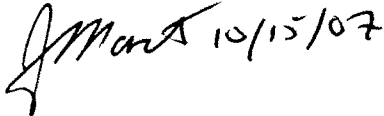


PADUCAH

Remediation Services

A Portage Shaw Joint Venture Company

OWNER: Radiological Control	PRS-RAD-1319	REV. NO. 0
SUBJECT MATTER AREA: RADCON	PREPARER: Dan Tockstein	Page 1 of 6
DOC TYPE: <input checked="" type="checkbox"/> PROCEDURE <input type="checkbox"/> POLICY	APPROVED BY/DATE: John Martin, CHP – Safety and Health Manager (Signature on File in DCC) - 10/15/2007 	
PROC TYPE: <input checked="" type="checkbox"/> OPERATING PROCEDURE <input type="checkbox"/> FACILITY SPECIFIC PROCEDURE FACILITY: _____		
TITLE: Calibration of Tenelec XLB Series 2 & 5, Low Background Counting System		
USQD <input checked="" type="checkbox"/> UCD <input checked="" type="checkbox"/> CAT EX <input type="checkbox"/>	EFFECTIVE DATE: 10/22/2007	
USQD/UCD No: USQD-PH-RAD-0077/UCD-PH-RAD-0136	REQUIRED REVIEW DATE: 10/22/2010	
Mandatory Subcontractor Pro Forma Procedure? <input type="checkbox"/>	If an interim Procedure, Expiration Date:	

REVISION LOG		
Revision Number	Description of Changes	Pages Affected
0	Initial Release. Intent Change. Changed numbers and headings to define the beginning point of Paducah Remediation Services documentation and to establish Document Control as the control point for tracking document numbers. This document replaces Blue-sheeted AD-MCS-8.13 procedure.	All

CAUTION

This procedure describes specific safety basis requirements for safety significant items used by the Paducah Project. Any proposed changes must be processed in accordance with the procedure change control process defined in PRS-DOC-1107 and all changes shall be reviewed by the USQD process and approved by PRS Nuclear/Facility Safety. Specific safety basis requirements are noted in this document in the following format: <SB DOCUMENT REFERENCE>.

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1.0 PURPOSE

The purpose of this procedure is to provide instructions for the calibration of the Tennelec XLB Series 2 & 5, Low Background Alpha/Beta-Gamma Counting System. This procedure also provides instruction on documenting the calibration, including acceptance criteria, and records management.

2.0 SCOPE

This procedure applies to all activities by Paducah Remediation Services (PRS) Radiological Control (RADCON) personnel involving inspection, calibration, and performance response checks of the Tennelec Low Background Counting System.

3.0 PROCEDURE

3.1 Responsibilities

Radiation
Protection
Technical Program
Manager

3.1.1 PRS Radiation Protection Technical Program Manager (RPTPM) ensures the following:

- Implementation of this procedure
- Required review of the records generated by this procedure
- Qualified RADCON personnel are properly trained.

Radiological
Control Technician
(RCT)

3.1.2 The Radiological Control Technician ensures the following:

- Performance of the calibration and maintenance of the Tennelec XLB Series 2 & 5.
- Completion of the required documentation set forth in this procedure.
- Completion of the applicable instrument Job Performance Measures, JPMs.

3.2 Detailed Instruction

3.2.1 The frequency of calibration for this instrument must be:

- Annually, or sooner if requested by RPTPM; or
- Must be performed after any scheduled or unscheduled maintenance is done that may affect the instrument operation. <KY/EM-174, January 1997 - Section 7.8>, <BJC/OR-1394, Revision2, September 2003 – Section 7.8>.

3.2.2 Calibration Performance and Daily Operational Check <KY/EM-174, January 1997 - Section 7.8>, <BJC/OR-1394, Revision2, September 2003 – Section 7.8>.

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- Calibrations shall be performed by the manufacturer, qualified vendor or qualified RCT to factory specifications and American National Standards Institute, ANSI N42.25-1997 standards using National Institute of Standards and Technology (NIST) traceable equipment and traceable reference standards.

The following are checked prior to use, or on a daily basis:

- Verify P-10 gas (90% Argon / 10% Methane) cylinder bottle pressure is greater than 200 pounds per square inch, gauge (PSIG). **IF** 200 psig or less, **THEN** replace gas cylinder, check for leaks and proceed.

NOTE: The P-10 gas cylinder should not be allowed to run dry to prevent cylinder contamination.

- Verify line pressure is set at 10-psig \pm 1-psig.
- Verify P-10 gas regulator located on Series 2 changer NIM panel is set between 0.1 and 0.2 standard cubic feet per hour (SCFH).
- **IF** the above criteria are not met, **THEN** perform the following:
 - Tag instrument as "Out of Service"
 - Notify RPTPM

3.2.3 Voltage Plateau Generation

- Prepare a planchet with a beta plateau source.
- Load GROUP carrier followed by the carrier containing the beta plateau source.
- Utilizing the pre-programmed routine to perform the plateau, start the plateau.
- The Eclipse software will run the plateau routine showing voltage increments of 30 volts. The start and stop voltages can be entered if a different range from the default is desired.
- When completed, the computer will print a plateau report.
- Select the "Plateau" tab located on the right side of the screen.
- Enlarge the window to view the entire plateau plots.
- Observe that the counts rise rapidly (knee), then begin to flatten out (plateau).
- Determine the beta operating voltage (60 to 100 volts above the knee) in the plateau region for either Series 5 or Series 2.

3.2.4 To set the Operating Voltages on the Series 5 or Series 2:

- Set points will be shown at bottom of screen.
- Click on this screen.
- Choose either "Auto Select" or "Chart Selected", if a different voltage is desired.

