

**LUDLUM MODEL 182  
RADON FLASK COUNTER**

**June 2011  
Serial Number PR206794 and Succeeding  
Serial Numbers**

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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**

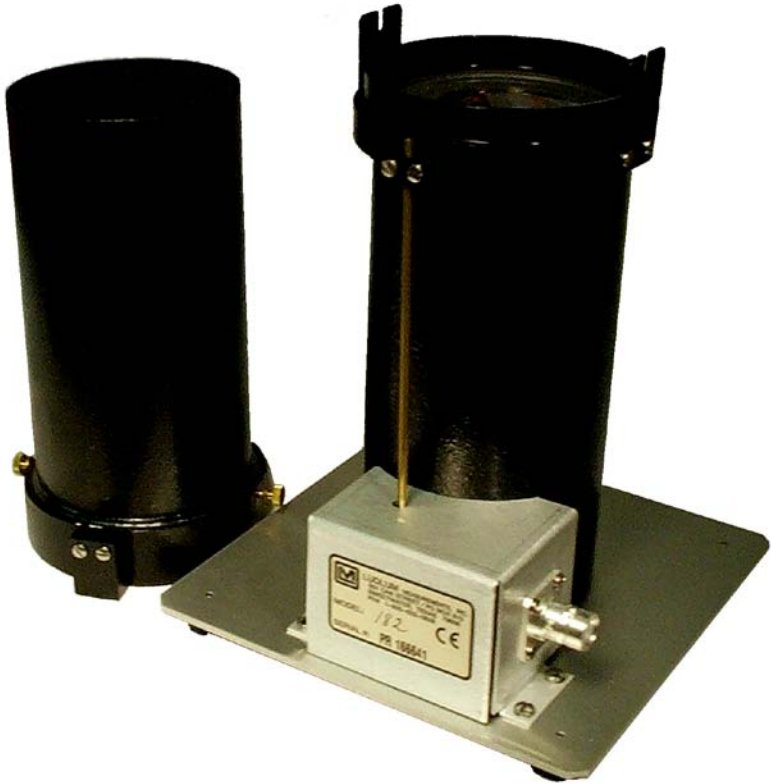
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**Model 182 Radon Flask Counter**

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*Model 182 Radon Flask Counter – open*

### **Introduction**

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**T**he Model 182 Radon Flask Counter is a light-tight sample box that uses scintillation techniques for the detection of radiation material. It consists of a light-tight cylindrical well, a two-inch photomultiplier tube (PMT) optically coupled to a light pipe, and an automatic high voltage ON-OFF switch. For sample counting, the radon flask is placed on the acrylic light pipe. The upper tube body assembly is fitted onto the lower tube base and held in place with two thumbscrews. When the upper tube body is in place on the lower base, a push-rod assembly automatically activates a microswitch, allowing high voltage to be applied to the PMT. When the upper tube assembly is removed, the HV is automatically disconnected. This allows the cover to be removed without turning off the high voltage on the accompanying scaler/count-rate meter type instrument.

The Model 182 Switch Shield/Connector Box is constructed for a Series C connector. The Series C connector uses a one-wire system combining the HV and Signal. The HV is blocked from the Signal part of the PMT by a capacitor located in the tube socket. A terminal strip containing a filter circuit prevents unwanted noise from the microswitch's actuations.

Separate BNC signal and MHV high-voltage connectors can be provided on the connector box.

### **Operation**

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Connect detector cable from Scaler/Counter to the Flask Counter. Remove top cover from main body and place

## **Model 182 Radon Flask Counter**

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scintillation material on top of the plexiglass. The plexiglass should be checked for cleanliness and cleaned, if necessary, prior to using the Flask Counter. Place the radiation source on top of the scintillation material. Fasten cover to main body by tightening the thumbscrews and record data.

### **Note:**

A delay of 20 or more minutes of dark adaptation may be required after scintillation material is exposed to direct room light.

## **Specifications**

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Photomultiplier Tube (PMT): 5.1 cm (2 in.) diameter, 14-pin 10-stage dynode string

Operating Range: 400-1250 V

Maximum PMT Voltage: 1500 V

Connector: standard Series C

Dark Adaptation: function of scintillation material (ranges from 20 minutes to 48 hours)

Maximum Sample Size: 6.1 x 12.7 cm (2.4 x 5 in.) (Dia x H)

Size: 8.9 x 38.1 cm (3.5 x 15 in.) (Dia x H) with a 15.2 x 15.2 cm (6 x 6 in.) square base

Weight: 4.5 kg (10 lb)

Finish: black powder coat (inside and outside)

Dynode String Resistance: 60 Megohm

## **Safety Considerations**

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### **ENVIRONMENTAL CONDITIONS FOR NORMAL USE**

Indoor use

No maximum altitude (The detector may be affected by altitude. Refer to the detector manual for more information.)

