode Lower PDiode Upper	0 ÷ 20 ÷ 0 ÷ 0 ÷ 0 ÷	Patient     Exposure       Patient     UDF 1       Patient     UDF 1       Patient     UDF 2       Patient     UDF 3       Patient     UDF 4       Patient     UDF 5       Patient     UDF 6       Patient     UDF 7       Patient     UDF 8       Patient     UDF 10       Patient     UDF 11       Patient     UDF 12       Patient     UDF 13       Patient     UDF 14       Patient     UDF 15       Patient     UDF 15       Patient     UDF 16       Patient     UDF 17       Patient     UDF 18	About User Defined Fields
				Patient UDF 20	
Force Dosimeter Preassignment Verification					
Force Calibration Dosimetry Use Type Match					
Force Daily QC test					
Force Calibration Hardware Settings Match					
Apply Sensitivity Adjustment Factor values		Save Cancel		L	

Figure 5-3: Configuration Tab – Manage Readers

- **STEP 3:** In the Reader Management dialog box, validate that the reader successfully connected by verifying that the DEFAULT reader has the following two values:
  - ✓ A **Reader UID** value that corresponds to the last four digits of the serial number on the back of the reader.
  - The **CurrentHardwareSettingID** value is 1.

Used	ID	Reader Name	UID	Machine Name	Dosimeter Type	Notes	CurrentHardwareSettingID	
•	1	DEFAULT	1593	MECROWIN7	nanoDot		1	
	_							
Add Ne Reade	tw.							OK

Figure 5-4: Reader Management Dialog Box



STEP 4:	Assign a	unique	reader	name	to the	reader:
---------	----------	--------	--------	------	--------	---------

- a. Click the Add New Reader button.
- b. New Reader dialog box, enter in a unique name for the new reader.

New Reader		×
Enter a unique	name for the new r	eader.
READER 1 - ONC		
	ОК	Cancel

Figure 5-5: New Reader Dialog Box

- c. Click OK and the new reader will be listed on the Reader Management window.
- **STEP 5:** Verify the Used check box is selected next to the new reader entry. Click OK to exit the Reader Management window.

## **5.4** Creating User Accounts

To support compliance with HIPPA guidelines, microSTARii provides the capability to configure unique user accounts. Creating individual user accounts supports security audits and provides traceability.

In addition to individual accounts, microSTARii uses profiles to control user permissions. The system includes three default profiles for common permissions: Administrator, Advanced Operator, and Operator. The following table lists the default profiles and security limitations. For a full listing of permissions see *Appendix A: Profile Permissions Listing*.

PROFILE	USER TYPE	RESTRICTIONS
Administrator	Administration	- Cannot operate reader
		- Cannot modify reader factory hardware settings
Advanced Operator	Expert Level	- Cannot create user accounts
		- Cannot access advanced configuration settings
		- Cannot modify reader factory hardware settings
Operator	Routine Dosimetry	- Cannot access most configuration settings
		- Cannot access certain advanced features such as Sensitivity Assessment
		- Cannot modify reader factory hardware settings

Accounts and profiles are managed on the Security tab (Figure 5-2).

NOTE: The admin account cannot be used to operate the reader for dosimetry measurements. At aminimum, you must set up an account using the Advanced Operator profile to complete the configurationinChapter7Testing&Calibration.

It is recommended that a system administrator account is created using the Advanced Operator profile to allow the administrator to verify reader configuration and performance during operations.

Complete the following steps to add a new Advanced Operator user account.

**STEP 1:** On the *Security* tab (Figure 5-2), click the Add button under the Users table.

**STEP 2:** Fill in the fields in the dialog box (Figure 5-6).

- a. Username
- b. Password (must be greater than four characters, with no spaces)
- c. Confirm Password
- d. Profile (select Advanced Operator)
- e. Employee ID
- f. First Name
- g. Last Name
- h. Active (Y/N Check Box)
- i. Notes (optional)

*Note: Fields a-d are required.* 

**STEP 3:** Click OK to add the user.

	Username	ajones
	Password	*****
	Confirm Password	****
	Profile	Advanced Operator
	Employee ID	38472
	First Name	Adam
	Last Name	Jones
Notes		Active

Figure 5-6: New User Form

**STEP 4:** Repeat steps to set up additional user accounts. (Change value in Step 2.d. for other profiles.)



	r	nicrost	ARII me	dical dosir	netry syste	em		
Backu	ps	Security		Event Log		Configuration		About
		Us	ers	-	-			Profiles
Status	Username	First Name	Last Name	Employee ID	Profile			Name
Active	admin				Administrator		Administrato	r
Active	Active ajones Adam		Jones	38472	Advanced Operator	r i i i i i i i i i i i i i i i i i i i	Advanced O	perator
							Operator	

Figure 5-7: Updated User Account Listing

# CHAPTER 6 SYSTEM CONFIGURATION

Use the information in this chapter to configure the system for reporting and dosimetry measurements.

- ✓ Organization Information
- ✓ Beam Use Mode
- ✓ Verification Threshold

### **Information Needed**

• Factory Test Result Sheet

### **NOTES:**

The system configuration outlined in this section should be completed using the **admin** account. All configuration outlined in this chapter is completed on the *Configuration* tab. To apply changes, click the **Save** button at the bottom of the screen.

mi	Crostarii med	lical dosimetry system				- ×
Backups	Security	Event Log	Con	figuration		About
Backappe      Conservery Calegories      Co	Security One Unit One Of Of O for Dealer Response Security Dealer Security	tvent to	Con Organization Organization Dipartment Division Location Daily QC Control Lumis Dark Lower PMT Lower PMT Lower PMT Lower PDireck Lower PDireck Lower		201112 (Epsone) anisot core 1 atisat core 1 atisat core 2 atisat core 2 atisat core 3 atisat core 3 atisat core 4 atisat core 6 atisat core 6 atisat core 6 atisat core 1 atisat core 1	Abut User Dafined Fields
Connected	User: admin	Reader: DEFAULT	Beam Use Mode: Automatic	9/22/2013		6:47 PM

Figure 6-1: Configuration Tab

Use the information in the following table to configure the system.

**NOTE:** The Daily QC Control Limits fields are updated based on the results of the configuration tests run in section 7.1.1. Other values on the configuration screen can be modified based on usage and operational needs.

