

**LUDLUM MODEL 421-1  
PMT BASE WITH SELECTABLE ANODE/PREAMP  
AND BIAS SUPPLY**

**August 2009**

**Serial Number PR282093 and Succeeding  
Serial Numbers**

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AND BIAS SUPPLY**

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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**

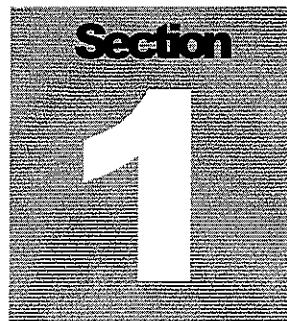
**800-622-0828    325-235-5494  
FAX 325-235-4672**

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## Introduction

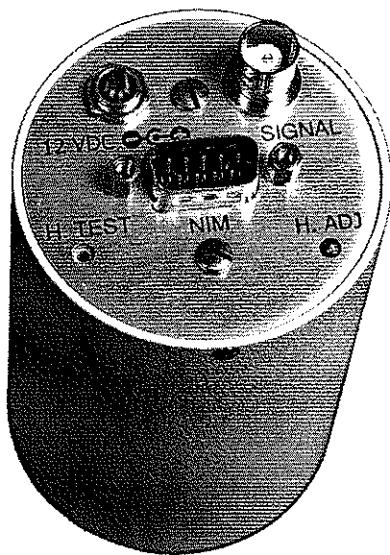
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The Ludlum Model 421-1 Photomultiplier (PMT) Base with Preamplifier and High Voltage (HV) supply is intended for use with 10-stage PMT's fitted with standard 14-pin sockets.

The assembly consists of a resistive divider/preamplifier and HV bias supply board. A BNC receptacle provides either AC coupled anode output (negative) or pre-amplified output (positive).

The output pulse has a decay constant of  $\sim 50 \mu\text{sec}$  intended for connection to a shaping amplifier. Output amplitude varies by HV adjustment.

The unit operates on 8-18 VDC power applied either through the NIM compatible plug (9-pin "D") or through a 2.5 mm X 5.5 mm barrel plug.



*Model 421-1*



## **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 thirty-six (36) 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.

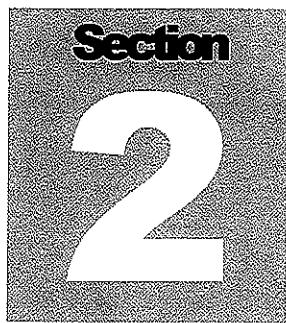
There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option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

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## Specifications

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**Preamplifier:** Gain fixed at approximately -3 V/V. Output of pre-amp is positive with 500 nsec risetime [NaI(Tl)] and approximately 50  $\mu$ sec "tail" pulse.

**Output:** BNC connector, 50 ohms impedance. Maximum output amplitude is 10 V peak (with 12 V supply).

**Rise Time:** Less than 50 nsec.

**High Voltage:** Adjustable between 0 and 1,800 Vdc maximum.

**Dynode Divider Resistance:** Total resistance is approximately 43 megohm intended for low power and moderate to low count rate operation. Other variations can be made available.

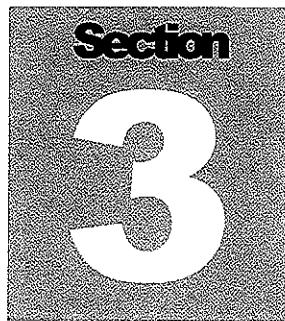
**Power Consumption:** Quiescent power is 250 mW at 12 Vdc.

**NIM 9 pin "D":** Pin 1 and 2 GND, Pin 3 HV Read back(1,000 V equals 1 V), Pin 4 (+12 VDC), Pin 8 GND to shut off HV.

**Size:** 2.3" (5.8 cm) diameter, 4.2" (10.7 cm) height

**Weight:** 0.35 lbs (0.2 kg)





## Controls and Functions

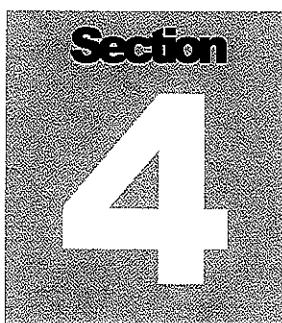
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**Signal:** BNC connector providing either Anode(negative) out or pre-amplified signal(positive) output.

