LUDLUM MODEL 43-93, 43-93-2, and 43-93-4 ALPHA/BETA SCINTILLATORS

August 2026

LUDLUM MODEL 43-93, 43-93-2, and 43-93-4 ALPHA/BETA SCINTILLATORS

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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: SERVICE DEPARTMENT
501 OAK STREET
SWEETWATER, TX 79556

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

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Section 1

Introduction

The Model 43-93 and 43-93-2 detectors are designed for alpha-beta surveying when coupled with compatible instruments. Functionally, these two detectors are very similar but differ in the type of protective window screen and the size of the active and open window areas.

Discriminating between alpha and beta radiation simultaneously requires the counting instrument to have either separate power supplies or window/threshold controls for each channel. The Ludlum Model 2929 Scaler, Model 2223, Model 2224, Model 2360, Model 3002, or Model 3003 instruments provide the necessary circuitry for simultaneous alpha-beta discrimination.

A Zinc Sulfide [ZnS (Ag)] scintillator is used for detecting alpha particles, and a thin plastic scintillator is employed for detecting beta radiation. The scintillation material is covered by metallized Mylar to reduce light response, limiting excessive background counts. The Model 43-93 window is protected by an 88% open square-hole screen, where the Model 43-93-2 window is protected by a 79% open hexagonal-hole screen.

The photomultiplier tube (PMT) and crystal assembly may easily be removed for repair. Refer to the assembly view drawing in section 5 of this manual for details on construction and parts. The photomultiplier tube typically operates between 500 and 1200 volts with a recommended maximum of 1500 volts.

This manual also covers the Model 43-93-4, a detector similar to the Model 43-93 with a higher temperature-tolerant scintillator. This scintillator has the same size and efficiency as the Model 43-93, but has a higher glass transition temperature, allowing operation to 50 °C (122 °F). The Model 43-93-4 is recommended as an alternative to the Model 43-93 if the detector will be exposed to temperatures above 40 °C (104 °F).

Section 2

Specifications

Photomultiplier Tube: 2.9 cm (1.1 in.) diameter; magnetically shielded

Scintillator Material: Zinc Sulfide [ZnS (Ag)] deposited on a 0.25 mm (0.010 in.) rectangular plastic scintillator

Window: 1.2 mg/cm^2 metalized polyester

Window Area (Model 43-93 and 43-93-4):

Active area: approximately 100 cm^2

Open area: approximately 88 cm^2

Window Area (Model 43-93-2):

Active area: approximately 126 cm^2

Open area: approximately 100 cm^2

Protective Screen: 0.79 mm (0.031 in.) thick, 6.5 mm (0.26 in.) square openings, 88% open for the 43-93 and 43-93-4 and 79 % open for the 43-93-2. There are also other protective screen options available.

Outer Dimensions (L x W): 168 x 92 mm (6.6 x 3.6 in.). Tool-less removal for quick window replacements.

Efficiency (4π):

Model 43-93 and 43-93-4: typically 15% for ^{99}Tc, 20% for ^{90}Sr ^{90}Y, and 20% for ^{239}Pu

Model 43-93-2: typically 10% for ^{99}Tc, 17% for ^{90}Sr ^{90}Y, and 15% for ^{239}Pu

Background (in a 10µR/hr field):

Alpha: 3 cpm or less
Beta: 300 cpm or less

Crosstalk:

Alpha to Beta: 10% or less

Beta to Alpha: 1% or less

Detector Uniformity: within 15% of average reading

Operating Voltage: typically 500-1200 Vdc (1500 Vdc max.)

Dynode String Resistance: 60 megohm

Gamma Sensitivity: 15-20 cpm/μR/hr (^{137}Cs)

Dead Time: typically 5 μsec or less

Connector: Series "C" unless otherwise specified

Temperature Range: -20 to 40 °C (-4 to 104 °F). The Model 43-93-4 has a plastic scintillator designed for use at higher temperatures, up to 50 °C (122 °F).

Environmental Rating: IP rating of 63

Size: 6.4 x 9.5 x 31 cm (2.5 x 3.8 x 12.3 in.) (H x W x L)

Weight: approximately 0.45 kg (1 lb)

Construction: aluminum housing with beige powder-coat finish

Section

3

Safety Considerations

Environmental Conditions for Normal Use

Indoor or outdoor use

No maximum altitude

Temperature range of -20 to 40°C (-4 to 104 °F) (standard)

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

Cleaning Instructions and Precautions

The detectors specified in this manual may be cleaned externally with a damp cloth, using only water as the wetting agent. Do not immerse the detector in any liquid. Do not attempt to clean a detector that is attached to an instrument providing high voltage. Disconnect the detector cable before cleaning.

Repair and Calibration

To return an instrument for repair or calibration, provide sufficient packing material to prevent damage during shipment.

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 "Service Center" from the drop-down menu. Then choose the appropriate Service division where you will find a link to the form.

