



Calibration Certificate
ID Number: 19020549438-0

Customer: Chuck Mikaitis
Cabrera Services, Inc.
 473 Silver Lane
 East Hartford, CT 06118-

Instrument
 Ludlum Model 2221

Serial Number
 190205

Probe Model
 Alpha Spectra Inc G5

Serial Number
 010700D2

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
39.92 Kcpm	39.96 Kcpm	39.97 Kcpm	39.95 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
X1000	400 Kcpm	399.322 Kcpm #	399.322 Kcpm #
X1000	100 Kcpm	98.717 Kcpm #	98.717 Kcpm #
X100	40 Kcpm	39.915 Kcpm #	39.915 Kcpm #
X100	10 Kcpm	9.950 Kcpm #	9.950 Kcpm #
X10	4 Kcpm	3.998 Kcpm #	3.998 Kcpm #
X10	1 Kcpm	0.992 Kcpm #	0.992 Kcpm #
X1	400 cpm	400 cpm #	400 cpm #
X1	100 cpm	99 cpm #	99 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10% of Target value
 Readings with # indicate ranges were calibrated using a pulser

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
G5 010700D2	Co-57	0.3200 C/D	Co-57 (SN: 129584)	@ 1cm
G5 010700D2	I-129	0.2940 C/D	I-129 (SN: NES-186S)	@ 1cm

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500SN: 134720	09/07/2011

Outer Physical Check: *Pass* Mechanical Zero: *Pass*
 Internal Check: *Pass* Tap Test: *Pass*
 Geotropism Check: *Pass*

Electronics Checks	As Found	As Left
High Voltage	900 Volts	900 Volts
Low Level Discriminator #1	set at 100	set at 100
Window	out	out

Comments: analog and digital displays reflect appropriate congruence

Calibrated by:  QA Review: 

Date: 08/03/2011
 Expires: 08/03/2012

Atmospheric Conditions - Temperature: 70° F Humidity: 48% Barometric Pressure: 29.65 in/hg

This calibration was performed by RSCS Inc. 91 Portsmouth ave, Stratham NH 03885 using a NIST Traceable radiation source, in conformance to the following standards: ANSI N323A (1997). RSCS New Hampshire Radioactive Material License Number: 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedure. This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc



Designer and Manufacturer
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CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20190675/371807

Mfg. Ludlum Measurements, Inc. Model 2221 Serial No. 216512

Mfg. RSCS Model G1 Serial No. C442E

Cal. Date 29-Dec-11 Cal Due Date 29-Dec-12 Cal. Interval 1 Year Meterface 202-159

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 71 °F RH 21 % Alt 698.8 mm Hg

New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck. Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 4.4 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 750 V Input Sens. 10 mV Det. Oper. 750 V at 10 mV Threshold Dial Ratio 100 = 10 mV

HV Readout (2 points) Ref./Inst. 500 / 501 V Ref./Inst. 2000 / 2009 V

COMMENTS:

Firmware:261028 OL checked but not set.
Calibrated with window in OUT position.

Calibrated with 12' cable.

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1K	400kcpm	400	400
x1K	100kcpm	100	100
x100	40kcpm	400	400
x100	10kcpm	100	100
x10	4kcpm	400	400
x10	1kcpm	100	100
x1	400cpm	400	400
x1	100cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
400kcpm	400/5 (0)	400/5 (0)	500kcpm	500kcpm	500kcpm	500kcpm
40kcpm	3997	3997	50kcpm	50kcpm	50	50
4kcpm	399	399	5kcpm	5kcpm	5	5
400cpm	40	40	500cpm	500cpm	500	500
40cpm	4	4	50cpm	50cpm	50	50

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Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897 Ra-226 S/N Y982
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304

Alpha S/N _____ Beta S/N _____ Other _____

m 500 S/N 63893 Oscilloscope S/N _____ Multimeter S/N 93870637

Calibrated By: Alamy Thompson Date 29-Dec-11

Reviewed By: Dwain Adcox Date 29 Dec 11



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POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector G1 Serial No. C442E
Customer CABRERA SERVICES Order #. 20190675/371807
Counter 2221 Serial No. 216512 Counter Input Sensitivity 10 mV
Count Time 6 seconds Distance Source to Detector Surface
Other _____

High Voltage	Background	Isotope <u>Am241</u> Size <u>20.7µCi</u>	Isotope Size	Isotope Size	Isotope Size
650	179	14402			
700	164	14566			
*750	161	14424			
800	256	14546			
850	292	14317			
900	213	14909			
950	433	25153			

Signature *Jeremy Thompson* Date 29-Dec-11



Calibration Certificate
ID Number: 21856348618-0

Customer: Chuck Mikaitis
Cabrera Services, Inc.
 473 Silver Lane
 East Hartford, CT 06118-

Instrument
 Ludlum Model 2221

Serial Number
 218563

Probe Model
 Bicron G-1

Serial Number
 C443E

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
10,047.00 cpm	10,053.00 cpm	10,053.00 cpm	10,051.00 cpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
X1000	400 Kcpm	399 Kcpm #	399 Kcpm #
X1000	100 Kcpm	100 Kcpm #	100 Kcpm #
X100	40 Kcpm	39.9 Kcpm #	39.9 Kcpm #
X100	10 Kcpm	10 Kcpm #	10 Kcpm #
X10	4 Kcpm	3.9 Kcpm #	3.9 Kcpm #
X10	1 Kcpm	.99 Kcpm #	.99 Kcpm #
X1	400 cpm	399 cpm #	399 cpm #
X1	100 cpm	100 cpm #	100 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10% of Target value
 Readings with # indicate ranges were calibrated using a pulser

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
G-1 C443E	Co-57	0.1178 C/D	Co-57 (SN: 129584)	@ 1cm
G-1 C443E	I-129	0.0633 C/D	I-129 (SN: NES-186S)	@ 1cm

MTE Instrument Type	Model	CalDueDate
* Pulser	Ludlum 500-4SN: 66151	02/10/2012

Outer Physical Check: <i>Pass</i>	Mechanical Zero: <i>Pass</i>
Internal Check: <i>Pass</i>	Tap Test: <i>Pass</i>
Geotropism Check: <i>Pass</i>	

Electronics Checks	As Found	As Left
High Voltage	795 Volts	795 Volts
Low Level Discriminator #1	Set at 98	Set at 98
Window	Out	Out

Comments: Analog and digital displays reflect appropriate congruence.

Calibrated by: _____ QA Review: _____

Date: 06/29/2011
 Expires: 06/29/2012

Atmospheric Conditions - Temperature: 72° F Humidity: 47% Barometric Pressure: 29.00 inHg
 This calibration was performed by RSCS Inc. 91 Portsmouth Ave, Stratham NH 03885 using a NIST Traceable radiation source, in conformance to the following standards: ANSI N323A (1997), RSCS New Hampshire Radioactive Material License Number: 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedure. This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc



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SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES - EH ORDER NO. 20180668/366013
Mfg. Ludlum Measurements, Inc. Model 2224-1 Serial No. 162425
Mfg. Ludlum Measurements, Inc. Model 43-93 Serial No. PN182403
Cal. Date 1-Aug-11 Cal Due Date 1-Aug-12 Cal. Interval 1 Year Meterface 202-848

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 36 % Alt 698.8 mm Hg
 New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments
 Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity
 F/S Resp. ck. Reset ck. Window Operation Geotropism
 Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.
Instrument Volt Set 950 V Input Sens. Comment mV Def. Oper. 950 V at Comment mV Threshold Dial Ratio = _____ mV
 HV Readout (2 points) Ref./Inst. 500 / 498 V Ref./Inst. 1000 / 998 V

COMMENTS:

Alpha Threshold: 120mv Overload set to simulate light leak.
Beta Threshold: 3.5mv Firmware: 390094
Beta Window: 30mv

Th230 SN:E121495 Size:19800dpm, Counts:3982cpm, Background:1cpm, 4pi Eff:20.10%
Tc99 SN:5280 Size:93200dpm, Counts:20192cpm, Background:240cpm, 4pi Eff:21.40%
SrY90 SN:5281 Size:102085dpm, Counts:35886cpm, Background:240cpm, 4pi Eff:34.91%
Ni63 SN:4017 Size:281620dpm, Counts:739cpm, Background:240cpm, 4pi Eff:0.17%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*	
x1000	800k cpm	<i>N/A</i>	800	
x1000	200k cpm	<i>(Large handwritten bracket)</i>	200	
x100	80k cpm		800	
x100	20k cpm		200	
x10	8k cpm		800	
x10	2k cpm		200	
x1	800 cpm		800	
x1	200 cpm		200	

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	<i>N/A</i>	799486	Log Scale		
800kcpm		79964			
8kcpm	<i>S</i>	7998			
800cpm		799			
80cpm		80			

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Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70877
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N _____ Beta S/N _____ Other _____
 m 500 S/N 190566 Oscilloscope S/N _____ Multimeter S/N 86250390

Calibrated By: Jana F... Date 1-Aug-11
Reviewed By: Shak Han Date 1 Aug 11

AC Inst. Only	<input type="checkbox"/> Passed Dielectric (Hi-Pot) and Continuity Test
	<input type="checkbox"/> Failed:



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POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-93 Serial No. PA182403 Order #. 20180668/366013
 Customer CABRERA SERVICES - EH Alpha Input Sensitivity 120 mV
 Counter 2224-1 Serial No. 162425 Beta Input Sensitivity 3.5 mV
 Count Time 1Minute Beta Window 30 mV
 Other _____ Distance Source to Detector Surface

Isotope Th230 Isotope Tc99 Isotope SrY90 Isotope Ni63
 Size 19800dpm Size 93200dpm Size 102085dpm Size 281620dpm

High Voltage	Background		Isotope <u>Th230</u>		Isotope <u>Tc99</u>		Isotope <u>SrY90</u>		Isotope <u>Ni63</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
925	0	187	3830	584	27	17855	1	32834	2	388
950	1	240	3982	724	29	20192	2	35886	1	739
975	1	262	4078	919	19	22750	4	37645	3	1277
1000	3	314	4154	1182	24	24801	4	37782	3	2202

- Gas Proportional detector count rate decreased \leq 10% after 15 hour static test using 39" cable.
- Gas proportional detector count rate decreased \leq 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Juan Flores Date 1-Aug-11



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501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES - EH ORDER NO. 20183503/367657
Mfg. Ludlum Measurements, Inc. Model 2224-1 Serial No. 162426
Mfg. Ludlum Measurements, Inc. Model 43-93 Serial No. PR193921
Cal. Date 7-Sep-11 Cal Due Date 7-Sep-12 Cal. Interval 1 Year Meterface 202-848

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 36 % Alt 701.8 mm Hg

New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck. Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 825 V Input Sens. Comment mV Def. Oper. 825 V at Comment mV Threshold Dial Ratio = mV

HV Readout (2 points) Ref./Inst. 500 / 499 V Ref./Inst. 1000 / 999 V

COMMENTS:

Alpha Threshold: 120mv Firmware: 390096 Cal'd with 5ft cable
Beta Threshold: 3.5mv Overload set to simulate light leak.
Beta Window: 30mv HV set with detector not connected.

Tc99 SN:5280 Size:93200dpm, Background:256cpm, Counts:20080cpm, 4pi Eff:21.27%
SrY90 SN:5281 Size:102085dpm, Background:256cpm, Counts:38074cpm, 4pi Eff:37.04%
Ni63 SN:4017 Size:280409dpm, Background:256cpm, Counts:400cpm, 4pi Eff:0.05%
Th230 SN:E121495 Size:19800dpm, Background:1cpm, Counts:4081cpm, 4pi Eff:20.60%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	800k cpm	800	800
x1000	200k cpm	200	200
x100	80k cpm	800	800
x100	20k cpm	200	200
x10	8k cpm	800	800
x10	2k cpm	200	200
x1	800 cpm	800	800
x1	200 cpm	200	200

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	800kcpm	799862				
	80kcpm	79988				
	8kcpm	7998				
	800cpm	800				
	80cpm	80				

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Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N Beta S/N Other
 m 500 S/N 190566 Oscilloscope S/N Multimeter S/N 86250390

Calibrated By: [Signature] Date 7 Sept 11

Reviewed By: [Signature] Date 7 Sep 11

AC Inst. Only	<input type="checkbox"/> Passed Dielectric (Hi-Pot) and Continuity Test
	<input type="checkbox"/> Failed:



Bench Test Data For Detector

Detector 43-93 Serial No. PN193921 Order #. 20183503/367657
 Customer CABRERA SERVICES - EH Alpha Input Sensitivity 120 mV
 Counter 2224-1 Serial No. 162426 Beta Input Sensitivity 3.5 mV
 Count Time 1Minute Beta Window 30 mV
 Other _____ Distance Source to Detector Surface

High Voltage	Background		Isotope <u>Th230</u> Size <u>19800dpm</u>		Isotope <u>Tc99</u> Size <u>93200dpm</u>		Isotope <u>Sr90</u> Size <u>102085dpm</u>		Isotope <u>Ni 63</u> Size <u>280409dpm</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
800	0	210	3741	552	28	1747	5	33807	5	223
825	1	256	4081	676	27	20080	2	38074	1	400
850	3	337	4374	900	25	23047	3	40254	1	811

- Gas Proportional detector count rate decreased \leq 10% after 15 hour static test using 39" cable.
- Gas proportional detector count rate decreased \leq 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Juan F... Date 7-Sept-11



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501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20192797/373076
Mfg. Ludlum Measurements, Inc. Model 2224-1 Serial No. 227246
Mfg. Ludlum Measurements, Inc. Model 43-93 Serial No. PR 244549
Cal. Date 26-Jan-12 Cal Due Date 26-Jan-13 Cal. Interval 1 Year Meterface 202-848

