

NIST Scoping Study	Scoping Report: 144265-RPT-001, NIST Scoping Study Report	
	Revision: A	Appendix
<div>Appendix A</div> <div>Scoping Survey Calibration Sheets</div>		



Safety and Ecology Corporation SEC PROCEDURE # ICAL # 67 Rev 0
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Calibration Certificate

Calibration Certificate for MICRO REM, Serial # E050A, Bar Code # ,Property # SEC-5378

Date: 04/26/22

Date Last Cal. Expires: 12/10/20

Technician: Jacob Galyon

Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL MP-2	SERIAL #: 314	CAL DUE: 01/11/23
MODEL 87 V	SERIAL #: 18740384	CAL DUE: 03/01/23
MODEL	SERIAL #:	CAL DUE:

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	ASSAY DATE
	0300-GY	Cs-137	202.897 Ci	2/14/2022
	KR-4097	Cs-137	65.94 mCi	2/14/2022

AS FOUND DATA

Physical Cond SAT Geotropism: SAT Bat. Check SAT Speaker Check N/A

As Found

As Left

High Voltage

High Voltage Indicated in OK Band

OK

OK

+5 Volt Power Supply (4.5 to 5.5V)

5.086

5.086

-5 Volt Power Supply (-3.74 to -5.06 V)

-4.27

-4.27

CALIBRATION DATA

Scale	HV AL		Instrument Reading		Percent Error	
	Exposure Rate		As Found	As Left	As Found	As Left
0.1	5	(Pulsed = TO)	5.25	5.25	5.00	5.00
	10	(Pulsed = TO)	10	10	0.00	0.00
	15	(Pulsed = TO)	16	16	6.67	6.67
1	50	(.05)	52.5	52.5	5.00	5.00
	100	(.1)	100	100	0.00	0.00
	150	(.15)	160	160	6.67	6.67
10	500	(0.5)	500	500	0.00	0.00
	1000	(1.0)	950	1000	-5.00	0.00
	1500	(1.5)	1500	1550	0.00	3.33
100	5000	(5)	4500	5000	-10.00	0.00
	10000	(10)	9250	10000	-7.50	0.00
	15000	(15)	14000	15000	-6.67	0.00
1000	50000	(50)	47500	47500	-5.00	-5.00
	100000	(100)	100000	100000	0.00	0.00
	150000	(150)	147500	147500	-1.67	-1.67

Precision

Scale	Exposure Rate	As Found	Mean Value	% Dev
X1000	100000 (100)	100000.00		0.00
		100000.00	100000.00	0.00
		100000.00		0.00

Comments:

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached? Next Calibration Due Date: 04/26/23

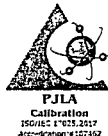
Performed by: Jacob Galyon

Reviewed by: [Signature] Issue Date: 4/26/22

Printed Name: Jacob Galyon



All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013
The results in this report relate only to the item calibrated or tested.



Safety and Ecology Corporation SEC PROCEDURE # SEC-IS-407 Rev 3
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Calibration Certificate

Calibration Certificate for 44-9, Serial # PR150385, Bar Code # ,Property # SEC-5121

Date: 09/28/22 Date Last Cal. Expires: 10/19/22 Technician: Jake Alcorn Reason For Calibration: Due for Calibration

Temp: RelHum: BP: CableLength 5 Ft

NIST EQUIPMENT USED DURING CALIBRATION

MODEL: 12 SERIAL #: 229284 CAL DUE: 09/28/23
MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2 π	ASSAY DATE
5746-06	Tc-99	31899 dpm	19,999 cpm	1/31/2022
5744-06	Sr-90	14539 dpm	10,202 cpm	1/31/2022

Geometry = in contact with surface unless otherwise specified.

