Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

8/8/2008

Calibration Certificate for 2221,Serial # 102034, Bar Code # ,Property # CEC5

Date: 10/24/07 Date Last Cal. Expires: Technician: Carl Hall

Location: 126032, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 132896 CAL DUE: 08/11/08

MODEL: SERIAL #: CAL DUE:

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

HIGH VOLTAGE (+/- 10% tolerance)		AS FOUND HV	AS LEFT HV				
	500 V:	527 V	505 V	New Batteries?		AF Mechanical Zero:	0
				Threshold ratio: 100=10mV		AL Mechanical Zero:	0
	1000 V:	1021 V	1000 V	AF THRESHOLD:	2.1 mV	AF HV Reading:	881 V
	1500 V:	1515 V	1496 V	AL THRESHOLD:	10.0 mV	AL HV Reading:	1050 V

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	405	1.25%	395	1.25%
x1 or x10	1000	1100	10.00%	1000	0.00%
	2500	2600	4.00%	2500	0.00%
	4000	4050	1.25%	3950	1.25%
x10 or x100	10K	11	10.00%	10	0.00%
	25K	26	4.00%	25	0.00%
	40K	40.5	1.25%	39.5	1.25%
x100 or x1000	100K	110	10.00%	100	0.00%
	250K	260	4.00%	250	0.00%
	400K	405	1.25%	395	1.25%

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

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:	250.2 K	% ERR:	0.08%	AL 250K:	AF K	% ERR:	0.08%

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

LOG SCALE

AF 200:	200	% ERR:	0.00%	AL 200:	AF	% ERR:	0.00%
AF 2000:	2000	% ERR:	0.00%	AL 2000:	AF	% ERR:	0.00%
AF 20K:	19 K	% ERR:	5.00%	AL 20K:	AF K	% ERR:	5.00%
AF 200K:	180 K	% ERR:	10.00%	AL 200K:	AF K	% ERR:	10.00%

✔ 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?

Audio Response: SAT

Audio Divide: SAT

Push Buttons: SAT

Lamp: SAT

Scaler/Digital: SAT

✔ Fast / Slow Response Function Properly?

Comments: Married as a set with: Model: 44-10 Serial #: PR105942 Bar Code #:

Initial calibration.

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

Date Instrument is Due For Next Calibration: 10/24/08

Performed by: Reviewed by: Date: 10-24-2007

Printed Name: Carl Hall

Entered in Computer Maintenance By: Date: 10/24/07

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

Calibration Certificate for 44-10,Serial # PR105942, Bar Code # ,Property # CEC6

Date: 10/24/07 Date Last Cal. Expires: Technician: Carl Hall

Location: 126032, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 2221 SERIAL #: 102034 CAL DUE: 10/24/08

MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
99CS250-0288	Cs-137	7.5 uCi		3/18/1999

Efficiency from Last Calibration: % HV From Last Calibration: V Calibration Threshold: 10 mV

1 MINUTE COUNTS (CPM)

AS FOUND DATA

AS FOUND Instrument Condition: SAT

HV: V

Center:

Background:

Probe Efficiency: Cs-137

AS LEFT DATA after repair of HV adjust

AS LEFT Instrument Condition: SAT

HV: V

Center:

Background:

Probe Efficiency: Cs-137

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

Reproducibility: Isotope: Cs-137 115432 115917 116264 Average: 115871 ✔ Are the individual counts within 10% of the average?

* If As Found Efficiency (even after repair) is within 10% of the last calibration and uniformity is <10%, the technician may N/A the Plateau Data and proceed to Comments. Geometry – Nai probes are 4 1/2" from source. All other probes are in contact with surface unless otherwise specified.

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background
900	108628	3541
950	113595	3547
1000	115472	3588
1050	116204	3623
1100	115646	3662
1150	116141	3666
1200	116648	3716

HV	CENTER	Background	Efficiency
1050 V	115826	3599	Cs-137 0.67%

Comments: Married as a set with: Model: 2221 Serial #: 102034 Bar Code #:

Initial calibration.

