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# Calibration and Use of the Canberra iSolo 300G

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Shingleton

November 30, 2010

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**From:** [Sundsmo, Todd B.](#)  
**To:** [Lane, Gina E.;](#)  
**Subject:** FO-002 Change Request  
**Date:** Tuesday, March 16, 2010 1:41:33 PM  
**Attachments:** [11-16-05\\_HP-FO-002\\_Rev\\_1.0\\_iSolo\\_Procedure\\_pen\\_ink change 10-07.pdf](#)

---

Hi Gina,  
Here's the Fo-002 change request from Greg. I printed the changed pages and will copy for you.

Todd

\*\*\*\*\*

X-Mailer: QUALCOMM Windows Eudora Version 7.1.0.9  
Date: Wed, 26 Aug 2009 08:08:32 -0700  
To: Kathy Shingleton <shingleton2@llnl.gov>, Todd Sundsmo <sundsmo2@llnl.gov>  
From: Greg Jones <jones88@llnl.gov>  
Subject: Fwd: FO-002 (iSOLO) pen/ink changes attached  
Cc: Phil Worley <worley6@llnl.gov>

Here's a copy of the pen/ink markups made to HP-FO-002 (iSOLO use).  
Would politely suggest sending this version along to any off-site contractors who would be working on converting this to the new format.

At some point, we also need to add two sentences that says to count an iCAM filter using the 25mm geometry for 10 min count time.

Hope this helps, call if any questions.

=Greg

Date: Tue, 31 Mar 2009 13:05:28 -0700  
To: todd Sundsmo <sundsmo2@LLNL.GOV>  
From: Greg Jones <jones88@llnl.gov>  
Subject: Fwd: FO-002 (iSOLO) pen/ink changes attached

Todd,

Not sure if anyone is working on updating the iSOLO procedure. (HP-FO-002)  
It was last issued on 11/16/05. Subsequent to that I made the pen-ink change

noted below.

I seem to recall that you were removing calibrations from the 2929 procedure, but could not remember if the same was true for iSOLO.

In any event, we have passed the nominal "3-year" anniversary period where we normally update procedures.

Since this procedure pre-dates the HP-FO-100, I was not sure if I should use the "Procedure update Request Form" for this, or rely upon section 5.5 of the procedure that instructs me to send any updates to the author(s).

In the meantime, it may not hurt to put the SBK pen-ink change version attached to this email up on iDocman so that other groups using the iSOLO have the latest and greatest.

=Greg

Date: Thu, 11 Oct 2007 17:15:21 -0700

To: Kathy Shingleton <shingleton2@llnl.gov>

From: Greg Jones <jones88@llnl.gov>

Subject: FO-002 (iSOLO) pen/ink changes attached

Cc: todd Sundsmo <sundsmo2@LLNL.GOV>, Tim Smith <smith326@llnl.gov>, "Lynn M. Smith" <smith345@llnl.gov>, Quang Le <le22@llnl.gov>

Kathy,

You may recall that I proposed pen/ink changes to HP-FO-002 (Calibration and Use of the Canberra iSolo 200G) at the 9/5/07 weekly HP meeting.

The basic intent is to address the technical service bulletin from Canberra dealing with the algorithm's ability to subtract Radon correctly.

The company made two basic recommendations:

- Wait at least 20 min between removal of the sample filter and counting the filter.
- A minimum count time of 10 minutes is recommended for air sample filters.

I passed out proposed markups to the iSOLO procedure to all hp's for discussion. At the conclusion, you gave your verbal approval and asked me to proceed with the formal pen/ink change.

Attached you will find a PDF pen/ink version that will be used in NMTP facilities

beginning tomorrow (10/11/07).

Per section 5.5 of this procedure, I am providing you a written copy of the changes.

If you find the NMTP changes useful, you may consider rolling this out across LLNL. Please call if you have any questions.

=Greg

P.S. The same Vendor bulletin had recommendations for the iMATIC counter, but I agreed to let RML address any RML procedure changes.

