

**LUDLUM MODEL 44-110-2**  
**WINDOWLESS GAS FLOW PROPORTIONAL**  
**DETECTOR**

**November 2011**

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DETECTOR**

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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.

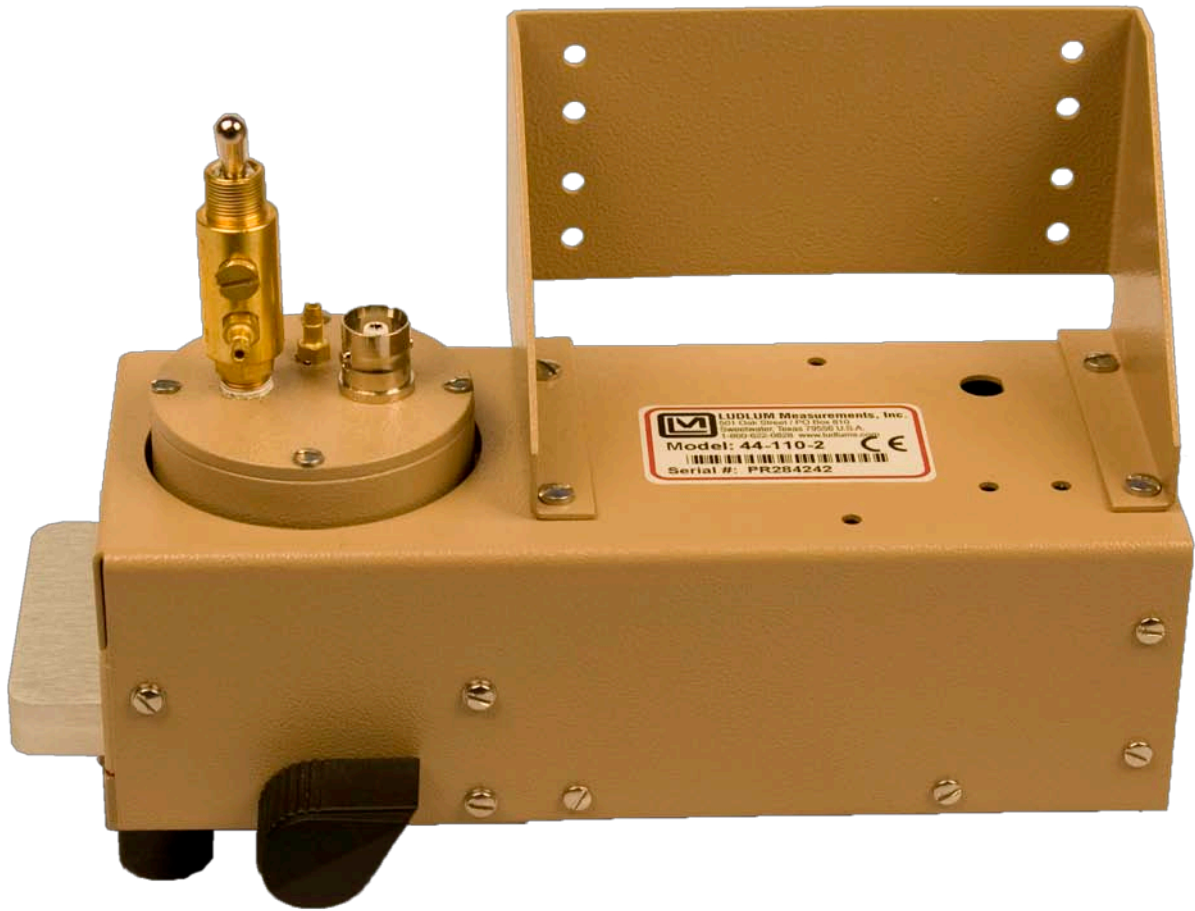
There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option 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**



*Model 44-110-2*

**Model 44-110-2 Windowless Gas Proportional Detector**  
**November 2011**

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**Model 44-110-2 Windowless Gas Proportional Detector**  
**November 2011**

**1. GENERAL**

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The Model 44-110-2 is a windowless gas flow proportional sample counter capable of holding up to a 5.1 cm (2 in.) diameter filter or planchet. The sample drawer, when fully closed, strikes a microswitch to allow high voltage (HV) to be applied to the detector. The sample drawer is locked in the closed position by rotation of the slide lever mounted on the side of the instrument.

If simultaneous alpha-beta discrimination is

desired, the counting instrument must have separate power supplies or threshold controls for each channel. The Ludlum Model 3030 Scaler or Model 2360 instruments provide the necessary circuitry for simultaneous alpha-beta discrimination. Otherwise, a single-channel instrument, such as the Model 2200, may be adjusted to count alpha, beta, or both.

