







# Safety and Ecology Corporation

SEC PROCEDURE # SEC-IS-418

2800 Solway Road

Knoxville, TN 37931

## Calibration Certificate

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9/18/2009

### Calibration Certificate for 2360, Serial # 145474, Bar Code # , Property # SEC-5742

Date: 09/18/09

Date Last Cal. Expires: 03/10/10

Technician: Thomas Thompson

Location: 9999,

Reason For Calibration: Other (See Comments)

#### EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 190580 CAL DUE: 01/23/10

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: 512 V

AF V

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

4 mV

AF mV

1000 V: 1004 V

AF V

BW (40 mV +/- 4 mV):

40 mV

AF mV

1500 V: 1497 V

AF V

AT (120 mV +/- 10 mV):

120 mV

AF mV

AF HV Setting: 1675 V

AL HV Setting: 1700 V

#### RATE METER

#### DIGITAL SCALER

SCALE RATE CPM AS FOUND % ERROR AS LEFT % ERROR

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:	2501	% ERR: 0.04%	AL 2500:	AF	% ERR: 0.04%
AF 25K:	25.01 K	% ERR: 0.04%	AL 25K:	AF K	% ERR: 0.04%
AF 250K:	250.1 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 #: PR066273

Bar Code #:

Does Instrument Meet Final Acceptance Criteria?

Calibration Sticker Attached?

Date Instrument is Due For Next Calibration:

09/18/10

Performed by:

Reviewed by:

Date: 10/13/09

Printed Name: Thomas Thompson

Entered in Computer Inventory By:

Date: 9.18.09



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**Calibration Certificate**

SEC PROCEDURE # SEC-IS-417

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**Calibration Certificate for 43-37, Serial # PR066273, Bar Code #, Property # SEC-5173**

Date: 09/18/09      Date Last Cal. Expires: 03/10/10      Technician: Thomas Thompson  
 Location: 9999,      Reason For Calibration: Other (See Comments)

**EQUIPMENT USED DURING CALIBRATION**      MODEL: 2360      SERIAL #: 145474      CAL DUE 09/18/10

<b>NIST TRACEABLE SOURCES USED</b>		SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
		4071-02	Th-230	40600 dpm	20,600 cpm	1/10/2008
		4072-02	Tc-99	27700 dpm	17,300 cpm	1/10/2008
		4076-02	Sr-90	13300 dpm	9,300 cpm	1/10/2008
		4079-02	Pu-239	28700 dpm	14,600 cpm	1/10/2008

**AS FOUND DATA**

AS FOUND Instrument Condition: SAT  
 Calibration Setpoints

HV : 1700 V

Threshold Beta: - mV

**Efficiencies from last calibration**

Pu: 17.60 %  
 Tc: 19.63 %  
 Th: 15.36 %  
 SrY: 30.07 %

Back ground:	Alpha	CPM	Beta	CPM	A-B XTLK
Pu-239:	5484	CPM	892	CPM	6.3%
Tc-99:	13	CPM	6806	CPM	
Th-230:	6696	CPM	N/A	CPM	
SrY-90:	N/A		4290	CPM	

AS FOUND Pu-239: 19.08%      Tc-99: 22.59%  
 Efficiencies: Th-230: 16.47%      SrY-90: 28.13%

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

Back ground:	Alpha	CPM	Beta	CPM	A-B XTLK
Pu-239:		CPM		CPM	
Tc-99:		CPM		CPM	
Th-230:		CPM	N/A	CPM	
SrY-90:	N/A			CPM	

AS LEFT Pu-239: [ ]      Tc-99: [ ]  
 Efficiencies: Th-230: [ ]      SrY-90: [ ]

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

Reproducibility : Isotope: Sr-90 4318 4263 4296 Average: 4292.3  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 the Geometric sources. If used to surface (except gas proportional probes) >1/8" from surface unless otherwise specified.