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

Date Instrument is Due For Next Calibration: 10/24/08

Performed by: Reviewed by: Date: 10-24-2007

Printed Name: Carl Hall

Entered in Computer Inventory By: Date: 10/24/07

SAFETY AND ECOLOGY CORP.
CALIBRATION DATA SHEET

FORM 73-1
REV. 0

CUSTOMER NAME	: SAFETY AND ECOLOGY	INST. MANUFACTURER	: LUDLUM INST.
PLANT NAME	: SEC LAB	TYPE	: SCINTILLATION
ADDRESS	: 10512 Lexington Dr. KNOXVILLE TN	MODEL NO.	: 19
		SERIAL NO.	: 187871
CONTACT PERSON	: JERRY DEGROODT		

SOURCE USED

CAL. SOURCE USED : CESIUM -137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE : 08/29/2008

M&TE

MINIPULSER S/N	: 314	CALIBRATION DUE DATE :	07/24/2008
DVM S/N	: 82730524	CALIBRATION DUE DATE :	02/28/2009
H.V. PROBE S/N	: 82630102	CALIBRATION DUE DATE :	03/02/2009

CALIBRATION DATA

		AS FOUND	AS LEFT	
HIGH VOLTAGE	:	800	800	VOLTS
INPUT SENSITIVITY	:	36	36	MILLIVOLTS

SCALE	EXPOSURE RATE uR/HR	EXPOSURE RATE (MR/HR)	INSTRUMENT READING AS FOUND	INSTRUMENT READING AS LEFT	PER CENT ERROR AS FOUND	PER CENT ERROR AS LEFT
25	5	(PULSED = TO)	5.00	5.00	0.00	0.00
	12	(PULSED = TO)	12.00	12.00	0.00	0.00
	20	(PULSED = TO)	20.00	20.00	0.00	0.00
50	10	(PULSED = TO)	10.0	10.0	0.00	0.00
	25	(PULSED = TO)	25.0	25.0	0.00	0.00
	40	(PULSED = TO)	40.0	40.0	0.00	0.00
250	50	(PULSED = TO)	50.0	50.0	0.00	0.00
	120	(PULSED = TO)	120.0	120.0	0.00	0.00
	200	(PULSED = TO)	200.0	200.0	0.00	0.00
500	200	(0.2)	200	200	0.00	0.00
	250	(0.25)	250	250	0.00	0.00
	400	(0.4)	400	400	0.00	0.00
5000	1000	(1.0)	1000	1000	0.00	0.00
	2500	(2.5)	2500	2500	0.00	0.00
	4000	(4.0)	3900	3900	-2.50	-2.50

PRECISION

SCALE	EXPOSURE RATE		AS FOUND	MEAN VALUE	% DEV.
5000	2500	(2.5)	2500		0.00
			2500	2500	0.00
			2500		0.00

COMMENTS/REMARKS:

DOSE RATE CALIBRATION DONE WITH N.I.S.T. TRACEABLE SOURCES AND CALIBRATED TEST EQUIPMENT.
PULSE RATE CALIBRATION DONE AS REQUIRED DUE TO BACKGROUND RADIATION AND CORRELATED TO DOSE RATE CALIBRATION ON HIGHER SCALES.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL EXPOSURE RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 73.

CALIBRATED BY : JM REVIEWED BY : [signature]

DATE CALIBRATED : 4-30-2008 DATE REVIEWED : 5/5/08

CALIBRATION DUE DATE : 4-30-2009

Safety and Ecology Corporation

2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

10/5/2007

Calibration Certificate for 2929,Serial # 99055, Bar Code # ,Property # SEC-5194

Date: 10/05/07 **Date Last Cal. Expires:** 08/18/07 **Technician:** Carl Hall

Location: 9999, **Reason For Calibration:** Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 **SERIAL #:** 132896 **CAL DUE:** 02/09/08

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):	3.9-48.0	mV	3.5-50.0	mV	
Alpha Channel Threshold (175 mV):	167	mV	175	mV	
Alpha Counts w/Pulser @ 10,000 CPM:	9,999	CPM	AF	CPM	% Error: 0.01%
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:	3.08		2.90	
HV Setpoints:	774	V	775	V
500 V Reading:	475	V	AF	V
1000 V Reading:	995	V	AF	V
1500 V Reading:	1516	V	AF	V
Max HV (1500 V +):				

DIGITAL SCALER

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?