PREVIOUS Tc-99 EFFICIENCY: 13.66% Calibration Voltage: 900 V Calibration Threshold: 35 mV

AS FOUND Instrument Condition: SAT

AS LEFT Instrument Condition: SAT

AS FOUND DATA

1 MINUTE COUNTS (CPM)

AF Background: 26
Tc-99 Count: 4212 4134 4124 AVERAGE 4156.7
Sr-90 Count: 3294

4 π Efficiencies

Tc-99 EFF: 12.95% Sr-90 EFF: 22.48%

AS LEFT DATA

1 MINUTE COUNTS (CPM)

AL Background: 26
Tc-99 Count: 4212 4134 4124 AVERAGE 4156.7
Sr-90 Count: 3294

4 π Efficiencies

Tc-99 EFF: 12.95% Sr-90 EFF: 22.48%

"AF" in the AL Efficiency fields means to refer to the AF Efficiencies in the AS FOUND DATA Section

- ☒ Is the AS FOUND efficiency within 20% of efficiency from last calibration?
- ☒ Reproducibility: Are the individual counts within 10% of the average?
- ☒ Does the probe meet final acceptance criteria?
- ☒ Calibration sticker attached?

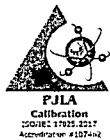
Comments: Married as a set with: Model: 12 Serial #: 229284 Bar Code #:

Date Instrument is Due For Next Calibration: 09/28/23

Performed by: Jake Alcorn Reviewed by: JM/7/25 Issue Date: 10.22.22
Printed Name: Jake Alcorn

All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013
The results in this report relate only to the item calibrated or tested.





Safety and Ecology Corporation SEC PROCEDURE # SEC-IS-404 Rev 3
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Calibration Certificate

Calibration Certificate for 12, Serial # 229284, Bar Code #, Property # SEC-6278

Date: 09/28/22 Date Last Cal. Expires: 10/19/22 Technician: Jake Alcorn Reason For Calibration: Due for Calibration

Temp: RelHum: BP:

NIST EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 190580 CAL DUE: 06/08/23
MODEL: SERIAL #: CAL DUE:

AS FOUND DATA Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

HIGH VOLTAGE

AS FOUND HV

AS LEFT HV

☐ New Batteries? Battery Check: SAT

Alarm: N/A

(+/- 10% tolerance)

500 V: 515 515
1000 V: 990 1000
1500 V: 1475 1480

AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0
AS FOUND THRESHOLD: 33.5mV AS LEFT THRESHOLD: 35mV
AS FOUND HV Reading: 900V AS LEFT HV Reading: 900V

HV Range 400-1500V: SAT

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	100	0.00%
	250	255	2.00%	250	0.00%
	400	405	1.25%	400	0.00%
x1 or x10	1000	1000	0.00%	1000	0.00%
	2500	2550	2.00%	2500	0.00%
	4000	4005	0.12%	4000	0.00%
x10 or x100	10K	10	0.00%	10	0.00%
	25K	25.5	2.00%	25	0.00%
	40K	40.5	1.25%	40	0.00%
x100 or x1000	100K	105	5.00%	100	0.00%
	250K	255	2.00%	250	0.00%
	400K	410	2.50%	400	0.00%

☒ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250: 251 % ERR: 0.40% AL 250: AF % ERR: 0.40%
AF 2500: 2510 % ERR: 0.40% AL 2500: AF % ERR: 0.40%
AF 25K: 25.1 K % ERR: 0.40% AL 25K: AF K % ERR: 0.40%
AF 100K: 100.4 K % ERR: 0.40% AL 100K: AF K % ERR: 0.40%

☒ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale: 250 250 250
x1 or x10 Scale: 2500 2500 2500
x10 or x100 Scale: 25 K 25 K 25 K
x100 or x1000 Scale: 250 K 250 K 250 K

☒ Are the Individual Counts Within 10% of the Average?

☒ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT

Audio Divide: N/A

Push Buttons: SAT

Lamp: N/A

Scaler/Digital: SAT

Comments: Married as a set with: Model: 44-9 Serial #: PR150385 Bar Code #:

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration:

09/28/23

Performed by: Jake Alcorn

Reviewed by: [Signature]

Issue Date: 10.22.22

Printed Name: Jake Alcorn



All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013
The results in this report relate only to the item calibrated or tested.