Field	DESCRIPTION	CONFIGURATION
Organization	This information is used in dosimetry reports (i.e., the Patient Dose Report) and associated database records.	<ul> <li>Fill in the following fields:</li> <li>Organization Name</li> <li>Department</li> <li>Division</li> </ul>
	OrganizationNorthwest Medical CenterDepartmentRadiation OncologyDivisionPhysicsLocationBld 2 Rm 194	- Location
Beam Use Mode	This setting determines whether the reader switches between strong and weak LED levels (Automatic) or uses only the LED level regardless of dose level (Force Weak). In most applications, automatic mode is used. Force Weak is used in non-linear calibrations for high doses.	<ol> <li>Verify the Automatic option is selected.</li> <li>Validate that the COP value matches the Factory Test Results sheet.</li> </ol>
Reading Parameters (Verification Threshold)	This setting is the limit for the dosimeter pre-assignment test.	The default and recommended value for nanoDots read using the strong beam mode is 500 raw counts. The value can be lowered for very low dose applications to reduce the acceptable limit. <b>NOTE:</b> Unexposed dosimeters that have been manufactured within the last six months prior to verification, typically yield strong beam raw count values below 200.





# CHAPTER 7 TESTING CALIBRATION

Performance testing and reader calibration must be completed in order to prepare the system for use. Use the information in this chapter to prepare the system for reporting and dosimetry measurements.

### **Performance Testing**

The built-in performance testing assesses the stability of the reader electronics, photomultiplier tube (PMT), and LED.

- ✓ Establish Intrinsic Test Control Limits (Reader QC Test) (7.1.1)
- ✓ Perform Intrinsic Test (Reader Daily QC Test) (7.1.2)
- ✓ Perform nanoDot Reading Reproducibility Test (7.1.2)

### **Reader Calibration**

Reader calibration uses the LANDAUER-provided calset and QC set of dosimeters to create the calculations needed to verify the reader performance and set a baseline for 80 kVp, Cs137, or Non-Standard exposure conditions.

- ✓ Perform Reader Calibration (7.2.1)
- ✓ Perform Post-Calibration Quality Control Check (7.2.2)

### **Equipment Needed**

- NIST-Traceable 80 kVp, Cs137, or Non-Standard Calset
- NIST-Traceable 80 kVp, Cs137, or Non-Standard Post-Calibration QC Set
- 1 Consistency nanoDot

As part of this step of configuration, you will need to handle the nanoDot. While the nanoDot can fit in the tray in various positions, for the nanoDot to be properly read and the drawer to close, the nanoDot must be put in the tray well with the barcode facing up and at the upper-left corner. The nanoDot must be sitting flat in the tray. If the drawer does not easily close, do not try to force it to close.





Figure 7-1: Correct nanoDot Orientation



**WARNING:** If the nanoDot is incorrectly positioned in the reader drawer (e.g., not set in completely or put in with barcode facing down) the reader and nanoDot may be significantly damaged.

To eject the nanoDot, pull the blue ejector toward the nanoDot.



Figure 2: Ejected nanoDot

### **NOTES:**

The system configuration and testing outlined in this section should be completed using an Advanced Operator account.

The reader should be turned on for at least **60 minutes** with a **connected** device status. (Status is the first value listed on the bottom bar of the microSTARii application window.)

## 7.1 Performance Testing

The performance testing is conducted on the QA tab.

microst	ARII medical	dosimetry sys	stem	
Reading Dosimeter Assignment Calibration	Data Sensitivit	y Assessment QA	Backups Event Log	Configuration About
<u>Reader Daily OC Tests</u> Step 1: Reader Intrinsic Stability Test				
Step 2: Dosimeter Reading Reproducibility Test		Current Daily QC	Status Untested QC Test Performed: N/A	
Reader QC Tests Start Verify / Establish QC Control Limits Dosimeter Verification Pre-Assignment		Population Backg Test Seria Aver Aver	round Dosimeter Date / Time: N/A I Number: N/A age Counts (vreak): N/A age Counts (vreak): N/A	
Start         Read Population Background Reference Dosimeter           Start         Verify Dosimeters Using Population Background Reference           Start         Verify Dosimeters Using Individual Background Readings				
Connected User: alpha_medphys	Reader: Reader 1 - Rad Onc	Beam Use Mode: Automatic	8/5/2014	10:00 AM

Figure 7-3: QA Screen – Untested

**NOTE:** The results for all tests run in this chapter can be found in the microSTARii system directory: C:\ProgramFiles\LandauerInc\microSTARiiReader\Reports. The reports are generated in PDF, XLS, and XML formats. *See Appendix B: QC Report Examples for example reports.* 

It is recommended that you maintain all QC record data in either electronic or hardcopy format, for the life of the reader.

### 7.1.1 Intrinsic Test: Reader QC Test

Complete the following steps to establish QC Control Limits for the system:

- **STEP 1:** On the *QA* tab, click *Verify/Establish QC Control Limits* Start button.
- **STEP 2:** A *High precision intrinsic measurement test* prompt will appear. Confirm there is no dosimeter in the reader and that the door is closed.



Reading Dosimeter Assignment Calibration	ARII medical dosimetry system	Event Log Configuration About
Reader Daily OC Tests Step 1: Reader Intrinsic Stability Test Step 2: Dosimeter Reading Reproducibility Test Start	High Precision Intrinsic Measurement Test Reader Intrinsic Measurement Test  Reader Intrinsic Measurement Test  Dark PMT P-Diode	Started: 1/29/2016 9:44:37 AM
Reader QC Tests Start Verify / Establish QC Control Limits	High precision intrinsic measurement test Make sure there is no dosimeter in the reader and the door is closed before continuing.	Step 1: Raview results Step 2: Enter testing notes
Dosimeter Verification Pre-Assignment Start Read Population Background Reference Dosimeter Start Verify Dosimeters Using Population Background Reference	OK Cancel	Stop 3: If test was successful and new control limits are needed, check option to update control limits Stop 4: Click Complete to save your changes
Start Verify Dosimeters Using Individual Background Readings	Notes	Update Control Limits

Figure 7-4: Verify/Establish QC Control Limits

**STEP 3:** After 20 cycles of measurements have been completed, the report will be updated with a colored bar reflecting the test result (green for a passed test, red for a failure). Click OK on the test results dialog box.