Comments: Married as a set with: **Model:** 43-10-1 **Serial #:** PR146976 **Bar Code #:**

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

Date Instrument is Due For Next Calibration: 10/05/08

Performed by: _____ Reviewed by: _____ Date: 10.5.07

Printed Name: Carl Hall

Entered in Computer Inventory By: _____ Date: 10/5/07

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

10/5/2007

Calibration Certificate for 43-10-1,Serial # PR146976, Bar Code # ,Property # SEC-5372

Date: 10/05/07 **Date Last Cal. Expires:** 08/18/07 **Technician:** Carl Hall

Location: 9999, **Reason For Calibration:** Due and Repair

EQUIPMENT USED DURING CALIBRATION **MODEL:** 2929 **SERIAL #:** 99055 **CAL DUE:** 10/05/08

MODEL: **SERIAL #:** **CAL DUE:**

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	5744-06	Sr-90	21700 dpm	15,200 cpm	12/6/2006
	5746-06	Tc-99	34000 dpm	21,200 cpm	12/7/2006
	5747-06	Pu-239	27700 dpm	14,100 cpm	12/6/2006
	5748-06	Th-230	34700 dpm	17,600 cpm	12/6/2006

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints **HV:** 775 V **Vernier:** 3.08

Threshold **Beta:** 3.5 - 50.0 mV **Alpha:** 175 mV

Efficiencies from last calibration	
Pu:	35.3 %
Tc:	18.86 %
Th:	33.83 %
SrY:	39.41 %

	Alpha		Beta		
Back ground:	0	CPM	0	CPM	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 FOUND Efficiencies: Pu-239: 0.00% Tc-99: 0.00% Th-230: 0.00% SrY-90: 0.00%

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust **HV:** 775 V **Vernier:** 2.90

	Alpha		Beta		
Back ground:	0	CPM	49	CPM	A-B XTLK
Pu-239:	10115	CPM	188	CPM	1.4%
Tc-99:	4	CPM	5806	CPM	B-A XTLK
Th-230:	12347	CPM	N/A		0.1%
SrY-90:	N/A		7808	CPM	

AS LEFT Efficiencies: Pu-239: 36.52% Tc-99: 16.93% Th-230: 35.58% SrY-90: 35.76%

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

Reproducibility: Isotope: Sr-90 7764 7789 7826 Average: 7793.0 ☑ 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 = NaI probes are 4 1/2" from source. All other probes are in contact with surface unless otherwise specified. Calibrated with a 3 foot cable unless otherwise specified.

PLATEAU DATA

High Voltage	Source 1: Tc-99 Response (CPM) A ch.	B ch.	Net Eff.	Source 2: Th-230 Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%	Net B to A Xtalk: <1%
N/A									N/A	
									N/A	
									N/A	
									N/A	
									N/A	
									N/A	

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

Comments: Married as a set with: Model: 2929 Serial #: 99055 Bar Code #:

Replaced damaged mylar.

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

Date Instrument is Due For Next Calibration: 10/05/08

Performed by: [signature] Reviewed by: [signature] Date: 10-5-7

Printed Name: Carl Hall

Entered in Computer Inventory By: [signature] Date: 10/5/07

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

6/30/2008

Calibration Certificate for 2221,Serial # 132836, Bar Code # ,Property # SEC-5514

Date: 06/30/08 **Date Last Cal. Expires:** 01/31/08 **Technician:** David Moyer

Location: 9999, **Reason For Calibration:** Due and Repair

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 **SERIAL #:** 209797 **CAL DUE:** 07/24/08

MODEL: **SERIAL #:** **CAL DUE:**

AS FOUND DATA

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

HIGH VOLTAGE (+/- 10% tolerance)		AS FOUND HV	AS LEFT HV
	500 V:	507 V	503 V
	1000 V:	1007 V	1000 V
	1500 V:	1503 V	1493 V

☑ New Batteries?

