

**LUDLUM MODEL 421 AND 421-3
PMT BASE WITH PREAMPLIFIER/BIAS SUPPLY**

October 2014

Serial Number 200000

and Succeeding Serial Numbers

**LUDLUM MODEL 421 AND 421-3
PMT BASE WITH PREAMPLIFIER/BIAS SUPPLY**

October 2014

Serial Number 200000

and Succeeding Serial Numbers



1300 W. Broadway
Sweetwater, Texas 79556
Tel: (888) 800-8771 (325) 235-4296
FAX: (325) 235-0701
Website: www.eljentechnology.com

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

<i>Introduction</i>	<i>1</i>
<i>Getting Started</i>	<i>2</i>
<i>Specifications</i>	<i>3</i>
<i>Controls and Functions</i>	<i>4</i>
<i>Recycling</i>	<i>5</i>
<i>Drawings and Diagrams</i>	<i>6</i>

Section

1

Introduction

The Model 421 and 421-3 Photomultiplier (PMT) Base with Preamplifier and High Voltage (HV) supply is intended for use with 10-stage PMTs fitted with standard 14-pin sockets.

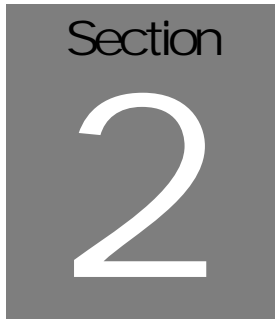
The assembly consists of a resistive divider/preamplifier and bias supply board. A BNC receptacle provides the pre-amplified signal output.

The tail-pulse output is a positive-going pulse (The Model 421-3 is a negative-going pulse.) with approximately 50 μ sec tail for connection to a shaping amplifier. The output amplitude may be varied by HV bias adjustment.

The unit operates from a 12 Vdc supply only (NIM type "D" connector).



Model 421

A dark gray square graphic containing the word "Section" in a small, white, sans-serif font at the top, and a large, white, stylized number "2" in the center.

Getting Started

Remove the calibration certificate or detector functional check certificate and place it in a secure location. Remove the detector(s) and accessories (if applicable) and ensure that all items listed on the packing list are in the carton. If multiple detectors are included, refer to the calibration certificates for serial number (SN) matches.

To return an instrument or detector for repair or calibration, provide sufficient packing material to prevent damage during shipment, and affix appropriate warning labels to promote careful handling.

Every returned instrument must be accompanied by an **Instrument Return Form**, which can be downloaded from the Ludlum website at www.ludlums.com. Find the form by clicking the "Support" tab and selecting "Repair and Calibration" from the drop-down menu. Then choose the appropriate Repair and Calibration division where you will find a link to the form.

Section

3

Specifications

Preamplifier: gain fixed at approximately -2 V/V. Output of pre-amp is positive with a 500 nsec rise time [NaI (Tl)] and approximately 50 μ sec “tail” pulse. Other decay times can be made available.

Output: BNC detector, approximately 50 ohms impedance. Maximum output amplitude is 10 V peak.

Rise Time: less than 50 nsec

High Voltage: adjustable between 0 and 1800 Vdc maximum

High Voltage Test: accurate within 5% of actual

Dynode String Resistance: 100 megohm

Dynode Divider Resistance: Total resistance is approximately 36 meg, 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+2 GND, Pin 3 VHV, Pin 4 +12 Vdc, and Pin 8 GND to shut off HV

Size: 5.8 cm (2.3 in.) Diameter; 10.7 cm (4.2 in.) Height

Weight: 0.16 kg (0.35 lb), excluding detector and cables

Section

4

Controls and Functions

SIGNAL: BNC connector providing pre-amplified signal output.

H Adj: hole allowing access to the high-voltage bias adjustment screw.

H Test: a test point providing access to the PMT bias level (1000 V bias equals 1 V). Touch ground lead to case. Use a standard DC multi-meter to read the bias setting.