Safety and Ecology Corporation SEC PROCEDURE # SEC-IS-417 Rev 5
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Calibration Certificate

Calibration Certificate for 43-37, Serial # PR042477, Bar Code # ,Property # SEC-5027

Date: 10/17/22 Date Last Cal. Expires: 05/05/23 Technician: Jeffrey Knight Reason For Calibration: Due for Calibration

Temp: 74 F RelHum: 30 % BP: 28.96 inHG CableLength:

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 287589 CAL DUE 10/17/23

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
Efficiencies from last calibration					
Pu: 12.10 %	5747-06	Pu-239	25793 dpm	13,097 cpm	1/31/2022
Tc: 17.54 %	5746-06	Tc-99	31899 dpm	19,999 cpm	1/31/2022
Th: 7.44 %	5748-06	Th-230	34897 dpm	17,699 cpm	1/31/2022
SrY: 28.65 %	5744-06	Sr-90	14539 dpm	10,202 cpm	1/31/2022

AS FOUND DATA AS FOUND Instrument Condition: SAT
Calibration Setpoints
HV: 1750 V

Threshold Beta:	4	-	40	mV Alpha:	120 mV
Back ground:	Alpha	Beta	AF 4 π Efficiencies	A-B XTLK	
Pu-239:	4	CPM	669	CPM	16.57%
Tc-99:	4278	CPM	1112	CPM	19.58%
Th-230:	28	CPM	6916	CPM	
SrY-90:	N/A	CPM	N/A	CPM	

☐ Is the As Found Data within 20% of the efficiency from the last cal.?

AS LEFT DATA AS LEFT Instrument Condition: SAT
AS LEFT DATA after repair, HV adjust or Plateau

Back ground:	Alpha	Beta	AL 4 π Efficiencies	A-B XTLK	
Pu-239:	2	CPM	533	CPM	15.05%
Tc-99:	3883	CPM	757	CPM	21.88%
Th-230:	13	CPM	7511	CPM	12.66%
SrY-90:	4419	CPM	N/A	CPM	28.39%

"AF" in the AL Efficiency fields means to refer to the AF Efficiencies in the AS FOUND DATA Section

Reproducibility: Isotope: Tc-99 7468 7383 7330 Average: 7393.7 ☒ Are the individual counts within 10% of the average?

If the As Found data (even after repair) is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the Plateau Data and go directly to Comments. Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

	Source 1: Sr-90			Source 2: Pu-239			Background (CPM)		Net A to B
High Voltage	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	Xtalk: <10%
1700	9	4537	27.42%	3987	741	15.44%	5	550	4.80%
1720	9	4716	28.58%	3969	882	15.36%	7	561	8.10%
1730	11	4967	30.17%	4194	2873	16.26%	0	580	54.67%

2 Pi Efficiencies: Pu-239 29.63% Tc-99 34.89% Th-230 24.96% SrY-90 40.46%

Comments: Married as a set with: Model: 2360 Serial #: 287589 Bar Code #:
Calibrated with Teflon spacers installed. New plateau to determine HV setting.

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 10/17/23

All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013

Performed by: Jeffrey Knight
Printed Name: Jeffrey Knight

Reviewed by: [Signature] Issue Date: 10/19/22



Safety and Ecology Corporation
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Oak Ridge, TN 37830
Calibration Certificate

SEC PROCEDURE # SEC-IS-418 Rev 3

Calibration Certificate for 2360, Serial # 287589, Bar Code # ,Property # SEC-7426

Date: 10/17/22 Date Last Cal. Expires: 05/05/23 Technician: Jeffrey Knight Reason For Calibration: Due for Calibration

NIST EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 153622 CAL DUE: 11/16/22
MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