Section 4

Parts List

For Model 43-93

Assembly View, Drawing 393 × 140

Reference	Description	Part Number
UNIT	Completely Assembled Model 43-93 Alpha /Beta Scintillator	47-2556

Quantity	Description	Part Number
1 ea	Welded Body Assembly	2393-141
1 ea	Mirror	2310698
1 ea	Connector Cap	7393-102
1 ea	Mylar Window Assembly	4393-149
1 ea	Window Frame	7393-148
1 ea	Face Ring	7393-137
1 ea	Square Screen (external snap-on screen)	7393-171
1 ea	Backup w/Plastic Scintillator and ZnS	4393-153
1 ea	Plastic Scintillator-EJ444L-2.94 x5.91x 0.010	01-5692
1 ea	Photomultiplier Tube	01-6005
1 ea	Voltage Divider Board	5435-484
*	Foil-NETIC	01-5019
*	Foil-CO-NETIC	01-5026
9 ea	Sponge	7002-065-04
1 ea	Tube Holder Assembly	2393-117
1 ea	Gasket	7393-139
1 ea	O-Ring	16-8366
1 ea	Series "C" Connector RECPT-UG706/U	4478-011
1 ea	Model 43-93 Vinyl Cover	7393-162

For Model 43-93-2

Assembly View, Drawing 393 × 119

Reference	Description	Part Number
UNIT	Completely Assembled Model 43-93-2 Alpha /Beta Scintillator	47-3227

Quantity	Description	Part Number
1 ea	Welded Body Assembly	2393-105
1 ea	Mirror	2310654
1 ea	Connector Cap	7393-102
1 ea	Mylar Window Assembly	4393-126
1 ea	Window Frame	7393-109
1 ea	Face Ring	7393-112
1 ea	Hex Screen (external snap-on screen)	7393-116
1 ea	Backup w/Plastic Scintillator and ZnS	4393-127
1 ea	Plastic Scintillator-EJ212-3.12 x 6.67 x 0.010	01-5685
1 ea	Photomultiplier Tube	01-6005
1 ea	Voltage Divider Board	5435-484
*	Foil-NETIC	01-5019
*	Foil-CO-NETIC	01-5026
9 ea	Sponge	7002-065-04
1 ea	Tube Holder Assembly	2393-117
1 ea	Gasket	7393-110
1 ea	O-Ring	16-8366
1 ea	Series "C" Connector RECPT-UG706/U	4478-011
1 ea	Model 43-93-2 Vinyl Cover	7393-169

For Model 43-93-4

Reference	Description	Part Number
UNIT	Completely Assembled Model 43-93-4 High-Temp Alpha/Beta Scintillator	47-4468

Quantity	Description	Part Number
1 ea	Welded Body Assembly	2393-141
1 ea	Mirror	2310698
1 ea	Connector Cap (painted)	7393-102-1

1 ea	Mylar Window Assembly	4393-149
1 ea	Window Frame	7393-148
1 ea	Face Ring (painted)	7393-137-1
1 ea	Square Screen (external snap-on screen)	7393-171
1 ea	Plastic Scintillator- EJ299-26-2.94 x5.91x 0.010 w/Zns	01-5692-01
1 ea	Photomultiplier Tube	01-6005
1 ea	Voltage Divider Board	5435-484
*	Foil-NETIC	01-5019
*	Foil-CO-NETIC	01-5026
9 ea	Sponge	7002-065-04
1 ea	Tube Holder Assembly	2393-117
1 ea	Gasket	7393-139
1 ea	O-Ring	16-8366
1 ea	Series "C" Connector RECPT-UG706/U	4478-011
1 ea	Model 43-93 Vinyl Cover	7393-162

Parts Common to all models

1 1/8-inch Voltage Divider Board, Drawing 435 × 1325

	Reference	Description	Part Number
	BOARD	Completely Assembled 1 1/8 inch Voltage Divider Board	5435-484
CAPACITORS	C1- C3	0.01uF, 200V	04-5725
	C4	0.0047uF, 3KV	04-5547
RESISTORS	R1	10M, 1/8W, 1%	12-7996
	R2	7.5M, 1/8W, 5%	12-7971
	R3-R10	10M, 1/8W, 1%	12-7996
	R11	2.21M, 1/8W, 1%	12-7002
	R12-R13	10M, 1/8W, 1%	12-7996
MISCELLANEOUS	*	SOCKET 1 1/8 inch PCB MOUNT	4435-103
	W1	Wire-#22AWG WHT 9 65/40	21-8543
	W4	Wire-#22AWG BLK 0 65/40	21-8552