Check mark Applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 20 % Alt 694.8 mm Hg
 New Instrument Instrument Received Within Toler. +-10% 10-20% Out of Tol. Requiring Repair Other-See comments
 Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity
 F/S Resp. ck. Reset ck. Window Operation Geotropism
 Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.
Instrument Volt Set 925 V Input Sens. 500 mV Det. Oper. 925 V at 500 mV Threshold 1495 mV
 HV Readout (2 points) Ref./Inst. 500 / 497 V Ref./Inst. 1500 / 1495 V

COMMENTS:

Input Sens. Settings: Alpha:120mv
Beta:3.5mv
Beta Window:30mv
Overload set to simulate light leak.
Eff:Th230:sn:E121495,ACTIVITY:10,100cpm,Background:1cpm,Sourcecount:4263cpm,EFF:39.56% 2A
Tc99:sn:5280,ACTIVITY:58,300cpmpm,Background:267cpm,Sourcecount:25,685cpm,EFF:43.59% 2A
Sr90Y90:sn:4016,ACTIVITY:24,941cpm,Background:267cpm,Sourcecount:14,068cpm,EFF:55.23% 2A
Ni63:sn:4017,ACTIVITY:139,827cpm,Background:267cpm,Sourcecount:3188cpm,EFF:2.08% 2A
Firmware:390094 High Voltage set with 43-93 connected.
Calibration performed with 5' C cable.
Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	800k cpm	800	800
x1000	200k cpm	200	200
x100	80k cpm	800	800
x100	20k cpm	200	200
x10	8k cpm	800	800
x10	2k cpm	200	200
x1	800 cpm	800	800
x1	200 cpm	200	200

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	800kcpm	797984			
	80kcpm	79798			
	8kcpm	7979			
	800cpm	800			
	80cpm	80			

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Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897 Ra-226 S/N Y982
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N Th230: E121495 Beta S/N Tc99: 5280/5890990:4016 Other _____
 m 500 S/N 94940 Oscilloscope S/N _____ Multimeter S/N 78401031

Calibrated By: S. Cant Date 26-Jan-12
Reviewed By: R. Hain Date 26 Jan 12



Designer and Manufacturer
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POST OFFICE BOX 810 PH. 325-235-5494
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SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-93 Serial No. PR 244549 Order # 20192797/373076
 Customer CABRERA SERVICES Alpha Input Sensitivity 120 mV
 Counter 2224-1 Serial No. 227246 Beta Input Sensitivity 3.5 mV
 Count Time 1Minute Beta Window 30 mV
 Other H.V. set with 43-93 connected Distance Source to Detector SURFACE

High Voltage	Background		Isotope <u>Th230</u> Size <u>10,100cpm</u>		Isotope <u>Tc99</u> Size <u>58,300cpm</u>		Isotope <u>Sr90Y90</u> Size <u>24,941cpm</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
875	1	154	4039	697	34	22140	6	11874
900	1	219	4103	961	28	24596	19	13430
925 <u>950SD</u>	1	267	4263	1309	28	25685	19	14068
950	4	286	4363	1801	38	26581	48	13837

- Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.
- Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature [Handwritten Signature] Date 26-5-12

work order #:
20192268/372778

ATTACHMENT(44-93)
(PR244549)

Eff:Th230:sn:5020,ACT:3220dpm,Background:1cpm,Sourcecount:676cpm ,
EFF:20.49%(4pi)

Eff:Th230:sn:5020,ACT:1630cpm,Background:1cpm,Sourcecount:676cpm
EFF:41.41%(2pi)

Eff:Tc99:sn:5279,ACT:28,800dpm,,Background:107cpm,Sourcecount:5,714cpm
EFF:19.46%(4pi)

Eff:Tc99:sn:5279,ACT:18,800cpm,Background:107cpm,Sourcecount:5,714cpm
EFF:31.15%(2pi)

Eff:Sr90Y90:sn:4016,ACT:35,646dpm,Background:107comSoourcecount:11,041cpm
EFF:30.67%(4pi)

Eff:Sr90Y90:sn:4016,ACT:24,952cpm,Background:107cpm,Sourcecount:11,041cpm
EFF:43.82%(2pi)

Eff:Ni63:sn:4017,ACT:279,687dpm,Background:107cpm,Sourcecount:545cpm,
EFF:0.159%(4pi)

Eff:Ni63:sn:4017,ACT:139,843cpm,Background:107cpmSourcecount;545cpm,
EFF:0.313%(2pi)

cal:brated By
Scott S. Thomas



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20177310/364063

Mfg. Ludlum Measurements, Inc. Model 2360 Serial No. 193635

Mfg. Ludlum Measurements, Inc. Model 43-10-1 Serial No. PR 202583

Cal. Date 7-Jun-11 Cal Due Date 7-Jun-12 Cal. Interval 1 Year Meterface 202-855

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 38 % Alt 701.8 mm Hg

New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck. Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC RS-232 Port OK

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 600 V

HV Readout (2 points) Ref./Inst. 500 / 502 V Ref./Inst. 2000 / 1999 V

Firmware Version: 39010-20 (EEPROM Settings)

Alpha Threshold: 175 mV User Time: 30.0

Beta Threshold: 4 mV Alpha Alarm: 999999

Beta Window: 50 mV Beta Alarm: 999999

Overload Checked BUT NOT SET. A/B Alarm: 999999

Instrument calibrated with a 39' cable. Model 2360 Date: 6/07/2011

High voltage set with detector NOT CONNECTED. Calibration Date Due: 6/07/2012

COMMENTS:
Th230 SN:E121495, Size:19800dpm, Counts:7727cpm, Background:1cpm, 4pi Eff:39.02%
Tc99 SN:5280, Size:93200dpm, Counts:27219cpm, Background:63cpm, 4pi Eff:29.13%
SrY90 SN:5281, Size:102085dpm, Counts:48007cpm, Background:63cpm, 4pi Eff:46.96%
Ni63 SN:4017, Size:280894dpm, Counts:4783cpm, Background:63cpm, 4pi Eff:1.68%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	400k cpm	400	400
x1000	100k cpm	100	100
x100	40k cpm	400	400
x100	10k cpm	100	100
x10	4k cpm	400	400
x10	1k cpm	100	100
x1	400 cpm	400	400
x1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	400kcpm	39986(0)			
	40kcpm	3998			
	4kcpm	400			
	400cpm	40			
	40cpm	4			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL 7540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897

Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304

Alpha S/N Beta S/N Other

m 500 S/N 190566 Oscilloscope S/N Multimeter S/N 86250390

Calibrated By: [Signature] Date 7-Jun-11

Reviewed By: [Signature] Date 7 Jun 11



Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-10-1 Serial No. PN 202583 Order #. 20177310/364063
 Customer CABRERA SERVICES Alpha Input Sensitivity 175 mV
 Counter 2360 Serial No. 193635 Beta Input Sensitivity 4 mV
 Count Time 1 Minute Beta Window 50 mV
 Other _____ Distance Source to Detector TRAY

High Voltage	Background		Isotope <u>Th230</u> Size <u>19800dpm</u>		Isotope <u>Tc99</u> Size <u>93200dpm</u>		Isotope <u>Sr90</u> Size <u>102085dpm</u>		Isotope <u>Ni63</u> Size <u>280894dpm</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
<u>575</u>	<u>1</u>	<u>62</u>	<u>7580</u>	<u>619</u>	<u>42</u>	<u>22571</u>	<u>2</u>	<u>44796</u>	<u>2</u>	<u>1338</u>
<u>600</u>	<u>1</u>	<u>63</u>	<u>7727</u>	<u>942</u>	<u>39</u>	<u>27219</u>	<u>2</u>	<u>48007</u>	<u>5</u>	<u>4783</u>
<u>625</u>	<u>1</u>	<u>51</u>	<u>7561</u>	<u>973</u>	<u>55</u>	<u>30991</u>	<u>3</u>	<u>48499</u>	<u>7</u>	<u>9100</u>

- Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.
- Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature Juan Ferrer Date 7-Jun-11



**CALIBRATION
CERTIFICATE**

EnergySolutions Services, Inc.
628 Gallaher Road
Kingston, TN 37763
Phone: (877) 462-4873
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address: 628 Gallaher Road, Kingston, TN 37763		Model: 2360	Serial Number: 193647
Contact Name: Tony Riggs		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: N/A	Work Order Number: 2011-11583	Calibration Method: Electronic	

INSTRUMENT CALIBRATION INFORMATION								
Instrument Range	Calibration Standard Value	Rateometer Response ($\pm 10\%$ of Standard Values)		Calibration Standard Value CPM	Time Base (minutes)	Tolerances (cpm) $\pm 2\%$	Scaler Response	
		As Found	As Left				As Found	As Left
X 1	100	100	100	1,000 CPM	0.1	90 - 110	98	98
X 1	250	250	250	1,000 CPM	0.5	450 - 550	486	486
X 1	400	400	400	1,000 CPM	1	900 - 1,100	990	990
X 10	1,000	1,000	1,000	1,000 CPM	2	1.8K-2.2K	1,989	1,989
X 10	2,500	2,500	2,500	1,000 CPM	5	4.5K-5.5K	4,956	4,956
X 10	4,000	4,000	4,000	1,000 CPM	10	9K-11K	9,913	9,913
X 100	10,000	10,000	10,000					
X 100	25,000	25,000	25,000					
X 100	40,000	40,000	40,000					
X 1000	100,000	100,000	100,000	Calibrated in accordance with OEM Technical Manual				
X 1000	250,000	250,000	250,000					
X 1000	400,000	400,000	400,000					

STATEMENT OF CERTIFICATION		
We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).		
Instrument		
Calibrated By: M. Paul	Reviewed By: <i>[Signature]</i>	Date: 9/12/11
Calibration Date: 07/12/2011	*Calibration Due (6mo): 01/12/2012	
	*Calibration Due (12mo): 07/12/2012	

* Calibration due date is dependant on users regulatory requirements.

Model: 2360

Serial Number: 193647

M&TE				Environmental Conditions		
Volt Meter	ID# 94710023	Cal Due: 10/28/2011		Barometer	ID# 3590	Cal Due: 09/21/11
Pulser	ID# 151067	Cal Due: 08/27/2011		Thermometer	ID# 3590	Cal Due: 09/21/11
Humidity	ID# 958670	Cal Due: 06/07/2012		Temp: 21.7°C	Pressure: 741 mmHg	Humidity: 43%
Special Test						
BAT Check		Sat (✓) Unsat ()		Geotropism		Sat (✓) Unsat ()
LCD Display Check		Sat (✓) Unsat ()		Audio Check		Sat (✓) Unsat ()
Mechanical Zero		Sat (✓) Unsat ()		Low BAT Set		Sat (✓) Unsat ()
Reset		Sat (✓) Unsat ()				
HV Analog Display		Sat (✓) Unsat ()		As Found		As Left
High Voltage Calibration (± 10%)				Alpha Sensitivity = 119 mv		Alpha Sensitivity = 120 mv
Voltage	Tolerance	As Found	As Left	Beta Sensitivity = 3.6 mv		Beta Sensitivity = 3.5 mv
500	450-550	556	556	Beta Window = 30.4 mv		Beta Window = 30 mv
1000	900-1100	1,056	1,056	Beta Setpoints--Pulser counts detected at 3.5mv ± 1mv and shut off at 30mv for beta. For Alpha channel counts detected at 120mv and above.		
1500	1350-1650	1,559	1,559			
H.V. Set With Detector Not Connected				Overload to be set with detector to be used		
COMMENTS						
<p>Calibrated in accordance with OEM Technical Manual</p> <p>See detector certificate for High Voltage setting</p> <p>**Calibrated with 5ft cable**</p>						
Instrument				Reviewed By: <i>[Signature]</i> Date: <i>7/12/11</i>		
Calibrated By: <i>M. Paul</i>				*Calibration Due (6mo): 01/12/2012		
Calibration Date: 07/12/2011				*Calibration Due (12mo): 07/12/2012		

* Calibration due date is dependant on users regulatory requirements.



**CALIBRATION
CERTIFICATE**

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION	
Customer Name: EnergySolutions- Instrument Services		Manufacturer: Ludlum	
Address: 628 Gallaher Road Kingston, TN 37763		Detector Model: 43-93	
Contact Name: Tony Riggs		Serial Number: 238107	
Customer Purchase: Order Number: N/A	Work Order Number: 2011-11538	Evaluation Method: Source	

DETECTOR EVALUATION INFORMATION						
Source Nuclide	Serial Number	Activity (dpm)	2 Pi Emissions	Net Response (cpm)	Efficiency (%)	
Th-230	119738	18,600	8,640/ min	3,355	18.0% (4pi)	38.8% (2pi)
*Pu-239	019442	13,607	N/A	2,974	21.9% (4pi)	*N/A (2pi)
Tc-99	099608	21,311	10,500/ min	3,413	16.0% (4pi)	32.5% (2pi)

SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold
2360	193647	07/12/2012	0.4	800V	Alpha (120mV)
2360	193647	07/12/2012	209	800V	Beta (3.5-30mV)

ATTACHMENTS					
Voltage Plateau:		√ YES	NO	MDA/Cross Talk Evaluation:	
				√ YES	NO

COMMENTS	LINEARITY TEST	
* No 2pi emission rate is listed on the source certificate. Calibrated with 5ft cable Linearity test performed with Tc-99#099608. Calibrated in accordance with original equipment technical manual.	Count 1 (Toe)	3,671
	Count 2 (Mid)	3,672
	Count 3 (Heel)	3,524
	Average	3,622
	Pass/Fail	PASS (+/-10% Tolerance)

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector		
Certified By: <i>M. Pauli</i>	Reviewed By: <i>[Signature]</i>	Date: <i>7/12/11</i>
Certification Date: 07/12/2011	*Certification Due (6mo): 01/12/2012 *Certification Due (12mo): 07/12/2012	

* Calibration due date is dependant on users regulatory requirements.