High Precision Intrinsic Measurement Test         Started: 12/21/2015 11:43:59 AM         Reader Intrinsic Measurement Test       PDiode         I       7       887       892         2       10       895       894         3       13       882       881         4       2       883       892         5       12       884       883         6       5       897       884         7       14       899       895         8       17       886       882         9       6       887       893         11       9       881       886         12       18       882       893         13       8       883       886         14       17       884       898         15       0       891       861         16       2       898       893         20       13       899       896         MN       0       881       861         MAX       18       899       898         CTRL-LU       0       845       542         VG <th></th> <th></th> <th></th> <th></th> <th></th>					
Reader Intrinsic Measurement Test           #         Dark         PMT         P-Diode           1         7         887         892           2         10         895         894           3         113         882         881           4         2         883         892           5         12         884         883           6         5         897         884           7         14         899         895           8         17         886         882           9         6         887         893           10         9         894         886           12         18         882         897           13         8         883         888           14         17         894         898           15         0         891         892           16         2         898         893           17         15         891         891           18         17         899         892           20         13         899         893           AVG         10.200	High P	recision Intrin	nsic Measure	ement Test	Started: 12/21/2015 11:43:59 AM
#         Dark         PMT         P-Diode           1         7         887         892           2         10         895         894           3         13         882         881           4         2         883         892           5         12         884         883           6         5         897         884           7         14         899         893           10         9         894         883           11         9         881         886           12         18         882         893           13         8         883         888           14         17         884         898           15         0         891         866           16         2         898         893           17         15         891         894           18         17         899         893           19         10         892         893           AVG         10.20         8934         894           CTRL-UL         20         934         933           AVG		Reader Intrinsic	Measurement	Test	
1 7 867 892 2 10 895 894 3 13 882 881 4 2 883 892 5 12 884 883 6 5 897 884 7 14 899 895 8 17 866 882 9 6 887 893 10 9 881 886 11 9 881 886 12 18 882 897 13 8 883 883 886 14 17 884 898 15 0 891 886 16 2 898 893 17 15 891 894 18 17 899 882 19 10 892 883 20 13 899 890 MIN 0 881 881 8 89 980 CTRL-11 0 885 882 20 13 899 890 MIN 0 881 881 MAX 18 899 890 CTRL-11 0 885 884 20 13 899 890 MIN 0 881 881 MAX 18 899 890 CTRL-11 0 885 884 CTRL-11 0 885 700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006	#	Dark	PMT	P-Diode	
2 10 895 894 3 13 882 881 4 2 883 892 5 12 884 883 6 5 897 884 7 14 899 895 8 17 886 882 9 6 887 893 10 9 884 881 11 9 881 886 12 18 882 897 13 8 883 888 14 17 884 898 15 0 891 886 16 2 898 893 17 15 891 894 18 17 899 882 19 10 892 883 20 13 899 890 MIN 0 881 881 81 881 18 17 899 882 19 10 892 883 20 13 899 890 MIN 0 881 881 81 881 MAX 18 899 898 CTRL-U 0 845 844 CTRL-U 0 885.700 888.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed	1	7	887	892	
3       13       882       881         4       2       883       892         5       12       884       883         6       5       897       884         7       14       899       895         8       17       86       882         9       6       887       893         10       9       894       881         11       9       881       886         12       18       882       897         13       8       883       888         14       17       884       898         15       0       891       886         16       2       98       893         17       15       891       894         18       17       899       882         20       13       899       898         CTRL-UL       0       845       844         CTRL-UL       0       889.700       888.700         STDEV       5415       5.546       5.723         CV       0.531       0.007       0.006	2	10	895	894	
4 2 883 992 5 12 884 883 6 5 897 884 7 14 899 995 8 17 886 882 9 6 887 893 10 9 884 881 11 9 881 882 12 18 882 897 13 8 883 888 14 17 884 883 15 0 891 886 16 2 898 993 17 15 891 896 18 17 899 882 19 10 892 883 20 13 899 892 18 17 899 882 19 10 892 883 20 13 899 892 18 17 899 882 19 10 892 883 20 13 899 892 19 10 881 881 MAX 18 899 892 10 881 881 MAX 18 899 892 10 881 881 MAX 18 899 892 10 885 700 888.700 5TEFV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Lim	3	13	882	881	
5       12       884       883         6       5       897       884         7       14       899       895         8       17       886       882         9       6       887       893         10       9       884       881         11       9       881       886         12       18       882       897         13       8       883       888         14       17       884       898         15       0       891       886         16       2       898       893         17       15       891       894         18       17       899       892         20       13       899       898         CTRL-UL       0       845       844         CTRL-UL       0       845       844         CTRL-UL       0       889,700       888,700         STDEV       5.415       6.546       5.723         CV       0.531       0.007       0.006	4	2	883	892	
6 5 897 884 7 14 899 895 8 17 886 882 9 6 887 893 10 9 884 881 11 9 881 886 12 18 882 897 13 8 883 888 14 17 884 898 15 0 891 886 16 2 898 893 17 15 891 894 18 17 899 882 19 10 892 883 20 13 899 890 MIN 0 881 881 MAX 18 899 890 MIN 0 881 881 MAX 18 993 890 CTRL-UL 0 885 700 888.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Link	5	12	884	883	
7 14 899 895 8 17 886 882 9 6 887 893 10 9 884 881 11 9 881 886 12 18 882 897 13 8 883 888 14 17 884 898 15 0 891 886 16 2 898 893 17 15 891 896 16 2 898 893 17 15 891 894 17 89 882 19 10 892 883 20 13 899 890 10 881 881 884 20 13 899 890 10 881 881 18 899 898 18 81 17 19 899 898 18 81 17 88 899 890 10 881 881 18 81 17 88 899 890 10 881 881 18 81 17 88 899 890 10 881 881 18 81 17 89 899 890 10 881 881 18 81 19 10 885 844 18 899 898 18 819 19 10 881 881 18 819 899 898 18 819 19 10 881 881 10 885 844 18 899 898 18 819 18 819 899 898 18 819 19 10 881 881 19 10 881 881 18 819 899 898 19 10 881 881 18 819 899 898 19 10 988 10 10 100 881 881 10 004ate control limits 10 004ate control lim	5	5	897	884	
8       17       886       882         9       6       887       893         10       9       894       881         11       9       881       886         12       18       882       897         13       8       883       888         14       17       884       898         15       0       891       886         16       2       898       893         17       15       891       894         18       17       899       882         19       10       892       883         20       13       899       890         MIN       0       881       881         MAX       18       899       893         CTRL-UL       0       845       844         CTRL-UL       0       885.700       828.700         STDEV       5.415       6.546       5.223         CV       0.531       0.007       0.006    Passed    Lugdate Control Lint	7	14	899	895	
9 6 887 893 10 9 894 881 11 9 881 886 12 18 882 897 13 8 883 888 14 17 884 898 15 0 891 886 16 2 898 893 17 15 891 894 18 17 899 882 20 13 899 882 20 13 899 890 WIN 0 881 881 MAX 18 899 898 CTRL-UL 0 885 884 CTRL-UL 20 934 933 AVG 10.200 889.700 888.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Lin Complete the save successful and new successful	В	17	886	882	