---

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# Health Physics Field Operations Procedure

HP-FO-002

Revision 1.0

## Calibration and Use of the Canberra iSolo™ 300G

- New procedure
- Major change
- Minor change
- Editorial change
- No change

Prepared by:

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Concurred by:

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Concurred by:

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Approved for use by:

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Kathleen L. Shingleton, RSS Leader

Approval date:

11-16-05

Supersedes procedure: HP-FO-002, Rev 0/ Calibration and Use  
of the Canberra iSolo™ 300G/June 1,  
2005

Number/Name/Date

**Calibration and Use of the Canberra *iSolo* 300G**

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## Field Use and Calibration of the Canberra *iSolo* 300G

### 1.0 Purpose

This procedure provides instructions for the calibration and use of the Canberra *iSolo* Low Background Alpha/Beta Counting System (*iSolo*) that is used for counting air filters and swipe samples. This detector is capable of providing radioisotope identification (e.g., it can discriminate between radon daughters and plutonium).

### 2.0 Scope

This procedure includes step-by-step instructions for:

- Performing periodic or daily “Background” and “Efficiency QC” checks.
- Setting-up the *iSolo* for counting swipes and air filters.
- Counting swipes and air filters for alpha and beta activity.
- Annual calibration.

#### NOTES:

- (i) The *iSolo* users Manual provides additional information for such tasks as:
- Setting up the *iSolo*.
  - Setting up security levels.
  - Obtaining system information.
  - Setting up the printer.
  - Defining reports, sources, detector parameters, display menus, view menus, print menus, QC and Calibration parameters.
  - Updating *iSolo* Firmware.
- (ii) Text in this procedure that appears in quotes generally refers to *iSolo* buttons, menu options, or *iSolo* procedure references.

### 3.0 Procedure Preparations

#### 3.1 Safety Considerations

There are no unique safety considerations associated with the use of the *iSolo*. However, use of calibration sources and handling of contaminated swipes or air filters introduces potential low-level contamination hazards to the work area.



**3.1.1 Sealed Radioactive Sources**

Handle sealed radioactive sources with care, ensuring the surface of the source is not abraded or compromised. Avoid touching the active surface of the source (usually the side opposite the label).

STOP and notify the ES&H Team Health Physicist (HP) if a source is

- Lost.
- Suspected of leaking (e.g., if there is unexpected contamination in the area, if the source appears damaged, or the source has been exposed to forces or stresses that it was not designed to withstand).

**3.1.2 Potentially Contaminated Samples**

Wear gloves or use tweezers when handling swipe tabs or air filters that are suspected of being contaminated (including those used for surveys within an RMA).

- If a sample result exceeds the surface removable contamination values in Table 1 by a factor of 100 or more in an area where such contamination levels are not expected, immediately notify the HP and appropriate program staff so appropriate follow-up actions can be taken.
- If a sample result exceeds the surface removable contamination values listed in Table 1 in an area where contamination is not expected, notify the HP, who is responsible for initiating appropriate follow-up actions.

**Table 1: Surface Contamination values in dpm/100 cm<sup>2</sup> (See Table note):**

Radionuclide	Removable	Total (Fixed plus Removable)
U-nat, U-235, U-238, and associated decay products	1000 (alpha)	5000 (alpha)
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500 (100 for release to public)
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	1000	5000
Tritium and tritiated compounds	10,000	N/A

NOTE: This table is provided for the convenience of the user. If there is a conflict between this table and the *ES&H Manual*, the *ES&H Manual* values prevail. *ES&H Manual*, Document 20.2, Table D-1 contains further explanation of these values.

After counting contaminated swipes or air samples, monitor the counting area for contamination. If activity is found:

- Notify the HP.
- Decontaminate swipe counter areas with above-background levels of radioactivity

## 3.2 Prerequisites

### 3.2.1 Obtain a password

All actions on the *iSolo* are password protected to prevent inadvertent corruption of data, programming, and procedures. The RCL or the HP will provide users with passwords to allow them to perform actions specified by this procedure.

### 3.2.2 Training

Users must be trained on this procedure prior to performing independent measurements. Training may be accomplished by completing the Job Performance Measure (JPM), or by direct instruction of the HP.

## 3.3 Description of the Equipment

### 3.3.1 Power

The *iSolo* can run on internal batteries (nickel metal hydride) after fully charging for about 12 hours. Use external power for routine operations. The green LED indicates the unit is connected to an external power supply and the power switch is on.

If the unit is operated on its internal battery, the Battery LED and an icon shown in the display indicate the status of the battery. A green LED indicates the battery has sufficient charge to operate. A yellow LED indicates the batteries are near the end of their life and the unit will automatically shut down in 10 – 15 minutes. The LCD battery indicator shows the state of the charged battery.

See the *iSolo* user's manual for further information.