Threshold ratio: 100=10mV

AF THRESHOLD: 10 mV

AL THRESHOLD: 10 mV

AF Mechanical Zero: <0

AL Mechanical Zero: 0

AF HV Reading: 900 V

AL HV Reading: 2000 V

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	105	5.00%	100	0.00%
	250	260	4.00%	250	0.00%
	400	420	5.00%	400	0.00%
x1 or x10	1000	1050	5.00%	1000	0.00%
	2500	2600	4.00%	2500	0.00%
	4000	4200	5.00%	4000	0.00%
x10 or x100	10K	10.5	5.00%	10	0.00%
	25K	26	4.00%	25	0.00%
	40K	42	5.00%	40	0.00%
x100 or x1000	100K	105	5.00%	100	0.00%
	250K	260	4.00%	250	0.00%
	400K	420	5.00%	400	0.00%

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

DIGITAL SCALER

AF 250:	250	% ERR:	0.00%	AL 250:	AF	% ERR:	0.00%
AF 2500:	2497	% ERR:	0.12%	AL 2500:	AF	% ERR:	0.12%
AF 25K:	24.97 K	% ERR:	0.12%	AL 25K:	AF K	% ERR:	0.12%
AF 250K:	249.7 K	% ERR:	0.12%	AL 250K:	AF K	% ERR:	0.12%

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

LOG SCALE

AF 200:	250	% ERR:	25.00%	AL 200:	200	% ERR:	0.00%
AF 2000:	2500	% ERR:	25.00%	AL 2000:	2000	% ERR:	0.00%
AF 20K:	25 K	% ERR:	25.00%	AL 20K:	20 K	% ERR:	0.00%
AF 200K:	250 K	% ERR:	25.00%	AL 200K:	200 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?

Audio Response: SAT

Audio Divide: SAT

Push Buttons: SAT

Lamp: SAT

Scaler/Digital: SAT

☑ Fast / Slow Response Function Properly?

Comments: **Married as a set with:** **Model:** 43-37 **Serial #:** PR161295 **Bar Code #:**

Replaced meter movement. Cleaned board contacts.

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

Date Instrument is Due For Next Calibration: 06/30/09

Performed by: _____ **Reviewed by:** _____ **Date:** 6-30-2008

Printed Name: David Moyer

Entered in Computer Maintenance By: _____ **Date:** 6-30-08

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

Calibration Certificate for 43-37,Serial # PR161295, Bar Code # ,Property # SEC-6111

Date: 06/30/08 Date Last Cal. Expires: 05/06/09 Technician: David Moyer

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION MODEL: 2221 SERIAL #: 132836 CAL DUE 06/30/09

MODEL: SERIAL #: CAL DUE

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
4049-02	Th-230	30300 dpm	15,400 cpm	10/17/200
4050-02	Tc-99	36600 dpm	22,900 cpm	10/13/200
4052-02	Sr-90	22400 dpm	15,700 cpm	10/13/200
99PU470-0268	Pu-239	15400 dpm	7,820 cpm	9/26/2006

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV (Alpha): 1350 V HV (Beta): 2000 V Threshold: 10 mV

Efficiencies from last calibration	
Pu:	22.40 %
Tc:	28.17 %
Th:	20.11 %
SrY:	43.06 %

	Alpha		Beta	
Back ground:	0	CPM	855	CPM
Pu-239:	3269	CPM	N/A	
Tc-99:	N/A		11179	CPM
Th-230:	6071	CPM	N/A	
SrY-90:	N/A		9698	CPM

AS FOUND Efficiencies: Pu-239: 21.23% Th-230: 20.04% Tc-99: 28.21% SrY-90: 39.48%

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV (Alpha): V HV (Beta): V

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

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

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

Reproducibility : Isotope: Sr-90 9625 9777 9638 Average: 9680.0 ☑ Are the individual counts within 10% of the average?