Section

5

Drawings and Diagrams

Model 43-93 Assembly View, Drawing 393 × 140F

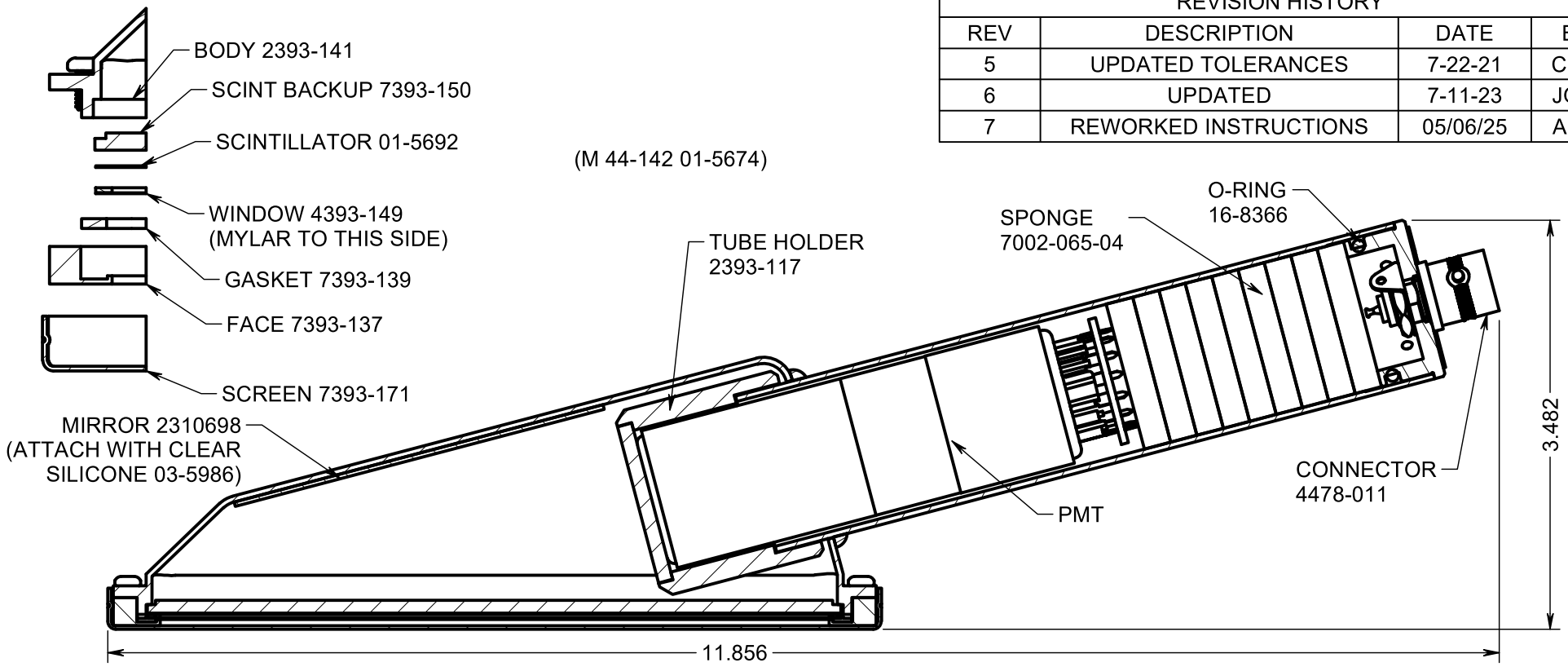
Model 43-93-2 Assembly View, Drawing 393 × 119

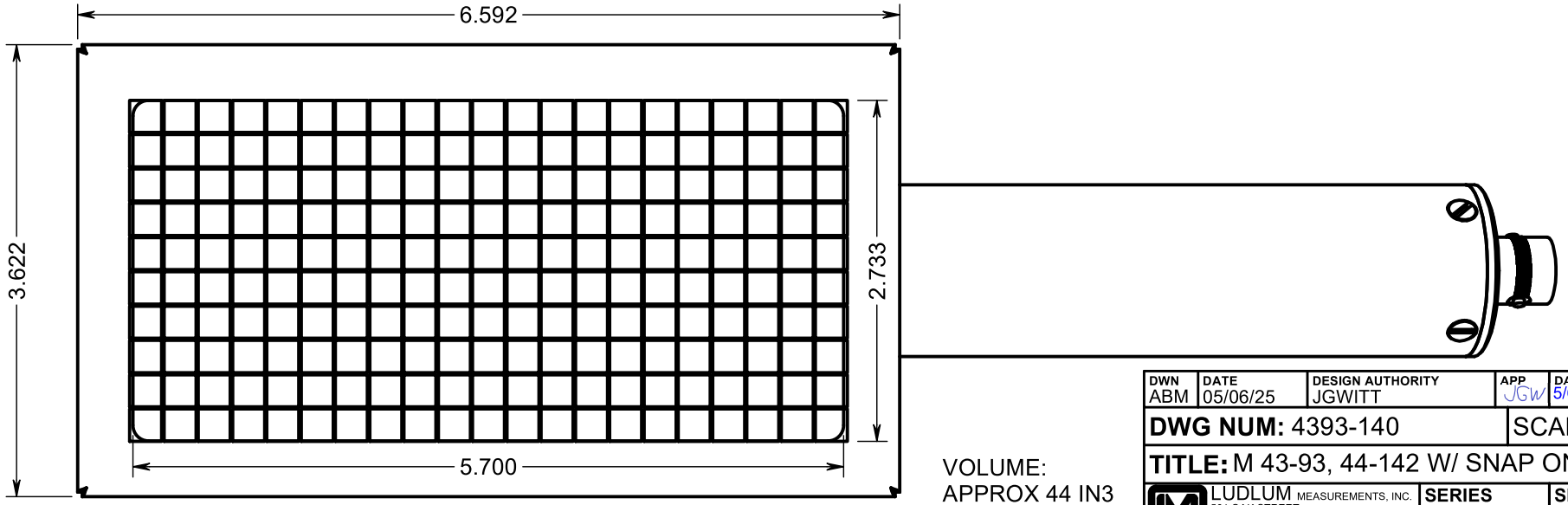
Mylar Window Replacement, Drawing 393 x 165A