Temperature range of -20 to 50 °C (-4 to 122 °F); may be certified for operation from -40 to 65 °C (-40 to 150 °F)

Maximum relative humidity of less than 95% (non-condensing)

Pollution Degree 2 (as defined by IEC 664)

#### **Caution!**

The operator or responsible body is cautioned that the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by Ludlum Measurements, Inc.

### **CLEANING AND MAINTENANCE PRECAUTIONS**

The Model 182 may be cleaned externally with a damp cloth, using only water as the wetting agent. Do not immerse the detector in any liquid. Observe the following precautions when cleaning or performing maintenance on the detector:

Disconnect the detector from the instrument. Allow the detector to sit for one minute before cleaning the exterior or accessing any internal components for maintenance.



### **Recycling**

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**L**udlum Measurements, Inc. supports the recycling of the electronic products it produces for the purpose of protecting the environment and to comply with all regional, national, and international agencies that promote economically and environmentally sustainable recycling systems. To this end, Ludlum Measurements, Inc. strives to supply the consumer of its goods with information regarding reuse and recycling of the many different types of materials used in its products. With many different agencies – public and private – involved in this pursuit, it becomes evident that a myriad of methods can be used in the process of recycling. Therefore, Ludlum Measurements, Inc. does not suggest one particular method over another, but simply desires to inform its consumers of the range of recyclable materials present in its products, so that the user will have flexibility in following all local and federal laws.

The following types of recyclable materials are present in Ludlum Measurements, Inc. electronic products, and should be recycled separately. The list is not all-inclusive, nor does it suggest that all materials are present in each piece of equipment:

- Batteries
- Glass
- Aluminum and Stainless Steel
- Circuit Boards
- Plastics
- Liquid Crystal Display (LCD)

# **Calibration and Maintenance**

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## **CALIBRATION**

- Connect the Model 182 to a calibrated counting instrument.
  - HV Range: 500-1200 V; nominally 1100 V
  - Input Sensitivity: 2-500 mV; nominally 10 mV

Place the top cover on the Model 182. Push the top cover down. Tighten the thumbscrews to lock the top cover in place. The push rod on the side of the detector should trip the microswitch, providing HV to the photomultiplier tube. The lip on the top cover should bottom out in the groove of the lower tube, ensuring the lid sits securely.

With no source or scintillator material, check the instrument from 500 volts to 1500 volts in 100-volt increments to determine the background count.

Place the scintillation flask or scintillation material being used onto the light pipe.

Plateau the instrument from 500 volts in 100-volt increments. Increase the voltage until the background count exceeds 10 cpm. Do not exceed 1500V or the manufacturer's PMT specifications. Record the count measured due to scintillation material.

Place the check source with the scintillation material in the Model 182.

Plateau the instrument, starting at 500 volts. Increase voltage in 50-volt increments up to the voltage previously determined (10 cpm or greater background count reached).

Determine the HV starting point. From the data, select HV where background is equal to or less than 2 cpm above the knee of the plateau. Normally, the HV operating point is between the knee of the plateau and the middle of the plateau to minimize background count.

To determine counter efficiency, position a check source in the instrument. Use the same type of source as the material to be measured, with similar geometry to the material to be measured, if possible. Divide the sample count by the calibrated source size in disintegrations per minute (DPM). Multiply by 100 to obtain % efficiency ( $4\pi$ ).

Document using the appropriate forms.

### **MAINTENANCE**

The surface of the acrylic light pipe is vulnerable to mars and scratches, requiring attentive handling of the flasks or other apparatuses when placing them on the surface. The surface should also be kept clean for optimum light transfer from the flask to the PMT. The switch rod can be adjusted in height for proper operation of the microswitch, which applies high voltage to the PMT, by adjusting the switch rod cap at the end of the rod.

## **Troubleshooting**

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Occasionally you may encounter problems with your LMI instrument or detector that may be repaired or resolved in the field, saving turnaround time and expense in returning the instrument to us for repair. Toward that end, LMI electronics technicians offer the following tips for troubleshooting the most common problems. Where several steps are given, perform them in order until the problem is corrected.

We hope these tips will prove to be helpful. As always, please call if you encounter difficulty in resolving a problem or if you have any questions.

### **Symptom**

Zero counts:

### **Possible Cause**

Model 182 not connected to counting instrument

HV push rod not properly adjusted

Cable malfunction

Broken HV or signal wire

PMT/Tube socket malfunction

No scintillation material or source

No light path from scintillation material to

PMT

No Source Plateau:

Top cover not seated properly to lower tube

Noisy microswitch

Cable malfunction

PMT/Tube socket malfunction

Excessive Background Count On Plateau

- A. Expected Background Count
  - 3 counts per 10 minutes or less with scintillation material
- B. Excessive:
  - Light leak
  - Cable malfunction
  - Microswitch malfunction
  - PMT noisy
  - Instrument contaminated