**2. SPECIFICATIONS**

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**DETECTOR OPERATING VOLTAGE:** alpha is typically 1100-1400 volts; beta-gamma is typically 1600-1800 volts.

**GAS FLOW:** typically 3 L/min, detector equipped with 3.2 mm (0.125 in.) hose connection and two-position switch flow valve

**EFFICIENCY (4 $\pi$ ):** 14% for <sup>63</sup>Ni; 40% for <sup>239</sup>Pu

**COUNTER THRESHOLD SETTINGS:** typically 2-5 mV

**HV SWITCH:** opening sample slide disables high voltage

**SAMPLE SLIDE AND HOLDER:** anodized aluminum tray with 2.5 cm (1.0 in.) diameter sample ring to allow for 2.5 or 5.1 cm (1.0 or 2.0 in. (Dia x L)

**CONSTRUCTION:** aluminum housing with beige powder coating

**TEMPERATURE:** -20 to 50 °C (-4 to 122 °F)

**SIZE:** 15.2 x 11.4 x 23.6 cm (6 x 4.5 x 9.3 in.) (H x W x L)

**WEIGHT:** 1.5 kg (3.3 lb)

**3. OPERATING PROCEDURES**

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Connect the Model 44-110-2 to the scaler counting instrument. The coax cable with "C" connectors carries both the signal and HV.

HV is applied to the detector when the sample slide is pushed completely in, tripping the microswitch. Rotate the sample slide lever to the locked position, securing sample slide in the "ON" position.

To check a radioactive sample, place sample on the appropriate side of the sample holder for the 2.5 or 5.1 cm (1 or 2 in.) filters. Do not allow the sample to extend above the top of the sample slide. A background count should be taken after each source count to check for contamination on the sample holder or area within the O-ring.

## 4. CALIBRATION

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**CAUTION:** Do not tip sample counter over, which could cause contamination of the anode wires.

For instruments with separate power supplies (fixed threshold), the alpha channel will operate at a lower voltage than the beta channel.

### 4.1 Counting Instrument

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Calibrated scaler instrument

HV range, nominally 1200-1800 V

Nominal input sensitivity:

-2 mV for a single-channel

instrument or

{ alpha channel = -75 mV  
beta channel = -2 mV (with upper  
discriminator set at 50 mV)

### 4.2 Operating Voltage

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1. Set the scaler count time for 60 seconds.
2. Connect the Model 44-110-2 detector and place the source on the detector face.
3. Begin the search for the operating voltage at 1200 V. Observing the count, increase the HV until the desired efficiency is achieved. Note the HV.
4. Using one-minute count times,

record count rates for the desired alpha and/or beta sources. The starting HV value should be 25 V less than the HV reading obtained in the above step. Continue in 25-volt steps until any one of the necessary criteria is not met (that is, alpha or beta efficiency, acceptable background or "cross talk" parameters). The ending HV value should be at least 25 V greater than the HV reading obtained in the above step.

5. Select the optimum operating voltage that gives the greatest alpha and beta source efficiency and acceptable background cpm.

### 4.3 Calculating Efficiency

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1. NIST-traceable sources required.
2. Set HV as determined above.
3. Record a one-minute background and one-minute source count. Subtract the background count from the source count. Divide the net source count by the dpm value of the source, times 100 for  $4\pi$  efficiency.

**If the source value is listed in  $\mu\text{Ci}$  (activity):**

4. Convert the  $\mu\text{Ci}$  value to a dpm value by multiplying the microcurie value by  $2.22 \times 10^6$ . Calculate the  $4\pi$  efficiency as in the previous steps.

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**PARTS LIST**

| Ref. No.            | Description     | Part No.          | Quantity   | Part Description         | Part No. |
|---------------------|-----------------|-------------------|------------|--------------------------|----------|
|                     |                 |                   | 1 EA.      | M 44-110-2 CASE TOP      | 7142-245 |
|                     |                 |                   | 1 EA.      | M 44-110-2 SCREEN        | 7142-249 |
|                     |                 |                   | 1 EA.      | M 44-110-2 LIFTER        | 7142-250 |
|                     |                 |                   | 1 EA.      | M 43-10-1 PROTECTION LBL | 9142-212 |
| <b>Model</b>        | <b>44-110-2</b> | <b>Windowless</b> | <b>Gas</b> |                          |          |
| <b>Proportional</b> | <b>Detector</b> |                   |            |                          |          |

