

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		INSTRUMENT INFORMATION	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address: 628 Gallaher Road, Kingston, TN 37763		Model: 2221	Serial Number: 176940
Contact Name: Tony Riggs		Probe: N/A	Serial Number: N/A
Customer PO Number: N/A	Work Order Number: 2008-05469	Calibration Method: Electronic	

**INSTRUMENT CALIBRATION INFORMATION**

Instrument Range	Calibration Standard Value CPM	Scaler Response ( $\pm 10\%$ )		Ratemeter Response ( $\pm 10\%$ )	
		As Found	As Left	As Found	As Left
X 1	100	100	100	100	100
X 1	200	199	199	200	200
X 1	400	399	399	400	400
X 10	1,000	1,000	1,000	1,000	1,000
X 10	2,000	1,994	1,994	2,000	2,000
X 10	4,000	3,990	3,990	4,000	4,000
X 100	10,000	10,003	10,003	10,000	10,000
X 100	20,000	19,954	19,954	20,000	20,000
X 100	40,000	39,899	39,899	40,000	40,000
X 1000	100,000	100,029	100,029	100,000	100,000
X 1000	200,000	199,358	199,358	200,000	200,000
X 1000	400,000	398,996	398,996	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: 	Reviewed By: 	Date: 12/3/08	
Calibration Date: 12/03/08	Calibration Due: 12/03/09		

Model: 2221Serial Number: 176940

M&TE					Environmental Conditions				
Volt Meter	Due Date:	09/29/09	ID	6565015	MC-250L	Due Date:	08/26/09	ID:	8029
Pulser	Due Date:	09/11/09	ID	246163	Humidity	Due Date:	03/28/09	ID:	992290
Timer	Due Date:	03/07/09	ID	22226011	Temp: 23.9°C	Pressure: 748 mmHg		Humidity: 18%	
INSTRUMENT CALIBRATION INFORMATION									
Special Test									
Geotropism	Sat (✓) Unsat ( )			Hold			Sat (✓) Unsat ( )		
BAT > 4.5	Sat (✓) Unsat ( )			Volume Test			Sat (✓) Unsat ( )		
Mechanical Zero	Sat (✓) Unsat ( )			Audio Divide			Sat (✓) Unsat ( )		
Digital Zero	Sat (✓) Unsat ( )			Window Switch			Sat (✓) Unsat ( )		
Count	Sat (✓) Unsat ( )			Lamp			Sat (✓) Unsat ( )		
Sensitivity	Sat (✓) Unsat ( )			Response Test			Sat (✓) Unsat ( )		
Over Range Test	Sat (✓) Unsat ( ) N/A ( )								
Threshold	As Found= 100			As Left= 100					
Window	As Found= Off			As Left= Off					
LCD HV	As Found= 1650			As Left= 1650					
Precision Test	Reading 1= 4000			Reading 2= 4000			Reading 3= 4000 MEAN= 4000		
High Voltage Calibration									
Voltage	Tolerance ± 2%			As Found			As Left		
350	343-357			352			352		
1,500	1,470-1,530			1,498			1,498		
2,000	1,960-2,040			1,994			1,994		
Logmeter Scale Linearity Check									
<u>Input</u>		<u>±20% Tolerance</u>			<u>As Found</u>			<u>As Left</u>	
LOG	400	320-480			400			400	
LOG	4,000	3,200-4,800			4,000			4,000	
LOG	40,000	32,000-48,000			40,000			40,000	
LOG	400,000	320,000-480,000			400,000			400,000	
COMMENTS									
Calibrated in accordance with CP-IN-WI-237 Rev 1 Threshold 100=10mv									
Instrument									
Calibrated By: <i>[Signature]</i>					Reviewed By: <i>[Signature]</i> Date: 12/13/08				
Calibration Date: 12/03/08					Calibration Due: 12/03/09				



**DETECTOR  
CERTIFICATE**

Duratek Instrument Services  
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CUSTOMER INFORMATION		DETECTOR INFORMATION	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address: 628 Gallaher Rd Kingston, TN 37763		Detector Model: 43-68A	
Contact Name: Tony Riggs		Serial Number: 122020	
Customer Purchase Order Number: N/A	Work Order Number: 2008-04988	Evaluation Method: Source	