**PLATEAU DATA**

Source 1: Tc-99      Source 2: Th-230

Response (CPM)      Response (CPM)      Background (CPM)      Net A to B Xtalk: <10%

High Voltage	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net A to B Xtalk: <10%
N/A									N/A
									N/A
									N/A
									N/A
									N/A
									N/A

Background:      Alpha      Beta      HV      Pu-239      Tc-99      Th-230      SrY-90  
 V      CPM      CPM      CPM      CPM

AL Efficiencies: [ ]      [ ]      [ ]      [ ]

**Comments:** Married as a set with: Model: 2360      Serial #: 145474      Bar Code #:

Threshold a 120 B 4-40.

Does Instrument Meet Final Acceptance Criteria?       Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 09/18/10

Performed by: Thomas Thompson      Reviewed by: [Signature]      Date: 10/13/09

Printed Name: Thomas Thompson  
 Entered in Computer Inventory By: [Signature]      Date: 9.18.09



# Safety and Ecology Corporation

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## Calibration Certificate

9/18/2009

### Calibration Certificate for 2929, Serial # 152275, Bar Code # ,Property # SEC-5261

Date: 09/18/09

Date Last Cal. Expires: 12/01/07

Technician: Thomas Thompson

Location: 9999,

Reason For Calibration: Due for Calibration

#### EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2	SERIAL #: 190580	CAL DUE: 01/23/10
MODEL:	SERIAL #:	CAL DUE:

#### AS FOUND DATA

AS FOUND Instrument Condition: SAT

AS LEFT Instrument Condition: SAT

AS FOUND Mechanical Zero: 0

AS LEFT Mechanical Zero: 0

Scaler Function Check	AS FOUND	AS LEFT		
Beta Channel Window (4-50 mV):	4-50 mV	AF	mV	
Alpha Channel Threshold (175 mV):	175 mV	AF	mV	
Alpha Counts w/Pulser @ 10,000 CPM:	10,000 CPM	AF	CPM	% Error: 0.00%
Beta Counts w/Pulser @ 10,000 CPM:	10,000 CPM	AF	CPM	% Error: 0.00%

If AS FOUND data in Scaler Function Check is within 10%, the technician may place AF in AS LEFT section and proceed to High Voltage power supply section.

#### HIGH VOLTAGE POWER SUPPLY CALIBRATION

	AS FOUND	AS LEFT
Vernier Setting:	1000	3.97
HV Setpoints:	1000 V	AF V
500 V Reading:	506 V	AF V
1000 V Reading:	998 V	AF V
1500 V Reading:	1493 V	AF V
Max HV (1500 V +):		

#### DIGITAL SCALER

AF 250: 250	% ERR: 0.00%	AL 250: AF	% ERR: 0.00%
AF 2500: 2502	% ERR: 0.08%	AL 2500: AF	% ERR: 0.08%
AF 25K: 25.02 K	% ERR: 0.08%	AL 25K: AF	K % ERR: 0.08%
AF 250K: 250.1 K	% ERR: 0.04%	AL 250K: AF	K % ERR: 0.04%

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

Comments: Married as a set with: Model: 43-10-1 Serial #: PR155350 Bar Code #:

Does Instrument Meet Final Acceptance Criteria?

Calibration Sticker Attached?

Date Instrument is Due For Next Calibration:

09/18/10

Performed by: Thomas Thompson

Reviewed by: [Signature] Date: 9/18/09

Printed Name: Thomas Thompson

Entered in Computer Inventory By: [Signature] Date: 9.18.09



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**Calibration Certificate for 43-10-1, Serial # PR155350, Bar Code # ,Property # SEC-5262**

Date: 09/18/09 Date Last Cal. Expires: 12/01/07 Technician: Thomas Thompson  
 Location: 9999, Reason For Calibration: Due for Calibration

**EQUIPMENT USED DURING CALIBRATION**

MODEL: 2929 SERIAL #: 152275 CAL DUE: 09/18/10  
 MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USE	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40600 dpm	20,600 cpm	1/10/2008
	4072-02	Tc-99	27700 dpm	17,300 cpm	1/10/2008
	4076-02	Sr-90	13300 dpm	9,300 cpm	1/10/2008
	4079-02	Pu-239	28700 dpm	14,600 cpm	1/10/2008