1 1/8 inch Voltage Divider Circuit Board, Drawing 435 × 1325

1 1/8 inch Voltage Divider Component Layout, Drawing 435 × 1324 (2 sheets)

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
5	UPDATED TOLERANCES	7-22-21	CMC
6	UPDATED	7-11-23	JGW
7	REWORKED INSTRUCTIONS	05/06/25	ABM





VOLUME:
APPROX 44 IN3

DWN	DATE	DESIGN AUTHORITY	APP	DATE
ABM	05/06/25	JGWITT	JGW	5/6/2025

DWG NUM: 4393-140 | SCALE: 3/4

TITLE: M 43-93, 44-142 W/ SNAP ON SCRN

LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556
CAGE CODE: 23609

SERIES	SHEET
393	140F

REV #	ALTERATIONS	DATE	BY
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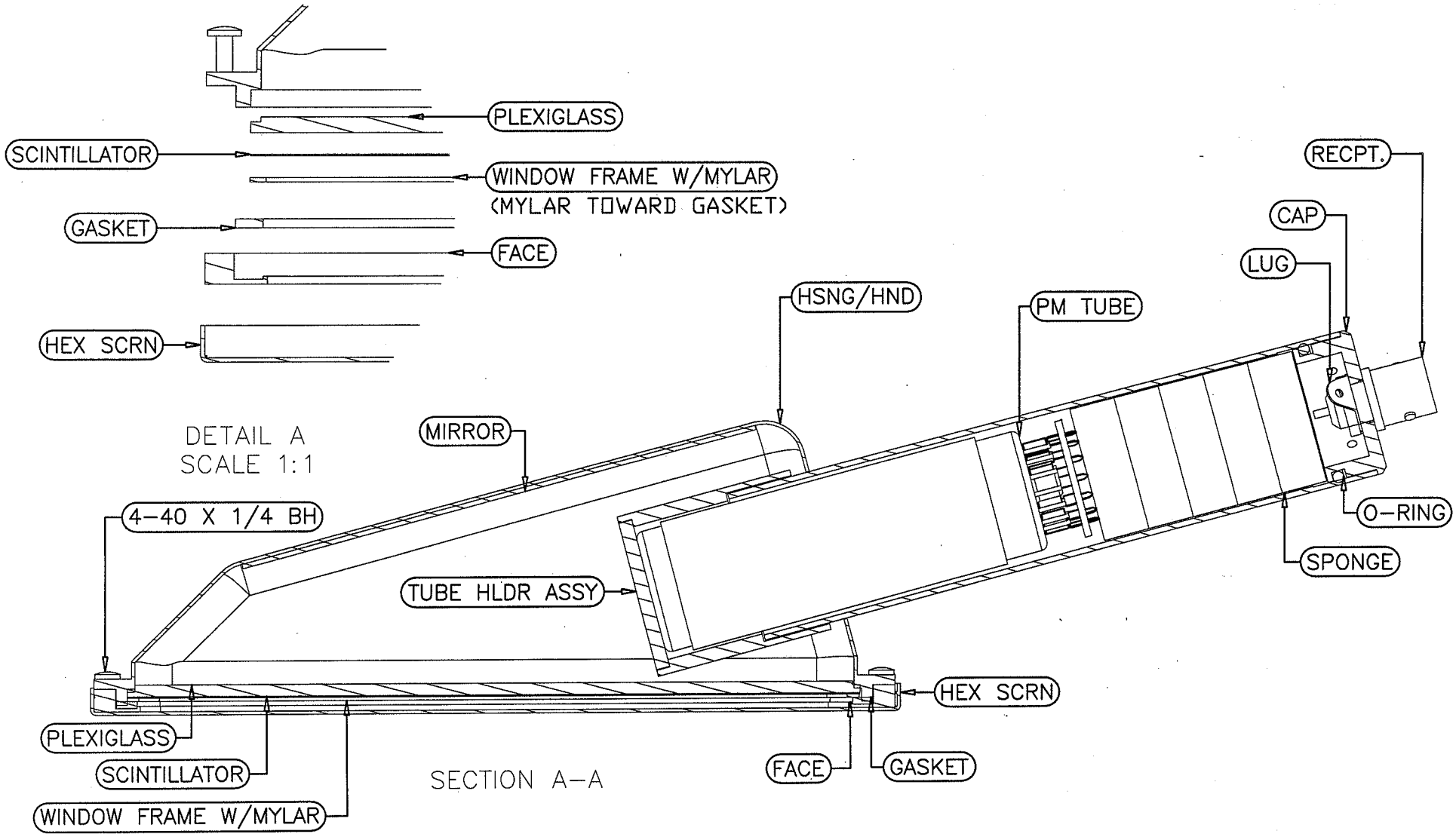
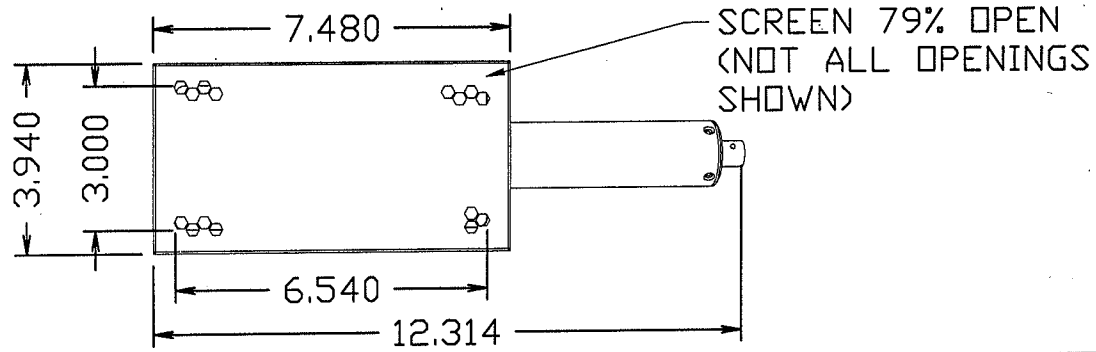




