



Radiation Safety



RADIATION PROCEDURES MANUAL

Procedure Cover Sheet

Procedure Title: Instrument Response Checks

Procedure Number: RS-24 Rev 0

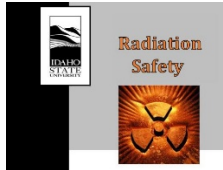
Effective Date: August 1, 2020

Reviewed By: Mason Jaussi
Assistant Radiation Safety Officer

Date: 22-Jun-2020

Approved By: John Longley
Radiation Safety Officer

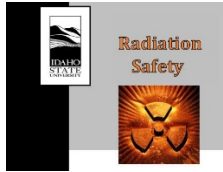
Date: 22-Jun-2020



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1. INTRODUCTION

Idaho State University maintains a large number of radiation survey and area monitoring instruments. Calibration of these instruments is performed annually (12 ± 2 months) in accordance with section 16.1. of the RSM and 10 CFR 20.1501(c). A response check is performed when an instrument is returned from calibration or when there is justifiable suspicion that it is not operating properly. Source checks are done daily or prior to use. All response and daily check information is recorded on the Instrumentation Performance Log (found on google sheets).

2. PURPOSE

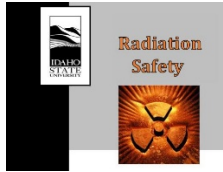
The purpose of this procedure is to outline the steps to perform operational checks on radiation detection instruments and keep them in a proper functioning order.

3. SCOPE

The instruction in this procedure is to provide clear details on how to range and source check survey and area monitoring instruments prior to use. Step by step instructions will be outlined to demonstrate the proper method to source and response check the instruments used at Idaho State University.

4. ROLES AND RESPONSIBILITIES

- Radiation Safety Officer
 - Maintain this procedure and applicable sections of the Radiation Safety Manual.
- Authorized User
 - Assist Radiation Workers when needed.
 - Provide access to sources for response and daily checks.
 - Verify that the Instrumentation Performance Log is properly filled out by the Radiation Workers.
 - Develop method for reproducible geometric configuration to be used to response and daily check each dose rate and contamination instrument used at their location.
- Radiation Worker
 - Maintain annual radiation safety training.
 - Perform instrumentation checks per this procedure.
 - Fill out the Instrumentation Performance Log.



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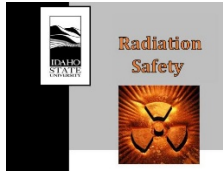
5. REQUIRED MATERIAL(S)

- Current radiation safety annual training.
- Proper PPE for usage of check sources.
- Access to the Instrumentation Performance log sheet (Shared Access on google sheets).

6. PROCEDURE

6.1. Definitions

- 6.1.1. **Response Check:** A series of counts are taken (usually ten), averaged and an acceptance interval established.
- 6.1.2. **Battery Check:** Verification that all batteries are properly working by either an analog check or a digital readout.
- 6.1.3. **Physical Check:** Observation of dents, breaks, cracks, or other forms of damage that may impact functionality.
- 6.1.4. **Source Check:** Verifying that the instrument responds to a radioactive source within an established range.
- 6.1.5. **Daily Check:** A combination of a source, physical, battery, and HV checks; followed by adding the required information on the Instrumentation Performance Log.
- 6.1.6. **HV Check:** A high voltage check is performed by checking the HV range with either an analog switch or digital readout.
- 6.1.7. **Dose Rate instrument:** An instrument that is designed and/or programed to measure a dose or exposure rate from an emitting source or field of beta, x-ray, gamma, and neutron radiation or a combination of them. (e.g. 53.6 mR/hr).
- 6.1.8. **Contamination instrument:** An instrument designed and/or programed to identify and quantify surface or personnel contamination. (e.g. 25 cpm).



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6.2. Instrument Performance Log

6.2.1. Google sheets can be downloaded as an application on most mobile devices including iOS, android, and windows. Sign in with your ISU school/ work Gmail account (e.g. hillbill@isu.edu).

6.2.1.1. The password to sign into google sheets is the same as the one for your email account.

6.2.2. The AU will have shared access to the Instrument Performance Log template. The Radiation Safety Office will create two new workbooks for each facility or lab.

6.2.2.1. The first copy is the working copy and should be used for response and daily checks. It will have a name with your facility or lab in it (e.g. IPL_CAES_MaCS).

6.2.2.2. The second copy is used for archiving sheets from the working copy and will have a similar naming structure (e.g. IPL_IAC_Archive).

6.2.3. There will be a sheet in the workbook for each instrument at your lab/facility. The name of the sheet will be the serial number of that instrument.

6.3. Response Check

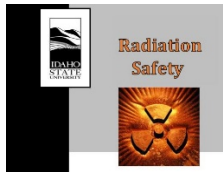
6.3.1. Copy the data from the Instrumentation Performance Log to the Archive.

6.3.1.1. From the sheet tab left click on the downward facing arrow next to the right of the serial number. Scroll to the **Copy to** option and guide the mouse to the right following the right facing arrow. Select the **Existing Spreadsheet** option and select the archive workbook for your lab or facility.