UNIT Completely Assembled  
44-110-2 Detector 47-3678

Assembly View, Drawing 142 X 235A

|        |                                |             |
|--------|--------------------------------|-------------|
| 1 EA.  | M 44-110-2 BASE WITH TUBE ASSY | 2142-236    |
| 1 EA.  | M 44-110-2 CHAMBER TUBE        | 7142-237    |
| 1 EA.  | M 44-110-2 TUBE BASE           | 7142-244    |
| 1 EA.  | RECPT-UG706/U "C"              | 4478-011    |
| 1 EA.  | KNOB-POINTER MS91258-2P2B      | 8-6608      |
| 1 EA.  | O-RING-2-019                   | 16-8253     |
| 1 EA.  | O-RING-2-147                   | 16-8339     |
| 10 EA. | STNDOFF-013-2003-000-470 BLK   | 18-8780     |
| 2 EA.  | SPACER-4-40 X .937 M-F         | 18-8914     |
| 6 EA.  | WASHER-#4 ITLW                 | 20-9008     |
| 4 EA.  | MOUNT-ISOLATION 8-32 X 1/2 BLK | 21-8922     |
| 1 EA.  | FTG-1/8 HOSE MH1332-1/4 HEX    | 21-9305     |
| 1 EA.  | VALVE-MTV-2P                   | 21-9754     |
| 1 EA.  | M 44-10, 43-17 SMPL DRWR       | 7142-001-06 |
| 1 EA.  | M 43-10 PLANCHET HOLDER        | 7142-001-07 |
| 1 EA.  | M 43-10 ADAPTER PLATE          | 7142-003-01 |
| 1 EA.  | M 43-10 CASE BOTTOM            | 7142-004-04 |
| 1 EA.  | M 43-10/43-17 BASE PLATE       | 7142-018    |
| 1 EA.  | M 43-10/43-17 SHAFT            | 7142-019    |
| 1 EA.  | M 43-10/43-17 PIN X5           | 7142-021    |
| 1 EA.  | M 44-110-2 CONNECTOR CAP       | 7142-238    |
| 1 EA.  | M 44-110-2 STANDOFF PLATE      | 7142-240    |

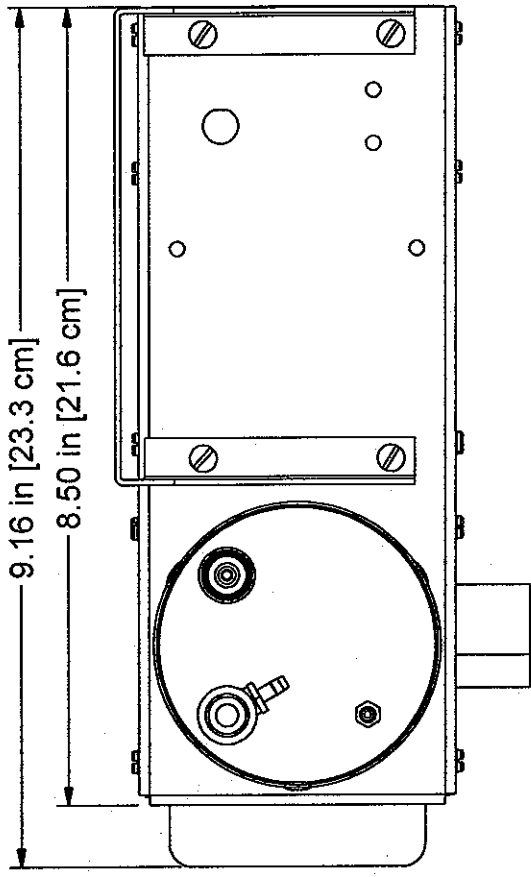
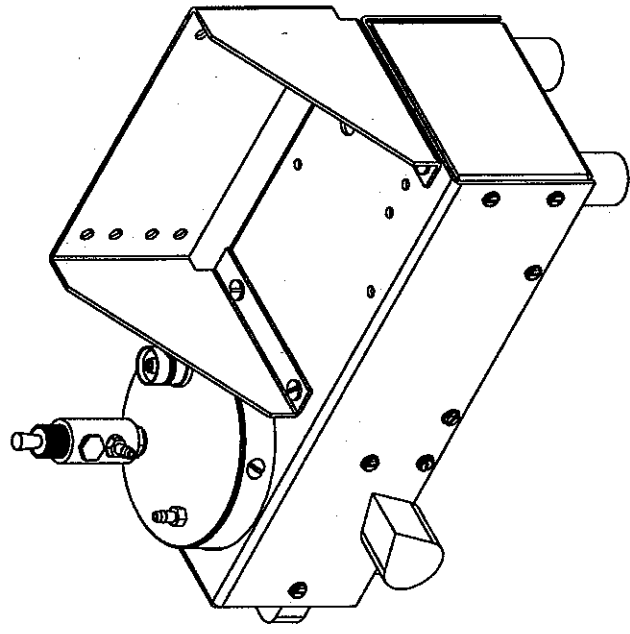