**CALIBRATION
CERTIFICATE**

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 3776

Phone: (865) 376-8337
Fax: (865) 376-8331
Email: Isfstaff@energysolutions.com

<http://www.energysolutions.com/>

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION				INSTRUMENT INFORMATION			
Customer Name:	Energy Solutions			Manufacturer:			
Address:	628 Gallaher Rd, Kingston TN 37763			Model:	2360	S.N.	193647
Contact Name:	Tony Riggs			Probe:	43-93	S.N.	238107
Customer PO No.:	N/A	Work Order Number:	2011-11247	Calibration Method:	Source		

Source Information

	Isotope	Source ID	Certification Date	Activity (dpm)
α Source	Pu-239	019442	6/1/92	13,607
β Source	Tc-99	099608	8/8/96	21,311

Ludlum Model 2929 High Voltage Plateau with crosstalk

Operating Voltage	High Voltage	Background		Alpha Source		Beta Source		Crosstalk		Efficiency	
		Alpha	Beta	Alpha	Beta	Alpha	Beta	α to β	β to α	α	β
	750	1.0	118.0	2,855.0	263.0	0.0	2,643.0	5.30%	0.00	20.97%	11.85%
	775	2.0	167.0	2,872.0	471.0	1.0	3,130.0	11.24%	0.00	21.09%	13.90%
	800	2.0	206.0	3,125.0	790.0	3.0	3,797.0	20.01%	0.03%	22.95%	16.85%
	825	1.0	232.0	3,080.0	1,104.0	1.0	4,259.0	30.62%	0.00%	22.63%	18.90%
	850	0.0	240.0	3,061.0	2,252.0	2.0	4,490.0	71.32%	0.05%	22.50%	19.94%

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Comments:

Calibrated By: Nike Paul Reviewed By: [Signature] Date: 7/12/11

Calibration Date: 7/12/11 Calibration Due: 7/11/12



**CALIBRATION
CERTIFICATE**

EnergySolutions Instrument Services
628 Gallaher Road
Kingston, TN 3776

Phone: (865) 376-8337
Fax: (865) 376-8331
Email: Isfstaff@energysolutions.com

http://www.energysolutions.com/

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION				INSTRUMENT INFORMATION			
Customer Name:	Energy Solutions			Manufacturer:			
Address:	628 Gallaher Rd, Kingston TN 37763			Model:	2360	S.N.	193667
Contact Name:	Tony Riggs			Probe:	43-93	S.N.	238112
Customer PO No.:	N/A	Work Order Number:	2011-11340	Calibration Method:	Source		

Source Information

	Isotope	Source ID	Certification Date	Activity (dpm)
α Source	Pu-239	019442	6/1/92	13,607
β Source	Tc-99	099608	8/8/96	21,311

Ludlum Model 2929 High Voltage Plateau with crosstalk

Operating Voltage	High Voltage	Background		Alpha Source		Beta Source		Crosstalk		Efficiency	
		Alpha	Beta	Alpha	Beta	Alpha	Beta	α to β	β to α	α	β
	775	1.0	130.0	3,154.0	283.0	1.0	2,191.0	5.06%	0.00%	23.17%	9.67%
	800	3.0	214.0	3,082.0	444.0	1.0	3,092.0	8.02%	0.00	22.63%	13.50%
SET	825	0.0	221.0	3,246.0	727.0	0.0	3,677.0	16.73%	0.00%	23.86%	16.22%
	850	0.0	300.0	3,420.0	846.0	0.0	4,362.0	17.50%	0.00%	25.13%	19.06%
	875	2.0	298.0	3,320.0	1,474.0	0.0	5,309.0	38.91%	0.00	24.38%	23.51%

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Comments:

Calibrated By: M. Paul Reviewed By: Jeff Outerson Date: 3/25/11

Calibration Date: 3/24/11 Calibration Due: 3/24/12



**CALIBRATION
CERTIFICATE**

EnergySolutions Services, Inc.
628 Gallaher Road
Kingston, TN 37763
Phone: (877) 462-4873
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION			DETECTOR INFORMATION			
Customer Name: EnergySolutions- Instrument Services			Manufacturer: Ludlum			
Address: 628 Gallaher Road Kingston, TN 37763			Detector Model: 43-93			
Contact Name: Tony Riggs			Serial Number: 238112			
Customer Purchase: Order Number: N/A		Work Order Number: 2011-11340		Evaluation Method: Source		
DETECTOR EVALUATION INFORMATION						
Source Nuclide	Serial Number	Activity (dpm)	2 Pi Emissions	Net Response (cpm)	Efficiency (%)	
Th-230	090226	28,600	14,500/ min	5,921	20.7% (4pi)	40.8% (2pi)
*Pu-239	019442	13,607	N/A	3,213	23.6% (4pi)	*N/A (2pi)
Tc-99	099608	21,311	10,500/ min	3,577	16.8% (4pi)	34.1% (2pi)
SCALER INFORMATION			DETECTOR INFORMATION			
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold	
2360	193667	03/24/2012	1.0	825V	Alpha (120mV)	
2360	193667	03/24/2012	221.8	825V	Beta (3.5-30mV)	
ATTACHMENTS						
Voltage Plateau: <input checked="" type="checkbox"/> YES NO		MDA/Cross Talk Evaluation: <input checked="" type="checkbox"/> YES NO				
COMMENTS			LINEARITY TEST			
* No 2pi emission rate is listed on the source certificate. Calibrated with 5ft cable Linearity test performed with Tc-99#099608. Calibrated in accordance with original equipment technical manual.			Count 1 (Toe)	3,946		
			Count 2 (Mid)	3,723		
			Count 3 (Heel)	3,728		
			Average	3,799		
			Pass/Fail	PASS (+/-10% Tolerance)		
STATEMENT OF CERTIFICATION						
We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).						
Detector						
Certified By: <i>M. Paul</i>		Reviewed By: <i>J. M. Dabson</i>			Date: 3/25/11	
Certification Date: 03/24/2011		*Certification Due (6mo): 09/24/2011				
		*Certification Due (12mo): 03/24/2012				

* Calibration due date is dependant on users regulatory requirements.



**CALIBRATION
CERTIFICATE**

EnergySolutions Services, Inc.
628 Gallaher Road
Kingston, TN 37763
Phone: (877) 462-4873
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION				INSTRUMENT INFORMATION				
Customer Name: Duratek Instrument Services				Manufacturer: Ludlum				
Address: 628 Gallaher Road, Kingston, TN 37763				Model: 2360	Serial Number: 193667			
Contact Name: Tony Riggs				Probe: N/A	Serial Number: N/A			
Customer Purchase Order Number: N/A		Work Order Number: 2011-11340		Calibration Method: Electronic				
INSTRUMENT CALIBRATION INFORMATION								
Instrument Range	Calibration Standard Value	Ratemeter Response ($\pm 10\%$ of Standard Values)		Calibration Standard Value CPM	Time Base (minutes)	Tolerances (cpm) $\pm 2\%$	Scaler Response	
		As Found	As Left				As Found	As Left
X 1	100	100	100	1,000 CPM	0.1	90 - 110	100	100
X 1	250	250	250	1,000 CPM	0.5	450 - 550	502	502
X 1	400	400	400	1,000 CPM	1	900 - 1,100	1,004	1,004
X 10	1,000	1,000	1,000	1,000 CPM	2	1.8K - 2.2K	2,007	2,007
X 10	2,500	2,500	2,500	1,000 CPM	5	4.5K - 5.5K	5,017	5,017
X 10	4,000	4,000	4,000	1,000 CPM	10	9K - 11K	10,035	10,035
X 100	10,000	10,000	10,000					
X 100	25,000	25,000	25,000					
X 100	40,000	40,000	40,000					
X 1000	100,000	100,000	100,000	Calibrated in accordance with OEM Technical Manual				
X 1000	250,000	250,000	250,000					
X 1000	400,000	400,000	400,000					
STATEMENT OF CERTIFICATION								
We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).								
Instrument				Reviewed By: <i>J.M. Dubois</i> Date: 3/25/11				
Calibrated By: <i>M. Paul</i>				*Calibration Due (6mo): 09/24/2011				
Calibration Date: 03/24/2011				*Calibration Due (12mo): 03/24/2012				

* Calibration due date is dependant on users regulatory requirements.

Model: 2360

Serial Number: 193667

M&TE				Environmental Conditions				
Volt Meter	ID#	94710023	Cal Due:	10/28/2011	Barometer	ID# 3314	Cal Due: 06/29/11	
Pulser	ID#	151067	Cal Due:	08/27/2011	Thermometer	ID# 3314	Cal Due: 06/29/11	
Humidity	ID#	958670	Cal Due:	06/10/2011	Temp:	24.4 °C	Pressure: 747 mmHg	Humidity: 27%
Special Test								
BAT Check			Sat (✓) Unsat ()		Geotropism		Sat (✓) Unsat ()	
LCD Display Check			Sat (✓) Unsat ()		Audio Check		Sat (✓) Unsat ()	
Mechanical Zero			Sat (✓) Unsat ()		Low BAT Set		Sat (✓) Unsat ()	
Reset			Sat (✓) Unsat ()					
HV Analog Display			Sat (✓) Unsat ()		As Found		As Left	
High Voltage Calibration (± 10%)				Alpha Sensitivity =		106 mv	Alpha Sensitivity =	120 mv
Voltage	Tolerance	As Found	As Left	Beta Sensitivity =		3.5 mv	Beta Sensitivity =	3.5 mv
500	450-550	507	507	Beta Window =		28 mv	Beta Window =	30 mv
1000	900-1100	996	996	Beta Setpoints--Pulser counts detected at 3.5mv ± 1mv and shut off at 30mv for beta. For Alpha channel counts detected at 120mv and above.				
1500	1350-1650	1,498	1,498					
H.V. Set With Detector Not Connected				Overload to be set with detector to be used				
COMMENTS								
<p>Calibrated in accordance with OEM Technical Manual</p> <p>See detector certificate for High Voltage setting</p> <p>**Calibrated with 5ft cable**</p>								
Instrument				Reviewed By: <i>J. M. DeBenedis</i> Date: 3/25/11				
Calibrated By: <i>M. Pauli</i>				*Calibration Due (6mo): 09/24/2011				
Calibration Date: 03/24/2011				*Calibration Due (12mo): 03/24/2012				

* Calibration due date is dependant on users regulatory requirements.



CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES - EH ORDER NO. 20183500/367656
Mfg. Ludlum Measurements, Inc. Model 2360 Serial No. 202398
Mfg. Ludlum Measurements, Inc. Model 43-93 Serial No. PR211706
Cal. Date 6-Sep-11 Cal Due Date 6-Sep-12 Cal. Interval 1 Year Meterface 202-855

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 32 % Alt 699.8 mm Hg

- New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments
- Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity
 F/S Resp. ck. Reset ck. Window Operation Geotropism
 Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC RS-232 Port OK
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 750 V

HV Readout (2 points) Ref./Inst. 500 / 502 V Ref./Inst. 2000 / 1998 V

Firmware Version: 39010-27

(EEPROM Settings)

Alpha Threshold: 120 mv

User Time: 1.0

Beta Threshold: 3.5 mv

Alpha Alarm: 50000

Beta Window: 30 mv

Beta Alarm: 50000

Overload Set to simulate light leak

A/B Alarm: 50000

Instrument calibrated with a SAT cable.

Model 2360 Date: 9/6/2011

High voltage set with detector NOT CONNECTED

Calibration Date Due: 9/6/2012

COMMENTS:

Tc99 SN:5280 Size:93200dpm, Background:258cpm, Counts:18332cpm, 4pi Eff:19.39%
SrY90 SN:5281 Size:102085dpm, Background:258cpm, Counts:35124cpm, 4pi Eff:34.15%
Ni63 SN:4017 Size:280409dpm, Background:258cpm, Counts:758cpm, 4pi Eff:0.17%
Th230 SN:E121495 Size:19800dpm, Background:1cpm, Counts:3960cpm, 4pi Eff:20.00%

Gamma Calibration: GM detectors positioned perpendicular to source except for M44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	400k cpm	400	400
x1000	100k cpm	100	100
x100	40k cpm	400	400
x100	10k cpm	100	100
x10	4k cpm	400	400
x10	1k cpm	100	100
x1	400 cpm	400	400
x1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout 400kcpm	39986(0)	39986(0)				
40kcpm	3998	3998				
4kcpm	400	400				
400cpm	40	40				
40cpm	4	4				

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCCL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

73410 1131 781 059 280 60646 70897
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N Beta S/N Other
 m 500 S/N 190566 Oscilloscope S/N Multimeter S/N 86250390

Calibrated By: [Signature]

Date 6 Sept 11

Reviewed By: [Signature]

Date 6 Sep 11



Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-93 Serial No. PR 211706 Order #. 20183500/367656
 Customer CABRERA SERVICES - EH Alpha Input Sensitivity 120 mV
 Counter 2360 Serial No. 202398 Beta Input Sensitivity 3.5 mV
 Count Time 1Minute Beta Window 30 mV
 Other _____ Distance Source to Detector Surface

High Voltage	Background		Isotope <u>Th 230</u> Size <u>19800dpm</u>		Isotope <u>Tc 99</u> Size <u>93200dpm</u>		Isotope <u>Sr 90</u> Size <u>102085dpm</u>		Isotope <u>Ni 63</u> Size <u>280409dpm</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
<u>725</u>	<u>0</u>	<u>235</u>	<u>3776</u>	<u>570</u>	<u>26</u>	<u>14521</u>	<u>1</u>	<u>30492</u>	<u>0</u>	<u>354</u>
<u>750</u>	<u>1</u>	<u>258</u>	<u>3960</u>	<u>827</u>	<u>24</u>	<u>18332</u>	<u>3</u>	<u>35124</u>	<u>3</u>	<u>758</u>
<u>775</u>	<u>1</u>	<u>329</u>	<u>4064</u>	<u>979</u>	<u>27</u>	<u>21903</u>	<u>8</u>	<u>36086</u>	<u>1</u>	<u>1665</u>