10       9       894       881         11       9       881       886         12       18       882       897         13       8       883       888         14       17       884       898         15       0       891       886         16       2       898       893         17       15       891       894         18       17       899       882         20       13       899       893         20       13       899       898         20       13       899       898         20       13       899       898         20       13       899       898         20       13       899       898         21       20       934       933         AVG       10.020       889.700       888.700         STDEV       5.456       5.723         CV       0.531       0.007       0.006    Update Control Lint Update Control Lint Complexity of the state	9	6	887	893	
11       9       881       886         12       18       882       897         13       8       883       888         14       17       884       898         15       0       891       886         16       2       898       893         17       15       891       894         18       17       899       882         19       10       892       883         20       13       899       890         MIN       0       881       881         MAX       18       899       898         CTRL-UL       0       845       844         CTRL-UL       0       889.700       888.700         STDEV       5.415       6.5.46       5.723         CV       0.531       0.007       0.006	10	9	894	881	
12     18     882     897       13     8     883     888       14     17     884     898       15     0     891     886       16     2     898     893       17     15     891     894       18     17     899     882       20     13     899     890       MN     0     881     881       MXX     18     899     898       CTRL-UL     0     845     844       CTRL-UL     20     934     933       AVG     10.200     889.700     888.700       STDEV     5.415     6.546     5.723       CV     0.531     0.007     0.006	11	9	881	886	
13       8       883       888         14       17       884       898         15       0       891       886         16       2       898       893         17       15       891       894         18       17       899       882         19       10       892       883         20       13       899       890         MN       0       881       881         MAX       18       899       893         AVG       10.200       889.700       888.700         STDEV       5.415       6.546       5.723         CV       0.531       0.007       0.006	12	18	882	897	
14     17     884     898       15     0     891     886       15     2     898     893       17     15     891     894       18     17     899     882       20     13     899     890       MIN     0     881     881       MXX     18     899     898       CTRL-LU     0     845     852,723       CV     0.531     0.007     0.006	13	8	883	888	
15     0     891     886     Step 1: Review results       16     2     898     893     Step 1: Review results       17     15     891     894     Step 2: Enter testing notes       18     17     899     882     Step 3: If test was successful and new control limits are needed, check option to update control limits.       10     881     881     881       11     0     885     898       11     0     899     898       11     0     885     894       11     0     885     894       11     0     885     898       11     0     885     894       11     0     885     894       11     0     885     894       11     0     885     894       11     0     885     894       11     0     895     898       11     0     885     894       11     0     887.00     887.00       12     0.007     0.006         Update Control Ling	4	17	884	898	
66         2         898         893         500 Print for the total           17         15         891         894         500 Print for the total           18         17         899         882         500 Print for the total         500 Print for the total           18         17         899         882         500 Print for the total         500 Print for the total           19         10         892         883         500 Print for the total         500 Print for the total           11         0         881         881         881         600 Print for the total         500 Print for the total           11         0         881         881         881         600 Print for the total         500 Print for the total           11         0         845         844         600 Print for the total         500 Print for the total         500 Print for the total           11         0         934         933         933 Print for the total         500 Print for the total         500 Print for the total           11         0.007         0.006         10.200 Print for the total         1000 Print for the total         1000 Print for the total         1000 Print for the total           10         10.200 Print for the total         10.200 Print for the	.5	0	891	886	Sten 1: Review results
7     15     891     894       8     17     899     882       9     10     892     883       0     13     899     890       1N     0     881     881       MX     18     899     898       TRL-U     0     945     844       TRL-UL     20     934     933       VG     10.200     889.700     888.700       TDEV     5.415     6.546     5.723       V     0.531     0.007     0.006	6	2	898	893	Step 1. Noview results
8     17     899     882       9     10     892     883       90     13     899     890       MN     0     881     881       MAX     18     899     898       TTR-LL     0     845     844       TTR-UL     20     934     933       VG     10.200     889.700     888.700       STDEV     5.415     6.546     5.723       V     0.531     0.007     0.006	7	15	891	894	Step 2: Enter testing notes
9         10         892         883         Step 3: If test was successful and new control limits are needed, check option to update control limits           MN         0         881         881         881         secontrol limits are needed, check option to update control limits           MN         0         881         881         secontrol limits         secontrol limits           MX         18         899         898         step 3: If test was successful and new control limits           TRI-LL         0         845         844         step 3: If test was successful and new control limits           TRI-UL         20         934         933         step 4: Click Complete to save your changes           TRI-UL         20         934         933         step 4: Click Complete to save your changes           TRI-UL         20         888.700         888.700         step 3: Option           TDEV         5.415         6.546         5.723         Update Control Limits           V         0.531         0.007         0.006         Update Control Limits	.8	17	899	882	
0 13 899 890 control limits are needed, check option to update control limits are needed, check	9	10	892	883	Step 3: If test was successful and new
to update control limits tax 18 899 898 TRL-LL 0 845 844 CTRL-UL 20 934 933 VG 10.200 889,700 888.700 TDEV 5.415 6.546 5.723 V 0.531 0.007 0.006 Passed Update Control Lin Completion	0	13	899	890	control limits are needed, check option
VIIN         0         881         881           VAX         18         899         898         Step 4: Click Complete to save your changes           TRL-LL         0         845         844         changes           VIG         10.200         898,700         888.700         Step 4: Click Complete to save your changes           STDEV         5.415         6.546         5.723         Complete         Complete         Complete					to update control limits
MAX 18 899 898 CTRL-UL 0 845 844 CTRL-UL 20 934 933 AVG 10.200 889.700 888.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Lin Complete to save your	MIN	0	881	881	
CTRL-LL 0 845 844 CTRL-UL 20 934 933 AVG 10.200 889.700 888.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Lin Compl	MAX	18	899	898	Step 4: Click Complete to save your
CTRL-UL 20 934 933 AVG 10.200 889.700 888.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Lir	CTRL-LL	0	845	844	changes
AVG 10.200 889.700 889.700 STDEV 5.415 6.546 5.723 CV 0.531 0.007 0.006 Passed Update Control Lin Compl	CTRL-UL	20	934	933	
STDEV         5.415         6.546         5.723           CV         0.531         0.007         0.006             Passed         Update Control Lin   Complete Control Line Complete Control Line	AVG	10.200	889.700	888.700	
CV 0.531 0.007 0.006 Passed Update Control Lin Compl	STDEV	5.415	6.546	5.723	
Update Control Line	CV	0.531	0.007	0.006	
Compl		Pa	ssed		Update Control Limits
Comp					Complete
					Complete