**AS FOUND DATA**

AS FOUND Instrument Condition: SAT  
 Calibration Setpoints Threshold  
 HV: 1000 V Vernier: 3.97 Beta: 4 - 50 mV  
 Alpha: 175 mV

Efficiencies from last calibration	
Pu:	38.16 %
Tc:	19.42 %
Th:	35.65 %
SrY:	45.28 %

Back ground:	Alpha	Beta	A-B XTLK
Pu-239:	0 CPM	0 CPM	#Div/0!
Tc-99:	0 CPM	0 CPM	B-A XTLK
Th-230:	0 CPM	N/A	#Div/0!
SrY-90:	N/A	0 CPM	

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust  
 HV: 1000 V Vernier: 3.97

Back ground:	Alpha	Beta	A-B XTLK
Pu-239:	10368 CPM	247 CPM	2.1%
Tc-99:	0 CPM	5626 CPM	B-A XTLK
Th-230:	14071 CPM	N/A	0.0%
SrY-90:	N/A	5456 CPM	

AS FOUND Efficiencies: Pu-239: 0.00% Tc-99: 0.00% Th-230: 0.00% SrY-90: 0.00%  
 AS LEFT Efficiencies: Pu-239: 36.13% Tc-99: 20.20% Th-230: 34.66% SrY-90: 40.80%

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

Reproducibility: Isotope: Sr-90 5335 5313 5463 Average: 5370.3  Are the individual counts within 10% of the average?

AS FOUND Data (even after repair) is within 10% of the last calibration and the B-A Xtlk is < 1% and the A-B Xtlk is < 10% when the technician may N/A the Plateau Data and the Comments. Comments: All probes are 4 1/2" from source. All other probes are in contact with 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 Xtalk: <10% Net B to A Xtalk: <1%

High Voltage	Response (CPM)			Background (CPM)		Net A to B Xtalk: <10%	Net B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.		
N/A						N/A	
						N/A	
						N/A	
						N/A	
						N/A	
						N/A	

Background: Alpha Beta HV/Vernier Pu-239 Tc-99 Th-230 SrY-90  
 CPM CPM CPM CPM  
 AL Efficiencies: [ ] [ ] [ ] [ ]

**Comments:** Married as a set with: Model: 2929 Serial #: 152275 Bar Code #:

Replaced mylar.

Does Instrument Meet Final Acceptance Criteria?  Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 09/18/10

Performed by: Thomas Thompson Reviewed by: [Signature] Date: 10/13/09

Printed Name: Thomas Thompson

Entered in Computer Inventory By: [Signature] Date: 9-18-09



# Safety and Ecology Corporation

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## Calibration Certificate

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### Calibration Certificate for 2360, Serial # 184906, Bar Code # , Property # SEC-5495

Date: 09/18/09

Date Last Cal. Expires: 09/12/09

Technician: Thomas Thompson

Location: 9999,

Reason For Calibration: Due for Calibration

#### EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2

SERIAL #: 190580

CAL DUE: 01/23/10

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: 504 V

AF V

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

3.5 mV

4 mV

1000 V: 1003 V

AF V

BW (40 mV +/- 4 mV):

40.8 mV

40 mV

1500 V: 150 V

AF V

AT (120 mV +/- 10 mV):

120 mV

AF mV

AF HV Setting: 802 V

AL HV Setting:

1650 V

#### RATE METER

#### DIGITAL SCALER

SCALE RATE CPM AS FOUND % ERROR AS LEFT % ERROR

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:	2501	% ERR: 0.04%	AL 2500:	AF	% ERR: 0.04%
AF 25K:	25.01 K	% ERR: 0.04%	AL 25K:	AF K	% ERR: 0.04%
AF 250K:	250.1 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: 43-68

Serial #: PR116721

Bar Code #:

Does Instrument Meet Final Acceptance Criteria?

Calibration Sticker Attached?