- Gas Proportional detector count rate decreased \leq 10% after 15 hour static test using 39" cable.
- Gas proportional detector count rate decreased \leq 10% after 5 hour static test using 39" cable and alpha/beta counter. *

Signature *Juan Fernandez* Date 6-Sept-11



**CALIBRATION
CERTIFICATE**

EnergySolutions Services, Inc.
628 Gallaher Road
Kingston, TN 37763
Phone: (877) 462-4873
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION			DETECTOR INFORMATION			
Customer Name: EnergySolutions Services, Inc.			Manufacturer: Ludlum			
Address: 628 Gallaher Road Kingston, TN 37763			Detector Model: 43-93			
Contact Name: Tony Riggs			Serial Number: 295818			
Customer Purchase: Order Number: N/A		Work Order Number: 2011-11272		Evaluation Method: Source		
DETECTOR EVALUATION INFORMATION						
Source Nuclide	Serial Number	Activity (dpm)	2 Pi Emissions	Net Response (cpm)	Efficiency (%)	
*Pu-239	019442	13,607	N/A	2,923	21.5% (4pi)	*N/A (2pi)
Th-230	119738	18,600	8,640/ min	3,115	16.8% (4pi)	36.1% (2pi)
Tc-99	099608	21,311	10,500/ min	2,777.3	12.5%(4pi)	26.45% (2pi)
SCALER INFORMATION			DETECTOR INFORMATION			
Model	Serial Number	Due Date	**Background	Operating Voltage	Threshold	
2360	276935	02/07/2012	0	650V	Alpha (120mV)	
2360	276935	02/07/2012	116	650V	Beta (3.5-30mV)	
ATTACHMENTS						
Voltage Plateau: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		MDA/Cross Talk Evaluation: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				
COMMENTS			LINEARITY TEST			
* No 2pi emission rate is listed on the source certificate. ** 5 minute background performed. Linearity test performed with Tc-99#099608. Calibrated with 5ft cable Calibrated in accordance with original equipment technical manual.			Count 1 (Toe)	2,648		
			Count 2 (Mid)	2,753		
			Count 3 (Heel)	2,931		
			Average	2,777.3		
			Pass/Fail	PASS (+/-15% Tolerance per LMI)		
STATEMENT OF CERTIFICATION						
We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).						
Detector						
Certified By:		Reviewed By:		Date: 2/24/11		
Certification Date: 02/24/2011		*Certification Due (6mo): 08/24/2011				
		*certification Due (12mo): 02/24/2012				

* Calibration due date is dependant on users regulatory requirements.



Designer and Manufacturer
of
Scientific and Industrial
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CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER ENERGY SOLUTIONS ORDER NO. 20169058

Mfg. Ludlum Measurements, Inc. Model 2360 Serial No. 276935

Mfg. Ludlum Measurements, Inc. Model 43-93 Serial No. PR 295818

Cal. Date 7-Feb-11 Cal Due Date 7-Feb-12 Cal. Interval 1 Year Meterface 202-855

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 20 % Alt 707.8 mm Hg

New Instrument Instrument Received Within Toler. $\pm 10\%$ 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC RS-232 Port OK

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 650 V

HV Readout (2 points) Ref./Inst. 500 / 504 V Ref./Inst. 1500 / 1499 V

Firmware Version: 39010N24

(EEPROM Settings)

Alpha Threshold: 120 mV

User Time: 1.0

Beta Threshold: 3.5 mV

Alpha Alarm: 99999

Beta Window: 30 mV

Beta Alarm: 999999

Overload Set with Am241 910dpm

A/B Alarm: 999999

Instrument calibrated with a 5ft. cable.

Model 2360 Date: 02/07/2011

High voltage set with detector connected

Calibration Date Due: 02/07/2012

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	400kcpm		400
x1000	100kcpm		100
x100	40kcpm		400
x100	10kcpm		100
x10	4kcpm		400
x10	1kcpm		100
x1	400cpm		400
x1	100cpm		100

*Uncertainty within $\pm 10\%$ C.F. within $\pm 20\%$

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	400kcpm	39962 (0)	Log Scale		
	40kcpm	3997 (0)			
	4kcpm	400 (0)			
	400cpm	40 (0)			
	40cpm	4 (0)			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other international Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL 2540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304

Alpha S/N Pu239 #4337 Beta S/N Tc99 #635/83, Sr90v90 Other _____

m 500 S/N 38120 Oscilloscope S/N _____ Multimeter S/N 84260131

Calibrated By: Laura Ortega Date 7-Feb-11

Reviewed By: Diana M. P. ... Date 8 Feb 11

211611



Designer and Manufacturer
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LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-93 Serial No. 1R 29 5818 Order #. 20169058
 Customer ENERGY SOLUTIONS Alpha Input Sensitivity 120 mV
 Counter 2360 Serial No. 276935 Beta Input Sensitivity 3.5 mV
 Count Time 1Minute Beta Window 30 mV
 Other _____ Distance Source to Detector Surface

High Voltage	Background		Isotope <u>Pa 239</u> Size <u>30900 dpm</u>		Isotope <u>Tc 99</u> Size <u>22900 dpm</u>		Isotope <u>Sr 90 y 90</u> Size <u>8808 dpm</u>	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
<u>600</u>	<u>0</u>	<u>30</u>	<u>4349</u>	<u>462</u>	<u>4</u>	<u>1381</u>	<u>0</u>	<u>1042</u>
<u>625</u>	<u>0</u>	<u>61</u>	<u>5568</u>	<u>339</u>	<u>5</u>	<u>2746</u>	<u>0</u>	<u>1676</u>
<u>650</u>	<u>1</u>	<u>104</u>	<u>6073</u>	<u>401</u>	<u>3</u>	<u>4009</u>	<u>0</u>	<u>2330</u>
<u>675</u>	<u>0</u>	<u>145</u>	<u>6779</u>	<u>447</u>	<u>5</u>	<u>6019</u>	<u>0</u>	<u>2913</u>
<u>700</u>	<u>0</u>	<u>208</u>	<u>7077</u>	<u>315</u>	<u>7</u>	<u>5587</u>	<u>1</u>	<u>2261</u>

- Gas Proportional detector count rate decreased ≤ 10% after 15 hour static test using 39" cable.
- Gas proportional detector count rate decreased ≤ 10% after 5 hour static test using 39" cable and alpha/beta counter.

Signature *Laura Ortega* Date 7-Feb-11

J 2/24/11



Designer and Manufacturer
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CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20173303/361787
Mfg. Ludlum Measurements, Inc. Model 3030E Serial No. 217611
Mfg. Ludlum Measurements, Inc. Model 43-10-1 Serial No. PR 232046
Cal. Date 6-Apr-11 Cal Due Date 6-Apr-12 Cal. Interval 1 Year

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 28 % Alt 698.8 mm Hg
 New Instrument Instrument Received Within Toler. +-10% 10-20% Out of Tol. Requiring Repair Other-See comments
 Mechanical ck. Window Operation
 Audio ck.
Alpha Sensitivity 120 mV Beta Sensitivity 4 mV Beta Window 50 mV
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

Instrument Volt Set 575 V High Voltage set with detector connected.
 HV Readout (2 points) Ref./Inst. 500 , 502 V Ref./Inst. 2000 , 1998 V
(EEPROM Settings)

Instrument in DPM mode.
QC mode turned OFF ON
Firmware version: 39013 / 16
Overload checked but not set.
Battery voltage measured at 12.6 Vdc.
C-14 Efficiency ~ 12.2 % (4 pi) Net

(PC) Count Time: 1666.7
Alpha Alarm: 999999 cpm
Beta Alarm: 999999 cpm
Alpha/Beta Alarm: 999999 cpm
Calibration Due Date: 4/6/2012
LOC (Loss of Count) time = 30 minutes (default)

	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Alpha Channel Digital Readout	400K cpm	39986 (0)	39986 (0)
	40K cpm	3998	3998
	4K cpm	400	400
	400 cpm	40	40
	40 cpm	4	4
Beta/Gamma Channel Digital Readout	400K cpm	39986 (0)	39986 (0)
	40K cpm	3998	3998
	4K cpm	400	400
	400 cpm	40	40
	40 cpm	4	4

*Uncertainty within ± 10% C.F. within ± 20%

(0) indicates 0.1 minute count

COMMENTS:

See ATTACHMENT For EFFICIENCIES.

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other international Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Alpha S/N _____ Beta S/N _____ Other _____
 m 500 S/N _____ Oscilloscope S/N _____ Multimeter S/N _____

Calibrated By: Jason Free Date 6-APR-11
Reviewed By: Shane Ham Date 6 April

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.

AC Inst- Only Passed Dielectric (Hi-Pot) and Continuity Test
Failed:

Attachment

M3030E S/N:217611 43-10-1 SN:PR232046

Th230 SN:5020

Source Size: 3220dpm Source Counts: 1219cpm
Background: 1cpm 4pi Eff: 37.82%

Tc99 SN:5279

Source Size: 28800dpm Source Counts: 10412cpm
Background: 76cpm 4pi Eff: 35.88%

SrY90 SN:5281

Source Size: 102085dpm Source Counts: 48899cpm
Background: 76cpm 4pi Eff: 47.82%

Ni63 SN:4017

Source Size: 281225dpm Source Counts: 11391dpm
Background: 76cpm 4pi Eff: 4.02%



Designer and Manufacturer
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CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20198463/377281
Mfg. Ludlum Measurements, Inc. Model 3030E Serial No. 217611
Mfg. Ludlum Measurements, Inc. Model 43-10-1 Serial No. PR232046
Cal. Date 30-Apr-12 Cal Due Date 30-Apr-13 Cal. Interval 1 Year

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 36 % Alt 700.8 mm Hg
 New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments
 Mechanical ck. Window Operation
 Audio ck.
Alpha Sensitivity 120 mV Beta Sensitivity 4 mV Beta Window 50 mV
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

Instrument Volt Set 575 V High Voltage set with detector connected.
 HV Readout (2 points) Ref./Inst. 500 / 501 V Ref./Inst. 1000 / 998 V

Instrument in DPM mode.
QC mode turned OFF ON
Firmware version: 39013.16
Overload checked but not set.
Battery voltage measured at 12.6 Vdc.
C-14 Efficiency ~ 11.3 % (4 pi) Net

(EEPROM Settings)
(PC) Count Time: 1666.7
Alpha Alarm: 999999 cpm
Beta Alarm: 999999 cpm
Alpha/Beta Alarm: 999999 cpm
Calibration Due Date: 4/30/2013
LOC (Loss of Count) time = 30 minutes (default)

	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Alpha Channel Digital Readout	<u>400K cpm</u>	<u>39972(0)</u>	<u>39972(0)</u>
	<u>40K cpm</u>	<u>3998</u>	<u>3998</u>
	<u>4K cpm</u>	<u>400</u>	<u>400</u>
	<u>400 cpm</u>	<u>40</u>	<u>40</u>
	<u>40 cpm</u>	<u>4</u>	<u>4</u>
Beta/Gamma Channel Digital Readout	<u>400K cpm</u>	<u>39968(0)</u>	<u>39968(0)</u>
	<u>40K cpm</u>	<u>3998</u>	<u>3998</u>
	<u>4K cpm</u>	<u>400</u>	<u>400</u>
	<u>400 cpm</u>	<u>40</u>	<u>40</u>
	<u>40 cpm</u>	<u>4</u>	<u>4</u>

*Uncertainty within ± 10% C.F. within ± 20%

(0) indicates 0.1 minute count

COMMENTS:

See Attachment for efficiencies.

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Alpha S/N Pu239 SN:7053 24900dpm Beta S/N Tc99 SN:5280 93200dpm Other _____
 m 500 S/N 190566 Oscilloscope S/N _____ Multimeter S/N 86250390

Calibrated By: [Signature] Date 30-Apr-12
Reviewed By: [Signature] Date 30 Apr 12

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.

AC Inst. Passed Dielectric (Hi-Pot) and Continuity Test
Only Failed:

Attachment

M3030E S/N:217611 43-10-1 SN:PR232046

Th230 SN:E121495

Source Size: 9900cpm Source Counts: 7837cpm
Background: 1cpm 2pi Eff: 79.15%

Tc99 SN:5280

Source Size: 46600cpm Source Counts: 34348cpm
Background: 58cpm 2pi Eff: 73.58%

SrY90 SN:5281

Source Size: 69345cpm Source Counts: 47415cpm
Background: 58cpm 2pi Eff: 68.29%

Ni63 SN:4017

Source Size: 140204cpm Source Counts: 11356dpm
Background:58cpm 2pi Eff: 8.05%

Ludlum Measurements, Inc.
 Model 3030 Plateau Data

4/30/2012
 10:59:41 AM

Header 1: John Q Pub\$yc
 Header 2: Serial#217611
 Header 3: DetSer#PR232046
 Header 4: Room 7\$yastWall
 Header 5: More Comments?
 Header 6: More Comments?