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION					
1) Source Nuclide: Th <sup>230</sup>	Serial Number: 119704		Activity (dpm): 18,900	Certification Date: 10/14/97	
Parameter	As Found	As Left	Precision Test		CPM (Source #1)
Count 1	3,239	3,211	Count 1(Heel)		3,124
Count 2	3,228	3,331	Count 2(Center)		3,322
Count 3	3,290	3,294	Count 3(Toe)		3,015
Average	3,252	3,279	Average		3,154
Background (cpm)	2.8	1.6	Tolerance		All counts within ±10% of Average
Net Counts	3,249	3,277	Pass/Fail		PASS
Efficiency	17.2%	17.3%			
Low Sample Activity: Source #: N/A		High Sample Activity: Source #: N/A		Dead Time (DT): N/A	Calibration Constant (CC): N/A

SCALER INFORMATION			DETECTOR INFORMATION		
<u>Model</u>	<u>Serial Number</u>	<u>Due Date</u>	<u>Background (cpm)</u>	<u>Operating Voltage</u>	<u>Threshold</u>
2221	176940	12/03/09	1.6	1350	40 = 4mV
Detector Setup Report	YES	NO <input checked="" type="checkbox"/>	Barcode Report	YES	NO <input checked="" type="checkbox"/>
			Voltage Plateau YES <input checked="" type="checkbox"/> NO		

**COMMENTS**

\*\*Calibrated with 6Ft. Cable\*\* Calibrated in accordance with CP-IN-WI-237, Rev. 0

10 minute background Efficiency determined w/43-68 source jig

**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>Jeff Robinson</i>	Date: 12/14/08
Certification Date: 03/31/08	Certification Due: 03/31/09	

BACKGROUND PLATEAU 43-68#122020 6FT CABLE 3/26/2008

900	0
950	0
1000	0
1050	0
1100	4
1150	3
1200	1
1250	0
1300	1
1350	0
1400	0
1450	5
1500	12
1550	33
1600	62
1650	131
1700	213
1750	264
1800	237
1850	320
1900	309
1950	343

ALPHA PLATEAU TH-230#119704 18,900DPM

900	0
950	0
1000	3
1050	628
1100	2196
1150	3017
1200	3155
1250	3304
1300	3235
1350	3262
1400	3316
1450	3315
1500	3693

BETA PLATEAU TC-99#099608 21,311DPM

1400	22
1450	304
1500	1081
1550	2166
1600	3130
1650	4449
1700	5102
1750	5173
1800	5364
1850	5907
1900	6497
1950	7308



**CALIBRATION  
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CUSTOMER INFORMATION				DETECTOR INFORMATION	
Customer Name: Duratek Instrument Services				Manufacturer: Ludlum	
Address: 628 Gallaher Rd Kingston, TN 37763				Detector Model: 43-37A	
Contact Name: Tony Riggs				Serial Number: 120106	
Customer Purchase Order Number: N/A		Work Order Number: 2008-05469		Evaluation Method: Source	
DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION					
Source Nuclide: Th <sup>230</sup>		Serial Number: 099603		Activity: 26,220 dpm	
				Certification Date: 08/14/96	
Parameter	As Found	As Left	Precision Test		CPM
Count 1	4,972	4,972	Count 1 (Heel)		4,998
Count 2	4,907	4,907	Count 2 (Center)		5,026
Count 3	5,117	5,117	Count 3 (Toe)		5,036
Count 4	4,864	4,864	Average		5,020
Count 5	4,942	4,942	Tolerance		±10%
Count 6	4,978	4,978	Pass/Fail		Pass
Average	4,963	4,963			
Background (CPM)	6.4	6.4			
Net Counts	4,957	4,957			
Efficiency	18.9%	18.9%			
Low Sample Activity: Source #: N/A		High Sample Activity: Source #: N/A		Dead Time (DT): N/A	Calibration Constant (CC): N/A
SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2221	211785	12/02/09	6.4	1400V	40 = 4 mV
Detector Setup Report		YES <input checked="" type="checkbox"/> NO	Barcode Report		YES <input checked="" type="checkbox"/> NO
			Voltage Plateau		YES <input checked="" type="checkbox"/> NO
COMMENTS					
5 minute background performed			Efficiency performed on contact with 6ft. cable		
STATEMENT OF CERTIFICATION					
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Detector					
Certified By: <i>M. Paul</i>		Reviewed By: <i>Jeff Dubson</i>		Date: 12/3/08	
Certification Date: 12/03/08			Certification Due: 12/03/09		