Zero Calibration: Measure the DC level on the SIGNAL connector using a voltmeter across the BNC connector. Adjust R24 (ZERO) for a reading of $0 \text{ mV} \pm 3 \text{ mV}$

Section

5

Recycling

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.

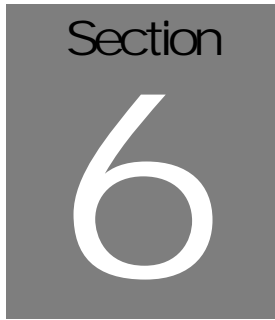
The following types of recyclable materials are present in Ludlum Measurements, Inc. electronics products, and should be recycled separately. The list is not all-inclusive, nor does it suggest that all materials are present in each piece of equipment:

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

Ludlum Measurements, Inc. products that have been placed on the market after August 13, 2005, have been labeled with a symbol recognized internationally as the “crossed-out wheelie bin,” which notifies the consumer that the product is not to be mixed with unsorted municipal waste when discarding. Each material must be separated. On the Model 26, the symbol will be placed on the serial number label located on the side of the instrument.

The symbol appears as such:

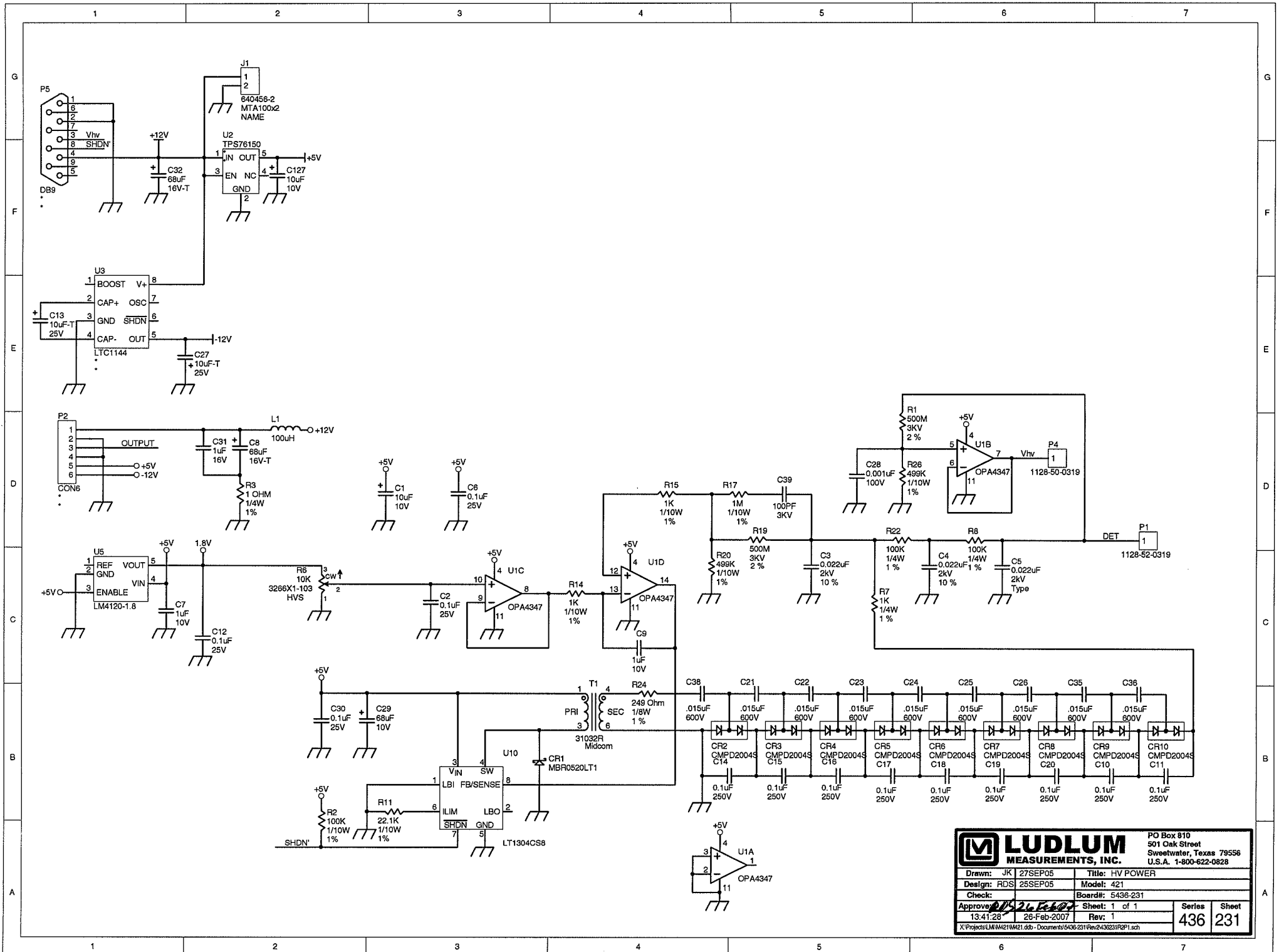


A dark gray square containing the word "Section" in a small, white, sans-serif font at the top, and a large, white, stylized number "6" in the center.