Calibration Due Date: 4/30/2013

Model 3030 Date: 4/30/2012
 Model 3030 Time: 4:19:32 AM

User PC Time: 1666.7

Alpha Isotope: Pu239
 Alpha Source Size (dpm): 24900
 Alpha Source Size (uCi): 0.011216216

Beta Isotope: Tc99
 Beta Source Size (dpm): 93200
 Beta Source Size (uCi): 0.041981982

Starting High Voltage: 525
 Starting High Voltage: 650
 High Voltage Increment: 25

Plateau Count Mode: SCALER
 Source Count Time (min): 1.0
 Background Count Time (min): 1.0

HV	Source (Beta)	ALPHA			CrossTalk	Source (Alpha)	BETA			Crosstalk
		Background	Eff				Background	Eff		
525	10701 (222)	1	43.0%		1.8%	24318 (38)	34	26.1%		0.2%
550	10769 (377)	1	43.2%		3.1%	29690 (54)	47	31.8%		0.2%
575	10556 (343)	1	42.4%		2.7%	34348 (39)	58	36.8%		0.1%
600	10705 (271)	1	43.0%		1.9%	37235 (44)	72	39.9%		0.1%
625	10640 (241)	0	42.7%		1.6%	38312 (49)	69	41.0%		0.1%
650	10667 (287)	1	42.8%		1.9%	37331 (48)	80	40.0%		0.1%



CERTIFICATE OF CALIBRATION

CUSTOMER CABRERA SERVICES ORDER NO. 20192324/372816

Mfg. Ludlum Measurements, Inc. Model 3 Serial No. 79511

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR137499

Cal. Date 23-Jan-12 Cal Due Date 23-Jan-13 Cal. Interval 1 Year Meterface 202-002

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 34 % Alt 694.8 mm Hg

- New Instrument
- Instrument Received
- Within Toler. +/-10%
- 10-20%
- Out of Tol.
- Requiring Repair
- Other-See comments
- Mechanical ck.
- Meter Zeroed
- Background Subtract
- Input Sens. Linearity
- F/S Resp. ck.
- Reset ck.
- Window Operation
- Geotropism
- Audio ck.
- Alarm Setting ck.
- Batt. ck. (Min. Volt) 7.2 VDC
- Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.
- Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 28 mV Det. Oper. 900 V at 28 mV Threshold Dial Ratio = mV

HV Readout (2 points) Ref./Inst. / V Ref./Inst. / V

COMMENTS:

Tc99 size: 93200dpm
B.G.: 50cpm
COUNTS: 20Kcpm
4p: EFF: 21.40%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 100	400kcpm	4K	4K
X 100	100kcpm	1	1
X 10	40kcpm	4.1	4
X 10	10kcpm	1	1
X 1	4kcpm	4.1	4
X 1	1kcpm	1	1
X 0.1	400cpm	4.2	4
X 0.1	100cpm	1.05	1

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

- Reference Instruments and/or Sources:** 73410 1131 781 059 280 60646 70897 Ra-226 S/N Y982
 Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N Beta S/N Other
 m 500 S/N 190566 Oscilloscope S/N Multimeter S/N 86250390

Calibrated By: [Signature] Date 23-Jan-12
 Reviewed By: [Signature] Date 23 Jan 12

AC Inst. Only Passed Dielectric (Hi-Pot) and Continuity Test
 Failed:



CONVERSION CHART

Customer CABRERA SERVICES Date 23-Jan-12 Order #. 20192324/372816

Model 3 Serial No. 79511 Detector Model 44-9 Serial No. PR137499

Source Cs-137 20 mCi High Voltage 900 V

Input Sensitivity 28 mV

Reference Point	"As Found" Readings (CPM):		After Adjustment Readings (CPM):	
	Meter Reading	Range/Scale	Meter Reading	Range/Scale
150 mR/hr	1.6 <i>Kcpm</i>	x 100	1.6 <i>Kcpm</i>	x 100
50 mR/hr	1.1	∫	1.1	∫
15 mR/hr	4.2	x 10	4.2	x 10
5 mR/hr	1.6	∫	1.6	∫
1.5 mR/hr	5	x 1	5	x 1
1.0 mR/hr	3.4	∫	3.4	∫

Signature: *[Handwritten Signature]* Date 23-JAN-12



Designer and Manufacturer
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Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20186661/369418

Mfg. Ludlum Measurements, Inc. Model 3 Serial No. 79552

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PP085941

Cal. Date 20-Oct-11 Cal Due Date 20-Oct-12 Cal. Interval 1 Year Meterface 202-002

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 20 % Alt 699.8 mm Hg

New Instrument Instrument Received Within Toler. +-10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck. Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 26 mV Det. Oper. 900 V at 26 mV Threshold Dial Ratio = mV

HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

4 pi Eff. for Tc99≈22,700dpm is:20.48%
Background: 50 cpm Reading: 4,700cpm

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X100	400Kcpm	4K	4K
X100	100Kcpm	1K	1K
X10	40Kcpm	4K	4K
X10	10Kcpm	1K	1K
X1	4Kcpm	4K	4K
X1	1Kcpm	1K	1K
X0.1	400cpm	4K	4K
X0.1	100cpm	1K	1K

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N _____ Beta S/N _____ Other _____
 m 500 S/N 63893 Oscilloscope S/N _____ Multimeter S/N 93870637

Calibrated By: Jeremy Thompson Date 20 Oct 11
Reviewed By: Bob Hill Date 21 Oct 11

AC Inst. Passed Dielectric (Hi-Pot) and Continuity Test Only Failed:



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LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CONVERSION CHART

Customer CABRERA SERVICES Date 20-Oct-11 Order # 20186661/369418

Model 3 Serial No. 79552 Detector Model 44-9 Serial No. PA085981

Source Cs-137 20 mCi High Voltage 900 V

Input Sensitivity 26 mV

Reference Point	"As Found" Readings (CPM):		After Adjustment Readings (CPM):	
	Meter Reading	Range/Scale	Meter Reading	Range/Scale
150 mR/hr	2K cpm	X100	2K cpm	X100
50 mR/hr	1K	S	1K	S
15 mR/hr	4.2K	X10	4.2K	X10
5 mR/hr	1.5K	S	1.5K	S
1.5 mR/hr	5K	X1	5K	X1
1.0 mR/hr	3.2K	S	3.2K	S

Signature: Sergio Thompson Date 20-Oct-11



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POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES ORDER NO. 20171834/361009

Mfg. Ludlum Measurements, Inc. Model 3 Serial No. 89973

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR084781

Cal. Date 21-Mar-11 Cal Due Date 21-Mar-12 Cal. Interval 1 Year Meterface 202-560

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 47 % Alt 701.8 mm Hg

New Instrument Instrument Received Within Toler. +-10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck. Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 27 mV Det. Oper. 900 V at 27 mV Threshold Dial Ratio = mV

HV Readout (2 points) Ref./Inst. / V Ref./Inst. / V

COMMENTS:

Calibrated with 5' cable.

4 ft cable EFF. IS: 17.44% for TC99 = 22,700 dpm
ST
Background 40 dpm Reading: 4K cpm

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*	
X 100	150 mR/hr	NA	1.5	
X 100	50 mR/hr		0.5	
X 10	15 mR/hr		1.5	
X 10	5 mR/hr		0.5	
X 1	1.5 mR/hr = 4930cpm		1.5	
X 1	1.0 mR/hr		1.0	
X 0.1	493 cpm		1.5	
X 0.1	164 cpm		0.5	

*Uncertainty within ± 10% C.F. within ± 20%

X 0.1 Range(s) Calibrated Electronically

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCCL 2540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N Beta S/N Other
 m 500 S/N 63893 Oscilloscope S/N Multimeter S/N 93870637

Calibrated By: Jeremy Thompson Date 21-March-11
Reviewed By: Rhoad Harris Date 21 March 11

AC Inst. Only	<input type="checkbox"/> Passed Dielectric (Hi-Pot) and Continuity Test
	<input type="checkbox"/> Failed: <u> </u>



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501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES - EH ORDER NO. 20175872/363245

Mfg. Ludlum Measurements, Inc. Model 3 Serial No. 135696

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR145224

Cal. Date 16-May-11 Cal Due Date 16-May-12 Cal. Interval 1 Year Meterface 202-002

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 26 % Alt 698.8 mm Hg

New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) _____ VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 36 mV Def. Oper. 900 V at 36 mV Threshold mV
Dial Ratio =

HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Tc99 SN:5296 Size:33200dpm, Counts:9000cpm, Background:50cpm, 4pi Eff:26.95%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 100	400kcpm	4K	4K
X 100	100kcpm	1	1
X 10	40kcpm	4	4
X 10	10kcpm	1	1
X 1	4kcpm	4	4
X 1	1kcpm	1	1
X 0.1	400cpm	4	4
X 0.1	100cpm	1	1

*Uncertainty within ± 10% C.F. within ± 20%

All Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCST 2540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897

Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304

Alpha S/N _____ Beta S/N _____ Other _____

m 500 S/N 190566 Oscilloscope S/N _____ Multimeter S/N 86250390

Calibrated By: Jarar F... Date 16-May-11

Reviewed By: Rhal H... Date 16 May 11

AC Inst. Only	<input type="checkbox"/> Passed Dielectric (Hi-Pot) and Continuity Test
	<input type="checkbox"/> Failed:



Designer and Manufacturer
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LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CONVERSION CHART

Customer CABRERA SERVICES - EH Date 16-May-11 Order #. 20175872/363245

Model 3 Serial No. 135696 Detector Model 44-9 Serial No. PA 145224

Source Cs-137 194.6 mCi Cs-137 20 mCi High Voltage 900 V

Input Sensitivity 36 mV

Reference Point	"As Found" Readings (CPM):		After Adjustment Readings (CPM):	
	Meter Reading	Range/Scale	Meter Reading	Range/Scale
150 mR/hr	4.5 K	x100	4.5 K	x100
50 mR/hr	2.5	}	2.5	}
15 mR/hr	1		1	
5 mR/hr	2.5		2.5	
1.5 mR/hr	5	x1	5	x1
1.0 mR/hr	3.4	}	3.4	}

Signature: *Juan Lopez* Date 16-MAY-11



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501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES - EH ORDER NO. 20179567/365385
Mfg. Ludlum Measurements, Inc. Model 3 Serial No. 166511
Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR073107
Cal. Date 7-Jul-11 Cal Due Date 7-Jul-12 Cal. Interval 1 Year Meterface 202-002

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 32 % Alt 701.8 mm Hg
 New Instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments
 Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity
 F/S Resp. ck. Reset ck. Window Operation Geotropism
 Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) _____ VDC
 Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.
Instrument Volt Set 900 V Input Sens. 37 mV Det. Oper. 900 V at 37 mV Threshold Dial Ratio _____ = _____ mV
 HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Tc99 SN:5280 Size:93200dpm, Background:50cpm, Counts:37kcpm, 4pi Eff:39.64%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 100	400kcpm	410	410
X 100	100kcpm	100	100
X 10	40kcpm	40	40
X 10	10kcpm	10	10
X 1	4kcpm	4	4
X 1	1kcpm	1	1
X 0.1	400cpm	400	400
X 0.1	100cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20%

ALL Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897
Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304
 Alpha S/N _____ Beta S/N _____ Other _____
 m 500 S/N 190566 Oscilloscope S/N _____ Multimeter S/N 86250390

Calibrated By: Juan F... Date 7-July-11
Reviewed By: Shel Han Date 7 Jul 11



Designer and Manufacturer
of
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Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CONVERSION CHART

Customer CABRERA SERVICES - EH Date 7-Jul-11 Order # 20179567/365385

Model 3 Serial No. 166511 Detector Model 44-9 Serial No. PR073107

Source (S137) 21mCi 1.9mCi High Voltage 900 V

Input Sensitivity 37 mV

Reference Point	"As Found" Readings (CPM):		After Adjustment Readings (CPM):	
	Meter Reading	Range/Scale	Meter Reading	Range/Scale
150 mR/hr	4.6 K	x 100	4.6 K	x 100
50 mR/hr	2.3	}	2.3	}
15 mR/hr	0.7		0.7	
5 mR/hr	2.8		2.8	
1.5 mR/hr	5	x 1	5	x 1
1.0 mR/hr	3.5	}	3.5	}

Signature: Juan Lopez Date 7-July-11



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CERTIFICATE OF CALIBRATION

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501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER CABRERA SERVICES - EH ORDER NO. 20179730/365464

Mfg. Ludlum Measurements, Inc. Model 19 Serial No. 193627

Mfg. _____ Model _____ Serial No. _____

Cal. Date 11-Jul-11 Cal Due Date 11-Jul-12 Cal. Interval 1 Year Meterface 202-016

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 76 °F RH 33 % Alt 702.8 mm Hg

New Instrument Instrument Received Within Toler. +/-10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 650 V Input Sens. 35 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
5000	4000 uR/hr	3800	4000
5000	1000 uR/hr	900	1000
500	400 uR/hr = 70,400 cpm	380	400
500	100 uR/hr	100	100
250	200 uR/hr = 35,600 cpm	200	200
250	100 uR/hr	100	100
50	7040 cpm	40	40
50	1760 cpm	10	10
25	3560 cpm	20	20
25	890 cpm	5	5

*Uncertainty within ± 10% C.F. within ± 20%

50, 25 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

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Reference Instruments and/or Sources: 73410 1131 781 059 280 60646 70897

Cs-137 Gamma S/N 1162 G112 M565 S105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-304

Alpha S/N _____ Beta S/N _____ Other _____

m 500 S/N 189506 Oscilloscope S/N _____ Multimeter S/N 94000441

Calibrated By: William Tinsley Date 11 July 2011

Reviewed By: Rhonda H. Date 11 Jul 11

AC Inst. Only	<input type="checkbox"/> Passed Dielectric (Hi-Pot) and Continuity Test
	<input type="checkbox"/> Failed:

Calibration Certificate



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Report No. MICROREM-9033
Page 1 of 1

Instrument MICROREM

Serial Number 9033

Calibration Standards: Cs-137 10mCi S/N 733 Cal Due:24 Jul 11
 Cs-137 10Ci S/N 375 Cal Due:24 Jul 11
 MP-2 S/N 174 Cal Due:10 May 11

Test Equipment: FLUKE 8010A S/N 2650076 Cal Due:10 Nov 11
 FLUKE 80K-40 S/N HVP-003 Cal Due:02 Feb 12

Range	Calibration Point	Reading
X.1	1600 CPM	16 µRem/hr
X.1	400 CPM	4 µRem/hr
X1	16K CPM	160 µRem/hr
X1	4K CPM	40 µRem/hr
X1	.16 mR/hr	160 µRem/hr
X10	1.6 mR/hr	1600 µRem/hr
X10	.4 mR/hr	400 µRem/hr
X100	16 mR/hr	16000 µRem/hr
X100	4 mR/hr	4000 µRem/hr
X1000	160 mR/hr	160000 µRem/hr
X1000	40 mR/hr	40000 µRem/hr

(*) Received readings out of specifications.