## 3.4 Required Materials

The following materials and equipment are required to carry out this procedure:

### 3.4.1 NIST traceable calibration sources

NIST traceable calibration sources in the activity range of 30k - 50k dpm shall be used for the annual calibration and the periodic background and efficiency QC checks. The calibration source diameter shall be matched to the sample size and type, as indicated below.

Source type	Active diameter	Sample type
Strontium/Yttrium-90	50 mm	Air filters
Strontium/Yttrium-90	25 mm	Swipe tabs
Americium-241	50 mm	Air filters
Americium-241	25 mm	Swipe tabs

### 3.4.2 Sample holders

Match sample holders to the sample media size. If the sample does not obviously fit the sample holder, contact the HP for guidance. Typical sample holder sizes include

1. 47 mm loose filter media (typically used for air filters).
2. 25 mm loose filter media (typically used for swipes).
3. Standard insert for any non-filter sample type up to 60mm diameter.

### 3.4.3 iSolo Log Book

Each *iSolo* counter shall have a log book that contains the following information:

1. Air Sample / Swipe Data Sheet (*iSolo* -1)
2. Daily (periodic) Background and Efficiency QC (*iSolo* -2)
3. Annual Calibration Report (*iSolo* -3)
4. Background, Efficiency, QC charts and other *iSolo* generated reports that support the data entered on the *iSolo* 1-3 forms listed above.

### 3.5 Required Personnel

One trained worker may carry out all the steps of this procedure. The HP (or designee) shall perform the setup and the calibration procedure. The calibration procedure shall be performed

- Annually (as defined in HP-DAP).
- After maintenance on the counter that could affect the calibration.
- After adjustment to the High Voltage.

## 4.0 iSolo Operations Procedure

The following instructions cover routine "Background", "Efficiency QC" and counting samples on the *iSolo*.

### 4.1 Turn on the iSolo

Turn the *iSolo* on by turning the switch on the right side of the *iSolo* to the "1" position. The Power LED glows when the instrument is powered. Immediately upon being turned on, the *iSolo* initializes and runs a diagnostic check on the major subsystems.

### 4.2 Gather Materials and Verify Calibration

Verify the *iSolo* has been calibrated within the past 12 months.

If the counter has not been calibrated within the previous 12 months, contact the HP (or his or her designee) and request the calibration be conducted. A counter that is outside the calibration period may not be used to count samples associated with regulatory or health and safety surveys.

**NOTE:** During urgent situations, the HP may authorize use of the swipe counter that is outside of its calibration period.

### 4.3 Perform “Background QC” Measurements

Following the steps below, perform a 10-minute background count

- Prior to conducting the efficiency check.
- Each day the counter is used, prior to counting samples.

**NOTE:** During urgent situations, the background count may be performed following the sample count.

Carry out the following steps to measure alpha (47 mm or 25 mm) and beta backgrounds (47 mm or 25 mm) as designated by the responsible HP. QC Geometry is determined by the HP during setup and calibration. Only one geometry is used for QC evaluation.

1. Press the “**Daily Bkg**” key in the upper left corner of the iSolo.
2. The display will prompt you to “Bkgblank Source XXmm”.

**NOTE:** Use a *new* swipe or air filter (as the background blank) each time background counts are conducted. Older ‘blanks’ can collect minute amounts of radon daughters and affect the quality of the results.

3. Insert the blank sample, close the sample slide and press the **Enter** key.
4. The iSolo will begin the background measurement.
5. When the background count is completed, compare the results displayed on the LCD screen with the following values.
 

Alpha:	0.5 cpm
Beta:	25.0 cpm
6. If the background count results are equal to or below these values, enter the background results on the next blank line of the form iSolo-2. Press **Enter** to accept the results. Then, open the sample slide and remove the background blank.

**NOTE:** If the background count results are above these values, obtain a new background sample blank from a sealed container and repeat steps 2-6. If the background fails acceptable levels for a second time, contact the HP for guidance.

### 4.4 Perform Alpha and Beta “Efficiency QC” Measurements:

A complete efficiency QC requires measuring an alpha source (Am241 50mmMxxxx or Am241 25mmMxxxx) and a beta source (Sr90 50mm Mxxxx or Sr90 25mm Mxxxx), where Mxxxx is the source ID. QC Geometry is determined by the HP during setup and calibration. Only one geometry is used for QC evaluation.

Follow this procedure once each day the counter is used, prior to counting samples.

**NOTE:** During urgent situations, the HP may authorize the efficiency measurements to be performed following the sample count.