☒ New Batteries? Battery Check: SAT AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

HIGH VOLTAGE

AS FOUND HV

AS LEFT HV

WINDOW SETTINGS

AS FOUND

AS LEFT

(+/- 10% tolerance)

500 V: 500 V

513 V

BT (4 mV +/- .4 mV):

4 mV

AF mV

1000 V: 980 V

1000 V

BW (40 mV +/- 4 mV):

41 mV

40 mV

1500 V: 1458 V

1492 V

AT (120 mV +/- 10 mV):

120 mV

AF mV

AF HV Setting: 1750 V

AL HV Setting: 1700 V

RATE METER

DIGITAL SCALER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

AF 250: 249 % ERR: 0.40% AL 250: AF % ERR: 0.40%
AF 2500: 2494 % ERR: 0.24% AL 2500: AF % ERR: 0.24%
AF 25K: 24.94 K % ERR: 0.24% AL 25K: AF K % ERR: 0.24%
AF 250K: 249.4 K % ERR: 0.24% AL 250K: AF K % ERR: 0.24%

☒ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale: 250 250 250
x1 or x10 Scale: 2500 2500 2500
x10 or x100 Scale: 25 K 25 K 25 K
x100 or x1000 Scale: 250 K 250 K 250 K

☒ Are the Individual Counts Within 10% of the Average?

☒ Is the As Found Data Within 20% of the Set Point?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-37 Serial #: PR042477 Bar Code #:

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 10/17/23

Performed by:

Reviewed by:

Issue Date: 10/19/22

Printed Name: Jeffrey Knight



All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013

The results in this report relate only to the item calibrated or tested.



Safety and Ecology Corporation
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Oak Ridge, TN 37830
Calibration Certificate

SEC PROCEDURE # SEC-IS-418 Rev 3

Calibration Certificate for 2360, Serial # 227394, Bar Code # ,Property # SEC-6283

Date: 10/20/22 Date Last Cal. Expires: 06/21/23 Technician: Jeffrey Knight Reason For Calibration: Other (See Comments)

NIST EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 153622 CAL DUE: 11/16/22
MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT

AS FOUND Instrument Condition: SAT

AS LEFT Instrument Condition: SAT

☒ New Batteries?

Battery Check: SAT

AS FOUND Mechanical Zero: 0

AS LEFT Mechanical Zero: 0

HIGH VOLTAGE

AS FOUND HV

AS LEFT HV

WINDOW SETTINGS

AS FOUND

AS LEFT

(+/- 10% tolerance)

500 V: 509 V

AF V

BT (4 mV +/- .4 mV):

3.4 mV

4 mV

1000 V: 995 V

AF V

BW (40 mV +/- 4 mV):

40 mV

AF mV

1500 V: 1488 V

AF V

AT (120 mV +/- 10 mV):

120 mV

AF mV

AF HV Setting: 1800 V

AL HV Setting: 1800 V

RATE METER

DIGITAL SCALER

SCALE RATE CPM AS FOUND % ERROR AS LEFT % ERROR

x.1 or 100 100 0.00% AF 0.00%

x1 250 250 0.00% AF 0.00%

400 400 0.00% AF 0.00%

x1 or 1000 1000 0.00% AF 0.00%

x10 2500 2500 0.00% AF 0.00%

4000 4000 0.00% AF 0.00%

x10 or 10K 10 0.00% AF 0.00%

x100 25K 25 0.00% AF 0.00%

40K 40 0.00% AF 0.00%

x100 or 100K 100 0.00% AF 0.00%

x1000 250K 250 0.00% AF 0.00%

400K 400 0.00% AF 0.00%

AF 250: 249 % ERR: 0.40% AL 250: AF % ERR: 0.40%

AF 2500: 2494 % ERR: 0.24% AL 2500: AF % ERR: 0.24%

AF 25K: 24.95 K % ERR: 0.20% AL 25K: AF K % ERR: 0.20%

AF 250K: 249.9 K % ERR: 0.04% AL 250K: AF K % ERR: 0.04%

☒ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale: 250 250 250

x1 or x10 Scale: 2500 2500 2500

x10 or x100 Scale: 25 K 25 K 25 K

x100 or x1000 Scale: 250 K 250 K 250 K

☒ Are the Individual Counts Within 10% of the Average?