Date Instrument is Due For Next Calibration:

09/18/10

Performed by:

Reviewed by:

Date: 10/13/09

Printed Name:

Thomas Thompson

Entered in Computer Inventory By:

Date: 9-18-09



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**Calibration Certificate**

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**Calibration Certificate for 43-68, Serial # PR116721, Bar Code # ,Property # SEC-5386**

Date: 09/18/09      Date Last Cal. Expires: 06/09/09      Technician: Thomas Thompson  
 Location: 9999,      Reason For Calibration: Due for Calibration

**EQUIPMENT USED DURING CALIBRATION**      MODEL: 2360      SERIAL #: 184906      CAL DUE 09/18/10

<u>NIST TRACEABLE SOURCES USED</u>	SOURCE	ISOTOPE	ACTIVITY	2 $\pi$	ASSAY DATE
	4071-02	Th-230	40600 dpm	20,600 cpm	1/10/2008
	4072-02	Tc-99	27700 dpm	17,300 cpm	1/10/2008
	4076-02	Sr-90	13300 dpm	9,300 cpm	1/10/2008
	4079-02	Pu-239	28700 dpm	14,600 cpm	1/10/2008

**AS FOUND DATA**

AS FOUND Instrument Condition: SAT  
 Calibration Setpoints

HV : 1650 V

Threshold Beta: - mV

Efficiencies from last calibration	Alpha		Beta		A-B XTLK
	CPM	CPM	CPM	CPM	
Back ground:	0	168	168	168	6.0%
Pu-239:	5969	524	524	524	
Tc-99:	12	5837	5837	5837	
Th-230:	7666	N/A	N/A	N/A	
SrY-90:	N/A	4314	4314	4314	

AS FOUND Pu-239: 20.80%      Tc-99: 20.47%  
 Efficiencies: Th-230: 18.88%      SrY-90: 31.17%

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

Back ground:	Alpha		Beta		A-B XTLK
	CPM	CPM	CPM	CPM	
Pu-239:					
Tc-99:					
Th-230:			N/A	N/A	
SrY-90:	N/A				

AS LEFT Pu-239: [ ]      Tc-99: [ ]  
 Efficiencies: Th-230: [ ]      SrY-90: [ ]

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

Reproducibility : Isotope: Sr-90 4346 4292 4370 Average: 4336.0  Are the individual counts within 10% of the average?

AS FOUND DATA: All counts are within 10% of the last calibration and the A-B Xtalk is 1% and the A-B Xtalk is 10% from the technician may N/A the Plateau Data and for the comments. Geometry of source is used to surface except for proportional probes = 1/8" from surface unless otherwise specified.

**PLATEAU DATA**

Source 1: Tc-99      Source 2: Th-230

Response (CPM)

Response (CPM)

Background (CPM)

Net A to B Xtalk: <10%

High Voltage	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net A to B Xtalk: <10%
N/A									N/A
									N/A
									N/A
									N/A
									N/A
									N/A

Background:      Alpha      Beta      HV      Pu-239      Tc-99      Th-230      SrY-90  
 V      CPM      CPM      CPM      CPM

AL Efficiencies: [ ]      [ ]      [ ]      [ ]

**Comments:** Married as a set with:      Model: 2360      Serial #: 184906      Bar Code #:

Threshold a 120 B 4-40.

Does Instrument Meet Final Acceptance Criteria?

Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 09/18/10

Performed by: Thomas Thompson

Reviewed by: [Signature]      Date: 10/13/09

Printed Name: Thomas Thompson

Entered in Computer Inventory By: [Signature]      Date: 9-18-09





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**Calibration Certificate**

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**Calibration Certificate for 43-68, Serial # PR160790, Bar Code # , Property # SEC-6340**

Date: 09/18/09      Date Last Cal. Expires: 05/21/10      Technician: Thomas Thompson  
 Location: 9999,      Reason For Calibration: Due for Calibration

**EQUIPMENT USED DURING CALIBRATION**      MODEL: 2360      SERIAL #: 225241      CAL DUE 09/17/10

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40600 dpm	20,600 cpm	1/10/2008
	4072-02	Tc-99	27700 dpm	17,300 cpm	1/10/2008
	4076-02	Sr-90	13300 dpm	9,300 cpm	1/10/2008
	4079-02	Pu-239	28700 dpm	14,600 cpm	1/10/2008

