

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: 168577
Contact Name: Tony Riggs		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: N/A	Work Order Number: 2008-05396	Calibration Method: Electronic	

INSTRUMENT CALIBRATION INFORMATION

Instrument Range	Calibration Standard Value CPM	Ratemeter Response		Calibration Standard Value CPM	Time Base (min)	Tolerances (cpm) ± 2%	Scaler Response	
		As Found	As Left				As Found	As Left
X 1	100	100	100	1,000 CPM	.1	98 - 102	100	100
X 1	250	250	250	1,000 CPM	.2	196 - 204	200	200
X 1	400	390	390	1,000 CPM	.5	490 - 510	501	501
X 10	1,000	1,000	1,000	1,000 CPM	1	980 - 1,020	1,001	1,001
X 10	2,500	2,500	2,500	1,000 CPM	2	1,960 - 2,040	2,002	2,002
X 10	4,000	4,000	4,000	1,000 CPM	5	4,900 - 5,100	5,005	5,005
X 100	10,000	10,000	10,000	Calibrated in accordance with OEM Technical Manual				
X 100	25,000	25,000	25,000					
X 100	40,000	40,000	40,000					
X 1000	100,000	100,000	100,000					
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: <i>M. Paul</i>	Reviewed By: <i>Jeff Dabinson</i>	Date: 10/29/08	
Calibration Date: 10/29/08	Calibration Due: 10/29/09		

Model: 2221Serial Number: 168577

M&TE					Environmental Conditions					
Volt Meter	Due Date:	03/27/09	ID	93950304	MC-250L	Due Date:	08/26/09	ID:	8029	
Pulser	Due Date:	09/11/09	ID	120935	Humidity	Due Date:	03/28/09	ID:	992290	
Timer	Due Date:	03/07/09	ID	22226011	Temp: 24.1 °C	Pressure: 747 mmHg	Humidity: 22%			
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 ()			
HV Adjust (50-2400)	Sat (✓) Unsat ()									
High Voltage Calibration										
Voltage	Tolerance ± 2%			As Found			As Left			
400	392-408			401			401			
1,000	980-1,020			1,010			1,010			
1,500	1,470-1,530			1,517			1,517			
1,900	1,862-1,932			1,921			1,921			
Threshold/Gain Calibration (Desired Ratio <u>10</u> mV/100)										
<u>Threshold Setting</u>	<u>Pulser Input</u>	<u>As Found Ratio (mV/100)</u>	<u>Pulser Input</u>	<u>As Left Ratio (mV/100)</u>	<u>Window</u>	<u>Threshold Cutoff (mV)</u>				
100	10.4	9.6	10.4	9.6	100	19.2				
200	20.2	9.9	20.2	9.9	200	28.4				
300	29.8	10.1	29.8	10.1	300	38.0				
400	39.1	10.2	39.1	10.2	400	47.3				
500	48.4	10.3	48.4	10.3	N/A	N/A				
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			37,500			37,500		
LOG	400,000	320,000-480,000			350,000			350,000		
COMMENTS										
Calibrated in accordance with OEM Technical Manual										
Instrument										
Calibrated By: <u>M. Paul</u>					Reviewed By: <u>Jeff Oatman</u>			Date: <u>10/29/08</u>		
Calibration Date: <u>10/29/08</u>					Calibration Due: <u>10/29/09</u>					



**CALIBRATION
CERTIFICATE**

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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: 092971	
Customer Purchase Order Number: N/A	Work Order Number: 2008-05469	Evaluation Method: Source	

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION				
Source Nuclide: Th ²³⁰	Serial Number: 099603	Activity: 26,220 dpm	Certification Date: 08/14/96	
Parameter	As Found	As Left	Precision Test	CPM
Count 1	4,300	4,300	Count 1 (Heel)	4,393
Count 2	4,453	4,453	Count 2 (Center)	4,543
Count 3	4,587	4,587	Count 3 (Toe)	4,295
Count 4	4,516	4,516	Average	4,410
Count 5	4,372	4,372	Tolerance	±10%
Count 6	4,282	4,282	Pass/Fail	Pass
Average	4,418	4,418		
Background (CPM)	10.2	10.2		
Net Counts	4,408	4,408		
Efficiency	16.8%	16.8%		
Low Sample Activity: Source #: N/A		High Sample Activity: Source #: N/A		Calibration Constant (CC): N/A
Dead Time (DT): N/A				

SCALER INFORMATION			DETECTOR INFORMATION		
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2221	168577	10/29/09	10.2	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

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 Dabson</i>	Date: 12/3/08
Certification Date: 12/03/08	Certification Due: 12/03/09	

BACKGROUND PLATEAU 43-37#092791 12/2/2008

900	0
950	0
1000	0
1050	0
1100	0
1150	2
1200	11
1250	4
1300	5
1350	6
1400	5
1450	11
1500	15
1550	29
1600	59
1650	125
1700	212
1750	385
1800	673
1850	982
1900	1076
1950	4292