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3.2.5 Cross Talk Determination, Series 5

- A cross talk run is performed by using a beta source.
- Ensure that no samples are running on either Tennelec System.
- Load GROUP carrier followed by the carrier containing the beta source.
- Select "System" then select "Amplifier Setup, Manual".
- Select the device and desired group.
- Click the "START COUNT" button.
- The system will move the sample into position and begin counting. Allow the system to gain 20,000 to 30,000 counts before adjusting spillover values.
- Click the "HALT" button.

NOTE 1: Setting the Beta into Alpha Spillover Percent (%).

- The first goal is to set the Beta into Alpha spillover to 3.5%
- If the Beta into Alpha spillover is greater than 3.5%, move the Beta Upper Level (BUL) up.
- If the Beta into Alpha spillover is less than 3.5 %, move the Alpha Lower Level (ALL) down.

NOTE 2: The system will not allow the Beta Upper Limit to be set above the Alpha Lower Level and vice versa.

- Click the "RESUME COUNT" button.
- Continue performing the previous steps until the Beta into Alpha spillover is $3.5\% \pm 0.2\%$.
- Click the "HALT" button. The BUL is now at its final position.
- Record the BUL discriminator setting on the "Beta Plateau Report".
- The second goal is to adjust the ALL upward until a $0.08\% \pm 0.02\%$ Beta into Alpha spillover is obtained.
- Move the ALL up 15% and press the "RESUME COUNT" button.
- If the Beta into Alpha spillover is less than 0.08%, click the "HALT COUNT" button and move the ALL down.
- If the Beta into Alpha spillover is greater than 0.1%, click the "HALT COUNT" button and move the ALL up.
- Click the "RESUME COUNT" button and continue with the previous steps until $0.08\% \pm 0.02\%$ spillover is achieved.
- Record the ALL discriminator setting on the Beta Plateau Report.
- Click the "APPLY" button, select "S5ROI" for series 5 or "5XLBROI" for series 5XLB, and click "OK".

3.2.6 Cross Talk Determination Series 2

- Open the NIM bin door and ensure the Alpha + Beta discriminator pot is set at 0.10.
- Perform cross talk run by using a beta source.
- Ensure that no samples are running on either Tennelec System.
- Load GROUP carrier followed by the carrier containing the beta source.

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- Select “System” then select “Amplifier Setup, Manual”.
- Select the device and desired group.
- Click the “START COUNT” button.
- The system will move the sample into position and begin counting. Allow the system to gain 20,000 to 30,000 counts before adjusting spillover values.
- Click the “HALT” button.

NOTE 3: Setting the Beta into Alpha Spillover %.

- The goal is to adjust the Alpha discriminator until the Beta into Alpha spillover is $0.08\% \pm 0.02\%$.
- Open NIM bin door and adjust the alpha discriminator pot clockwise to decrease spillover or counterclockwise to increase spillover.
- Click the “RESUME COUNT” button and continue with the previous steps until $0.08\% \pm 0.02\%$ spillover is achieved.
- Record the discriminator setting on the Beta Plateau Report.
- Click the “CANCEL BUTTON”.

3.2.7 Alpha/Beta-Gamma Counting Efficiencies

- Load the GROUP carrier followed by the carrier containing the specified calibration source. Repeat this for each source used as an efficiency.
- To establish the Alpha/Beta-Gamma counting efficiencies, click the “GO” button, choose the pre-programmed routine for the appropriate efficiency and assign the GROUP carrier used for each source.
- Eclipse will print out efficiency reports showing 4-pi efficiency for the sources.
- Eclipse will automatically apply the new counting efficiencies established by this routine.

Note: In DA Utilities, edit Efficiency Averages, and uncheck “Use for QC” for the calibration efficiency values.

3.2.8 Determination of Background and Efficiency Ranges

- From the Eclipse menu click on “QC”.
- Click Create Edit Profile.
- Select “QC Bkgd-Alpha-Series 5 or Series 2”.
- Change the “Sample Driven Test” end date to the day before this calibration.
- Change the “Start Date” to the previous calibration date (3 months prior).
- Click “SAVE”.
- Repeat the above steps for “QC Bkgd-Beta-Series 5 or Series 2”.
- Click “SAVE”.
- From the Eclipse menu click on “QC”.
- Click Create/Edit Profile.
- Select “QC Eff-Alpha-Series 5 or Series 2”.
- Change the “Sample Driven Test” end date to the new calibration date, then change the start date to the previous calibration date.

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- Click "SAVE".
- Repeat the following steps for "QC Eff-Beta-Series 5 or Series 2".
- From the Eclipse menu click on "QC".
- Click "Create/Edit Profile".
- Select "QC Eff-Beta-Series 5 or Series 2".
- Change the "Sample Driven Test" end date to the new calibration date, then change the start date to the previous calibration date.
- Click "SAVE".
- Click "OK".

3.2.9 Change calibration dates in instrument database

3.2.10 Print daily performance report showing new background and efficiency check ranges.

NOTE 4: The background ranges are ± 3 standard deviations and the efficiency ranges are ± 2 standard deviations.

3.2.11 If the instrument can not be satisfactorily calibrated, calibration can not be verified, or operational parameters can not be set, then the instrument must be immediately removed from service until repair can be performed by an authorized service individual.

- Tag the instrument as "Out of Service"
- Notify the RPTPM

4.0 RECORDS

The Instrument Group shall maintain records to include:

- Date instrument was originally placed in service, if known
- Calibration Certificates
- Record of any maintenance performed.
- Date the instrument is permanently removed from service and disposed.

5.0 SOURCE DOCUMENTS

- ANSI N42.25-1997, American National Standard Calibration and Usage of Alpha/Beta Proportional Counters
- Tennelec XLB Low Background Alpha/Beta Counting System Manufacturer Technical Manual