Received condition: In tolerance
 Out of tolerance

Calibration Standards used have calibration traceable to N.I.S.T.

Date: 9-May-11	Signature:
	Richard E. Smith
P.O. Number: N/A	Checkout Procedure: IW1024





Calibration Certificate
ID Number: C801F54235-0

Customer: Chuck Mikaitis
Cabrera Services, Inc.
 473 Silver Lane
 East Hartford, CT 06118-

Instrument
 Bicron Model MicroRem

Serial Number
 C801F


Precision Check				
Test 1	Test 2	Test 3	Mean	Results
4.00 mrem/hr	4.00 mrem/hr	4.00 mrem/hr	4.00 mrem/hr	Satisfactory

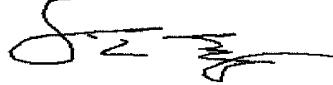
Accuracy Check			
Range	Target Value	As Found	As Left
X1000	160 mrem/hr	150 mrem/hr	160 mrem/hr
X1000	40 mrem/hr	30 mrem/hr *	40 mrem/hr
X100	16 mrem/hr	16.5 mrem/hr	16 mrem/hr
X100	4 mrem/hr	3.6 mrem/hr	4 mrem/hr
X10	1.6 mrem/hr	1.45 mrem/hr	1.7 mrem/hr
X10	0.4 mrem/hr	0.36 mrem/hr	0.4 mrem/hr
X1	160 µrem/hr	200 µrem/hr *	160 µrem/hr
X1	40 µrem/hr	40 µrem/hr #	40 µrem/hr #
X0.1	16 µrem/hr	18 µrem/hr #	16 µrem/hr #
X0.1	4 µrem/hr	4.5 µrem/hr #	4 µrem/hr #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500-4 SN: 66151	08/03/2012

Outer Physical Check: *Pass* Mechanical Zero: *Pass*
 Internal Check: *Pass* Tap Test: *Pass*
 Geotropism Check: *Pass*

Calibrated by: 

QA Review: 

Calibration Date: 01/31/2012
 Expires: 01/31/2013

Atmospheric Conditions - Temperature: 68°F Humidity: 20% Barometric Pressure: 30.15"hg
 This calibration was performed by RSCS using a NIST Traceable radiation source (Cs-137 Beam Source SN S-1110), in conformance to the following standards: ANSI N323A (1997).
 RSCS New Hampshire Radioactive Material License Number: 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedure. This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc
 Estimated uncertainty for measurements collected using the J.L. Shepherd and Associates Model 89 calibrator: 2.7%
 Estimated uncertainty for measurements collected using the Tech Ops Model 773 calibrator: 6.0%



Detector Specification and Performance Data

Doc. No.: DPF-009
Rev: E
Date: 12/6/2010

Specifications

Detector Model	<u>BE5020</u>	Detector Serial Number	<u>8566</u>
Preamplifier Model	<u>2002C</u>	Preamp Serial Number	<u>6058964</u>
Cryostat Model	<u>7935-7FRDC</u>	Order Number	<u>725435</u>

The purchase specifications, and therefore the warranted performance, of this detector are as follows:

Relative Efficiency	<u>---</u>	%	Active Volume	<u>---</u>	cc
Resolution	<u>---</u>	keV (FWHM) @ 1.33 MeV			
	<u>---</u>	keV (FWTM) @ 1.33 MeV			
	<u>---</u>	keV (FWHM) @ 122 keV			
	<u>---</u>	keV (FWHM) @ 5.9 keV			
Peak/Compton	<u>---</u>	:1			
Well diameter	<u>---</u>	mm	Well depth	<u>---</u>	mm

Cryostat description (if special) 4" Ø End Cap with 4.25" Remote Detector Chamber

Physical Characteristics

Active diameter	<u>80</u>	mm	Active area	<u>5000</u>	mm ²
Length/Thickness	<u>25</u>	mm	Well diameter	<u>---</u>	mm
Distance from window	<u>5</u>	mm	Well depth	<u>---</u>	mm
Window thickness	<u>0.6</u>	mm	Active volume	<u>---</u>	cc
Window material	<u>Carbon Composite</u>				

Electrical Characteristics

Depletion voltage	<u>(+)3000</u>	V dc
Recommended bias voltage	<u>(+)4000</u>	V dc
Test point voltage at recommended bias	<u>(-)0.37</u>	V dc (RC preamp only)
Reset interval at recommended bias	<u>---</u>	sec. (Reset preamp only)
Capacitance at recommended bias	<u>---</u>	pF

Measured Performance

With amp time constant of 4 μ S

Isotope	⁵⁷ Co	⁶⁰ Co	⁵⁵ Fe	⁵⁷ Co	¹⁰⁹ Cd	¹⁰⁹ Cd	¹⁰⁹ Cd Ratio
Energy (keV)	122	1332	5.9	6.4*	22	88	22:88
FWHM (keV)	0.736	1.999	---	0.486	---	---	---
FWTM (keV)	1.363	3.677	---	---	---	---	---
Peak/Compton/Bkgd	---	---	---	---	---	---	---
Efficiency %	---	---	---	---	---	---	---

* Substitutes for ⁵⁵Fe in some cases where ⁵⁵Fe peaks are not well separated

Cool Down Time 6 Hrs LN₂ Loss Rate <1.8 l/d PRTD 30.3 Ω (cold)

Tested by: *Wesley Moss* Date: 5/5/11

Approved by: *Pete Glaves* Date: 5/5/11



EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 7008
P.O.# 10-0260

Description of Standard:

Model No. DNS-11 Serial No. 7102-10 Isotope Th-230

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi alpha emission rate was measured using an internal gas flow proportional chamber. Absolute counting of alpha particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated alpha source S/N 75322-201

Measurement Result:

The observed alpha particles emitted from the surface of the disc per minute (cpm) on the calibration date was:

8,850 + 265

The total disintegration rate (dpm) assuming 1.5% backscatter of alpha particles from the surface of the disc, was:

17,400 + 523 (0.00785 μ Ci)

The uncertainty of the measurement is 3 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by: [Signature]

Calibration Technician: [Signature] Q.A. Manager: [Signature]

Calibration Date: 6-16-2010 Reviewed Date: 6/22/10

Source Manufacturing Lab
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 761-5413 Fax (505) 761-5416
areust@eberlineservices.com



EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Beta Standard

S.O.# 7008
P.O.# 10-0260

Description of Standard:

Model No. DNS-12 Serial No. 7104-10 Isotope Tc-99

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi beta emission rate was measured using an internal gas flow proportional chamber. Absolute counting of beta particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated beta source S/N 75323-201.

Measurement Result:

The observed beta count rate from the surface of the disc per minute (cpm) on the calibration date was:

7,760 ± 388

The total disintegration rate (dpm) assuming 25 % backscatter of beta particles from the surface of the disc, was:

12,400 ± 621 (0.00559 µCi)

The uncertainty of the measurement is 5 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST Reviewed by: [Signature]

Calibration Technician: [Signature] Q.A. Manager: [Signature]

Calibration Date: 6-21-2010 Reviewed Date: 6/23/10

Source Manufacturing Lab
7021 Pan American Freeway NE
Albuquerque, New Mexico 87109-4238
(505) 761-5413 Fax (505) 761-5416
areust@eberlineservices.com

CERTIFICATE OF CALIBRATION MIXED GAMMA STANDARD SOURCE

Radionuclide: Cs-137	Customer: CABRERA SERVICES, INC.
Radionuclide: Am-241	P.O. No.: 10-0184
Radionuclide: Co-60	Catalog No.: GF-CUSTOM
Half-life (Cs-137): 30.17 ± 0.16 years	Reference Date: 1-May-10 12:00 PST
Half-life (Am-241): 432.17 ± 0.66 years	Source No.: 1429-83
Half-life (Co-60): 5.272 ± 0.001 years	

Contained Radioactivity:

Cs-137:	1.052	μCi,	38.92	kBq	Co-60:	1.039	μCi,	38.44	kBq
Am-241:	1.021	μCi,	37.78	kBq	Total Activity:	3.112	μCi,	115.1	kBq

Physical Description:

A. Capsule type:	D (25.4 mm OD x 6.35 mm THK)
B. Nature of active deposit:	Evaporated metallic salts
C. Active diameter/volume:	5 mm
D. Backing:	Epoxy
E. Cover:	Acrylic

Radioimpurities: None detected**Method of Calibration:**

This source was assayed using gamma ray spectrometry.

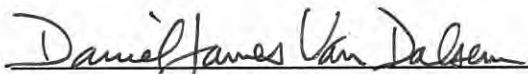
Cs-137:	661.7 keV	0.851 gammas per decay
Am-241:	59.5 keV	0.360 gammas per decay
Co-60:	1173, 1333 keV	0.9986, 0.9998 gammas per decay

Uncertainty of Measurement:

	Cs-137	Am-241	Co-60
A. Type A (random) uncertainty:	± 0.2 %	± 0.2 %	± 0.2 %
B. Type B (systematic) uncertainty:	± 3.0 %	± 3.0 %	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %	± 0.0 %	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %	± 3.0 %	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- EZIP participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from IAEA-TECDOC-619, 1991.
- This source has a working life of 5 years.


Quality Control

13-Apr-10
Date

EZIP Ref. No.: 1429-83

Standard Wipe Test

The source was wiped over its entire surface with a moistened filter paper disk. After drying, the disk was checked for activity using a scintillation detector. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

Special Wipe Test

The source was wiped over its entire surface with moistened polystyrene. The polystyrene was then dissolved in a liquid scintillation cocktail and counted in a liquid scintillation counter. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

Distilled Water Soak Test

The source was immersed in distilled water and maintained at $50^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for a minimum of four hours or room temperature ($20^{\circ}\text{C} \pm 5^{\circ}\text{C}$) for 24 hours. After removal of the source, the liquid was **a)** checked for activity using a liquid scintillation counter, or **b)** evaporated in a planchet and the residue checked for activity using a windowless proportional counter or end-window G.M. tube. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

Liquid Scintillation Soak Test

The source was immersed for a minimum of 3 hours at room temperature in a liquid scintillation cocktail, which does not attack the source's outer surface material. The source was stored away from light to avoid photoluminescence. The sealed source was then removed and the activity of the liquid scintillation cocktail was measured. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

Gas Source Test

The source was placed in a vacuum desiccator and maintained at a pressure of $<10 \text{ mm Hg}$ for not less than 12 hours. The activity was checked by introducing air into the desiccator and monitoring the air with an end-window G.M. tube. There was $<0.001 \mu\text{Ci}$ beta-gamma of removable activity.

Ampoule Leak Test

The ampoule was kept in an inverted position on a filter paper disk or polystyrene wipe for a minimum of 16 hours. The wipe was then checked for activity using a scintillation detector or liquid scintillation counter. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

Bubble Leak Test

The container was pressurized to its fill pressure; then soapy water was applied over its valve and neck or, the valve and neck of the vessel were immersed in water. If no growing bubbles were observed, the container was considered leak free.

Wipe Test for Industrial Ni-63 Sources

The sources were wipe tested by an approved sampling plan, which called for either 100% of the batch to be individually wipe tested, or, a subset thereof. The wipe test(s) used to test for removable contamination and the results of those tests are recorded on the front of this form.

Pressure Test for Triotech Kr-85 Sources

Prior to filling the vessel with Kr-85 gas, the vessel was evacuated to $<5 \text{ mm Hg}$, the gas manifold system shut off and the system allowed to stand for a minimum of 30 minutes. A vacuum difference not greater than the known vacuum loss of the manifold system itself signified the vessel did not leak.

Leak Test Not Applicable

The active area of the source is uncovered or is protected by a very thin coating. Although the deposit is adherent, it is not designed or certified to pass a standard leak test. The inactive portions of the source have been checked using the standard wipe test or special wipe test depending on the nuclide. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

Other Leak Test

Radiation Source Handling Instructions

for

Reference and Calibration Sources

ATTENTION! – The California Department of Public Health has approved distribution of sealed reference and calibration sources to persons licensed to use radioactive material identified in Title 17, California Code of Regulations, Chapter 5, Subchapter 4, Group 2 (Licensing of Radioactive Materials) as appropriate, and to persons who hold an equivalent license issued by the US Nuclear Regulatory Commission or an Agreement State.

Outside the United States users must meet the regulatory requirements of their authorities with responsibility for the use of radioactive material.

1. Summary

Standards reference and calibration sources consist of a radionuclide incorporated into an active matrix, contained within a sealed capsule. Please refer to the data sheet included with the source documentation for specific data on the nature and configuration of the active matrix, backing, and encapsulation.

These sources are used in Reference and Calibration applications for routine quality control and check of detectors, and/or as reference calibrators for detectors. Each detector is designed for use with specific nuclides and activities; please consult the operating manual or laboratory procedures for the specific performance specifications and source requirements.

Sources with NIST-traceable activity have the overall uncertainty in the listed activity stated on the Certificate of Calibration included with the source documentation packet. Please refer to the operating manual for the specific instrument and to your facility's procedures for instruction on including error propagation in measurements using calibrated instruments.