DWN	DATE	CHK	DATE	APP	DATE
DSW	2/12/02	JGW	2-12-02	DH	2-12-02

PART NUM: 4393-119 SCALE: FULL ☐ OTHER

TITLE M 43-93-2 & 44-142-2 ASSEMBLY

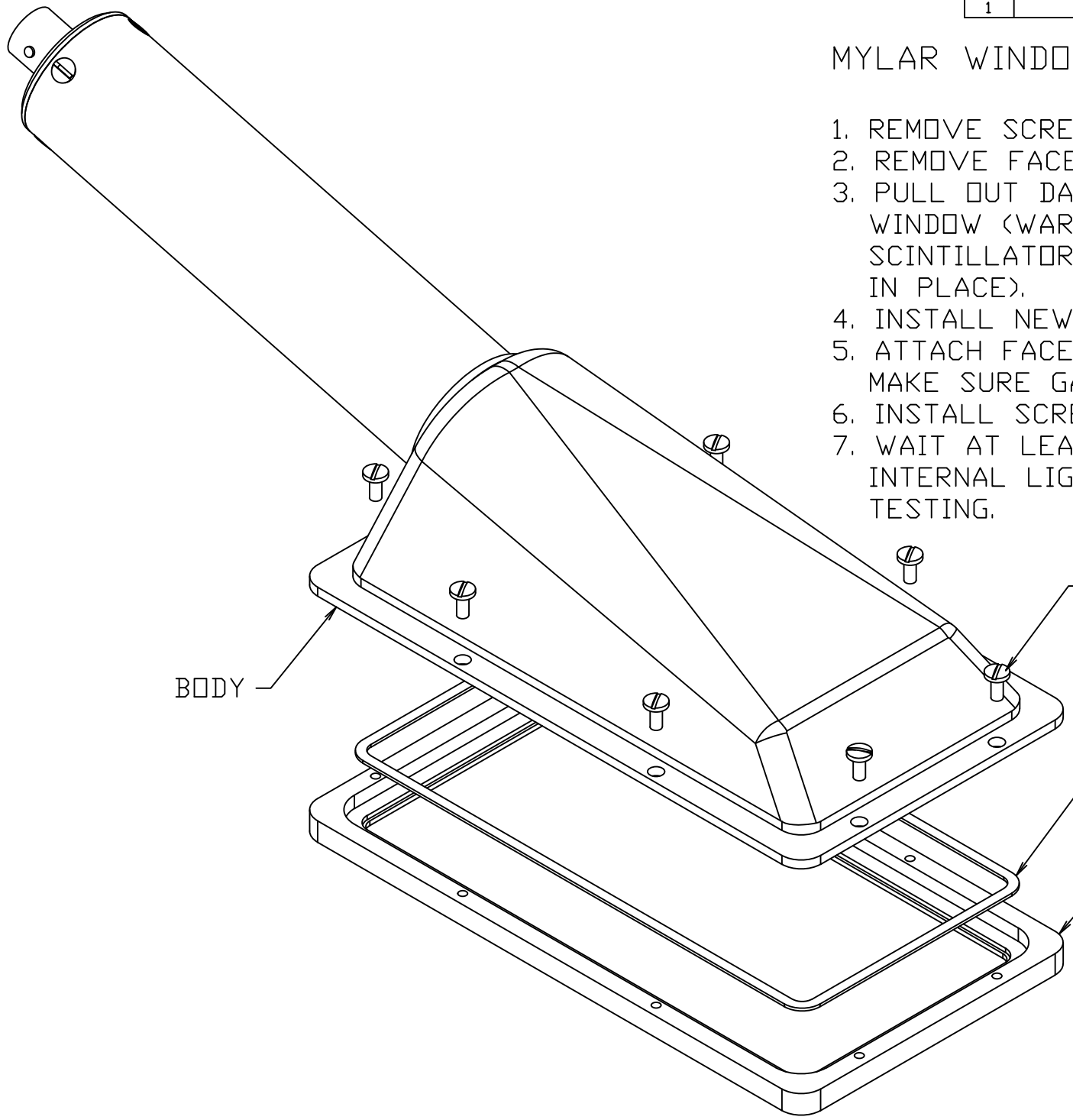
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556