☒ Is the As Found Data Within 20% of the Set Point?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-37 Serial #: PR037449 Bar Code #:

Calibrated for new customer.

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration:

10/20/23

Performed by: Jeffrey Knight

Reviewed by: CLH

Issue Date: 10/20/22

Printed Name: Jeffrey Knight



All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013

The results in this report relate only to the item calibrated or tested.



Safety and Ecology Corporation SEC PROCEDURE # SEC-IS-417 Rev 5
10512 Lexington Drive, Suite 200, Knoxville, TN 37932

Calibration Certificate

Calibration Certificate for 43-37, Serial # PR037449, Bar Code # , Property # SEC-5030

Date: 10/20/22 Date Last Cal. Expires: 06/21/23 Technician: Jeffrey Knight Reason For Calibration: Other (See Comments)

Temp: 73 F RelHum: 24 % BP: 22.44 inHG CableLength

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 227394 CAL DUE 10/20/23

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2 π	ASSAY DATE
<u>Efficiencies from last calibration</u>	5747-06	Pu-239	25793 dpm	13,097 cpm	1/31/2022
Pu: 13.90 %	5746-06	Tc-99	31899 dpm	19,999 cpm	1/31/2022
Tc: 15.96 %	5744-06	Sr-90	14539 dpm	10,202 cpm	1/31/2022
Th: 11.82 %	5748-06	Th-230	34897 dpm	17,699 cpm	1/31/2022
	AK-2579	C-14	23986 dpm		1/31/2022
SrY: 27.61 %					

AS FOUND Instrument Condition: SAT
AS FOUND DATA Calibration Setpoints
HV : 1800 V

Threshold Beta:	4	- 40	mV Alpha:	120 mV
Back	<u>Alpha</u>	<u>Beta</u>	<u>AF 4 π Efficiencies</u>	
ground:	20	CPM	712	CPM
Pu-239:	4478	CPM	1145	CPM
C-99:	307	CPM	5376	CPM
Th-230:		CPM	N/A	CPM
SrY-90:	N/A			CPM

☐ Is the As Found Data within 20% of the efficiency from the last cal.?

AS LEFT Instrument Condition: SAT
AS LEFT DATA after repair, HV adjust or Plateau

Back	<u>Alpha</u>	<u>Beta</u>	<u>AL 4 π Efficiencies</u>	
ground:	3	CPM	582	CPM
Pu-239:	3560	CPM	868	CPM
Tc-99:	17	CPM	7117	CPM
Th-230:	3694	CPM	N/A	CPM
SrY-90:	N/A		4836	CPM

"AF" in the AL Efficiency fields means to refer to the AF Efficiencies in the AS FOUND DATA Section

Reproducibility : Isotope: Sr-90 5026 4926 4931 Average: 4961.0 ☒ Are the individual counts within 10% of the average?

If the As Found data (even after repair) is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the Plateau Data and go directly to Comments. Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

	Source 1: Sr-90			Source 2: Pu-239			Background (CPM)		Net A to B
	<u>Response (CPM)</u>			<u>Response (CPM)</u>					Xtalk: <10%
<u>High Voltage</u>	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	
1700	7	4442	26.76%	3548	796	13.74%	5	552	6.89%
1725	5	4931	29.44%	3414	946	13.22%	3	650	8.68%
1750	33	5163	30.75%	3717	1070	14.40%	3	692	10.18%

2 Pi Efficiencies: Pu-239 27.16% Tc-99 32.68% Th-230 20.85% SrY-90 41.70%

Comments: Married as a set with: Model: 2360 Serial #: 227394 Bar Code #:

AF: High background - new plateau to verify HV setting. Calibrated with Teflon spacers installed. C-14 source #AK-2579: 3164 gcpm/23,986 dpm = 10.76% efficiency.