Drawings and Diagrams

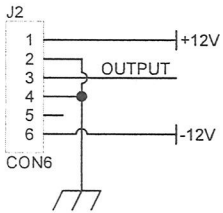
HV Power board, Drawing 436 x 231

Pre-Amp and Voltage Divider Board, Drawing 436 x 234

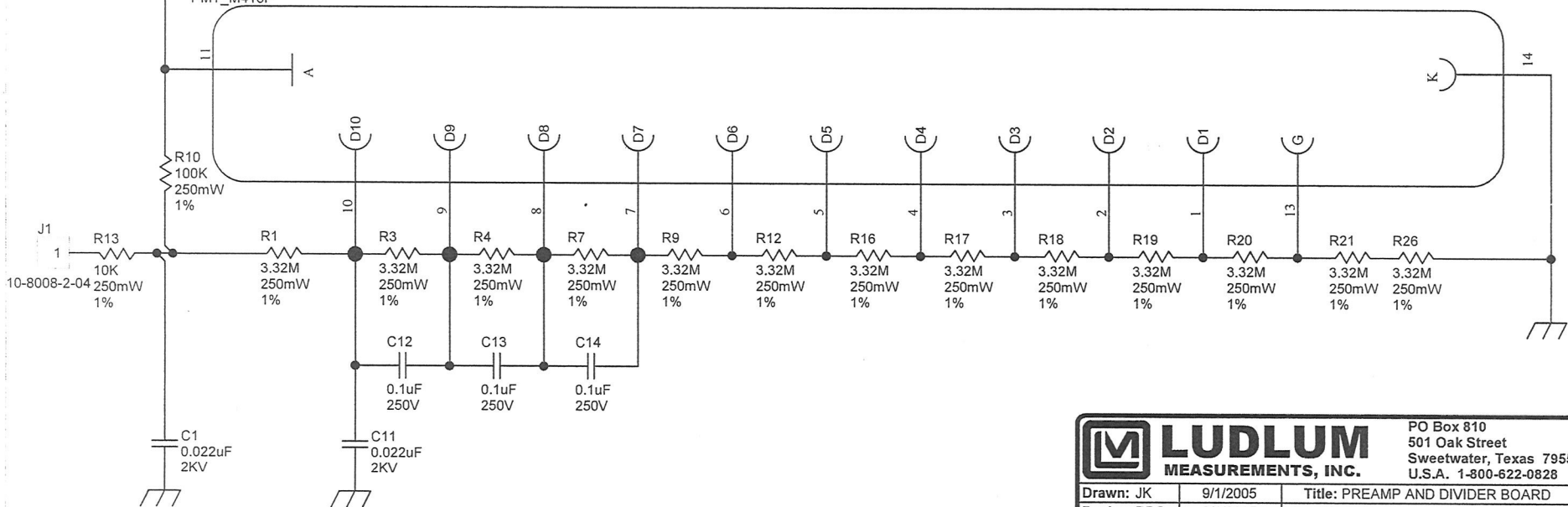
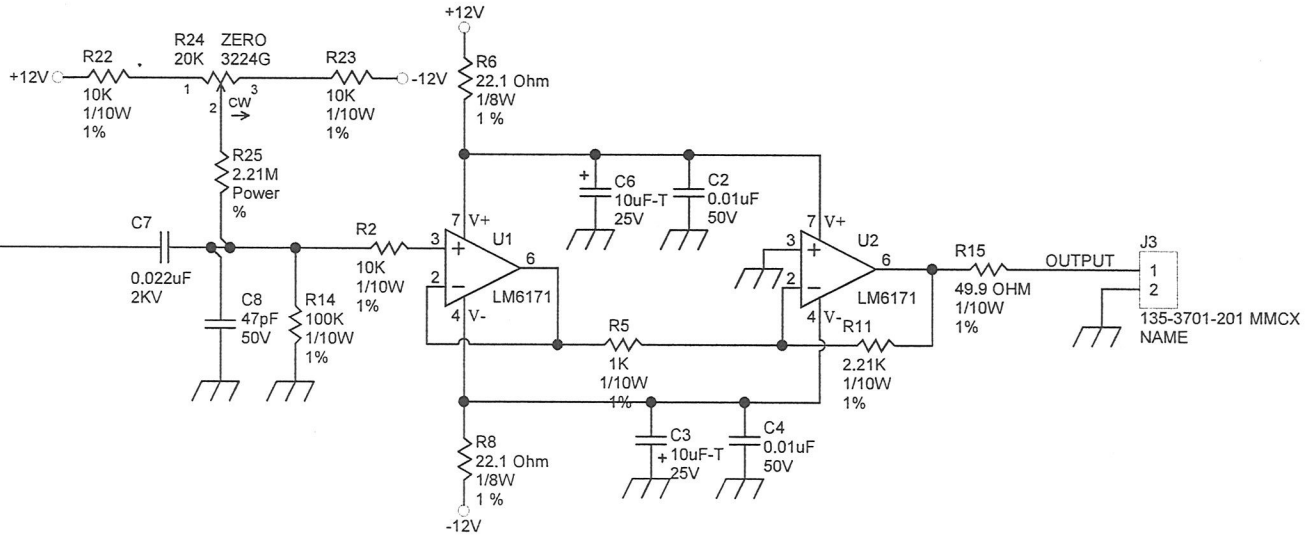


LUDLUM MEASUREMENTS, INC.
 PO Box 810
 501 Oak Street
 Sweetwater, Texas 79556
 U.S.A. 1-800-622-0828

Drawn: JK	27SEP05	Title: HV POWER
Des'gn: RDS	25SEP05	Model: 421
Check:		Board#: 5436-231
Approved: <i>[Signature]</i>	26-Feb-2007	Sheet: 1 of 1
13:41:28		Rev: 1
X:\Projects\LM4120\1M4120.sch - Documents\5436-231\Rev2\36231R2P1.sch		Series: 436
		Sheet: 231



For M 421-3
47-3836
Remove U2
Replace R5 & R11 with 12-8013



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	9/1/2005	Title: PREAMP AND DIVIDER BOARD	
Design: RDS	9/1/2005	Model: 421	
		Board#: 5436-234	
Approve: <i>RDS</i>	10/13/2014	Sheet: 1 of 1	Series
Print Date: 10/13/2014 12:59:07 PM	12:59:07 PM	Rev: 1	Sheet
W:\Projects\LMM 421\5436-234\rev2.0\436234R2_SchDoc		436	234