



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 ENVIRONMENTAL RESTORATION GROUP ORDER NO. 214376/280862

Mfg. Ludlum Measurements, Inc. Model 19 Serial No. 180310

Mfg. _____ Model _____ Serial No. _____

Cal. Date 15-Apr-04 Cal Due Date 15-Apr-05 Cal. Interval 1 Year Meterface 202-016

Check mark applies to applicable Instr. and/or detector IAW mfg. spec. T. 73 °F RH 25 % Alt 705.8 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

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 675 V Input Sens. 36 mV Det. Oper. _____ V at _____ mV Threshold _____ mV
Dial Ratio _____ = _____

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 μ R/hr	3900	4000
5000	1000 μ R/hr	950	1000
500	400 μ R/hr = 20400 cpm	400	400
500	100 μ R/hr	100	100
250	200 μ R/hr = 34300 cpm	200	200
250	100 μ R/hr	100	100
50	2040 cpm	40	40
50	1760 cpm	10	10
25	3430 cpm	20	20
25	850 cpm	5	5

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

50, 25 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/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 720 734 1616 Neutron Am-241 Be S/N T-30:

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

m 500 S/N 54683 Oscilloscope S/N _____ Multimeter S/N 70602489

Calibrated By: Duane Jackson Date 15-APR-04

Reviewed By: WJ Rob... Date 16 APR 04

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc. FORM C22A 11/26/2003

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

Certificate of Calibration

Ratemeter Certificate of Calibration



Environmental Restoration Group, Inc.
8809 Washington St. NE, Suite 150
Albuquerque, NM 87113
(505) 298-4224

Manufacturer: Ludlum Model: 12 Serial No.: 125264

All Ranges Calibrated Electronically; Ludlum Pulser Generator S.N. 97743

Reset Audio Mechanical Battery

High Voltage 500v 1000v 1500v

Instrument found within tolerance (+/- 10%) Yes No

Threshold Setting: 40 mV

Reference Setting	Ratemeter	Instrument "As found reading"
400 Kcpm	<u>400 Kcpm</u>	<u>+/- 10%</u>
100 Kcpm	<u>100 Kcpm</u>	
40 Kcpm	<u>40 Kcpm</u>	
10 Kcpm	<u>10 Kcpm</u>	
4 Kcpm	<u>4 Kcpm</u>	
1 Kcpm	<u>1 Kcpm</u>	
400 cpm	<u>400 cpm</u>	
100 cpm	<u>100 cpm</u>	

Calibrated By: [Signature] Calibration Date: 13 AUG 04

Calibration Due: 13 AUG 05

Reviewed By: [Signature] Date: 13 Aug 04

Efficiency Calibration



Environmental Restoration Group, Inc.
8809 Washington NE #150
Albuquerque, NM 87113
(505) 298-4224

Detector Mfg.: Ludlum Model: 449 Serial No: PR103362
Counter Mfg.: Ludlum Model: 12 Serial No: 125264

Source: Tc99 @ 18,100 dpm sn: 4099-03 Other: _____

Geometry / Distance to source: SIG

GM tube voltage: 900 volts

Counter Threshold Setting: 40 mV

Gross source counts: 2400 cpm

Background counts: 70 cpm

Net source counts: 2830 cpm

Efficiency = Net source counts (cpm) / Source activity (cpm,dpm)

Efficiency 4π: 13 %

Calibrated By: 

Calibration Date: 13 AUG 04

Calibration Due: 13 AUG 05

Reviewed By: 

Date: 13 Aug 04



INSTRUMENT CALIBRATION

CAL# 11206A
Prev. 10437A

health physics instruments

330 D South Kellogg Ave, Goleta, CA 93117 Tel 805.967.8422 Fax 805.964.3162 Division of Far West Technology, Inc.

INSTRUMENT OWNED BY: Rogers & Associates	EQUIPMENT NO. 2221	DATE: June 15, 2004
MFG.: Ludlum	MODEL: 2221	DATE DUE: June 15, 2005
SERIAL NUMBER: 144863	BATTERIES: Four D cell	PROBE SN/TYPE: 037117 / 3x3