Figure 7-5: Reader QC Tests – Passed

**STEP 4:** Select the Update Control Limits check box.



Figure 7-6: Update Control Limits Option



**STEP 5:** Click the Complete button to save and exit the test.

**STEP 6:** Navigate to the *Configuration* tab, and confirm the values have updated.

Daily QC Control Limits		Daily QC Control Limits	
Dark Lower	0 🔹	Dark Lower	0 🛟
Dark Upper	20 🜻	Dark Upper	20 🜻
PMT Lower	0 ≑	PMT Lower	845 🗘
PMT Upper	0 🔹	PMT Upper	934 🜻
PDiode Lower	0 🔹	PDiode Lower	847 ÷
PDiode Upper	0 🔹	PDiode Upper	936 🜻
FACTORY DEF	AULT	NEW	

Figure 7-7: Daily QC Control Limits Update Example

### 7.1.2 Reader Daily QC Test

### **Equipment Needed**

• 1 High-Dose Consistency nanoDot

After the Verify/Establish Control Limits process has been completed, complete the following steps to run the Reader Daily QC Tests. This test is divided into two parts: Intrinsic Measurement and Reading Reproducibility. They are automatically run in sequence after the Start button is pressed.

- **STEP 1:** On the *QA* tab, click the Start button under *Reader Daily QC Tests*. The Reader Intrinsic Measurement Test will start.
- **STEP 2:** A *Daily QC Test Step 1* prompt will appear. Confirm there is no dosimeter in the reader and that the door is closed.

MICROSTARI	medical dosimetry sy	rstem			- ×
Reading Dosimeter Assignment Calibration	Data Sensitivity Assessment	QA Back	ups Event Log	Configuration	About
	Reader Daily QC Test		Started: 1/29/2016	10:25:59 AM	
Reader Daily OC Tests	Reader Intrinsic Measurement     Dark PMT	P-Diode	Reading Reproduc	Raw Counts	
Step 1: Reader Intrinsic Stability Test					
Step 2: Dosimeter Reading Reproducibility Test					
Reader QC Tests	Daily QC Test: Step 1				
Start Verify / Establish QC Control Limits	Step 1: Make sure there is no dosimeter in th reader and the door is closed before continuir	le Ig. 🔔			
Dosimeter Verification Pre-Assignment	ОК	Cancel			
Start Read Population Background Reference Dosimeter					
Start Verify Dosimeters Using Population Background Reference					
Start Verify Dosimeters Using Individual Background Readings					
Notes					Cancel

Figure 7-8: Reader Daily QC Test – Start



**STEP 3:** When the first test is complete, click OK on the Reader Daily QC Test results prompt. The report will be updated with a colored bar reflecting the test results. The test will move on to the next step if the test is passed.

Reading	Dosimeter Assignment	Calibration	mec Data	lical dosim	netry sy	stem	Backups	Event Log	Configuration	Abou
				Reader Dail	ly QC Test	- ,	Sta	arted: 1/29/2016	10:25:59 AM	
				Reader Intrinsic M	easurement T	est		Reading Reproduc	ibility Test	
teader Daily	QC Tests	1		Dark	PMT	P-Diode			Raw Counts	
Charles 2 1 12	and an Antonia dis Mathematica	1		13	893	870				
Step 1: K	leader intrinsic Stability Test	2		10	957	935				
Step 2: D	osimeter Reading Reproducibility	Test 4		18	904	866				
orep in o	restricted tearing rechronicity	5		8	913	963				
Start		M	3N	5	893	855				
		M	AX	18	966	963		_		
		0	TRI-III	Reader Daily QC	Test					
Dosimeter Ve	QC Control Limits			Step	r or the Dally Q	u test passed.	OK			
Start	Read Population Backgroun Reference Dosimeter	вd								
Start	Verify Dosimeters Using Po Background Reference	pulation								
Start	Verify Dosimeters Using In Background Readings	dividual								
				Pass	ed					
		Notes								Canco

Figure 7-9: Reader Daily QC Test – Step 1 Passed

**STEP 4:** In the Daily QC Test: Step 2 prompt, enter the serial number or scan the barcode for a high-dose consistency nanoDot.

Daily QC test: Step 2		
Step 2: Please scar read and insert d	n a dosimeter serial r osimeter into the rea continuing.	number to be der before

Figure 7-10: Reader Daily QC Test – Consistency nanoDot Entry

- **STEP 5:** Place the consistency nanoDot in the reader drawer with the barcode facing up. Ensure the nanoDot is sitting flat. Close the drawer completely. (Figure 7-1)
- **STEP 6:** Click OK to start the Reading Reproducibility Test. Ten readings will be completed and the coefficient variation (CV) will be computed.
- **STEP 7:** When the test is complete, click OK on the Reader Daily QC Test results prompt. The report will be updated with a colored bar reflecting the test results. If the CV is  $\leq 1.0\%$  the test will pass.
- **STEP 8:** Click OK on the Test Passed notification, and click the Complete button to save and exit the test.
- **STEP 9:** The Current Daily QC Status on the *QA* tab should now be listed with a status of Passed.



	MICTOSTAR	i medical dosimetry syste	em		- ×
Reading	Dosimeter Assignment Calil	Data Sensitivity A	ssessment QA	Backups Event Log	Configuration About
Reader Daily OC Test	ba				
Step 1: Reader In	ntrinsic Stability Test				
Step 2: Dosimete	er Reading Reproducibility Test				
Start		Current Daily QC stal	art Parformed: 0/22/2012 8130-05 PM		
		case de r	es. renomes. 9/23/2013 0.10.03 PM		
Reader OC Tests					
	teeller / Establish				
Start	QC Control Limits	Population backgrou	/ Time: N/A		
		Serial No.	mber: N/A Counts (strong): N/A		
Dosimeter Verificatio	on Pre-Assignment	Average	Counts (weak): N/A		
Start	Read Population Background Reference Dosimeter				
Start I	Verify Dosimeters Using Population Background Reference				
Start 8	Verify Dosimeters Using Individual Background Readings				
Connected	User: alpha medohy	Reader: DEFAULT	Beam Lise Mode: Automatic	9/23/2013	8:15 PM

Figure 7-11: QA Tab — Daily QC Passed

## 7.2 Reader Calibration

After the performance tests are completed, the system can be calibrated using dosimeters with known doses to determine the calibration factors used to convert the raw PMT count to dose.

**NOTE:** microSTARii has four default calibrations included (two Linear and two Non-Linear), *Factory Default Calib*. These are **not for clinical use**. They are database placeholders.