If the As Found data (even after repair) is within 10% of the last calibration, then the technician may N/A Plateau Data and go directly to Comments. Geometry of source = flush to surface, except 43-37 probes = 1/8" from surface.

PLATEAU DATA

Alpha Source: Th-230

HV (Alpha)	Response CPM A ch.	Background CPM A ch.	Net Eff.
N/A			

Beta Source: Tc-99

HV (Beta)	Response CPM B ch.	Background CPM B ch.	Net Eff.
N/A			

BACKGROUND

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

AS LEFT Alpha Efficiencies: AS LEFT Beta Efficiencies:

Comments: Married as a set with: Model: 2221 Serial #: 132836 Bar Code #:

Calibrated to new sources.

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

Date Instrument is Due For Next Calibration: 06/30/09

Performed by: Reviewed by: Date: 6.30.2008

Printed Name: David Moyer

Entered in Computer Inventory By: WA Date: 6.30.08

Safety and Ecology Corporation

2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

6/17/2008

Calibration Certificate for 2360,Serial # 145484, Bar Code # ,Property # SEC-6042

Date: 06/16/08 **Date Last Cal. Expires:** 05/29/09 **Technician:** Thomas Thompson

Location: 9999, **Reason For Calibration:** Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 **SERIAL #:** 190580 **CAL DUE:** 07/24/08

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 (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	508 V	AF V
1000 V:	1002 V	AF V
1500 V:	1480 V	AF V
AF HV Setting:	706 V	AL HV Setting: 775 V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	4 mV	AF mV
BW (40 mV +/- 4 mV):	40 mV	AF mV
AT (120 mV +/- 10 mV):	120 mV	AF mV

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%

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

DIGITAL SCALER

AF 250:	249	% ERR: 0.40%	AL 250:	AF	% ERR: 0.40%
AF 2500:	2498	% ERR: 0.08%	AL 2500:	AF	% ERR: 0.08%
AF 25K:	24.97 K	% ERR: 0.12%	AL 25K:	AF K	% ERR: 0.12%
AF 250K:	249.7 K	% ERR: 0.12%	AL 250K:	AF K	% ERR: 0.12%

☑ **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

Comments: **Married as a set with:** **Model:** 43-89 **Serial #:** PR193034 **Bar Code #:**

☑ **Does Instrument Meet Final Acceptance Criteria?** ☑ **Calibration Sticker Attached?**

Date Instrument is Due For Next Calibration: 06/16/09

Performed by: _____ **Reviewed by:** _____ **Date:** 6/20/08

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ **Date:** 6.17.08

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

6/16/2008

Calibration Certificate for 43-89,Serial # PR193034, Bar Code # ,Property # SEC-5538

Date: 06/16/08 Date Last Cal. Expires: 09/07/08 Technician: Thomas Thompson

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 145484 CAL DUE 06/16/09

MODEL: SERIAL #: CAL DUE

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40600 dpm	20,600 cpm	5/10/2005
	4072-02	Tc-99	27700 dpm	17,300 cpm	5/10/2005
	4076-02	Sr-90	13300 dpm	9,300 cpm	5/10/2005
	4079-02	Pu-239	28700 dpm	14,600 cpm	5/10/2005

AS FOUND DATA AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : 775 V

Threshold Beta: 4 - 40 mV Alpha: 120 mV

Efficiencies from last calibration	
Pu:	17.71 %
Tc:	10.39 %
Th:	16.05 %
SrY:	22.91 %

	Alpha		Beta		
Back ground:	1	CPM	169	CPM	A-B XTLK
Pu-239:	5265	CPM	608	CPM	8.3%
Tc-99:	2	CPM	3186	CPM	
Th-230:	6342	CPM	N/A		
SrY-90:	N/A		3624	CPM	