To determine the Alpha and Beta efficiencies, perform the following steps:

1. Press the “**α-Eff.**” key in the upper left corner of the *iSolo*.
2. The display will prompt you to “Am-241 XX mm Mxxxx”.
3. Place the "Am-241 50 mm Mxxxx" on the *iSolo* Source holder slide. The source holder slide is a 60 mm slide designed especially for the *iSolo* sources.
4. Close the source slide and press the **Enter** key.
5. Press the **Enter** key to begin the efficiency QC measurement.
6. After the efficiency procedure is completed, enter the efficiency results on the appropriate line of the Form *iSolo* -2. Press **Enter** to accept the results.
7. Open the source slide and remove the source.
8. Repeat steps 1 - 10 (replacing “B Eff” and “Sr-90” for “a-Eff” and “Am-241”) for the beta efficiency measurement.
9. When the beta efficiency measurement is complete, press the **Enter** key to accept the results.
10. The screen will display "Insert Sample".
11. Ensure that all the sources meet the following Acceptable efficiencies:

Source	Source size (25 or 50 mm)
Am-241 (alpha)	± 20% of the annual calibration efficiency
Sr-90 (beta)	± 20% of the annual calibration efficiency

12. Contact the HP if the efficiency is outside the Acceptable range.

## 4.5 Count Samples

### 4.5.1 Procedure selection

1. Select the appropriate sample holder as indicated in the following table and insert it into the *iSolo* counting table.

Sample type	25 mm sample holder	47 mm sample holder
Swipes	X	
Portable remote head CAMs*	X	
Air samples and CAMs (other than portable remote head CAMs)		X

Note: Portable remote head CAMs have a 25 mm sampling area even though the filter is 47 mm in diameter.

2. Select the appropriate count time as indicated in the following table, unless otherwise instructed by the HP.

Sample type	2 minute count	10 minute count	60 minute count
Area swipe surveys Equipment release surveys	X		
First and second count of a CAM or PAS filter	X		
Third count of a CAM or PAS filter (if positive alpha activity detected on first two counts)		X	
As requested by ES&H Team HP			X

NOTE: There are several preset procedures for counting swipes and air filters. In general, the detection capabilities of the instrument are sufficient for using the 2-minute counting time for most swipes and air samples. Since the *iSolo* uses an algorithm to determine radon and non-radon contribution to the sample activity, a longer count may be necessary in some instances. This allows the instrument to collect more data. The decisions on counting time are dependent upon counting needs. For most applications a 2-minute count is appropriate. The 10 or 60 minute counting procedure differ only in counting time and may be requested by the HP or be required depending on the sample results in order to get a better result.

3. Place the sample to be analyzed in the *iSolo* sample holder and close the slide.
4. Press **Sel Procedure** to list the procedures available for sample analysis and place the cursor ">" beside the procedure to be used for this batch of samples. The *iSolo* should be programmed with the following preset 'procedures'; the procedure name refers to the geometry and count time.
- 47mm 2 min
  - 25mm 2 min
  - 47mm 10 min
  - 25mm 10 min
  - 47mm 60 min
  - 25mm 60 min

**Guidance for AIR FILTERS ONLY**

To determine if there is alpha activity (excluding Radon and Thoron daughters) on an air filter soon after it has been removed from the air flow, count the filter for 2 minutes to determine the gross level of activity. Recount it for 10 minutes to more accurately determine the activity.

**CAUTION:** The background subtract algorithm does not always give a result of 'zero' dpm if there is no activity on the filter.

The algorithm was tested by sampling with two filters overnight in a clean room and reading the filters in the morning. The test was repeated 5 times. Results are shown below. Note that the 2 minute count results varied from -120 to +10 dpm. Therefore, given the algorithm will subtract 120 dpm as background, it would be possible to have 120 dpm of Pu on the filter and have the result indicate '0 dpm'. Longer count times lessen the likelihood of missing 'real' activity.

Length of count following a 1 to 3 day sampling interval	Bkgd results for 'clean' air (dpm)
2 min	-120 to +10
10 min	-50 to +40
30 min	-15 to +5
60 min	-1 to +10

**NOTE:** 5 dpm represents 0.6 DAC-hr of Class W Pu239 and 0.2 DAC-hr of Class Y Pu239 (assuming air flow sampling rate of 30 lpm).