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Performed by: Jeffrey Knight

Reviewed by: [Signature] Issue Date: 10/20/22

Printed Name: Jeffrey Knight

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Safety and Ecology Corporation
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Oak Ridge, TN 37830
Calibration Certificate

SEC PROCEDURE # SEC-IS-418 Rev 3

Calibration Certificate for 2360, Serial # 227402, Bar Code # ,Property # SEC-6214

Date: 09/20/22 Date Last Cal. Expires: 09/20/23 Technician: Noah Kaye Reason For Calibration: Due for Calibration

NIST EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 171700 CAL DUE: 06/07/23
MODEL: SERIAL #: CAL DUE:

AS FOUND DATA Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT
☐ New Batteries? Battery Check: SAT AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0
HIGH VOLTAGE **AS FOUND HV** **AS LEFT HV** **WINDOW SETTINGS** **AS FOUND** **AS LEFT**
(+/- 10% tolerance) 500 V: 511 V AF V BT (4 mV +/- .4 mV): 4 mV AF mV
1000 V: 1009 V AF V BW (40 mV +/- 4 mV): 30 mV AF mV
1500 V: 1508 V AF V AT (120 mV +/- 10 mV): 121 mV AF mV
AF HV Setting: 680 V AL HV Setting: 675 V

RATE METER					
SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

DIGITAL SCALER					
AF 250:	250	% ERR:	0.00%	AL 250:	AF % ERR: 0.00%
AF 2500:	2514	% ERR:	0.56%	AL 2500:	AF % ERR: 0.56%
AF 25K:	24.9 K	% ERR:	0.40%	AL 25K:	AF K % ERR: 0.40%
AF 250K:	249 K	% ERR:	0.40%	AL 250K:	AF K % ERR: 0.40%

☒ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☒ Are the Individual Counts Within 10% of the Average?

Audio Response: SAT
Overload Light: SAT
Low Battery (2.2V): SAT

☒ Is the As Found Data Within 20% of the Set Point?

Comments: Married as a set with: Model: 43-93 Serial #: PR394086 Bar Code #:

☒ Does Instrument Meet Final Acceptance Criteria? ☒ Calibration Sticker Attached?

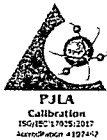
Date Instrument is Due For Next Calibration: 09/20/23

Performed by: Reviewed by: Issue Date: 9/20/22

Printed Name: Noah Kaye



All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013
The results in this report relate only to the item calibrated or tested.



Safety and Ecology Corporation SEC PROCEDURE # SEC-IS-420 Rev 3
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Calibration Certificate

Calibration Certificate for 43-93, Serial # PR394086, Bar Code #, Property # PFL-354

Date: 09/20/22 Date Last Cal. Expires: 03/30/23 Technician: Noah Kaye Reason For Calibration: Due for Calibration

Temp: RelHum: BP: CableLength 5 Ft

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 227402 CAL DUE 09/20/23

NIST TRACEABLE SOURCES USED	SOURCE	ISOPOE	ACTIVITY	2π	ASSAY DATE
<u>Efficiencies from last calibration</u>	4079-02	Pu-239	28991 dpm	14,695 cpm	1/31/2022
Pu: 23.40 %	4072-02	Tc-99	28299 dpm	17,699 cpm	1/31/2022
Tc: 17.24 %	4071-02	Th-230	40296 dpm	20,498 cpm	1/31/2022
Th: 21.63 %	4076-02	Sr-90	9306 dpm	6,529 cpm	1/31/2022
SrY: 35.20 %					

AS FOUND DATA AS FOUND Instrument Condition: SAT
Calibration Setpoints
HV: 675 V

Threshold Beta:	4	-	40	mV Alpha:	120 mV
Back	<u>Alpha</u>		<u>Beta</u>	<u>AF 4 π Efficiencies</u>	
ground:	2 CPM		143 CPM	<u>A-B XTLK</u>	
Pu-239:	6709 CPM		556 CPM	23.13%	6.16%
Tc-99:	3 CPM		5450 CPM	18.75%	
Th-230:	8505 CPM		N/A	21.10%	
SrY-90:	N/A		3435 CPM	35.38%	

☒ Is the As Found Data within 20% of the efficiency from the last cal.?