### 7.2.1 Initial Calibration

### **Equipment Needed**

• NIST-Traceable 80 kVp, Cs137, or Non-Standard Calset (Therapy)

Complete the following steps to calibrate the reader using the LANDAUER-provided calset:

- **STEP 1:** On the *Configuration* tab, confirm the following settings:
  - Beam Use Mode: Automatic
  - Dose Unit: mrad
- **STEP 2:** From the *Calibration* tab, enter a Process ID.

Operational Data	
User ID	Process ID
alpha_medphys	LINEAR CALIB 662 keV 09/23/2013



**STEP 3:** Sort the calset in dose order.

**STEP 4:** Complete the following steps for each dosimeter:

- a. Click in the Dosimeter # field. Scan an unread dosimeter from the set or enter the serial number into the Dosimeter # field. The Sensitivity field will automatically update. (It should match the number printed on the top of the nanoDot, DN###.)
- b. Fill in Exposed Dose Field using the SDE value on the LANDAUER Calibration Certificate. For unexposed dosimeters enter 0.0.
- c. Enter 4 for the Number of Reads value.
- d. Place the nanoDot in the reader drawer with the barcode facing up. Ensure the nanoDot is sitting flat. Close the drawer completely. (Figure 7-1)
- e. Click the Read button to run a series readings.
- f. Repeat steps a-e for each dosimeter in the calset.

Dosi	meter Info		Exposed Dose	Number of	
	Dosimeter #	Sensitivity	(mrad)	Reads	
	DN08934146V	0.00	0.0000	_4 ÷	Read

Figure 7-13: Dosimeter Info Field

**STEP 5:** After all dosimeters have been read, review all of the calibration data to ensure the displayed dose levels are correct and reflected in the correct dose units. If necessary, omit any inconsistent or outlier readings by unselecting the Used check box for that result. Verify that the coefficient of variation (CV) across all sensitivity-corrected counts for each dose level within acceptable limits ( $\leq 0.05$ ), and that for a specific dose range, that only doses corresponding to that dose range are included in the calibration data group.

							Linear C	alibrations (Units: m	rad)			
	Hide	Select	CalibrationID	Use Type	Calib. Type	Status	Beam Use Mode	Counts/Unit of Dose	CalibFactor	Name	Notes	DateTime V
₽.		<b>—</b>			Low Dose	Pending	Automatic	5.300	5.300			9/24/2013 7:13
	ExposedDose /	CountsUnit	STD	cv								
۲	0	85.131	9.301	0.109								
ė-	987	5315.791	94.452	0.018								
	Used	Dosimeter #	E1Counts	E1 Corrected								
	····	DN08942578G	4773	5363								
	····	DN08942578G	4733	5318								
	·	DN08942578G	4744	5330								
	····	DN08942578G	4715	5298								
	····	DN09270197P	5040	5478								
	····	DN09270197P	4992	5426								
	····	DN09270197P	4929	5358								
	····	DN09270197P	4899	5325								
	····	DN093579967	4970	5344								
	····	DN093579967	4792	5153								
	·	DN093579967	4836	5200								
	•	DN093579967	4833	5197								

### Figure 7-14: Calibration Detail (Showing Acceptable CV)

- **STEP 6:** For each new calibration, select the Pending calibration, and click the Accept button.
- **STEP 7:** Fill in the values on the Calibration dialog box, and click OK to confirm.
  - a. Cs-137 Calibration Use Type: Other
  - b. 80 kVp Calibration Use Type: Diagnostic



Acce	pt Calibration		٢
	Name	Calibration Use Type	
	LINEAR CALIB 662 keV	Other 🝷	
	Notes		
	Calibration performed du using Landauer-supplie Calset No	rring installation test d NIST traceable   . 1398	
	C	K Cancel	

Figure 7-15: Accept Calibration Dialog Box

**STEP 8:** After completing a calibration for both the low and high dose ranges, ensure both are listed on the *Calibration* tab and are selected. Click Save the Selection at the bottom of the screen.

			micr	OSTAR	i mec	dical dc	simetry s	system				
	Reading Dosimeter Assignment Calibration					Data	Sensit	ivity Assessment	Q	A Bac	kups I	Event Log
Ope	Operational Data User ID Process ID alpha_medphys		Dosimeter Dos	Info imeter # Sens	Exposed Di itivity (mrad)	ose Numb Rea	er of ids	Read				
							Linear C	Calibrations (Units: m	rad)			
	Hide	Select	CalibrationID	Use Type	Calib. Type	Status	Beam Use Mode	Counts/Unit of Dose	CalibFactor	Name	Notes	DateTime ∇
		<b>V</b>	6	Other	Low Dose	Accepted	Automatic	5.293	5.293	LINEAR CALIB 66	Calibration perfor	9/24/2013 7:13
		V	1	Other	High Dose	Accepted	Automatic	1.000	1.000	Factory Default C	Not for clinical us	9/21/2013 10:2
			2	Other	Low Dose	Accepted	Automatic	15.000	15.000	Factory Default C	Not for clinical us	9/21/2013 10:2

Figure 7-16: Completed Low Dose Calibration

### 7.2.2 Post-Calibration Quality Control Check

### **Equipment Needed**

• NIST-Traceable 80 kVp, Cs137, or Non-Standard Post-Calibration QC Set

After the system has been calibrated using the LANDAUER calset, complete the following steps to validate the calibration:

**STEP 1:** On the *Configuration* tab, confirm the following settings are configured.

Configuration Setting	CONFIGURATION VALUE
Dosimetry Category	Generic
Dosimetry Use Type	Other
Dose Reading Mode	Average
Beam Use Mode	Automatic
Dose Unit	mrad
<b>Reading Repetitions</b>	4



CONFIGURATION SETTING	CONFIGURATION VALUE					
ForceCalibrationHardware Settings Match	Selected					
Other Checkboxes	Unselected					
Dosimetry Category ○ Patient ④ Generic Dosimetry Use Type ○ Therapy ○ Diagnostic ④ Other	Dose Unit       Reading Parameters         Image: Comparison of the second s					
Dose Reading Mode	Manage Readers       □ Use Dosimeter Background Correction         Manage Databases       □ Force Dosimeter Preassignment Verification         Manage Databases       □ Force Calibration Dosimetry Use Type Match         □ Force Daily QC test       □ Force Calibration Hardware Settings Match         □ Apply Sensitivity Adjustment Factor values					

#### **Figure 7-17: Configuration Settings**

- STEP 2: On the *Reading* tab, enter a unique Process ID (e.g., Post Cal QC).
- **STEP 3:** Click to put the cursor in the Dosimeter # field. Scan the dosimeter or enter the serial number.
- **STEP 4:** On the New Dosimeter dialog box (*Is this a screened nanoDot?*), click Yes to confirm.
- **STEP 5:** On the *Process ID does not exist* prompt, click Yes to confirm the new Process ID.