5. Press **Enter** to select the procedure and press **Count** to start the analysis of the sample.
6. The green LED **Count** key will blink when the sample is finished counting.
7. Enter the results in the next line of Form *iSolo* -1.
8. If there are more samples to be counted using the selected 'procedure', open the sample holder, place the next sample in the sample holder, close the slide, and press **Count** again.
9. Enter the results in the next line of Form *iSolo* -1.
10. If there are no more samples to be counted using the selected 'procedure', press **Group Done** to terminate the Group.
11. Pressing the **Cancel** key after a count has completed will initiate a "Delete Group Data? 1 No, 2 Yes" screen. Select 'No' to save the count data or 'Yes' to delete the count data.
12. When all of the samples in a group (i.e., samples to be counted with the same 'procedure') have been counted, press the **Group Done** key to declare this group of samples complete. A screen appears asking the user to confirm, Declare Group Done, 1 No, 2 Yes.
13. If another sample needs to be counted as part of this same group, place the cursor ">" by 1 No and press the **Enter** key. Place another sample in the sample holder and count it as part of this original group. At the end group, print the most recent group results and file results in Swipe Log. Refer to Section 4.4.4 for instructions for printing reports.

#### 4.5.2 Recounts (Air Filters Only)

1. If an air filter is positive after the first 10 minute count (i.e., if positive radon-compensated alpha activity is identified), recount it using the 10 minute procedure.
2. If an air filter is positive after the second count, *contact the HP*. If the HP is unavailable, contact the appropriate facility personnel.
3. If any air sample has positive radon-compensated alpha activity, submit it to the RML (via STAR) for confirmatory measurement.

#### 4.5.3 Sample priority

Unless otherwise instructed by the HP, complete all 2-minute counts before beginning 10-minute counts.

#### 4.5.4 Printing reports

Ensure that the *iSolo* has been connected to an appropriate printer.

The front panel Print key provides access to a print menu where all print functions of the *iSolo*<sup>™</sup> are available. In many cases a report will automatically be printed when a procedure is run. If an additional report must be printed without recounting samples, and the sample data is still stored in the *iSolo*, the report can be selected and printed from this menu.

The *iSolo* has, battery backed-up storage for 300 samples. To prevent data from being inadvertently over-written, after 300 sets of sample data are stored the system will halt operation and display an "Insufficient Memory" error message.

##### PRINT MENU

> 1 Most Recent Grp

2 All Grps

3 Select Grp/Rpt

4 System Reports

5 Output Setup

##### **Print Most Recent Group**

The most recent group of samples counted will be printed using the report template selected in the counting procedure used to count this group of samples.

1. Press the **Print** key.
2. Move the ">" cursor to "1 Most Recent Grp" and press **Enter**.
3. See Section 5.7 for record keeping requirements.



#### 4.6 Disposition/disposal of Excess Materials:

Dispose of any used air filters or swipe tabs appropriately.

## 5.0 Non-routine Procedure Instructions

### 5.1 Calibrate the iSolo

A complete system calibration includes:

- Entering calibration source information.
- Selecting the output mode.
- Defining or modifying the calibration procedure.
- Measuring the alpha and beta backgrounds for each calibration procedure.
- Measuring the alpha and beta efficiencies for each calibration procedure.

#### 5.1.1 Enter calibration source information

The *iSolo* comes with sources specifically made to calibrate the *iSolo*. Each calibration source is 60 mm in diameter and has active diameters and activities as chosen by the user. The RCL or HP is responsible for entering the source calibration information.

To enter calibration source information carry out the following steps.

1. Press the **Setup** key.
2. Using the arrow keys, position the cursor ">" to item "7" in the menu, 'Define Std Sources', and press the **Enter** key.
3. Using the arrow keys, position the cursor ">" to select the desired standard source to edit, and press the **Enter** key.
4. Using the arrow keys position the cursor ">" to select the desired standard source template and press the **Enter** key. If the standard has been previously defined, pressing the Enter key will prompt the user with the selected source type (alpha, beta, background blank). Pre-defined standards will default to the appropriate type of emitter.
5. To modify the radionuclide name, use the up/down arrow keys to select characters, and the right/left arrow keys to select the character position (e.g., Sr90 50mmMXXXX) (Isotope, Geometry, ID of source with maximum 15 characters). Press the **Enter** key to accept and advance to the next question.
6. Using the numeric keypad, enter the radionuclide half-life in days using scientific notation as needed. Press the **Enter** key to accept and advance to the next question.
7. Using the arrow keys enter the month, day, year, hour, minutes, and seconds. Press the **Enter** key to accept and advance to the next question.
8. Using the numeric keypad, enter the radionuclide calibration activity in units of DPM. Press the **Enter** key to accept and advance to the next question.