SERIES 393 SHEET 119

REV #	ALTERATIONS	DATE	BY
1	VALID	1-27-11	CMC

MYLAR WINDOW REPLACEMENT

1. REMOVE SCREWS
2. REMOVE FACE RING
3. PULL OUT DAMAGED MYLAR WINDOW (WARNING!!! MAKE SURE SCINTILLATOR ASSEMBLY STAYS IN PLACE).
4. INSTALL NEW MYLAR WINDOW.
5. ATTACH FACE RING (WARNING!!! MAKE SURE GASKET IS NOT DAMAGED)
6. INSTALL SCREWS
7. WAIT AT LEAST 4 HOURS (FOR INTERNAL LIGHT DECAY) BEFORE TESTING.



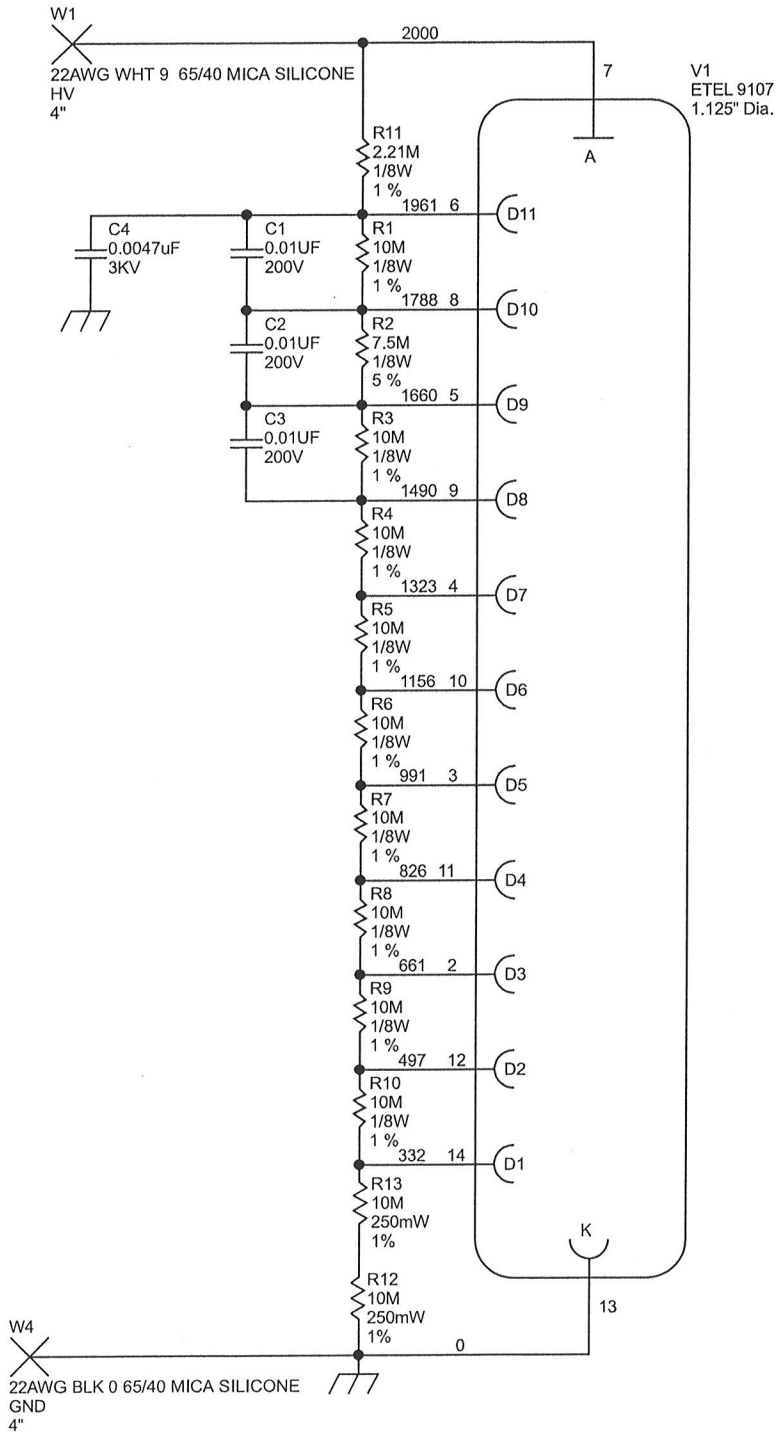
DWN	DATE	CHK	DATE	APP	DATE
CMC	9-26-24			JGW	9/26/2024

