

**LUDLUM MODEL43-9  
Alpha Sample Counter**

**September 2013**

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Alpha Sample Counter**

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**LUDLUM MEASUREMENTS, INC**  
501 OAK STREET, P.O. BOX 810  
SWEETWATER, TEXAS 79556  
325-235-5494, FAX: 325-235-4672

## **STATEMENT OF WARRANTY**

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material, and design for a period of twelve months from the date of delivery. The calibration of a product is warranted to be within its specified accuracy limits at the time of shipment. In the event of instrument failure, notify Ludlum Measurements to determine if repair, recalibration, or replacement is required.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages, arising from the purchase, use, or inability to use product.

## **RETURN OF GOODS TO MANUFACTURER**

If equipment needs to be returned to Ludlum Measurements, Inc. for repair or calibration, please send to the address below. All shipments should include documentation containing return shipping address, customer name, telephone number, description of service requested, and all other necessary information. Your cooperation will expedite the return of your equipment.

**LUDLUM MEASUREMENTS, INC.  
ATTN: REPAIR DEPARTMENT  
501 OAK STREET  
SWEETWATER, TX 79556**

**800-622-0828 325-235-5494  
FAX 325-235-4672**





## TABLE OF CONTENTS

1. GENERAL .....	1
2. OPERATION .....	1
3. SPECIFICATIONS .....	1
4. CALIBRATION PROCEDURE.....	2
4.1 Counting Instrument .....	2
4.2 Procedure .....	2
5. TROUBLE SHOOTING.....	3
5.1 Zero or Very Low Counts .....	3
5.2 Excessive Background Count .....	3
PARTS LIST .....	4
Model 43-9 Alpha Counter .....	4
Tube Socket Board, Drawing 2 x 287 .....	4
DRAWINGS AND DIAGRAMS .....	5



# Model 43-9 Alpha Sample Counter

## 1. GENERAL

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The Model 43-9 is an alpha sample counter for counting filters. The sample counter can be used with any of the Ludlum scaler instrument or other equivalent counting instruments.

The scintillator material ZnS (Ag) is attached to the light pipe.

## 2. OPERATION

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- Connect the Model 43-9 to the scaler. The coax cable "C" connector carries both the signal and HV.
- HV is applied to the photomultiplier tube (PMT) when the sample slide is pushed completely in, tripping the microswitch. Rotate the sample slide lever to the locked position, securing sample slide is in the ON position.
- Select appropriate count time and record background counts. Approximately 3 counts per minute can be expected as normal background activity.
- For counting source material, place the source material on the appropriate side of the sample holder for the one or two-inch filters. Do not allow the source material to extend above the top of the sample slide. Place sample slide in the locked position for a short time before taking the count, to allow room light to decay out of the scintillation material.
- A background count should be taken after each source count to check for contamination on the sample holder or area within the O-ring.

## 3. SPECIFICATIONS

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**Scintillator Material:** ZnS(Ag)

**Photomultiplier Tube:** 3.8 cm (1.5 in.) diameter

**Scaler Input Sensitivity:** 2-500 mV

**Sample Holder:** 2.54 cm (1 in.) diameter x 0.15 cm (0.06 in.) deep

**Operating Voltage:** 500-1200 volts

**Window:** 0.4 mg/cm<sup>2</sup>

**Sample Size:** (maximum) 2.54 cm (1.5 in.) diameter

**Efficiency (4pi):** 30% for <sup>230</sup>Th

**Size:** detector 7.6 x 21.6 cm (3 x 8.5 in.), sample tray 4.6 x 14 cm (1.8 x 5.5 in.) (Dia x L)

**Typical Background:** ≤ 3 cpm (in ambient background of 10 μR/hr)

**Weight:** 0.9 kg (2 lb)



## 4. CALIBRATION PROCEDURE

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**Caution:** Do not tip sample counter over with sample holder in sample slide. The sample holder will tear the thin metalized polyester window, allowing light to scintillate the ZnS and cause excessive count in the beta channel.

### 4.1 Counting Instrument

- Calibrated scaler instrument
- HV Range – nominally  $800 \pm 200$  volts
- Input Sensitivity – 2-500 mV; nominally 10 mV

**Note:** Model 43-9 should be dark adapted; slide closed and locked a minimum of 2 hours after assembly, before taking data.

### 4.2 Procedure

#### Background Check

- Connect the Model 43-9 to counting instrument with proper cable.
- Push sample drawer in and lock.
- Record background count starting at 500 volts with 50-volt increments. Increase voltage until background count exceeds 10 cpm or greater. Do not exceed 1500 volts.

#### Source Plateau

- Place check source in sample drawer. Close and lock.
- Run a count by recording sample count starting at 500 volts and increasing voltage in 50-volt increments. Plateau

recordings can be stopped where background count exceeds 10 cpm.

- Set HV just above knee of plateau. Background count should be less than 3 counts per minute. Remove source and recheck background.
- Begin operation as required.

#### Determining Efficiency

NIST traceable check source required.

- Set HV as determined in Source Plateau section, third step.
- Check next traceable check source data stated on certificate in surface emission rate (2pi), dpm (4pi), and/or microcuries.