**H Adj:** Access to the high voltage bias adjustment screw.

**H Test:** A test point providing access to the PMT bias level (1,000 V bias equals 1 V). Touch the ground to the lead case. Use a standard DC multi-meter to read the bias setting.





## Safety Considerations

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### Environmental Conditions for Normal Use

Indoor use only

Temperature range of -4°F to 122°F (-20°C to 50°C)

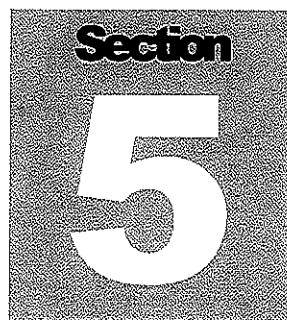
Maximum relative humidity of less than 95% (non-condensing)

Pollution Degree 3 (as defined by IEC 664).

### Cleaning Instructions

The Model 421-1 PMT Base may be cleaned externally with a damp cloth, using only water as the wetting agent. Do not immerse the instrument in any liquid.





## Getting Started

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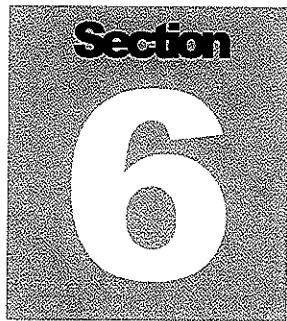
### Unpacking and Repacking

Remove the calibration certificate and place it in a secure location. Remove the instrument and stand, and ensure that all of the items listed on the packing list are in the carton. Check individual item serial numbers and ensure calibration certificates match. The Model 421-1 PMT Base serial number is located on the label on the base or the body of the detector for model and serial number identification.

To return an instrument for repair or calibration, provide sufficient packing material to prevent damage during shipment. Also, provide appropriate warning labels to ensure careful handling. Include brief information as to the reason for return, as well as return shipping instructions:

- **Return shipping address**
- **Customer name or contact**
- **Telephone number**
- **Description of service requested and all other necessary information**





## Recycling

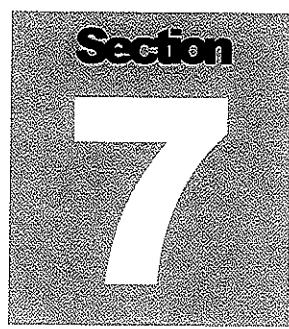
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Ludlum Measurements, Inc. supports the recycling of the electronics products it produces for the purpose of protecting the environment and to comply with all regional, national and international agencies that promote economically and environmentally 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. electronics 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)