NOTE: If the dpm value is not given on the calibration certificate, it can be calculated by multiplying the alpha or beta surface emission rate (counts s<sup>-1</sup> in 2 π steradian) (found on the source certificate) by 60 to convert to counts/min, and then multiply by 2 for alpha and by 1.6 for Sr90 (for 4π geometry activity).

9. Enter the 1-sigma activity uncertainty value. Press the **Enter** key to accept and advance to the next question.
10. Enter the active area of the calibration source (50mm). Press the **Enter** key.
11. Repeat steps 1 – 10 for each calibration source certificate. Press the **Cancel** key to return to the Setup menu.

### 5.1.2 Select Output Mode

Use the users manual to select the appropriate output mode and to perform the printer setup and ensure the settings are compatible with the printer used.

### 5.1.3 Define or Modify the Calibration Procedure

The HP is responsible to define or modify the *iSolo* calibration procedure. Upon completion of this step there should be a calibration procedure defined for:

- Air filters 47 mm
- Swipes 25 mm

To define or modify calibration procedures, follow the steps below.

1. Press the **Setup** key.
2. Using the arrow keys, position the cursor ">" to item "9" in the menu, 'Define Std Sources', and press the **Enter** key.
3. Two selections are provided; 'Define Calibration' and 'Execute Calibration'. Select 'Define Calibration' and press the **Enter** key.
4. Move the ">" cursor to the calibration procedure to be edited and press **Enter** or, name the calibration if it is a new calibration procedure (e.g., Air Filters 47 mm).
5. Move the ">" cursor to the calibration parameter you want to change and press the **Enter** key.
6. Number 1, 'Edit Cal Name': (e.g., Air Filters 47 mm).
7. Number 2, 'Bkg Cal Parameters':
  1. Count Time (10 minutes)
  2. Sample Repeat (10)
  3. 'Select Reference Src' (e.g., Bkg Blank 47 mm)
8. Number 3, 'Alpha Eff Cal Parameters':
  1. Count Time (2 minutes)
  2. Sample Repeat (10)
  3. Select Reference Src (e.g., Am241 50mmMP143)
9. Number 4 Beta Eff Cal Parameters:

1. Count Time (2 minutes)
2. Sample Repeat (10)
3. Select Reference Scr (e.g., Sr90 50mmMP155).

10. Repeat steps 1-9 for the "Swipe 25mm" calibration procedure.

#### 5.1.4 Perform *iSolo* Annual Calibration

The *iSolo* annual calibration process consists of conducting alpha and beta background and efficiency measurements for two calibration programs titled "Air Filters 47mm" and "Swipes 25 mm". If these programs are not present in the "select calibration" screen, then follow the steps in section 5.1.3. to define calibrations.

Calibrate the *iSolo* following the steps below.

1. To ensure there is sufficient *iSolo* memory, press the **Setup** key, using the arrow keys, position the cursor ">" to item "1" in the menu, "Delete Data", and press the enter key. Using the arrow keys, position the cursor ">" to item "2" in the menu, "Yes Delete".
2. Press the **Setup** key.
3. Using the arrow keys, position the cursor ">" to item "9" in the menu, "Calibrations", and press the **Enter** key.
4. Using the arrow keys, position the cursor ">" to item "2" in the menu, "Execute Calibration", and press the **Enter** key.

NOTE: Once starting this procedure it must be performed to completion to include background, alpha efficiency and beta efficiency measurements.

5. Using the arrow keys, select the appropriate calibration procedure (Start with #1 "Air Filters 47 mm" for the first round and then #2 "Swipes 25 mm" for the second round), and press the **Enter** key.
6. Using the arrow keys position the cursor ">" to item "1" in the menu, "Background", and press the **Enter** key.
7. Place the appropriate background blank on the *iSolo* sample slide.

NOTE: Use a *new* swipe or air filter (as the background blank) each time background counts are conducted. Older 'blanks' can collect minute amounts of radon daughters and affect the quality of the results.

8. Close the sample slide and press the **Enter** key.
9. Press the **Count** key to begin the background measurement.
10. When the background count is completed, compare the results on the LCD screen with the following values.