AS FOUND Efficiencies: Pu-239: 18.34% Tc-99: 10.89% Th-230: 15.62% SrY-90: 25.98%

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

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

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

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

Reproducibility : Isotope: Sr-90 3562 3608 3584 Average: 3584.7 ☑ 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: Tc-99 Source 2: Th-230

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

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

Comments: Married as a set with: Model: 2360 Serial #: 145484 Bar Code #:

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

Date Instrument is Due For Next Calibration: 06/16/09

Performed by: Reviewed by: Date: 6/20/08

Printed Name: Thomas Thompson

Entered in Computer Inventory By: Date: 6-17-08

Safety and Ecology Corporation

2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

6/3/2008

Calibration Certificate for 2360,Serial # 193637, Bar Code # ,Property # SEC-6151

Date: 06/03/08 **Date Last Cal. Expires:** 03/04/09 **Technician:** Thomas Thompson

Location: 9999, **Reason For Calibration:** Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 **SERIAL #:** 190580 **CAL DUE:** 07/24/08

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 (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	505 V	AF V
1000 V:	1000 V	AF V
1500 V:	1496 V	AF V
AF HV Setting:	1649 V	AL HV Setting: 1625 V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	4 mV	AF mV
BW (40 mV +/- 4 mV):	40 mV	AF mV
AT (120 mV +/- 10 mV):	120 mV	AF mV

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%

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

DIGITAL SCALER

AF 250:	250	% ERR: 0.00%	AL 250:	AF	% ERR: 0.00%
AF 2500:	2498	% ERR: 0.08%	AL 2500:	AF	% ERR: 0.08%
AF 25K:	24.97 K	% ERR: 0.12%	AL 25K:	AF K	% ERR: 0.12%
AF 250K:	249.7 K	% ERR: 0.12%	AL 250K:	AF K	% ERR: 0.12%

☑ 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

Comments: Married as a set with: **Model:** 43-37 **Serial #:** PR161368 **Bar Code #:**

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

Date Instrument is Due For Next Calibration: 06/03/09

Performed by: _____ Reviewed by: _____ Date: 6/5/08

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ Date: 6-3-08

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

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

Date: 06/03/08 **Date Last Cal. Expires:** 03/11/09 **Technician:** Thomas Thompson

Location: 9999, **Reason For Calibration:** Other (See Comments)

EQUIPMENT USED DURING CALIBRATION **MODEL:** 2360 **SERIAL #:** 193637 **CAL DUE** 06/03/09

MODEL: **SERIAL #:** **CAL DUE**

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40600 dpm	20,600 cpm	5/10/2005
	4072-02	Tc-99	27700 dpm	17,300 cpm	5/10/2005
	4076-02	Sr-90	13300 dpm	9,300 cpm	5/10/2005
	4079-02	Pu-239	28700 dpm	14,600 cpm	5/10/2005

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : 1700 V

Threshold Beta: - mV

Efficiencies from last calibration	
Pu:	18.46 %
Tc:	22.85 %
Th:	16.42 %
SrY:	29.53 %

	Alpha		Beta		A-B XTLK
Back ground:	9	CPM	546	CPM	
Pu-239:	4911	CPM	852	CPM	6.2%
Tc-99:	8	CPM	6478	CPM	
Th-230:	6010	CPM	N/A		
SrY-90:	N/A		4296	CPM	

AS FOUND Efficiencies: Pu-239: 17.08% Tc-99: 21.42% Th-230: 14.78% SrY-90: 28.20%

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

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

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

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

Reproducibility : Isotope: Sr-90 4286 4397 4515 **Average:** 4399.3 ☑ **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) A ch.	B ch.	Net Eff.	Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%
N/A									N/A
									N/A
									N/A
									N/A
									N/A
									N/A

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

Comments: **Married as a set with:** **Model:** 2360 **Serial #:** 193637 **Bar Code #:**

Threshold a 120 ß 4-40

☑ **Does Instrument Meet Final Acceptance Criteria?** ☑ **Calibration Sticker Attached?**