The stated activity on labels and data sheets for all sources provided by Eckert & Ziegler Isotope Products is the contained activity of the source, unless otherwise specified on the data sheet as "apparent activity". The apparent activity of a source to the detector may be higher or lower than the actual contained activity, depending on the nuclide, capsule material, type of radiation, and source configuration.

2. Radiation Safety Overview

This instruction provides general information for the safe and proper use of radioactive sources. It is imperative that this and other relevant regulations (local/national) and industry specific practices be followed for safe use. It should be understood that radiation sources emit

potentially harmful radiation. Radioactive sources should be handled and utilized under the supervision of authorized personnel.

To take advantage of limiting radiation exposure, remember to apply these three basic principles:

TIME - The simplest way to reduce exposure is to keep the time spent around a radioactive source to a minimum. If time is cut in half, so is the exposure, with all other factors remaining constant.

DISTANCE - Distance is another effective means to reduce radiation exposure. A formula known as the "inverse square law" relates the radiation exposure rate to distance. Doubling the distance from a radiation source reduces the exposure to one-fourth its original value. If the distance is tripled, the exposure is reduced by a factor of nine, etc.

SHIELDING - Shielding is any material used to reduce the radiation reaching the user from a radioactive source. While some types of radiation such as alpha particles may be stopped by a single sheet of paper, other particles such as neutrons and photons require much more shielding. Materials containing large amounts of hydrogen, such as polyethylene, are used to shield neutrons. Dense materials, such as lead, are used to shield photons.

3. Upon Receipt

A. Receipt - The package should be inspected upon arrival. If packaging damage is observed (e.g. crushed) stop the opening process and immediately notify your Radiation Safety Officer or authorized equivalent. During off-duty hours, comply with your radiation safety reception plan.

Ensure that all documentation and label description corresponds to the goods received. If not, do not open the package. Place package in a secure area and notify Eckert and Ziegler Isotope Products.

Notify the appropriate radiation protection personnel of the arrival of the package and conduct your internal inventory controls.

If the sources are not intended for immediate processing, place package in a secure radioactive controlled area. Packages are transported in compliance with applicable transport regulations for dose levels. However, these levels may be too high for storage in places of work without additional shielding.

B. Unpacking - Unpacking must be accomplished in a designated area by authorized personnel. Radiation levels should be checked using a dose rate meter at each stage of unpacking. Safety glasses and gloves should be worn at all times during the unpacking process.

Warning- Injuries typical of cutting or opening packages may result and applicable safety precautions should be taken.

Per IATA (IATA, Chapter 10, 10.5.17.2) and DOT (49CFR172.403) regulations, the dose rate of the outer surface of the package may be 2mSv/h (200 mrem/h). If the outer package dose rate exceeds 200 mrem/h, stop the unpacking process and notify your RSO.

During each phase of unpacking the surface dose rate may progressively increase. The use of shielding, gloves and remote handling equipment are recommended to minimize irradiation.

Remove the inner container and place in a properly shielded area. Wipe the external surface of the container with a cotton swab or filter paper. Assay the wipe sample in a low-background area to determine if there is any removable activity. If contamination is in excess of permissible limits, stop the procedure and notify the RSO. Open the inner container and remove the source using remote handling equipment. Wipe the source and assay the wipe sample in a low-background area to determine if there is any removable activity. If contamination is in excess of permissible limits, stop the procedure and notify the RSO.

The source should be inspected immediately following removal from the container. Care must be taken to ensure adequate shielding or distance to minimize dose levels. From the source, locate the serial number and determine that it agrees with the supplied certificate. If not, repack the source, place in a secure area, and notify EZIP.

Before package disposal, survey the packaging and packaging materials for contamination. If contamination is found, treat as radioactive waste. If damage to the packaging materials is not detected the materials may be used to return spent sources for recycling with prior approval.

Maintain the records of receipt, package survey, and wipe test results, or the records required by your organization.

4. Recommended Handling Procedures and Directions for Use

Always refer to your institution's Radioactive Materials License or Radiation Safety Manual for procedures for handling of radioactive material such as this source. You must comply with any special procedures required by your Radioactive Materials License or your institution's Standard Operating Procedures.

These instructions are intended as guidelines and are not meant to supersede your license or internal procedures.

Taking sources apart can cause damage to the active elements, windows, or the inactive capsule. Do not disassemble sources from their capsules.

All radioactive sources should be stored in a dedicated shielded area when not in use. It is not recommended to store high-activity radioactive sources near detectors, since they may contribute to background activity and affect experimental results.

Reference and calibration sources are designed to be used in ambient conditions. Prototypes have been tested to more severe environmental conditions, but this does not indicate that they are intended to be used or stored in these conditions.

While the source capsule is designed to be durable for the working life of the source, it should not be dropped and mechanical stress should be avoided.

5. Warnings and Precautions

Reference and calibration sources contain radioactive material and their use is governed by your institution's Radioactive Materials License.

Misuse of a radioactive source that results in a breach of that source with subsequent release of material, and possible ingestion of the radioactive material, may cause physical harm from high radiation dose including cancer.

When handling the source, use remote handling devices if possible, and always wear gloves. Do not touch the source with bare hands.

THE STATE OF CALIFORNIA, UNDER PROPOSITION 65, REQUIRES THIS WARNING; THIS SOURCE CONTAINS RADIONUCLIDES, WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS AND OTHER REPRODUCTIVE HARM. MISUSE OR MISHANDLING BEYOND ITS INTENDED USE MAY EXPOSE YOU TO EXCESS RADIATION. HANDLE WITH CARE. CONTACT YOUR RADIATION SAFETY OFFICER FOR ADDITIONAL INFORMATION.

Sources containing Ra-226, or Th-228 release Radon gas as a by product of their natural decay. Radon gas and its subsequent daughters may cause radioactive contamination on the inactive surfaces of the source. Sources with these isotopes should only be handled with gloves, and in well ventilated areas.

6. Additional Regulatory Considerations

1) The unique serial number that identifies this source is on the data sheet and on the source label. This number should be recorded on your radioactive material possession records.

2) Radioactive license requirements specify a leak test every six (6) months. The data should be recorded in a permanent log and kept for review or inspection. Leak test with readings above the regulatory limits should be reported to Eckert & Ziegler Isotope Products Radiation Safety Officer. If one is recorded, please confirm that it was not contamination from a short-lived nuclide utilized in the vicinity of the source.

3) Some sources contain nuclides which are cyclotron (accelerator) produced and its possession, use, and transfer are controlled in the United States only by State agencies and not the U.S. Nuclear Regulatory Commission (USNRC).

4) Dispose of spent sources properly via licensed disposal routes.

7. General Instructions Applicable to All Radiation Sources

A. **Source Usage** - All sources must be checked for the suitability of a given application prior to use. Unless otherwise specified, sources are generally intended for use at room temperature.

Do not expose the source to destructive or corrosive environments. Operating conditions for the use of the sources are assumed to be ambient and typical for laboratory and field environments.

B. Storage - Radioactive sources must be kept in a suitable container within a controlled area which provides secured access and adequate shielding. Dose rates on the outside of the storage area should not be greater than 2.5pSv/h (0.25mrem/h). Contact your Radiation Safety Officer for proper storage techniques.

C. Damage or Loss - If a source or package is damaged or involved in an accident, the radiation safety procedures as outlined in the radiation safety program must be followed. In addition, EZIP should be notified so that further safety related information can be forwarded. The local and/ or national regulatory agency may require notification.

If the source is lost, appropriate radiation safety personnel must notify your local and/ or national regulatory authorities.

D. Transfer and Disposal - If sources are resold or incorporated into any device which will be distributed, it is the responsibility of the customer to ensure that all subsequent users are knowledgeable of the type of radiation source and its specified use. In addition, appropriate warnings and instructions must be included within any shipment to ensure safe use, return, and disposal of the source.

Appropriate documentation must be recorded on the transfer of radioactive sources. Additionally, all users should be supplied with a copy of the original EZIP Calibration Certificate or Nominal Data Sheet.

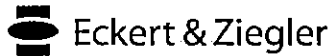
If it is determined that a source or other material is required to be disposed, it should be treated as potentially radioactive material. The source and any device or containers should be checked and decontaminated before disposal. Additionally the source must be leak tested. The material must then be properly packed to include documentation which complies with local or national regulatory agencies (U.S. DOT and EPA) transfer requirements for disposal and manifest prior to transfer to the disposal site.

E. Standards and Testing - EZIP radioactive sources are manufactured and designed to meet rigorous customer specifications. Every shipment, single source or batch, is issued a certificate of calibration or nominal data sheet. This certificate provides a leak test certificate, radioassay data, model number, serial or lot number.

Sources are leak tested prior to shipment. Results of the tests performed are listed on the test certificate. Additionally, leak tests must be completed at regular intervals. For the required leak test interval consult your regulatory agency.

Packaging is manufactured and tested in accordance with 49 CFR and IATA regulations.

Users are ultimately responsible for determining frequency of leak testing. If rigorous operating conditions are anticipated, an appropriate leak test frequency policy would be anticipated.



Eckert & Ziegler

Isotope Products

F. Recommended Working Life - The manufacturer indicates a recommended working life to the user. This is governed by radiotoxicity, activity, source construction, half-life and conditions of use. It is recommended that the source should be replaced at the end of this period.

It is quite possible that sources will be used under adverse environmental conditions, e.g. technical sources used in a moist atmosphere with a high SO₂ content. In such circumstances these sources should be checked more frequently and replaced earlier.

We advise customers to contact EZIP for additional details:

Eckert and Ziegler Isotope Products

24937 Avenue Tibbitts

Valencia, CA 91355

Telephone: (661) 309-1010 Fax: (661) 257-8303

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.

19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **16826**
Inst. s/n **4911**

Cal. Date **18 June 2012**

Due Date **18 June 2013**

Cal. Interval **1 year**

Barometric Press: Actual **29.80**

Corrected to: **29.80 in. Hg**

Temperature: Actual **76°F**

Corrected to: **76°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.63	14.89	1.69%
2	24.39	24.81	1.69%
3	34.15	33.74	-1.20%
4	43.90	42.67	-2.88%
5			
6			
7			
8			
9			
10			
11			
12			
13			

****Average percent deviation across the range = -0.17%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14936.

Calibrated by: **Kurt D. Newton**

Date: **18 June 2012**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
 Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
 Air Sampler Serial No. **16826**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	76	29.80	n/a	15.0	0.976	14.63	15.0	0.992	14.89
2	76	29.80	n/a	25.0	0.976	24.39	25.0	0.992	24.81
3	76	29.80	n/a	35.0	0.976	34.15	34.0	0.992	33.74
4	76	29.80	n/a	45.0	0.976	43.90	43.0	0.992	42.67
5									
6									
7									
8									
9									
10									
11									
12									
13									

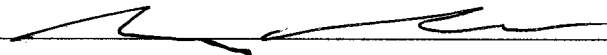
$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**



Date: **18 June 2012**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.

19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **16827**
Inst. s/n **4911**

Cal. Date **02 June 2011**

Due Date **02 June 2012**

Cal. Interval **1 year**

Barometric Press: Actual **29.55**

Corrected to: **29.55 in. Hg**

Temperature: Actual **78°F**

Corrected to: **78°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.55	14.80	1.71%
2	24.24	24.66	1.71%
3	33.94	34.53	1.71%
4	43.64	44.39	1.71%
5			
6			
7			
8			
9			
10			
11			
12			
13			

****Average percent deviation across the range = 1.71%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14180.

Calibrated by: **Kurt D. Newton**

Date: **02 June 2011**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
 Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
 Air Sampler Serial No. **16827**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	78	29.55	n/a	15.0	0.970	14.55	15.0	0.986	14.80
2	78	29.55	n/a	25.0	0.970	24.24	25.0	0.986	24.66
3	78	29.55	n/a	35.0	0.970	33.94	35.0	0.986	34.53
4	78	29.55	n/a	45.0	0.970	43.64	45.0	0.986	44.39
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**

Date: **02 June 2011**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.

19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **16827**
Inst. s/n **4911**

Cal. Date **03 May 2012**

Due Date **03 May 2013**

Cal. Interval **1 year**

Barometric Press: Actual **29.82**

Corrected to: **29.82 in. Hg**

Temperature: Actual **72°F**

Corrected to: **72°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.69	14.94	1.69%
2	24.49	24.91	1.69%
3	34.29	35.37	3.08%
4	44.08	45.84	3.83%
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****Average percent deviation across the range = 2.57%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14853.

Calibrated by: **Kurt D. Newton**

Date: **03 May 2012**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
 Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
 Air Sampler Serial No. **16827**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	72	29.82	n/a	15.0	0.980	14.69	15.0	0.996	14.94
2	72	29.82	n/a	25.0	0.980	24.49	25.0	0.996	24.91
3	72	29.82	n/a	35.0	0.980	34.29	35.5	0.996	35.37
4	72	29.82	n/a	45.0	0.980	44.08	46.0	0.996	45.84
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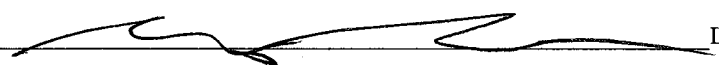
$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$


$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**



Date: **03 May 2012**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **16829**
Inst. s/n **4911**

Cal. Date **13 April 2011**

Due Date **13 April 2012**

Cal. Interval **1 year**

Barometric Press: Actual **29.72**
Temperature: Actual **70°F**

Corrected to: **29.72 in. Hg**
Corrected to: **70°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.70	14.95	1.70%
2	24.49	24.42	-0.31%
3	34.29	33.89	-1.19%
4	44.09	42.86	-2.87%
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****Average percent deviation across the range = -0.67%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14093.