Alpha: 0.5 cpm  
Beta: 25.0 cpm

11. If the background count results are equal to or below these values, enter the results in the appropriate space of the form *iSolo-3*, then press **Enter** to accept the results. Open the sample slide and remove the background blank. The Execute Calibration screen reappears.

If the background count results are above these values, obtain a new background sample blank from a sealed container and repeat steps 2-6. If the background fails acceptable levels for a second time, contact the ES&H Team HP for more guidance

12. Using the arrow keys position the cursor ">" to item "2" in the menu, "alpha Efficiency", and press the **Enter** key.
13. Place the source you are prompted to enter (e.g., "Am241 50mmMXXXX" for the first round and Am241 25mmMXXXX for the second round) on the *iSolo* sample slide.
14. Close the sample slide and press the **Enter** key.
15. Press the **Count** key to begin the alpha efficiency measurement.
16. When the alpha efficiency count is completed, compare the efficiency displayed on the LCD screen with the following values.

Source	Source size (25 mm)	Source size (50 mm)
Am-241 (alpha)	>30% and <45%	>30% and <45%

17. If the alpha efficiency results are equal to or above these values, enter the results in the appropriate space of the form *iSolo -3*, press **Enter** to accept the results. Then, open the sample slide and remove the source. The Execute Calibration screen reappears.

If the efficiency results are below these values re-do or recheck the execution of the calibration procedures. If the source of the problem is not identified and rectified, contact the HP for guidance.

18. Using the arrow keys position the cursor ">" to item "3" in the menu, "Beta Efficiency", and press the **Enter** key.
19. Place the source you are prompted to enter ("Sr90 50mmMXXXX" for first round and "Sr-90 25mmMXXXX" for second round) on the *iSolo* sample slide.
20. Close the sample slide and press the **Enter** key.
21. Press the **Count** key to begin the beta efficiency measurement.
22. When the beta efficiency count is completed, compare the efficiency displayed on the LCD screen with the following values.

Source	Source size (25 mm)	Source size (50 mm)
Sr-90 (beta)	>22% and <45%	>22% and <45%

23. If the beta efficiency results are equal to or above these values, enter the results in the appropriate space of the form *iSolo-3*, press **Enter** to accept the results. Then, open the sample slide and remove the source. The Execute Calibration screen reappears.

If the efficiency results are below these values, re-check to ensure the calibration procedure was carried out as defined. If problems persist, contact the RCL SME for guidance.

24. Repeat steps 1 – 22 for the second round of calibration procedure (e.g., “Swipe 25 mm).
25. Ensure that form iSolo-3 is complete. Print it and place it (with the iSolo reports attached) in the iSolo log.
26. Print the Calibration sticker, initial it and tape it to the iSolo.
27. Obtain a Measurement and Test Equipment (M&TE) label from the RCL and affix it to the iSolo.

### 5.3 Master Clear

Initiate a master clear by turning the power off and then turning the power back on while holding the **Cancel** button down.

**NOTE:** A master clear cycle shall *only* be performed under the guidance of Canberra service or technical support personnel. Only the cognizant HP or RCL personnel are authorized to use the Master Clear function.

**WARNING:** A master clear cycle will completely reset the iSolo to its initial state.

- All system setup information, calibration parameters, counting procedures, sample data, etc. will be cleared *except* the PIPS detector operating bias, threshold and gain.
- If an optional guard detector is installed, the bias and threshold settings for this detector will also be retained.

### 5.4 Response to Off-Normal Events

There are no *off-normal events* anticipated for this procedure. See Section 3.1 for general safety considerations.

**NOTE:** Contamination levels greater than 10 times the Appendix D ‘Total’ values could result in an off-normal event as required by DOE Order 231.1A.

When detector or work area is suspected of being contaminated, follow the steps in 3.1.2, “Suspect Contaminated Samples”.

### 5.5 On-the-spot Change Process

If an on-the-spot change is needed to this procedure, the individual carrying out this procedure should contact the HP for guidance. The HP (or any of the individuals who concurred with or approved the procedure (or their successors/backups) may authorize on-the-spot changes.

Procedure changes that are to be permanent shall be done with ‘pen and ink’ and initialed and dated on the working copy of the procedure. The HP shall submit the change in writing to the RSS Leader who shall approve (or disapprove) the change. As a general guide, submit this change to the RSS leader within two weeks of the on-the-spot change.