CALIBRATION DATA :

Source	Type	Cal Constant	Due Date	Source	Type	Cal Constant	Due Date
CS1:	CS137	mR/h @ 1 m	5/05	S:	Ra-226	1.929 mR/h @ 1 m	5/05
CS2:	CS137	mR/h @ 1 m	5/05	W:	Ra-226	0.128 mR/h @ 1 m	5/05
CS1-1:	CS137	mR/h @ 1 m	5/05	N1:	Cf252	mrem/h@ 1 m	Assay 1/91
CS1-2:	CS137	mR/h @ 1 m	5/05	N2:	Cf252	mrem/h@ 1 m	Assay 1/99
CS1-3:	CS137	mR/h @ 1 m	5/05	Pulser:	Model: MP2	Serial No.: 001	6/04

Source	Distance	Exposure	Scale Readings					Scaler 1 min *1	CPM/ μ R/h *2
			X 1000	X 100	X 10	X 1			
W	30.2	1,400	O/S					O/S	
	65.3	300	O/S					613,835	2009
	94.3	140	360,000					348,809	2412
	111.3	100	280,000					268,336	2572
	160.0	50	150,000					148,096	2740
	178.9	40	120,000					122,994	2798
	206.6	30	100,000					96,904	2861
	253.8	20	80,000					71,092	3000
	357.8	10			42,000			42,154	3107
	506.0	5			30,000			28,817	3547
		Background		10,000	O/S	O/S		11,083	
Pulser	CPM	LOG	X 1K	X 100	X 10	X 1	Scaler	Time	
	400K	400K	400K				399,866	1 min	
	400K	400K	400K				199,933	0.5 min	
	40K	40K		40K			3,998	0.1 min	
	4K	4K			4K		39,987	10 min	
	400	400				400			

BAROMETER mmHg: 760 TEMPERATURE °C: 20 AM 241: YES

COMMENTS: *1 background not subtracted from reading *2 calculated on 1 min scaler minus background. Threshold (300) HV (1278) Window (out)

CPM ranges set electronically. Background **NOT** subtracted from reading. () indicates reading as found. Gamma calibrations from the side of all GM tubes. Calibrations traceable to the National Institute Of Standards And Technology.

Instrument OK

CALIBRATION BY: RON GODDEN DATE: 6-15-04 CHECKED BY: JOHN S. HANDLOSER, JR. DATE: 6-15-04



Radiation Standards and Check Sources

2810 Siler Lane
Santa Fe, NM 87501
(505) 473-9538
FAX: (505) 473-5805

Certificate of Calibration (Beta Source)

The Technetium 99 beta source was measured in a gas proportional counter using P-10 as counting gas. The beta emissions from the surface of the source were measured at its plateau voltage to determine its 2π particle emission rate (i.e. particles per minute). Corrections were applied for background, coincidence loss and backscatter factors when applicable.

Beta standard 97TC4704553 is our NIST calibrated source used in establishing NIST traceability following ANSI N42.22 participating in the NIST radioactivity measurement assurance program annually.

REF.PO# _____

Model S-TC-47

Active Diameter (or area) 44mm Mounting Material SS
Total Diameter (or area) 47mm Thickness 0.79mm

<u>5.460</u>	ppm \pm	<u>273</u>	ppm 2π
<u>8.730</u>	dpm \pm	<u>436</u>	dpm 4π
<u>0.00393</u>	uCi		Bq
<u>08-27-97</u>	date of measurement		
<u>97TC4702666</u>	source serial number		
<u>5.0</u>	overall uncertainty (percent)		
<u>25</u>	backscatter(percent)		

Michael A. Ortiz Michael A. Ortiz Calibration Manager

Charles L. Gonzales Charles L. Gonzales . . Quality Assurance Manager

<2200 dpm leak test results (dpm/100cm²)

The overall uncertainty of the measurement is three times the value found from combining quadratically the sum of the overall uncertainty reported by NIST in the radioactive measurements assurance program; the standard deviation of the mean for the NIST standard as measured in the system used for calibration; and the standard deviation of the mean for the source measurements.

BC007-97