	mi	Crosta	Rii medical	dosimetry system	h			
Reading	Dosimeter Assign	ment	Calibration	Data Sensitivity Asse	ssment QA	Backups	Event Log Configuration	About
	Operational Data	Dosimetry Category	Linear Low Dose	Current Calibration	Calibration Use Type Other	Daily QC Status Passed	Process ID POST CAL QC	
		Generic	Linear High Dose	LINEAR CALIB 662 keV	Other	Screened Sensitivity	Dosimeter #	
			Non-linear High Dose	N/A	N/A	No 0.93	DN09357716J	
				New Dosimeter Is this a screened na	nodet" ?			
Connecto	b	User: alpha_m	edphys	Reader: DEFAULT	Beam Use Mode: Automatic		25/2013 6:1	12 AM

Figure 7-18: Reading Tab with QC nanoDot Settings

- **STEP 6:** Place the nanoDot in the reader drawer with the barcode facing up. Ensure the nanoDot is sitting flat. Close the drawer completely. (Figure 7-1)
- **STEP 7:** Click Read. The nanoDot will be read four times and the computed dosimetry results will display on the screen.



- **STEP 8:** Verify the computed dose is within  $\pm 5.5\%$  of the known exposed dose listed on the LANDAUER certificate.
- **STEP 9:** Repeat Steps 3-8 for all dosimeters in the QC Set.

	mi	Crost	ARII medico	al dosime	etry system							- ×
Reading	Dosimeter Assign	nent	Calibration	Data	Sensitivity Assessn	ent QA	Ba	ckups	Event L	og	Configuration	About
	Operational Data	Dosimetry Category	Linear Low Dose	Curre	nt Calibration CALIB 662 keV	Calibration Use Type Other	Daily	QC Status Passed		Process ID POST CAL QC		
		Generic	Linear High Dose	LINEAR	CALIB 662 keV	Other	Screen	ed Sensitivity		Dosimeter #		
			Non-linear High Dose		N/A	N/A	Yes	0.93		DN09357716J		
	Results	Used 2 2 2	Read ID 105 106 107 108	Beam Used Weak Weak Weak Weak	Test Counts 5604 5954 5760 5075	Raw Counts	137531 138402 138054 137219	Dose (mrad) 200.206.300 201.474.200 200.967.600 199.752.100	Avg. Raw Counts Std Dev CV	137801.5 528.152 0.0038		
	Notes			Avg Cali	Rev Counts Correct 137602 - bration Factor Sensitir 0.739 X 0.93	rity SAF	Avg. 1 2006	Dose (mrad) 500.768		Complete		
Connected		User: alpha_	nedphys	Reader: DEF	AULT	Beam Use Mode: Autom	atic		/25/2013		7:	06 AM

Figure 7-19: QC Set Reading Results

### 7.2.3 Custom Calibration

LANDAUER-manufactured calsets provide a baseline for 80 kVp, Cs137, or Non-Standard exposure conditions. These calsets are used to validate system performance.

After the initial calibration is completed, create a custom calset to mirror the conditions in your facility. To create a custom calset, irradiate screened nanoDots using the exposure conditions in your environment. Perform the calibration procedure outlined in section Chapter 7 using the custom calset. (Note: The Dose Unit configuration value may change based on exposure conditions.)

RECOMMENDED CUSTOM CALSET EXPOSURE							
Do	Doses in cGy						
Linear Calibration (Beam Use Mode: Automatic)							
Low Dose Linear Range (<15 cGy)	Low Dose Linear Range (<15 cGy)						
High Dose Linear Range (>15 cGy)	50, 100, 200 cGy						
Linear Calibration (Be	am Use Mode: Force Weak)						
High Dose Linear Range (>1cGy)	10, 50, 100, 200 cGy						
Non-Line	Non-Linear Calibration						
High Dose Non-Linear Range (300-1300 cGy)         50, 100, 300, 500, 800, 1000, 1300 cGy							
Note: The benefits of the Linear calibration using force weak mode a	ire that you only have to perform a single calibration and the reader will be						

The following table provides a guideline for custom calsets exposure levels.

*Note:* The benefits of the Linear calibration using force weak mode are that you only have to perform a single calibration and the reader will be operated using the weak beam, which is associated with lower depletion rates.

# CHAPTER 8 TROUBLESHOOTING

If you receive error messages or need further assistance, contact LANDAUER Technical Support.

## 8.1 Technical Support

Address	LANDAUER Customer Service
	2 Science Rd. Glenwood, IL 60425
Telephone	800-561-2708
Email	inlightcustserv@landauerinc.com
<b>Operating Hours</b>	Monday–Friday: 8:00 am to 4:30 pm Central Time

When calling LANDAUER, please provide the representative with the following information:

- Your contact Information (Name, Phone #, Email Address, and Organization/Facility)
- Type of Call (Informational or System Failure)
- Severity of Issue
- Device Status (Operational or System Down)
- Type of Issue (Hardware/Software)
- Reader Serial # (see back of reader)
- Software Version (see the About tab)
- Approximate Age of System

Please provide additional specific details of your hardware or software failure (if available):

- Operator User Name & Permissions Level (Administrator, Advanced Operator or Operator)
- System Warnings or Symptoms Encountered Prior to Issue
- Screenshot of Software Issue/Message
- Picture of Hardware Issue/Failure
- Event Logs

# **Appendix A: Profile Permissions Listing**

CATEGORY	PERMISSION	OPERATOR	Advanced Operator	Administrator
Backup	Screen: Backup		$\checkmark$	$\checkmark$
Backup	Groupbox: Reset Database			$\checkmark$
Backup	Button: Backup		$\checkmark$	$\checkmark$
Backup	Button: Restore			$\checkmark$
Backup	Button: Delete			$\checkmark$
Backup	Checkbox: Automatic Daily Backup			$\checkmark$
Calibration	Screen: Calibration	$\checkmark$	$\checkmark$	
Calibration	Groupbox: Operational Data	$\checkmark$	$\checkmark$	
Calibration	Groupbox: Dosimeter Info	$\checkmark$	$\checkmark$	
Calibration	Grid: Calibrations	$\checkmark$	$\checkmark$	
Calibration	Button: Save	$\checkmark$	$\checkmark$	
Calibration	Button: Hide	$\checkmark$	$\checkmark$	
Calibration	Button: Show All	$\checkmark$	$\checkmark$	
Calibration	Button: Edit Correction Factors	$\checkmark$	$\checkmark$	
Calibration	Button: Edit Control Dose	$\checkmark$	$\checkmark$	
Calibration	Button: Accept	$\checkmark$	$\checkmark$	
Calibration	Button: Reject	$\checkmark$	$\checkmark$	