120106

BACKGROUND PLATEAU 43-37#142520 12/2/2008

900	0
950	0
1000	0
1050	0
1100	0
1150	1
1200	5
1250	5
1300	2
1350	2
1400	5
1450	4
1500	8
1550	10
1600	32
1650	78
1700	149
1750	294
1800	481
1850	850
1900	1047
1950	1146

BETA PLATEAU TC-99#099608DPM

1400	7
1450	2
1500	0
1550	63
1600	550
1650	1562
1700	2621
1750	3813
1800	5260
1850	5782
1900	6071
1950	6323

ALPHA PLATEAU TH-230#099603 26,220DPM

900	125
950	0
1000	0
1050	0
1100	2
1150	759
1200	3613
1250	4660
1300	4777
1350	4927
1400	4990
1450	5152
1500	5072



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CUSTOMER INFORMATION				DETECTOR INFORMATION	
Customer Name: Duratek Instrument Services				Manufacturer: Ludlum	
Address: 628 Gallaher Rd Kingston, TN 37763				Detector Model: 43-37B	
Contact Name: Tony Riggs				Serial Number: 120106	
Customer Purchase Order Number: N/A		Work Order Number: 2008-05469		Evaluation Method: Source	
DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION					
Source Nuclide: Tc <sup>99</sup>		Serial Number: 099608		Activity: 21,312 dpm	
				Certification Date: 08/08/96	
Parameter	As Found	As Left	Precision Test		CPM
Count 1	6,309	6,309	Count 1 (Heel)		6,266
Count 2	6,422	6,422	Count 2 (Center)		6,476
Count 3	6,393	6,393	Count 3 (Toe)		6,393
Count 4	6,417	6,417	Average		6,378
Count 5	6,448	6,448	Tolerance		±10%
Count 6	6,238	6,238	Pass/Fail		Pass
Average	6,371	6,371			
Background (CPM)	1106.4	1106.4			
Net Counts	5,265	5,265			
Efficiency	24.7%	24.7%			
Low Sample Activity: Source #: N/A		High Sample Activity: Source #: N/A		Dead Time (DT): N/A	Calibration Constant (CC): N/A
SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2221	211785	12/02/09	1106.4	1900V	40 = 4 mV
Detector Setup Report		YES <input checked="" type="checkbox"/> NO	Barcode Report		YES <input checked="" type="checkbox"/> NO
					Voltage Plateau YES <input checked="" type="checkbox"/> NO
COMMENTS					
5 minute background performed			Efficiency performed on contact with 6ft. cable		
STATEMENT OF CERTIFICATION					
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Detector		Certified By: <i>M. Paul</i>		Reviewed By: <i>J. M. Dubson</i>	
		Date: 12/3/08			
Certification Date: 12/03/08			Certification Due: 12/03/09		

BACKGROUND PLATEAU 43-37#<sup>120106</sup>~~142520~~ 12/2/2008  
12-2-09-P

900	0
950	0
1000	0
1050	0
1100	0
1150	1
1200	5
1250	5
1300	2
1350	2
1400	5
1450	4
1500	8
1550	10
1600	32
1650	78
1700	149
1750	294
1800	481
1850	850
1900	1047
1950	1146

BETA PLATEAU TC-99#099608DPM

1400	7
1450	2
1500	0
1550	63
1600	550
1650	1562
1700	2621
1750	3813
1800	5260
1850	5782
1900	6071
1950	6323

ALPHA PLATEAU TH-230#099603 26,220DPM

900	125
950	0
1000	0
1050	0
1100	2
1150	759
1200	3613
1250	4660
1300	4777
1350	4927
1400	4990
1450	5152
1500	5072