AS LEFT DATA after repair, HV adjust or Plateau AS LEFT Instrument Condition: SAT

Back	<u>Alpha</u>		<u>Beta</u>	<u>AL 4 π Efficiencies</u>	
ground:	2 CPM		143 CPM	<u>A-B XTLK</u>	
Pu-239:	6809 CPM		556 CPM	23.48%	6.07%
Tc-99:	3 CPM		5450 CPM	18.75%	
Th-230:	8505 CPM		N/A	21.10%	
SrY-90:	N/A		3435 CPM	35.38%	

"AF" in the AL Efficiency fields means to refer to the AF Efficiencies in the AS FOUND DATA Section

Reproducibility: Isotope: Sr-90 3555 3515 3532 Average: 3534.0 ☒ Are the individual counts within 10% of the average?

If the As Found data (even after repair) is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the Plateau Data and go directly to Comments: Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

Source 1: Tc-99 Source 2: Th-230

	<u>Response (CPM)</u>			<u>Response (CPM)</u>			<u>Background (CPM)</u>		Net A to B Xtalk: <10%
<u>High Voltage</u>	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	
N/A									N/A
									N/A
									N/A
									N/A
									N/A
									N/A

2 Pi Efficiencies: Pu-239 46.32% Tc-99 29.98% Th-230 41.48% SrY-90 50.42%

Comments: Married as a set with: Model: 2360 Serial #: 227402 Bar Code #:

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 09/20/23

All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013



Performed by: Noah Kaye
Printed Name: Noah Kaye

Reviewed by: [Signature] Issue Date: 9/20/22



Safety and Ecology Corporation
10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Oak Ridge, TN 37830
Calibration Certificate

SEC PROCEDURE # SEC-IS-418 Rev 3

Calibration Certificate for 2360, Serial # 184947, Bar Code # ,Property # SEC-5549

Date: 10/14/22 Date Last Cal. Expires: 06/07/23 Technician: Jeffrey Knight Reason For Calibration: Repair

NIST EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 153622 CAL DUE: 11/16/22
MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT

AS FOUND Instrument Condition: UNSAT

AS LEFT Instrument Condition: SAT

☒ New Batteries?

Battery Check: SAT

AS FOUND Mechanical Zero: 0

AS LEFT Mechanical Zero: 0

HIGH VOLTAGE

AS FOUND HV

AS LEFT HV

WINDOW SETTINGS

AS FOUND

AS LEFT

(+/- 10% tolerance)

500 V: 496 V

502 V

BT (4 mV +/- .4 mV):

3.1 mV

4 mV

1000 V: 984 V

1000 V

BW (40 mV +/- 4 mV):

28 mV

40 mV

1500 V: 1473 V

1489 V

AT (120 mV +/- 10 mV):

120 mV

123 mV

AF HV Setting: 650 V

AL HV Setting: 650 V

RATE METER

DIGITAL SCALER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

AF 250: 250 % ERR: 0.00% AL 250: AF % ERR: 0.00%
AF 2500: 2494 % ERR: 0.24% AL 2500: AF % ERR: 0.24%
AF 25K: 24.94 K % ERR: 0.24% AL 25K: AF K % ERR: 0.24%
AF 250K: 249.4 K % ERR: 0.24% AL 250K: AF K % ERR: 0.24%

☒ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale: 250 250 250
x1 or x10 Scale: 2500 2500 2500
x10 or x100 Scale: 25 K 25 K 25 K
x100 or x1000 Scale: 250 K 250 K 250 K

☒ Are the Individual Counts Within 10% of the Average?