**AS FOUND DATA**      AS FOUND Instrument Condition: SAT  
 Calibration Setpoints

HV : 1650 V

Threshold Beta: - mV

Efficiencies from last calibration	Back ground:		Alpha		Beta		A-B XTLK
	CPM	CPM	CPM	CPM	CPM	CPM	
Pu: 20.31 %	0	0	0	0	0	0	#Div/0!
Tc: 19.86 %	0	0	0	0	0	0	
Th: 19.66 %	0	0	0	0	N/A	0	
SrY: 30.92 %	0	0	N/A	0	0	0	

AS FOUND Pu-239: 0.00%      Tc-99: 0.00%  
 Efficiencies: Th-230: 0.00%      SrY-90: 0.00%

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

HV : 1650 V *CSA*

Back ground:	Alpha	Beta	A-B XTLK
1	155	6.2%	
Pu-239: 6092	556	CPM	6.2%
Tc-99: 44	5671	CPM	
Th-230: 8240	N/A	CPM	
SrY-90: N/A	4515	CPM	

AS LEFT Pu-239: 21.22%      Tc-99: 19.91%  
 Efficiencies: Th-230: 20.29%      SrY-90: 32.73%

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

Reproducibility : Isotope: Sr-90 4409 4440 4418 Average: 4422.3  Are the individual counts within 10% of the average?

For data (even after repair) within 10% of the last calibration and the A-B Xtalk is < 10% and the A/B Xtalk is < 10% then the technician may N/A the Plateau Data. Comment: Geometry of source: flush to surface except gas proportional probes: 10% from surface unless otherwise specified.

**PLATEAU DATA**

High Voltage	Source 1: Tc-99			Source 2: Th-230			Background (CPM)		Net A to B Xtalk: <10%
	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

Background:      Alpha      Beta      HV      Pu-239      Tc-99      Th-230      SrY-90  
 V      CPM      CPM      CPM      CPM

AL Efficiencies:      [ ]      [ ]      [ ]      [ ]

**Comments:** Married as a set with: Model: 2360      Serial #: 225241      Bar Code #:  
 Replaced mylar. Threshold a 120 & 4-40.

Does Instrument Meet Final Acceptance Criteria?       Calibration Sticker Attached?  
 Date Instrument is Due For Next Calibration: 09/18/10

Performed by: *[Signature]*      Reviewed by: *[Signature]*      Date: 10/13/09  
 Printed Name: Thomas Thompson  
 Entered in Computer Inventory By: *[Signature]*      Date: 9.18.09



# Safety and Ecology Corporation

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## Calibration Certificate

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Calibration Certificate for 2360, Serial # 225241, Bar Code # , Property # SEC-6210

Date: 09/18/09

Date Last Cal. Expires: 09/17/09

Technician: Thomas Thompson

Location: 9999,

Reason For Calibration: Due for Calibration

### EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2

SERIAL #: 190580

CAL DUE: 01/23/10

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: 507 V

AF V

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

3.6 mV

4 mV

1000 V: 1005 V

AF V

BW (40 mV +/- 4 mV):

35.4 mV

40 mV

1500 V: 1511 V

AF V

AT (120 mV +/- 10 mV):

87 mV

120 mV

AF HV Setting: 1682 V

AL HV Setting:

1650 V

### RATE METER

### DIGITAL SCALER

SCALE RATE CPM AS FOUND % ERROR AS LEFT % ERROR

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:	2500	% ERR: 0.00%	AL 2500:	AF	% ERR: 0.00%
AF 25K:	25 K	% ERR: 0.00%	AL 25K:	AF K	% ERR: 0.00%
AF 250K:	250 K	% ERR: 0.00%	AL 250K:	AF K	% ERR: 0.00%

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: 43-68 Serial #: PR160790 Bar Code #:

Does Instrument Meet Final Acceptance Criteria?

Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 09/18/10

Performed by: Thomas Thompson

Reviewed by: [Signature] Date: 10/13/09

Printed Name: Thomas Thompson

Entered in Computer Inventory By: [Signature] Date: 9-18-09



**Safety and Ecology Corporation**  
 2800 Solway Road, Knoxville, TN 37931  
**Calibration Certificate**

SEC PROCEDURE # SEC-IS-405

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**Calibration Certificate for 3, Serial # 187558, Bar Code # ,Property # SEC-6447**

Date: 09/18/09      Date Last Cal. Expires: 11/10/09      Technician: Thomas Thompson  
 Location: 9999,      Reason For Calibration: Due for Calibration

**EQUIPMENT USED DURING CALIBRATION**

MODEL: 500-2      SERIAL #: 190580      CAL DUE: 01/23/10  
 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: N/A      N/A      AS FOUND Mechanical Zero: 0      AS LEFT Mechanical Zero: 0  
                                  1000 V: N/A      N/A      AS FOUND THRESHOLD: 37.3 mV      AS LEFT THRESHOLD: 37.3 mV  
                                  1500 V: N/A      N/A      AS FOUND HV Reading: 573 V      AS LEFT HV Reading: 900 V  
 HV Range 400-1500V: SAT

**RATE METER**

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	110	10.00%	100	0.00%
	250	260	4.00%	250	0.00%
	400	410	2.50%	400	0.00%
x1 or x10	1000	1100	10.00%	1000	0.00%
	2500	2600	4.00%	2500	0.00%
	4000	4100	2.50%	4000	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: 2502    % ERR: 0.08%    AL 2500: AF    % ERR: 0.08%  
 AF 25K: 25.01 K    % ERR: 0.04%    AL 25K: AF K    % ERR: 0.04%  
 AF 100K: 100.0 K    % ERR: 0.00%    AL 100K: AF K    % ERR: 0.00%

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

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

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 #: PR193572      Bar Code #:

Does Instrument Meet Final Acceptance Criteria?

Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 09/18/10

Performed by: Thomas Thompson

Reviewed by: Thomas Thompson      Date: 10/13/09

Printed Name: Thomas Thompson

Entered in Computer Inventory By: Thomas Thompson      Date: 9.18.09



**Safety and Ecology Corporation**  
 2800 Solway Road, Knoxville, TN 37931  
**Calibration Certificate**

SEC PROCEDURE # SEC-IS-407

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 9/18/2009

**Calibration Certificate for 44-9, Serial # PR193572, Bar Code # ,Property # SEC-5357**

Date: 09/18/09      Date Last Cal. Expires: 02/04/10      Technician: Thomas Thompson  
 Location: 9999,      Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 3      SERIAL # 187558      CAL DUE: 09/18/10  
 MODEL:      SERIAL #      CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
4072-02	Tc-99	27700 dpm	17,300 cpm	1/10/2008
4076-02	Sr-90	13300 dpm	9,300 cpm	1/10/2008

~~Geometry: In contact with surface unless otherwise specified.~~

PREVIOUS Tc-99 EFFICIENCY: 13.99 %      Calibration Voltage: 900 V      Calibration Threshold: 37.3 mV

AS FOUND Instrument Condition: SAT

AS LEFT Instrument Condition: SAT

**AS FOUND DATA**

1 MINUTE COUNTS (CPM)

AF Background: 0      **AVERAGE**  
 Tc-99 Count: 0      0      0      0,0  
 Sr-90 Count: 0

Efficiencies

Tc-99 EFF: 0.00%      Sr-90 EFF: 0.00%

**AS LEFT DATA**

1 MINUTE COUNTS (CPM)

AL Background: 36      **AVERAGE**  
 Tc-99 Count: 4146      4178      4037      4120.3  
 Sr-90 Count: 3515

Efficiencies

Tc-99 EFF: 14.74%      Sr-90 EFF: 26.16%

- 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: 3      Serial #: 187558      Bar Code #:  
 Replaced GMT.

Date Instrument is Due For Next Calibration: 09/18/10

Performed by: Thomas Thompson      Reviewed by: [Signature]      Date: 10/13/09  
 Printed Name: Thomas Thompson

Entered in Computer Inventory By: [Signature]      Date: 9.18.09