DWG NUM: 4393-165 SCALE: FULL ☒ OTHER

TITLE M 43-92, M 43-93 MYLAR WINDOW

LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

SERIES 393 SHEET 165A



LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
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Design: LL	8/19/2015	Model: ETEL 9107	
		Board#: 5435-484	
Approved:		Sheet: 1 of 1	Series 435 / Sheet 1325
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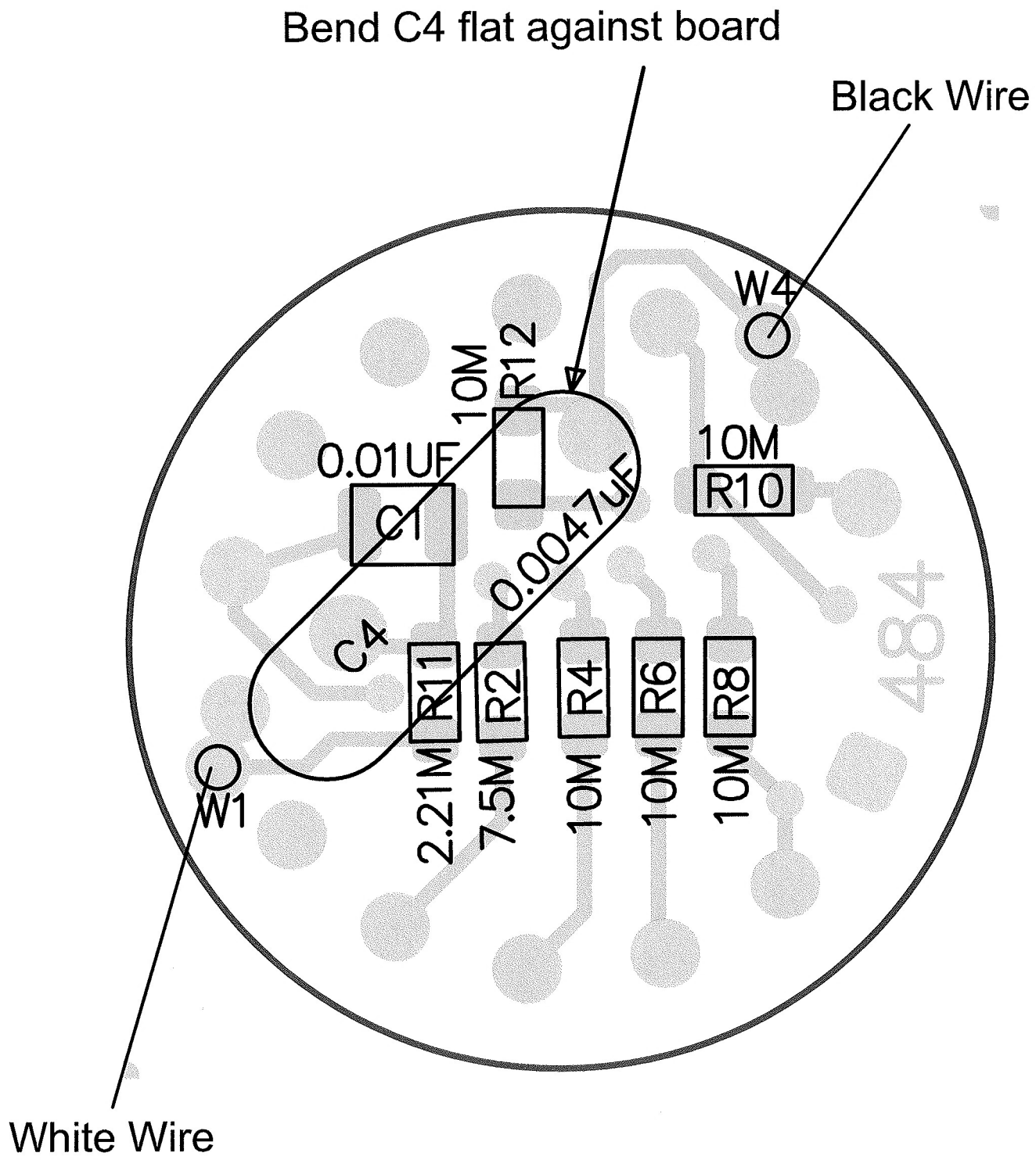