**DRAWINGS AND DIAGRAMS**

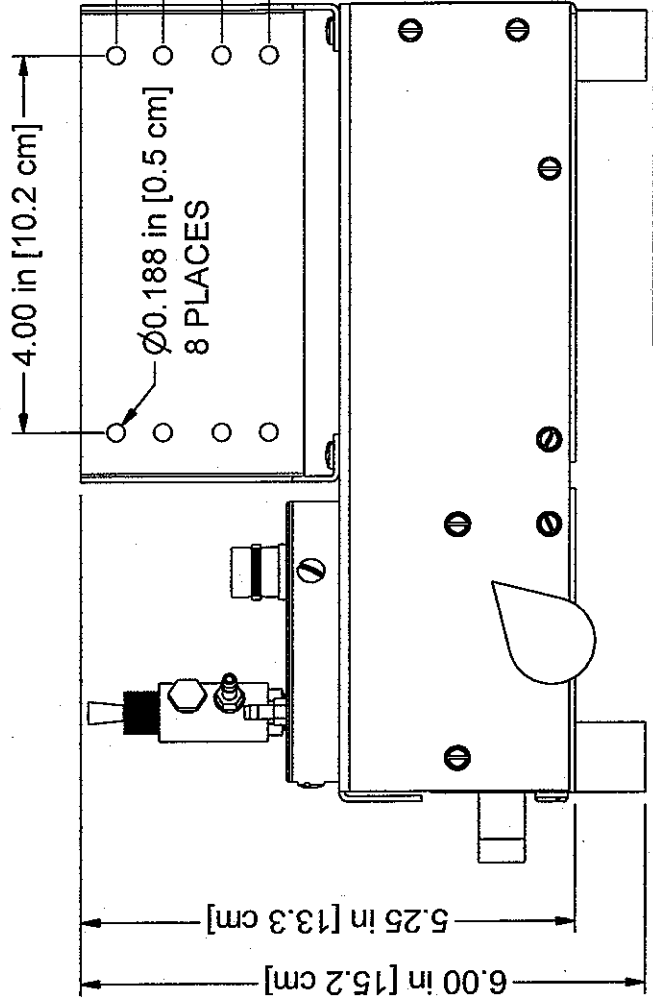
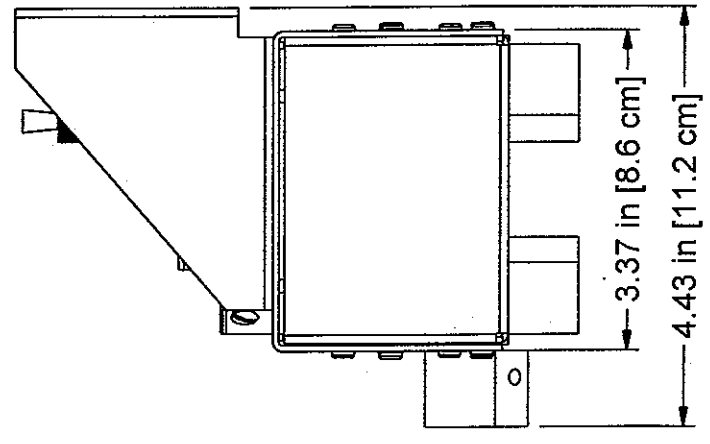
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Model 44-110-2 Assembly View, Drawing 142 x 235A

| REVISION HISTORY |             |            |     |
|------------------|-------------|------------|-----|
| REV              | DESCRIPTION | DATE       | BY  |
| 1                | VALID       | 11/16/2011 | CMC |



0.38 in [1.0 cm]  
 0.50 in [1.3 cm]  
 0.63 in [1.6 cm]  
 0.50 in [1.3 cm]



|  |          |                        |
|--|----------|------------------------|
| DWN DATE<br>CMC 11/16/2011                               | CHK DATE | APP DATE<br>11/16/2011 |
| DWG NUM: 4142-235  |          |                        |
| TITLE: 44-110-2 GAS PROBE                                |          |                        |
| SCALE: 3/8   |          |                        |
| MUDLUM MEASUREMENTS, INC.<br>142 SWEETWATER, TEXAS 75555 |          | SHEET<br>235A          |