## **Model 182 Radon Flask Counter**

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### **Parts List**

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<u>Part Number</u>	<u>Description</u>	<u>Quantity</u>
47-1633	Model 182 Radon Flask Counter	1
01-5042	2-inch Photomultiplier Tube	1
40-4040	Model 182 2-inch Socket Board	1
08-6538	Microswitch	1
18-8779	Terminal Strip (4 Pin)	1
10-7028	1 Megohm, ¼W Resistor	3
21-9353	Signal Coax-RG178/U	10 in.
22-9570	HV Wire #8869	10 in.
17-8757	Brass Thumbscrews 6-32 x ¼	2
04-5518	.0015µF, 3kV Capacitor	1
7186-026	Switch Rod Guide	1
7090-007-01	Switch Rod	1
7090-007-02	Switch Rod Cap	1
7090-006-01	Switch Shield	1
13-7752	Series C Connector	1
7090-007-08	Ear (Tube Lock)	1
2090-008-06	Upper Tube Assembly	1
7090-008-01	Switch Rod Contact	1

## **Drawings**

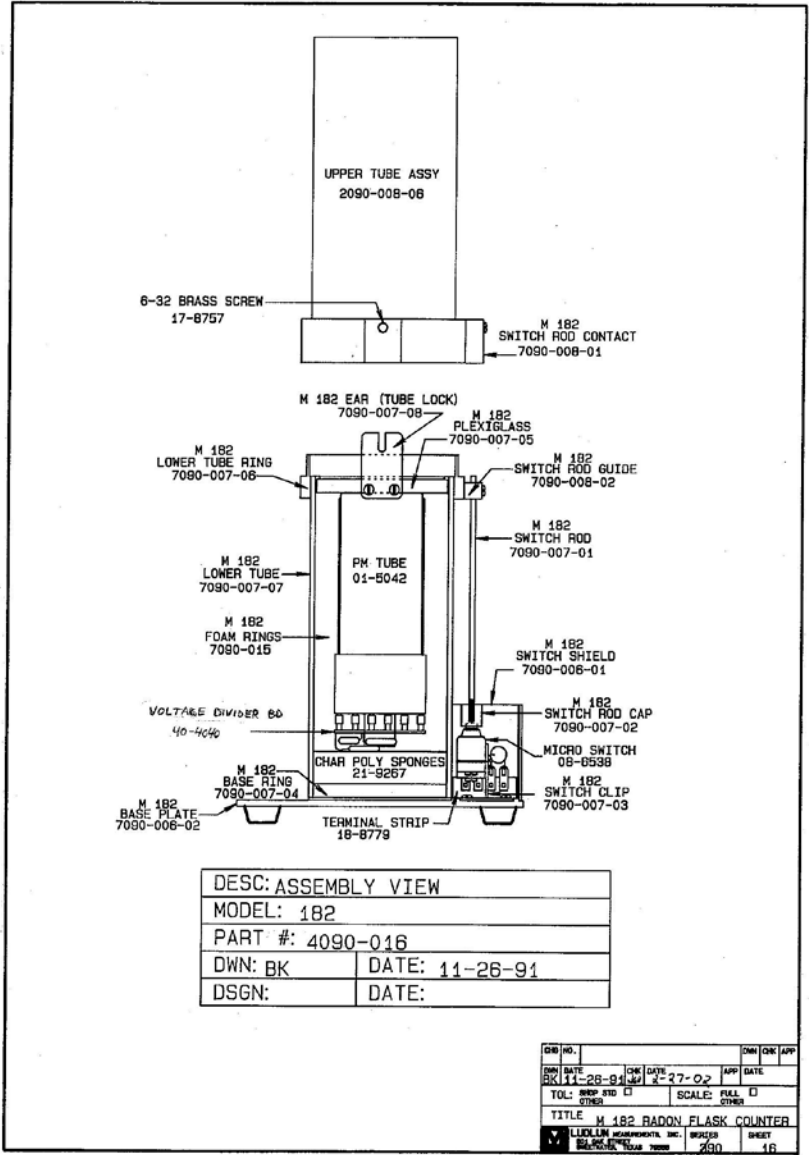
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Model 182 Assembly View, Drawing 90 x 16

Model 182 2-inch Socket, Drawing 2 x 180

# Model 182 Radon Flask Counter

VF



DESC: ASSEMBLY VIEW	
MODEL: 182	
PART #: 4090-016	
DWN: BK	DATE: 11-26-91
DSGN:	DATE:

GR. NO.	CHK	CHK	APP
DR. DATE	CHK DATE	APP DATE	
BK 11-28-91	11-27-91		
TOL: NEP STD <input type="checkbox"/>	SCALE: FULL <input type="checkbox"/>		
OTHER	OTHER		
TITLE M 182 RADON FLASK COUNTER			
LUDLUM MEASUREMENTS, INC.		DESIGN	DWG. NO.
260		16	

90 X 16



# Model 182 Radon Flask Counter