☒ Is the As Found Data Within 20% of the Set Point?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-93 Serial #: PR293983 Bar Code #:

AF: Broken HV/Reset switch - replaced switch.

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 10/14/23

Performed by:

Reviewed by: Issue Date: 10/14/22

Printed Name: Jeffrey Knight



☒ Instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013
The results in this report relate only to the item calibrated or tested.



Safety and Ecology Corporation SEC PROCEDURE # SEC-IS-420 Rev 3
 10512 Lexington Drive, Suite 200, Knoxville, TN 37932
Calibration Certificate

Calibration Certificate for 43-93, Serial # PR293983, Bar Code #, Property # SEC-7164

Date: 10/14/22 Date Last Cal. Expires: 06/07/23 Technician: Jeffrey Knight Reason For Calibration: Married Inst Needed R

Temp: 75 F RelHum: 26 % BP: 31.19 inHG CableLength 5 Ft

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 184947 CAL DUE 10/14/23

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
Efficiencies from last calibration					
Pu: 21.74 %	4079-02	Pu-239	28991 dpm	14,695 cpm	1/31/2022
Tc: 16.77 %	4072-02	Tc-99	28299 dpm	17,699 cpm	1/31/2022
Th: 18.95 %	4071-02	Th-230	40296 dpm	20,498 cpm	1/31/2022
SrY: 34.27 %	4076-02	Sr-90	9306 dpm	6,529 cpm	1/31/2022

AS FOUND DATA AS FOUND Instrument Condition: SAT Calibration Setpoints

HV : 650 V

Threshold Beta: 4 - 40 mV Alpha: 120 mV	
Back Alpha Beta AF 4 π Efficiencies A-B XTLK	
ground: 1 CPM 195 CPM 22.12% 5.00%	
Pu-239: 6415 CPM 516 CPM 19.53%	
Tc-99: 1 CPM 5721 CPM 20.38%	
Th-230: 8215 CPM N/A CPM 35.38%	
SrY-90: N/A 3487 CPM	

☒ Is the As Found Data within 20% of the efficiency from the last cal.?

AS LEFT DATA after repair, HV adjust or Plateau AS LEFT Instrument Condition: SAT

HV : 650 V

Back Alpha Beta AL 4 π Efficiencies A-B XTLK	
ground: 1 CPM 195 CPM 22.12% -3.02%	
Pu-239: 6415 CPM 1 CPM 19.53%	
Tc-99: 1 CPM 5721 CPM 20.38%	
Th-230: 8215 CPM N/A CPM 35.38%	
SrY-90: N/A 3487 CPM	

"AF" in the AL Efficiency fields means to refer to the AF Efficiencies in the AS FOUND DATA Section

Reproducibility: Isotope: Sr-90 3470 3412 3427 Average: 3436.3 ☒ Are the individual counts within 10% of the average?

If the As Found data (even after repair) is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the Plateau Data and go directly to Comments. Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

Source 1: Tc-99 Source 2: Th-230

High Voltage	Response (CPM)			Response (CPM)			Background (CPM)		Net A to B
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	Xtalk: <10%
N/A									N/A
									N/A
									N/A
									N/A
									N/A
									N/A

2 Pi Efficiencies: Pu-239 43.65% Tc-99 31.22% Th-230 40.07% SrY-90 50.42%

Comments: Married as a set with: Model: 2360 Serial #: 184947 Bar Code #:

☒ Does Instrument Meet Final Acceptance Criteria?

☒ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 10/14/23

All instrumentation is calibrated in accordance with the QAP to meet the criteria of ANSI N323AB-2013



Performed by: *Jeffrey Knight*

Reviewed by: *Jeffrey Knight* Issue Date: 10/19/22

Printed Name: Jeffrey Knight

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