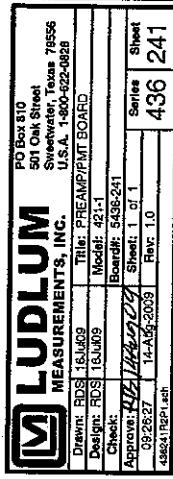
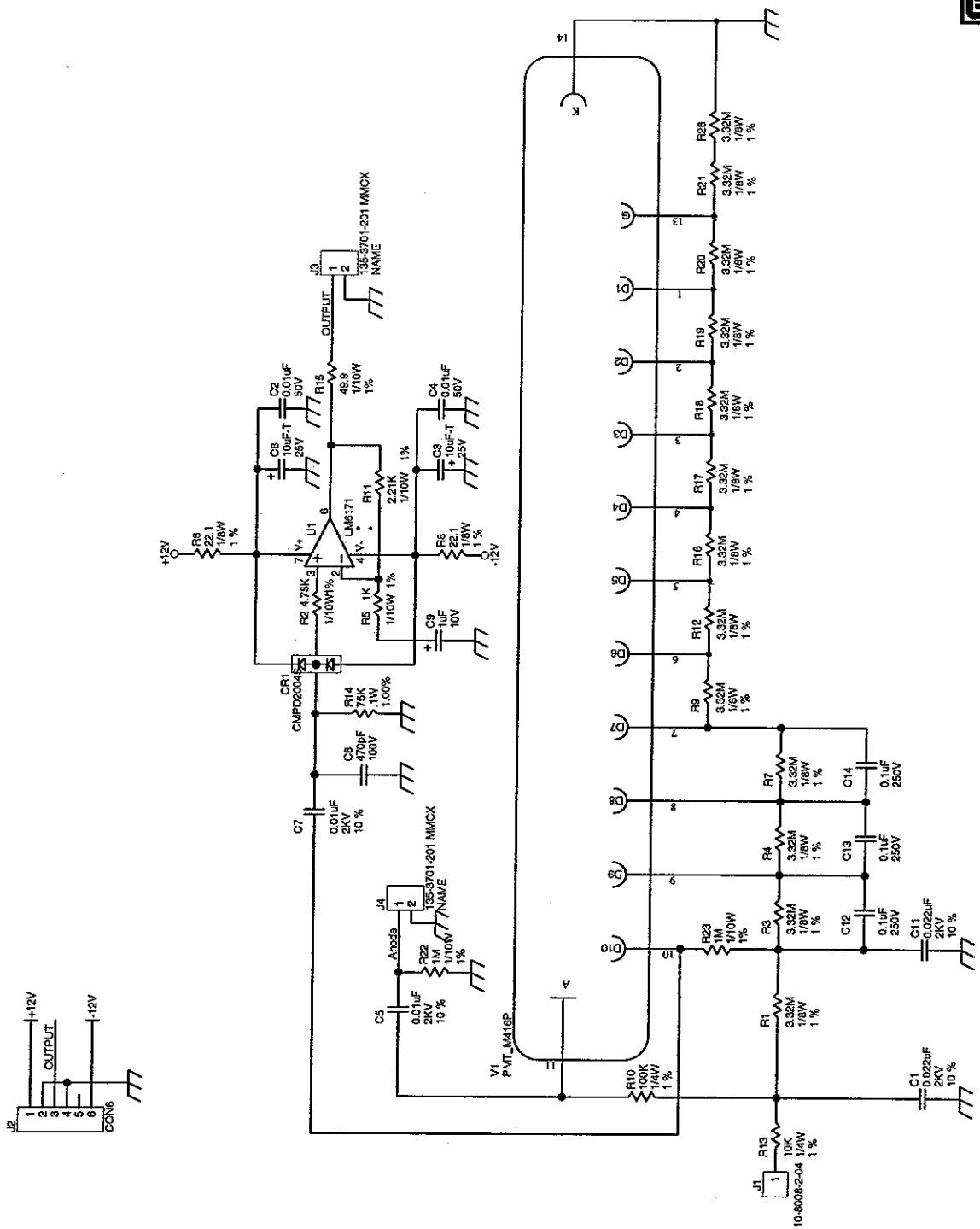


## **Drawings**

Model 421-1 Preamp Divider Board Layout, Drawing 436 X 242 (2 Sheets)