BETA PLATEAU TC-99#099608DPM

1400	12
1450	10
1500	17
1550	203
1600	904
1650	1887
1700	3040
1750	4251
1800	5171
1850	5601
1900	5712
1950	7535

ALPHA PLATEAU TH-230#099603 26,220DPM

900	135
950	0
1000	0
1050	0
1100	3
1150	700
1200	3046
1250	3812
1300	4191
1350	4208
1400	4250
1450	4444
1500	4367



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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: 092791	
Customer Purchase Order Number: N/A		Work Order Number: 2008-05469		Evaluation Method: Source	
DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION					
Source Nuclide: Tc ⁹⁹		Serial Number: 099608		Activity: 21,312 dpm	Certification Date: 08/08/96
Parameter	As Found	As Left	Precision Test		CPM
Count 1	5,953	5,953	Count 1 (Heel)		6,078
Count 2	5,957	5,957	Count 2 (Center)		5,986
Count 3	6,055	6,055	Count 3 (Toe)		6,048
Count 4	5,916	5,916	Average		6,037
Count 5	5,926	5,926	Tolerance		±10%
Count 6	5,967	5,967	Pass/Fail		Pass
Average	5,962	5,962			
Background (CPM)	1208.4	1208.4			
Net Counts	4,754	4,754			
Efficiency	22.3%	22.3%			
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		
Model	Serial Number	Due Date	Background (cpm)	Operating Voltage	Threshold
2221	168577	10/29/09	1208.4	1850V	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					
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 DeLama</i>		Date: 12/3/08	
Certification Date: 12/03/08			Certification Due: 12/03/09		



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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: 126795			
Customer Purchase Order Number: N/A		Work Order Number: 2008-05469		Evaluation Method: Source			
DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION							
1) Source Nuclide: Th ²³⁰		Serial Number: 099603		Activity (dpm): 26,220		Certification Date: 08/14/96	
Parameter	As Found	As Left	Precision Test		CPM (Source #1)		
Count 1	4,543	4,543	Count 1(Heel)		4,452		
Count 2	4,407	4,407	Count 2(Center)		4,508		
Count 3	4,466	4,466	Count 3(Toe)		4,516		
Average	4,472	4,472	Average		4,492		
Background (cpm)	1.6	1.6	Tolerance		All counts within ±10% of Average		
Net Counts	4,470	4,470	Pass/Fail		PASS		
Efficiency	17.0%	17.0%					
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	168577		10/29/09	1.6	1350V	40 = 4mV	
Detector Setup Report	YES	NO ✓	Barcode Report	YES	NO ✓	Voltage Plateau YES ✓ 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>J. Patterson</i>		Date: 12/4/08			
Certification Date: 12/04/08				Certification Due: 12/04/09			



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CUSTOMER INFORMATION				DETECTOR INFORMATION		
Customer Name: Duratek Instrument Services				Manufacturer: Ludlum		
Address: 628 Gallaher Rd Kingston, TN 37763				Detector Model: 43-68B		
Contact Name: Tony Riggs				Serial Number: 126795		
Customer Purchase Order Number: N/A		Work Order Number: 2008-05456		Evaluation Method: Source		
DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION						
1) Source Nuclide: Tc ⁹⁹		Serial Number: 099608		Activity (dpm): 21,312		Certification Date: 10/14/97
Parameter	As Found	As Left	Precision Test		CPM (Source #1)	
Count 1	5,210	5,210	Count 1(Heel)		5,037	
Count 2	5,389	5,389	Count 2(Center)		5,308	
Count 3	5,282	5,282	Count 3(Toe)		4,944	
Average	5,294	5,294	Average		5,096	
Background (cpm)	376.4	376.4	Tolerance		All counts within ±10% of Average	
Net Counts	4,918	4,918	Pass/Fail		PASS	
Efficiency	23.1%	23.1%				
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	168577		10/29/09	376.4	1800V	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						
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Detector						
Certified By: <i>M. Paul</i>		Reviewed By: <i>Jeff Dabrowski</i>		Date: 12/14/08		
Certification Date: 12/04/08				Certification Due: 12/04/09		

BACKGROUND PLATEAU 43-68#126795 12/4/2008

900	0
950	0
1000	0
1050	0
1100	0
1150	0
1200	0
1250	1
1300	0
1350	2
1400	0
1450	2
1500	11
1550	28
1600	69
1650	136
1700	206
1750	321
1800	325
1850	365
1900	437
1950	487

ALPHA PLATEAU TH-230#119706 18,900DPM

900	0
950	1
1000	0
1050	62
1100	1647
1150	2747
1200	3153
1250	3266
1300	3195
1350	3343
1400	3359
1450	3239
1500	3421

BETA PLATEAU TC-99#119716 22733DPM

1400	7
1450	127
1500	780
1550	1797
1600	2955
1650	4125
1700	5142
1750	5621
1800	5839
1850	6287
1900	6964
1950	8567