Calibrated by: **Kurt D. Newton** _____ Date: **13 April 2011**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
Air Sampler Serial No. **16829**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	70	29.72	n/a	15.0	0.980	14.70	15.0	0.997	14.95
2	70	29.72	n/a	25.0	0.980	24.49	24.5	0.997	24.42
3	70	29.72	n/a	35.0	0.980	34.29	34.0	0.997	33.89
4	70	29.72	n/a	45.0	0.980	44.09	43.0	0.997	42.86
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**

Date: **13 April 2011**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **16832**
Inst. s/n **4911**

Cal. Date **05 July 2011**

Due Date **05 July 2012**

Cal. Interval **1 year**

Barometric Press: Actual **29.60**

Temperature: Actual **78°F**

Corrected to: **29.60 in. Hg**
Corrected to: **78°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.56	14.81	1.70%
2	24.26	24.19	-0.30%
3	33.96	33.07	-2.70%
4	43.67	42.45	-2.87%
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****Average percent deviation across the range = -1.04%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14270.

Calibrated by: **Kurt D. Newton**

Date: **05 July 2011**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
 Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
 Air Sampler Serial No. **16832**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	78	29.60	n/a	15.0	0.970	14.56	15.0	0.987	14.81
2	78	29.60	n/a	25.0	0.970	24.26	24.5	0.987	24.19
3	78	29.60	n/a	35.0	0.970	33.96	33.5	0.987	33.07
4	78	29.60	n/a	45.0	0.970	43.67	43.0	0.987	42.45
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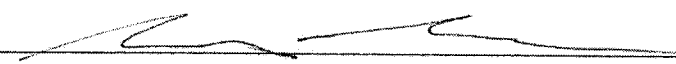
$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**



Date: **05 July 2011**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.

19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **16833**
Inst. s/n **4911**

Cal. Date **12 August 2011**

Due Date **12 August 2012**

Cal. Interval **1 year**

Barometric Press: Actual **29.64**

Temperature: Actual **78°F**

Corrected to: **29.64 in. Hg**
Corrected to: **78°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.57	14.82	1.70%
2	24.28	24.70	1.70%
3	33.99	34.58	1.70%
4	43.70	44.45	1.70%
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****Average percent deviation across the range = 1.70%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14348.

Calibrated by: **Kurt D. Newton**

Date: **12 August 2011**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
Air Sampler Serial No. **16833**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	78	29.64	n/a	15.0	0.971	14.57	15.0	0.988	14.82
2	78	29.64	n/a	25.0	0.971	24.28	25.0	0.988	24.70
3	78	29.64	n/a	35.0	0.971	33.99	35.0	0.988	34.58
4	78	29.64	n/a	45.0	0.971	43.70	45.0	0.988	44.45
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**

Date: **12 August 2011**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.

19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **18204**
Inst. s/n **4911**

Cal. Date **22 October 2010**

Due Date **22 October 2011**

Cal. Interval **1 year**

Barometric Press: Actual **29.62**

Corrected to: **29.62 in. Hg**

Temperature: Actual **72°F**


Corrected to: **72°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.64	14.90	1.70%
2	24.40	24.83	1.70%
3	34.17	34.76	1.70%
4	43.93	44.69	1.70%
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****Average percent deviation across the range = 1.70%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 13783.

Calibrated by: **Kurt D. Newton** 

Date: **22 October 2010**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: **RSA Laboratories, Inc.** Customer: **Cabrera Services, Inc.**

Calibrator Model **HI-Q Model HFC-50C**
Air Sampler Model **HI-Q CF-973T**

Calibrator Serial No. **4911**
Air Sampler Serial No. **18204**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	72	29.62	n/a	15.0	0.976	14.64	15.0	0.993	14.90
2	72	29.62	n/a	25.0	0.976	24.40	25.0	0.993	24.83
3	72	29.62	n/a	35.0	0.976	34.17	35.0	0.993	34.76
4	72	29.62	n/a	45.0	0.976	43.93	45.0	0.993	44.69
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$


$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: **Kurt D. Newton**

Date: **16 October 2009**

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.
 19 Pendleton Drive, P.O. Box 61
 Hebron, Connecticut 06248
 (860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
 Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **HI-Q**
 Reference Inst. **HI-Q Model HFC-50C**

Inst. Model **CF-973T**

Inst. s/n **18205**
 Inst. s/n **4911**

Cal. Date **03 May 2012**

Due Date **03 May 2013**

Cal. Interval **1 year**

Barometric Press: Actual **29.82**

Corrected to: **29.82 in. Hg**

Temperature: Actual **72°F**

Corrected to: **72°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (CFM)	Ref. Inst. Flow Rate (CFM)	Percent Deviation
1	14.69	15.44	4.68%
2	24.49	24.91	1.69%
3	34.29	34.88	1.69%
4	44.08	43.84	-0.54%
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****Average percent deviation across the range = 1.88%**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14854.

Calibrated by: **Kurt D. Newton**



Date: **03 May 2012**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: RSA Laboratories, Inc. Customer: Cabrera Services, Inc.

Calibrator Model HI-Q Model HFC-50C
Air Sampler Model HI-Q CF-973T

Calibrator Serial No. 4911
Air Sampler Serial No. 18205

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)	Indicated Flow (CFM)	Temp/Press Correction Factor	Corrected Flow (CFM)
1	72	29.82	n/a	15.0	0.980	14.69	15.5	0.996	15.44
2	72	29.82	n/a	25.0	0.980	24.49	25.0	0.996	24.91
3	72	29.82	n/a	35.0	0.980	34.29	35.0	0.996	34.88
4	72	29.82	n/a	45.0	0.980	44.08	44.0	0.996	43.84
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$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: Kurt D. Newton

Date: 03 May 2012

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**



RSA Laboratories, Inc.

19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **F&J Specialty Products**
Reference Inst. **F&J Venturi D-812**

Inst. Model **LV-1**

Inst. s/n **2590A**
Inst. s/n **2541**

Cal. Date **05 July 2011**

Due Date **05 July 2012**

Cal. Interval **1 year**

Barometric Press: Actual **29.60** in. Hg
Temperature: Actual **80°F**

Corrected to: **29.35** in. Hg
Corrected to: **78.8°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (LPM)	Ref. Inst. Flow Rate (LPM)	Percent Deviation
1	19.31	19.65	1.72
2	38.62	37.33	-3.45
3	48.27	48.13	-0.29
4	57.93	55.99	-3.45
5	77.23	72.69	-6.25
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****Average percent deviation across the range = -2.34**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14275.

Calibrated by: **Kurt D. Newton**

Date: **05 July 2011**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: RSA Laboratories, Inc. Customer: Cabrera Services, Inc.

Air Sampler Model **F&J LV-1**
 Calibrator Model **F&J Venturi D-812**

Air Sampler Serial No. **2590A**
 Calibrator Serial No. **2541**

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (LPM)	Temp/Press Correction Factor	Corrected Flow (LPM)	Indicated Flow (LPM)	Temp/Press Correction Factor	Corrected Flow (LPM)
1	78.8	29.35	1	20	0.965	19.31	20	0.982	19.65
2	78.8	29.35	1	40	0.965	38.62	38	0.982	37.33
3	78.8	29.35	1	50	0.965	48.27	49	0.982	48.13
4	78.8	29.35	1	60	0.965	57.93	57	0.982	55.99
5	78.8	29.35	1	80	0.965	77.23	74	0.982	72.69
6									
7									
8									
9									
10									
11									
12									

$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: Kurt D. Newton

Date: 05 July 2011

**CERTIFICATE
OF CALIBRATION
(AIR SAMPLER)**

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Cabrera Services, Inc., Attn: Charles Mikaitis (860) 569-0095**
Customer Address: **473 Silver Lane, East Hartford, CT 06118**

Inst. Mfr. **F&J Specialty Products**
Reference Inst. **F&J Venturi D-812**

Inst. Model **LV-1**

Inst. s/n **3401**
Inst. s/n **2541**

Cal. Date **05 July 2011**

Due Date **05 July 2012**

Cal. Interval **1 year**

Barometric Press: Actual **29.60** in. Hg

Corrected to: **29.35** in. Hg

Temperature: Actual **80°F**

Corrected to: **78.8°F**

Filters Used: Particulate Charcoal/silver zeolite Other:

Measurement	Air Sampler Flow Rate (LPM)	Ref. Inst. Flow Rate (LPM)	Percent Deviation
1	19.31	19.65	1.72
2	38.62	37.33	-3.45
3	48.27	46.17	-4.55
4	57.93	55.01	-5.30
5	77.23	70.73	-9.20
6			
7			
8			
9			
10			
11			
12			

****Average percent deviation across the range = -4.16**

This is to certify that RSA Laboratories, Inc. of Hebron, Connecticut, has on this date certified this air sampler to be within the accuracy specified above. The Reference Flow Device bears Letters of Certification traceable to the National Institute of Science and Technology. RSA Laboratories, Inc. ID# 14274.

Calibrated by: **Kurt D. Newton**

Date: **05 July 2011**

CERTIFICATE OF CALIBRATION

(AIR SAMPLER)

Facility: RSA Laboratories, Inc. Customer: Cabrera Services, Inc.

Air Sampler Model F&J LV-1
 Calibrator Model F&J Venturi D-812

Air Sampler Serial No. 3401
 Calibrator Serial No. 2541

AIR SAMPLER							CALIBRATOR		
Measurement	Inlet Temp. (°F)	Inlet Press (In-Hg)	Gauge Press (In-Hg)	Indicated Flow (LPM)	Temp/Press Correction Factor	Corrected Flow (LPM)	Indicated Flow (LPM)	Temp/Press Correction Factor	Corrected Flow (LPM)
1	78.8	29.35	1	20	0.965	19.31	20	0.982	19.65
2	78.8	29.35	1	40	0.965	38.62	38	0.982	37.33
3	78.8	29.35	1	50	0.965	48.27	47	0.982	46.17
4	78.8	29.35	1	60	0.965	57.93	56	0.982	55.01
5	78.8	29.35	1	80	0.965	77.23	72	0.982	70.73
6									
7									
8									
9									
10									
11									
12									

$$\text{Air Sampler Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}}} \times \frac{(\text{Inlet Press} - \text{Gauge Press})}{29.92 \text{ in. Hg}}$$

$$\% \text{ Deviation} = \frac{\text{Corrected Flow} - \text{Sampler Flow}}{\text{Corrected Flow}} \times 100$$

$$\text{Calibrator Temp/Press Corr Factor} = \sqrt{\frac{530^{\circ}\text{R}}{\text{Inlet temp } (^{\circ}\text{F}) + 460^{\circ}\text{R}}} \times \frac{\text{Inlet Press}}{29.92 \text{ in. Hg}}$$

$$\text{Corrected Flow} = (\text{Indicated Flow}) \times (\text{Temp/Press Corr Factor})$$

Calibrated by: Kurt D. Newton

Date: 05 July 2011



**CALIBRATION
CERTIFICATE**

EnergySolutions/Instrument Services
 1570 Bear Creek Road
 Oak Ridge, TN 37831
 Phone: (877) 462-4873
 Email: ISFStaff@energysolutions.com

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: EnergySolutions		Manufacturer: F&J Specialty Inc.	
Address: 1570 Bear Creek Road Oak Ridge, TN 37831		Model: LV-1	
Contact Name: Tony Riggs		Serial Number: 003662	
Contract/Task Number: N/A	Work Order Number: N/A	Calibration Method: Air Flow MC-250L # 8029	

INSTRUMENT CALIBRATION INFORMATION					
Instrument Range (LPM)	Standard Value (LPM)	Tolerance (±10%)	As Found	As Left	Comments
10 - 100	60	54-66	62.5	60.6	Barometer: 8029 Cal Due: 1/26/13
					Thermometer: 8029 Cal Due: 1/26/13
					Flow calibrator: 8029 Cal Due: 1/26/13
					Humidity: 992290 Cal Due: 5/31/13
					Fixed Flow Calibration: 60 LPM
					Temperature: 23.5 °C
					Pressure: 724 mmHg
					Humidity: 96 %
					Previous Media: FP47M
					Current Media: FP47M
					Limited Use: Flow Set to 60 LPM using FP47M media.. Rotometer Marked to indicate 60LPM flow.
					Calibrated in accordance with CP-IN-WI-301

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument	Calibrated By:	Reviewed By:	Date: 7/12/12
Calibration Date: 7/11/12	Calibration Due: 7/11/13		

**Certificate of Conformance
and
Calibration**

CASELLA
MEASUREMENT

Customer: Casella USA
Instrument: Microdust Pro
Serial No 1: 0681458
Part No.:
Ref Number: 0460371/01
Date of Issue: 28/10/2010
P/Ord Num: 2098

Calibration Method: -

The Instruments indicated values for the measurement parameters have been validated using the tested traceable equipment which has been calibrated with traceability to National and International references.

The uncertainties are for a confidence probability of not less than 95%. The single point, single dust limitations are understood and agreed by the customer.

Traceable Equipment: -

	<u>Equip No.</u>	<u>Cal DueDate</u>
Wind Tunnel	10732	06/12/2010

Test Conditions: -

Ambient Temperature : 21°C
Ambient Humidity : 39%RH
Ambient Pressure : 1,016 mBar

Results: -

<u>Applied Dust in mg/m³</u>		<u>Indicated Dust in mg/m³</u>
4.83	:	4.83

The calibration was conducted using Natural Arizona Dust, being one of the most representative medium available.

Comments:

Casella Measurement

Engineer :

Bashir Sobhani

Sig



Calibration Date 28/10/10



Casella Measurement, Regent House, Wolseley Road, Kempston, Bedford, MK42 7JY
Phone: +44(0)1234 844100, FAX: +44(0) 1234 841490, E-mail: Info@casellacel.com
Web: www.casellacel.com