Model 421-1 Preamp Divider Board Schematics, Drawings 436 X 241

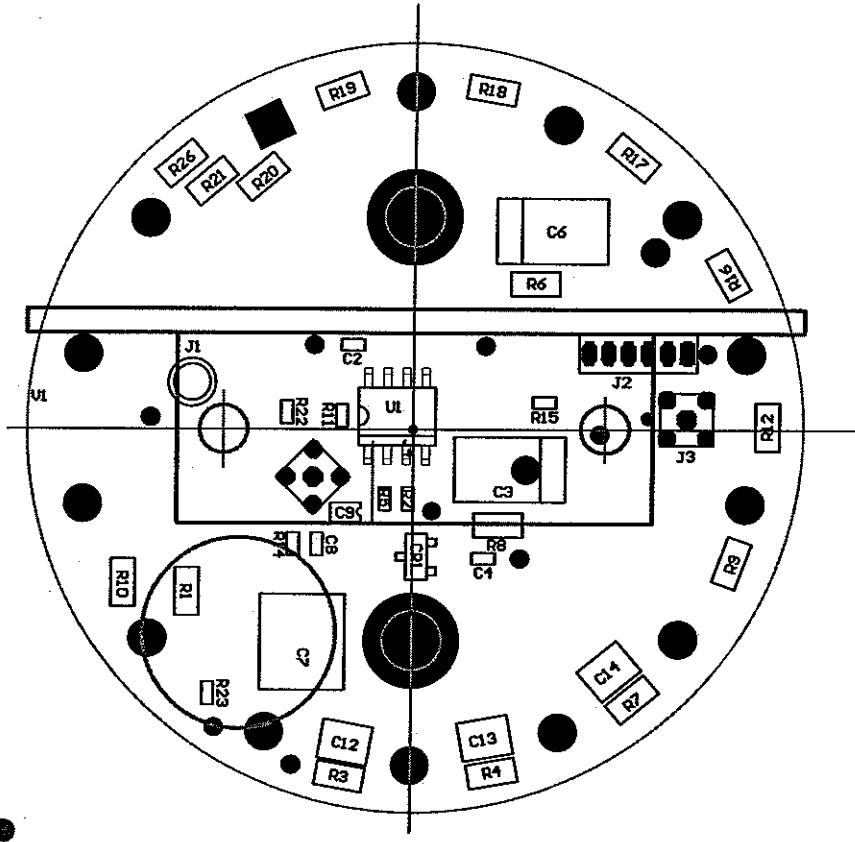




Design: RD5 18u09 Title: PREAMP/FORMAT BOARD  
Design: RD5 18u09 Model: 421-1  
Check: Board#: 5456-241  
Approve: RD5 14-AUG-2009  
Date: 09-18-2009 Rev: 1.0  
Comments: 14-AUG-2009  
BSP: 14-AUG-2009 Rev: 1.0  
BSP: 14-AUG-2009 Rev: 1.0

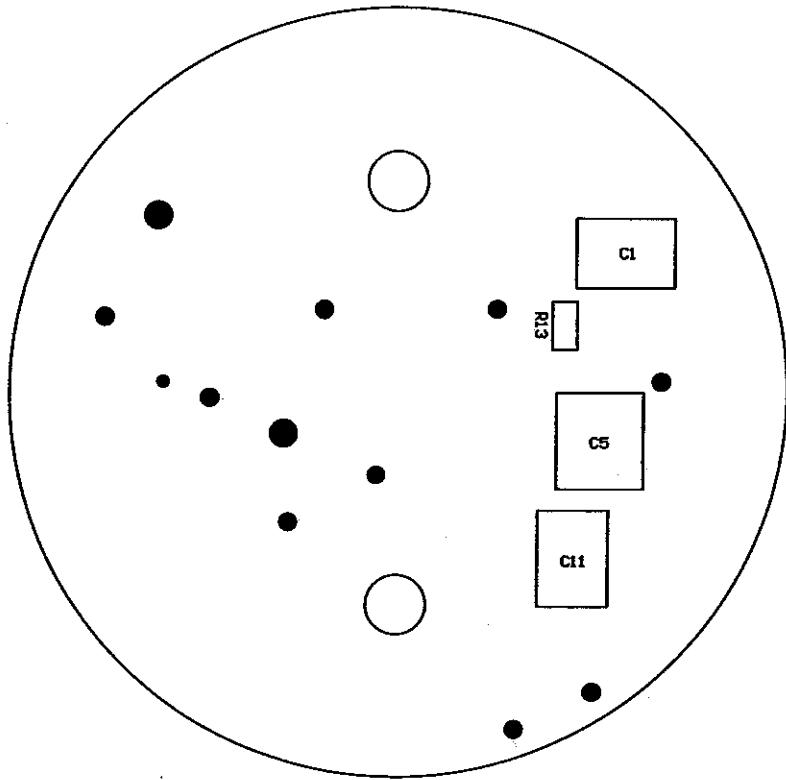
Digitized by srujanika@gmail.com





Drawn:	MC	07/23/09	Title: PREAMP/DIVIDER BOARD	
Design:	RDS	07/23/09		
		Model: 421-1		
Approve: <i>RDS 14 Aug 09</i>		Board #: 5436-241		
Layer: Mech.1 Mech.2 Mech.3		Rev: 1.0	Series 436	
	MID: 09:19:03 14-Aug-2009	SCALE: 2.02	Sheet 242	
436241R1X1.pcb				





Drawn:	MC	07/23/09	Title: PREAMP/DIVIDER BOARD
Design:	RDS	07/23/09	
			Model: 421-1
Approve:	RDS	14Aug09	Board #: 5436-241
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