Date Instrument is Due For Next Calibration: 06/03/09

Performed by: _____ **Reviewed by:** _____ **Date:** 6/5/08

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ **Date:** 6-3-08

Safety and Ecology Corporation

2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

7/3/2008

Calibration Certificate for 2224-1,Serial # 187272, Bar Code # ,Property # SEC-5850

Date: 07/03/08 **Date Last Cal. Expires:** 11/07/08 **Technician:** Thomas Thompson

Location: 9999, **Reason For Calibration:** Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 **SERIAL #:** 190580 **CAL DUE:** 07/24/08

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 (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	500 V	AF V
1000 V:	1000 V	AF V
1500 V:	1510 V	AF V
AF HV Setting:	632 V	AL HV Setting: 610 V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	3.5 mV	AF mV
BW (40 mV +/- 4 mV):	40 mV	AF mV
AT (120 mV +/- 10 mV):	123 mV	120 mV

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%

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

DIGITAL SCALER

AF 250:	250	% ERR: 0.00%	AL 250:	AF	% ERR: 0.00%
AF 2500:	2497	% ERR: 0.12%	AL 2500:	AF	% ERR: 0.12%
AF 25K:	24.96 K	% ERR: 0.16%	AL 25K:	AF K	% ERR: 0.16%
AF 250K:	249.6 K	% ERR: 0.16%	AL 250K:	AF K	% ERR: 0.16%

☑ 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

Comments: Married as a set with: **Model:** 43-89 **Serial #:** PR156411 **Bar Code #:**

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

Date Instrument is Due For Next Calibration: 07/03/09

Performed by: _____ Reviewed by: _____ Date: 7/3/08

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ Date: 7.3.08

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

7/3/2008

Calibration Certificate for 43-89,Serial # PR156411, Bar Code # ,Property # SEC-5285

Date: 07/03/08 **Date Last Cal. Expires:** 11/07/08 **Technician:** Thomas Thompson

Location: 9999, **Reason For Calibration:** Other (See Comments)

EQUIPMENT USED DURING CALIBRATION **MODEL:** 2224-1 **SERIAL #:** 187272 **CAL DUE** 11/07/08

MODEL: **SERIAL #:** **CAL DUE**

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40600 dpm	20,600 cpm	5/10/2005
	4072-02	Tc-99	27700 dpm	17,300 cpm	5/10/2005
	4076-02	Sr-90	13300 dpm	9,300 cpm	5/10/2005
	4079-02	Pu-239	28700 dpm	14,600 cpm	5/10/2005

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : 610 **V**

Threshold Beta: 3.5 - 40 **mV** **Alpha:** 120 **mV**

Efficiencies from last calibration	
Pu:	19.07 %
Tc:	12.27 %
Th:	17.01 %
SrY:	26.44 %

	Alpha		Beta		A-B XTLK
Back ground:	0	CPM	270	CPM	
Pu-239:	5580	CPM	808	CPM	9.6%
Tc-99:	2	CPM	3429	CPM	
Th-230:	6678	CPM	N/A		
SrY-90:	N/A		3924	CPM	

AS FOUND Efficiencies: Pu-239: 19.44% Tc-99: 11.40% Th-230: 16.45% SrY-90: 27.47%

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

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : **V**

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

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

Reproducibility : Isotope: Sr-90 4041 4011 3983 **Average:** 4013.3 ☑ **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	Source 1 Response (CPM) A ch.	B ch.	Net Eff.	Source 2 Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%
N/A									N/A
									N/A
									N/A
									N/A
									N/A
									N/A

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

Comments: Married as a set with: **Model:** 2224-1 **Serial #:** 187272 **Bar Code #:**

☑ **Does Instrument Meet Final Acceptance Criteria?** ☑ **Calibration Sticker Attached?**

Date Instrument is Due For Next Calibration: 07/03/09

Performed by: _____ **Reviewed by:** _____ **Date:** 7/3/08

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ **Date:** 7-3-08