6.3.1.2. Add the date to the newly archived sheet by left clicking the downward facing arrow to the right of the serial number. Scroll to find **Rename**. Add the month and year the information was added to the archive. (e.g. 05/2020 289840).

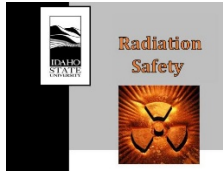
6.3.2. Delete the information from the working copy in the response check section under **Response check value** in cells E2-E11.

6.3.3. Delete the information from the daily check section under the **Date**, **HV check**, **Measured Value**, and **Performed by** columns.



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- 6.3.4. In cells B5, B6, and B7 enter the calibration due date as the first day of the month one year from when the calibration was performed, the nuclide used for response and daily checks, and the source number respectively.
- 6.3.5. Obtain the required check source for the instrument that you are checking.
 - 6.3.5.1. The authorized user will provide the appropriate check source and instructions on how to place the source in a reproducible geometric configuration in relation with the instrument.
- 6.3.6. Enter the date in the proper format. (e.g. 7-Mar-2022) in the first row of the Daily Check section.
- 6.3.7. Perform a physical check. (Section 6.1.3)
 - 6.3.7.1. The default is “Y” for yes.
 - 6.3.7.2. If there is observable damage, take the instrument out of service and send it to the radiation safety office for repairs.
- 6.3.8. Complete a battery check. (Section 6.1.2)
 - 6.3.8.1. The default is “Y” for yes.
 - 6.3.8.2. Replace batteries as necessary.
- 6.3.9. When applicable, perform a HV check and record the value. (Section 6.1.6)
 - 6.3.9.1. HV values should have little to no variation.
 - 6.3.9.2. For faulty HV checks, take the instrument out of service and send it to the radiation safety office for repairs.
 - 6.3.9.3. When not applicable, the default will be N/A.
- 6.3.10. If applicable, use the zero dial to zero the rate meter instrument.
 - 6.3.10.1. Ensure that this is done in a low background environment.
- 6.3.11. Collect ten consecutive counts by removing the instrument each time and repositioning it into the proper configuration in relationship with the source; then record the results on the Instrumentation Performance log on cells E4-E13. **Note:** the counts are to be performed in a reproducible geometric configuration.
- 6.3.12. The average of the ten numbers and a 20% acceptance interval is generated in the log sheet as outlined in the RSM, Section 16.1.



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6.3.13. Upon completion of a successful response check, the instrument will be ready for a daily check.

6.3.13.1. It is not necessary to complete every step of the daily check that has already been completed in the response check process. Complete the daily check by taking an eleventh measurement. Record the result and your initials in the Daily Check row.

6.4. Daily Check

6.4.1. On the Instrument Performance log, the proper information to complete the daily check is outlined. See Section 6.1.5 for definition.

6.4.2. Scroll down to the next available row and place today's date on the log sheet.

6.4.3. Check the Calibration End date to ensure the instrument is within calibration. The log sheet is tracking when calibration is due and will change from "YES" to "DUE" thirty days before it should be sent for calibration and "NO" when it is out of calibration.

6.4.3.1. **Note:** all instruments are calibrated every 12 ± 2 months in accordance with section 16.1 of the RSM. Calibration is flagged "NO" the first day of the month that calibration is due.

6.4.4. Perform a physical check of the instrument. (Section 6.1.3)

6.4.4.1. If there is observable damage, take the instrument out of service and send it to the radiation safety office for repairs.

6.4.5. Complete a battery check. (Section 6.1.2)

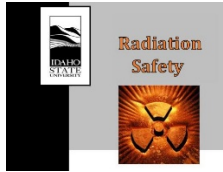
6.4.5.1. The default is "Y" for yes.

6.4.5.2. Replace batteries as necessary.

6.4.6. Perform a HV check and record the value. (Section 6.1.6)

6.4.6.1. HV values should have little to no variation.

6.4.6.2. For faulty HV checks, take the instrument out of service and send it to the radiation safety office for repairs.



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- 6.4.6.3. When not applicable, the default will be N/A.
- 6.4.7. If applicable, use the zero dial to zero the rate meter instrument.
- 6.4.7.1. Ensure that this is done in a low background environment.
- 6.4.8. Perform a count with the specified check source in the same geometric configuration as the response check.
- 6.4.9. Verify that the result of the count is within +/- 20% of the average value established from the response check. In the **Within Response** section a **YES** will appear if the value is within response.
- 6.4.9.1. If the value does not respond within expected values repeat the count and check again, making sure to double check all other steps of the daily check.
- 6.4.9.2. If the instrument continually does not respond properly, the instrument needs to be recalibrated and taken out of service. See RS-12_Instrumentation Calibrations Section 4.1 and Contact the Radiation Safety Department.
- 6.4.10. Enter your initials on the Instrumentation Performance Log.
- 6.4.11. Verify that all information is accurate.
- 6.4.12. When all information is completed, the dose rate or contamination instrument is ready to be used.
- 6.4.13. Properly store the source used for the daily check.

7. LIST OF FORMS

- Instrumentation Performance Log. (access through Google Sheets)