(2)

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
Title: 1 1/8" VOLTAGE DIVIDER			
Drawn: PAB	8/19/2015	**Model:** ETEL 9107	
Design: LL	8/19/2015	**Board#:** 5435-484	
Approve: RDS	22 Jun 16	**Rev:** 1	
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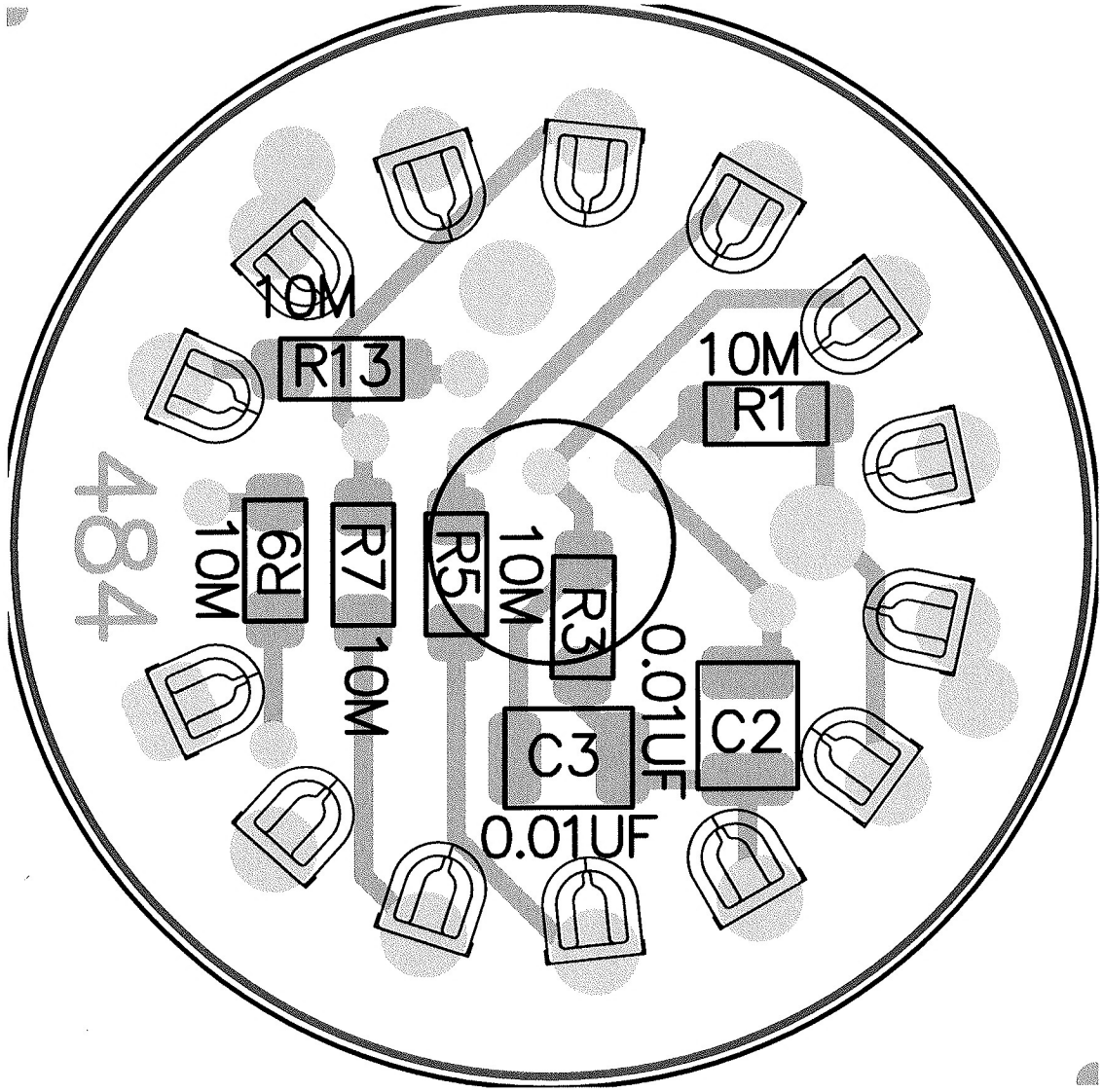

(2)

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
Title: 1 1/8" VOLTAGE DIVIDER			
Drawn: PAB	8/19/2015	**Model:** ETEL 9107	
Design: LL	8/19/2015	**Board#:** 5435-484	
Approve: RDS	22 Jun 16	**Rev:** 1	
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