#### Determine 2pi Efficiency

- Place check source stated in cpm (surface emission) in the 43-9.
- Record detector count. Divide detector source count by source (cpm), times 100 for percent efficiency (2pi).

#### Determine 4pi Efficiency

- Place source, stated in dpm, in the Model 43-9.
- Repeat first two steps above (determine efficiency).

## Model 43-9 Alpha Sample Counter

- Record detector source count. Divide detector source count by source (dpm) x 100 for percent efficiency (4pi).

**Note:** The manufacture may have calculated the dpm value of the source from the 2pi emission rate corrected for back scatter. Back scatter is due

from the source material being palted on a metal disk, which is typically 1.5% to 3%. If the dpm value has not been corrected for back scatter value, divide by 2 for determining surface emission rate.

### 5. TROUBLE SHOOTING

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#### 5.1 Zero or Very Low Counts

- Light leak
- PMT malfunction
- Broken HV/signal wire in tube socket
- Counting instrument malfunction
- Cable malfunction

#### 5.2 Excessive Background Count

- Light leak
- PMT malfunction
- Cable malfunction
- Instrument contaminated
- Metalized polyester window torn or removed
- HV on high end of plateau

# Model 43-9 Alpha Sample Counter

## **PARTS LIST**

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<b>Ref. No.</b>	<b>Description</b>	<b>Part No.</b>
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### **Model 43-9 Alpha Sample Counter**

Completely Assembled

Model 43-9 Alpha Sample Counter

47-1525

*	Photomultiplier Tube	01-5001
*	1 x 1 inch NaI Crystal Assy	40-5154
*	“C” Connector	13-7751
*	Tube Shield	40-4006
*	O-Ring	16-8263
*	Light pipe	4002-492
*	1.5 inch Tube Socket Board	5002-259
*	Base	7002-027-07
*	Sponge (2 each)	7002-029-05
*	Plexiglass cap	7002-029-04

### **1.5 inch Tube Socket Board, Drawing 2 x 287**

BOARD	Assembled 1.5 inch Tube Socket	5002-259
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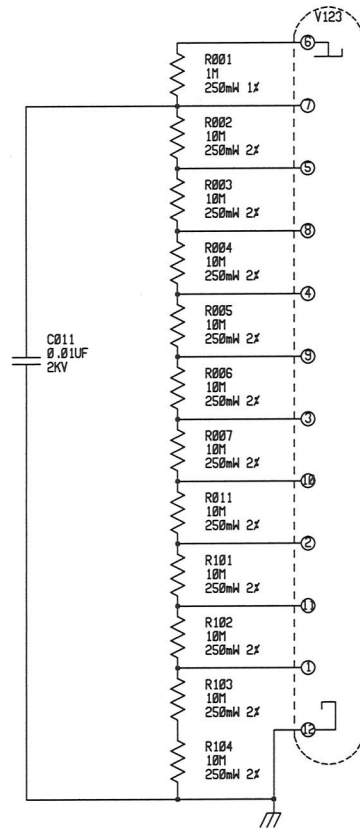
## Model 43-9 Alpha Sample Counter

### **DRAWINGS AND DIAGRAMS**

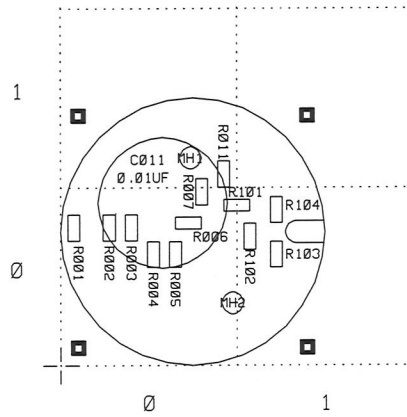
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1.5 inch Tube Socket Board, Drawing 2 x 286 & 2 x 287

REVISIONS						
EFF	AUTHORITY	ZONE	LTR	DESCRIPTION	DATE	APPROVED



UPDATED	-	LUDLUM MEASUREMENTS INC.				
DR CKB	-	02/08/95	TITLE: 1-1/2" TUBE SOCKET BOARD			
CHK	RJS	2-4-97				
DSGN	-	XX-XXX-XX	BOARD# 5002-259			
APPD	RDG	5 Feb 97	SIZE	MODEL	SERIES	SHEET
NEXT HIGHER ASSY.	-	-	C	-	2	286
09:50:14	5-Feb-97	SB002259	SHEET 1 OF 1			



<input checked="" type="checkbox"/> LUDLUM MEASUREMENTS INC. SWEETWATER, TX.				
DR	CKB	02/08/95	TITLE: 1-1/2" TUBE SOCKET BOARD	
CHK	255	2-5-97	BOARD# 5002-259	BS002259
DSGN	XX-XXX-XX	MODEL 1 1/2	SERIES 2	SHEET 287
APP	205	5 Feb 97	COMP ARTWORK <input type="checkbox"/>	SLDR ARTWORK <input type="checkbox"/>
09:49:00	5-Feb-97	COMP OUTLINE <input checked="" type="checkbox"/>	SLDR OUTLINE <input type="checkbox"/>	
COMP PASTE <input type="checkbox"/>	COMP MASK <input type="checkbox"/>	SLDR PASTE <input type="checkbox"/>	SLDR MASK <input type="checkbox"/>	