### 5.6 Component or System Shutdown

The iSolo has an 8-hour battery backup system. In the event of a power outage the instrument may be operated on this backup power. When not in use the instrument may be shut off with the on/off switch located on the lower right hand side of the instrument. The “power on” switch turns the instrument on.

**CAUTION:** Do **not** press the Cancel button for any reason during the power up phase. This will reset the instrument to the factory setting and cause all of the calibration information and programming to be cleared

**5.7 Record Keeping**

1. Sample data is stored in battery-backed memory in the *iSolo*. Data from 300 samples can be stored in this memory at one time. In order to prevent sample data from being inadvertently overwritten, once 300 sets of sample data are stored the *iSolo* will halt operation and display an "Insufficient Memory" error message. The memory must be cleared before another sample can be counted.
2. All reports generated by the *iSolo* must be printed and filed in the swipe log until archived
3. Records of Calibration should be filed in the swipe log until archived.

**6.0 Responsibilities**

Responsibilities that are unique to this procedure are listed below.

**6.1 ES&H Team HP**

1. Set up the *iSolo* for calibration and use.
2. Conduct the annual calibration of the *iSolo*.
3. Periodically review records generated by these procedures.

**6.2 *iSolo* users**

1. Carry out this procedure as written.
2. Notifying the HP if there are difficulties with this procedure or with recommendations for improvement.

**7.0 Definitions**

The following terms and acronyms are unique to this document and supplement the definitions in the ES&H Manual glossary. (Provide words/acronyms in alphabetical order.)

Term	Definition
Air Sample filters	Filter paper samples of air that is monitored to determine the airborne radioactivity in the work environment.
Alpha Activity	Total alpha activity including alpha emitting radon or thoron progeny and any other alpha emitters with energy between 2.2.and 9.6 MeV.
Alpha Beta Ratio	The ratio of alpha to beta activity. A unitless ratio.
Background count	A determination of the average background counts that will be measured when no sample activity is

Term	Definition
	expected. This background count will be deducted from the sample count.
Batch	A group of samples that are counted with the same 'procedure' (i.e., the same counting parameters).
Beta Activity	Total beta activity including beta emitting radon or thoron progeny and any other alpha emitters with energy between 125 keV and 2.26 MeV.
Bq.	Becquerel is equivalent to one disintegration per second
Calibration Source	A NIST traceable radioactive source used to determine the efficiency of a radioactive counting instrument.
Calibration	A systematic evaluation of an instrument using known standards. In this case it involves the use of NIST traceable sources.
CAM	Continuous Air Monitor
Check Source	A Source used to determine the operability of an instrument and to evaluate its performance in the interim period between annual calibrations.
Curie	Equivalent to 3.7 E10 disintegrations/sec or 3.7E 10 Bq.
DPM	Disintegration per minute
Efficiency	The number of counts per emission from the source being count. Counts per emission. (Some define this as Counts per decay.)
Group Done	A button on the face of the iSolo that must be pushed when a sample or group of samples have completed counting.
H&ST	Health and Safety Technician
HP	Health Physicist
iSolo	Trademark name for a Canberra low background alpha beta counter with the ability to selectively determine radon/thoron activity on samples and compensate for that activity
LCD Display	Liquid Crystal display.
NIST Traceable Source	A radioactive source that has been counted and activity determined in relation to a source calibration by NIST. Generally these are secondary calibrations that are traceable to a standard source at the NIST
PAS	Passive Air Sampler
Radon compensated alpha activity	Activity determination by the iSolo of alpha radioactivity determined by iSolo's algorithm that the activity does not originate from naturally occurring progeny of radon or thoron, generally known as radon daughters
Radon	A naturally occurring radioactive gas that decays into various progeny.
RH CAM	Remote Head Continuous Air Monitor
RML	Radiation Measurements Laboratory.
Sample Drawer	Drawer where samples are placed for counting.
Swipe Tabs	25mm filter papers used to wipe items or areas to determine dispersible radioactivity. Usually wiped over a 100 cm <sup>2</sup> area.

Term	Definition
Thoron	A naturally occurring radioactive gas that decays into various progeny.

## 8.0 References

1. iSolo™ Alpha/Beta Counting System User's Manual

## 9.0 Attachments

This procedure contains the following attachments:

Attachment A Excel workbook, including,

- iSolo Annual Calibration Data Sheet (iSolo-3)
- iSolo Background and Efficiency QC (Form iSolo-2)
- iSolo Data Sheet (Form iSolo-1)
- The iSolo calibration sticker.