CATEGORY	Permission	OPERATOR	Advanced Operator	Administrator
Configuration	Screen: Configuration	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Checkbox:ApplySensitivityAdjustmentFactor Value		$\checkmark$	$\checkmark$
Configuration	Checkbox:UserDosimeterBackgroundCorrection	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Checkbox: Non Linear Calibration	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Groupbox: Display Unit	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Groupbox: Beam Use Mode		$\checkmark$	$\checkmark$
Configuration	Button: Reader Management		$\checkmark$	$\checkmark$
Configuration	Button: Database Management			$\checkmark$
Configuration	Button: Add New Reader		$\checkmark$	$\checkmark$
Configuration	Groupbox: Daily QC Control Limits			$\checkmark$
Configuration	Groupbox: Organization			$\checkmark$
Configuration	Checkbox: Force Calibration Dosimetry Use Type Match		$\checkmark$	$\checkmark$
Configuration	Checkbox:ForceDosimeterPreassignmentVerification		$\checkmark$	$\checkmark$
Configuration	Checkbox: Force Daily QC		$\checkmark$	$\checkmark$
Configuration	Groupbox: User Defined Fields			$\checkmark$
Configuration	Textbox: Read Interval			$\checkmark$



CATEGORY	Permission	OPERATOR	ADVANCED Operator	Administrator
Configuration	Groupbox: Dosimetry Category	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Groupbox: Dosimetry Use Type	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Groupbox: Dose Reading Mode	$\checkmark$	$\checkmark$	$\checkmark$
Configuration	Textbox: Reading Repetitions		$\checkmark$	$\checkmark$
Configuration	Textbox: Verification Threshold			$\checkmark$
Configuration	Checkbox:ForceCalibrationHardwareSettings Match		$\checkmark$	$\checkmark$
Configuration	Textbox: Reader Serial Number			$\checkmark$
Configuration	Textbox: Reader Notes			$\checkmark$
Data	Screen: Data	$\checkmark$	$\checkmark$	
Data	Groupbox: Templates	$\checkmark$	$\checkmark$	
Data	Button: Export	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Screen: Dosimeter Assignment	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Button: Export Worklist	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Button: Add Patient	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Button: Edit Patient	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Button: Delete Patient	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Button: Edit Assignment	$\checkmark$	$\checkmark$	



CATEGORY	Permission	OPERATOR	Advanced Operator	Administrator
Dosimeter Assignment	Button: Remove Assignment	$\checkmark$	$\checkmark$	
Dosimeter Assignment	Textbox: Serial Number	$\checkmark$	$\checkmark$	
Event Log	Screen: Event Log		$\checkmark$	$\checkmark$
QA	Screen: QA	$\checkmark$	$\checkmark$	
Reading	Screen: Reading	$\checkmark$	$\checkmark$	
Reading	Button: Patient Details	$\checkmark$	$\checkmark$	
Reading	Button: Assignment Details	$\checkmark$	$\checkmark$	
Security:	Screen: Security			$\checkmark$
Sensitivity Assessment	Screen: Sensitivity Assessment		$\checkmark$	
Sensitivity Assessment	Sensitivity Adjustment Factors ->Edit SAF		$\checkmark$	

# **Appendix B: QC Report Examples**

## **Reader QC Test Example Report**

University of Somewhere Med Ctr

Radiation Oncology

#### MicroSTARii Control Limit Test Report

Date / Time of Test: 09/23/2013 06:00:54 PM Reader: DEFAULT Test Peformed by: alpha\_medphys

#### High Precision Intrinsic Measurement Test

#### Control Limits Updated: Yes

Reading	Dark Counts	PMT Counts	P-Diode Counts
1	12	17501	1105
2	11	17334	1113
3	9	17475	1100
4	9	17321	1121
5	10	17224	1111
6	9	17350	1098
7	12	17236	1094
8	13	17308	1084
9	10	17216	1107
10	8	17483	1093
11	13	17172	1083
12	10	17068	1079
13	13	17073	1102
14	8	17386	1093
15	11	17278	1102
16	9	17112	1094
17	9	17222	1083
18	14	17220	1085
19	13	17267	1099
20	10	17084	1085
Min	8	17068	1079
Max	14	17501	1121
CTRL-LL	0	16403	1042
CTRL-UL	20	18130	1151
AVG	10.650	17266.500	1096.550
STDEV	1.872	131.459	11.413
CV	0.176	0.008	0.010
Test Result	PASSED	PASSED	PASSED

Comments:

Signature of Reviewer: \_

Date Reviewed:

IMPORTANT NOTE: Reader Control Limits should only be changed when justified, i.e. after reader repair or preventative maintenance consistent with QA "Best Practices". Contact Landauer Customer Service at 1-800-561-2708 if reader Daily QC results exceed Control Limits.

## **Reader Daily QC Test Example Report**

University of Somewhere Med Ctr

Radiation Oncology

### MicroSTARii Daily QC Test Report

Date / Time of Test: 09/23/2013 08:10:05 PM Reader: DEFAULT Test Peformed by: alpha\_medphys

#### STEP 1: Daily Intrinsic Measurement Test

Reading	Dark Counts	PMT Counts	P-Diode Counts
1	7	17522	1139
2	8	17459	1091
3	11	17373	1111
4	11	17419	1138
5	7	17390	1104
Min	7	17373	1091
Max	11	17522	1139
CTRL-LL	0	16403	1042
CTRL-UL	20	18130	1151
AVG	8.800	17432.600	1116.600
STDEV	2.049	59.668	21.244
CV	0.233	0.003	0.019
Test Result	PASSED	PASSED	PASSED

#### STEP 2: Reading Reproducibility Test

Reading	Element Counts
1	125253
2	124846
3	124877
4	124785
5	125119
6	125164
7	124975
8	124915
9	125124
10	125028
AVG	125008.602
STDEV	153.986
CV	0.001
Test Result	PASSED

Comments:

Signature of Reviewer:

Date Reviewed:

IMPORTANT NOTE: Reader Control Limits should only be changed when justified, i.e. after reader repair or preventative maintenance consistent with QA "Best Practices". Contact Landauer Customer Service at 1-800-561-2708 if reader Daily QC results exceed Control Limits.

# Stakeholder Approval

This document meets LANDAUER standards for quality and use.

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