

**LUDLUM MODEL 43-89, MODEL 43-90,
AND MODEL 44-116
ALPHA/BETA SCINTILLATORS**

**June 2024
Serial No. PR 156693 and Succeeding
Serial Numbers**

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AND MODEL 44-116
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: REPAIR DEPARTMENT
501 OAK STREET
SWEETWATER, TX 79556**

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

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Model 43-89, 43-90, 44-116 Alpha/Beta Scintillators

June 2024

1. GENERAL

The Model 43-89, Model 43-90, and Model 44-116 detectors are used for detecting alpha and/or beta radiation. All three detectors use the same housing and differ only in the scintillator and window back-up that are used. The Model 43-89 is used for alpha and beta detection, the Model 43-90 for alpha detection only, and the Model 44-116 for beta detection only.

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 metalized polyester to reduce light response (causing excessive background counts). The window is protected by a 79% open, 0.076 cm (0.030 in.) thick, stainless steel hex 0.64 cm (0.25 in.) screen. *When changing the metalized polyester window on a detector, it is not necessary to recalibrate the instrument as long as a functional check is performed on the instrument and its readings are consistent with the readings before the window was replaced.*

The photomultiplier tube and crystal assembly may easily be removed for repair. Refer to the assembly view drawing near the end of this manual for details of construction and parts.

Discriminating alpha and beta radiation simultaneously (Model 43-89 only) 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, or Model 2360 instruments provide the necessary circuitry for simultaneous alpha-beta discrimination. Models 43-90 and 44-116 are compatible with any LMI general purpose survey meter, ratemeter, or scaler. Refer to the appropriate instrument manual for calibration procedures.

The photomultiplier tube typically operates between 500 and 1000 volts, and the manufacturer recommends no more than 1500 volts.

Model 43-89, 43-90, 44-116 Alpha/Beta Scintillators
June 2024

2. SPECIFICATIONS

Photomultiplier Tube: 3.8 cm (1.5 in.) diameter

Scintillator Material:

Model 43-89: ZnS (Ag) deposited on a 0.025 cm (0.010 in.) rectangular plastic scintillator

Model 43-90: ZnS (Ag)

Model 44-116: 0.025 cm (0.010 in.) rectangular plastic scintillator

Window:

Model 43-89: 1.2 mg/cm² metalized polyester

Model 43-90: 0.8 mg/cm² metalized polyester

Model 44-116: 1.2 mg/cm² metalized polyester

Window Area:

Open: approximately 100cm² (15.5 in.²)

Active: approximately 125 cm² (19.4 in.²)

Efficiency (4 π):

Model 43-89: 17.5% for ²³⁹Pu, 10% for ⁹⁹Tc and 17.5% for ⁹⁰Sr⁹⁰Y

Model 43-90: 20% for ²³⁹Pu

Model 44-116: 15% for ⁹⁹Tc, 4% for ¹⁴C and 30% for ⁹⁰Sr⁹⁰Y

Typical Background:

Model 43-89: Alpha: 3 cpm or less

Beta: 300 cpm or less

Model 43-90: Alpha: 3 cpm or less

Model 44-116: Beta: 300 cpm or less

Crosstalk: (Model 43-89 only)

Alpha to beta: 10% or less

Beta to alpha: 1% or less

Detector Uniformity: within 10% of average reading

Operating Voltage: 500-1000 V (1500 V maximum)

Gamma Sensitivity:

Model 43-89: approximately 20 cpm/ μ R/hr

Model 44-116: approximately 20 cpm/ μ R/hr

Temperature Range: -20 to 50 °C (-4 to 122 °F)

Connector: series "C," unless specified otherwise

Protector Screen: 22 ga [0.076 cm (0.030 in.)] stainless steel hex [0.64 cm (0.25 in.)], 79% open

Model 43-89 Outer Dimensions (LxW): 168 x 92 mm (6.6 x 3.6 in.)

Model 43-90 and 44-116 Outer Dimensions (LxW): 190 x 100 mm (7.5 x 3.9 in.)

Size: 33 x 10 x 10 cm (12.25 x 4 x 4 in.) (L x W x H)

Weight: 0.68 kg (1.5 lb)

Construction: aluminum with beige powder coating

Environmental Rating: IP rating of 63

**Model 43-89, 43-90, 44-116 Alpha/Beta Scintillators
June 2024**

3. REPLACEMENT PARTS LIST

Reference No.	Description	Part No.
Assembly View, Drawing 393 x 19		
UNIT	Complete Assembly	
	Model 43-89 Alpha/Beta Scintillator	47-2430
	Model 43-90 Alpha Scintillator	47-2448
	Model 44-116 Beta Scintillator	47-2696
Part No.	Description	Qty.
2393-355	Welded Body Assembly	1 ea.
4393-043	Metalized polyester Window Assembly (Models 43-89 and 44-116)	1 ea.
4393-044	Metalized polyester Window Assembly (Model 43-90)	1 ea.
7002-505	Connector End Cap	1 ea.
16-8317	O-Ring	1 ea.
7002-029-05	Sponge	2 ea.
2393-078	Tube Holder	1 ea.
7393-017	Window Holder	1 ea.
7393-019	Window Screen	1 ea.
9393-073	Window Backup (Model 43-89)	1ea.
7393-038	Window Backup (Model 43-90)	1ea.
7393-021	Window Backup (Model 44-116)	1ea.
40-4006	Tube Shield	1ea.
4478-011	RECPT-UG706/U SERIES"C"	1ea.
01-5842	1 1/8 inch PM Tube	1 ea.
22-9631	Silicone Cord	*
7393-048	Vinyl Cover	1ea.
7393-075	Stainless Steel Cover	(Optional)
4347-376	Wall-Mounting Holder	(Optional)

**Model 43-89, 43-90, 44-116 Alpha/Beta Scintillators
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Reference No.	Description	Part No.
2.9 cm (1 1/8 in.) Voltage Divider Board, Drawing 435 x 1325		
BOARD	Assembled 2.9 cm (1 1/8 in.) Voltage Divider Board	5435-484
CAPACITORS		
C1-C3	0.01 μ F, 200V	04-5725
C4	0.0047 μ F. 3kV	04-5547
RESISTORS		
R1	10 MEG,1/8 W, 1%	12-7996
R2	7.5 MEG,1/8 W, 5%	12-7971
R3-R10	10 MEG,1/8 W, 1%	12-7996
R11	2.21 MEG,1/8 W, 1%	12-7002
R12-R13	10 MEG,1/8 W, 1%	12-7996
MISCELLANEOUS		
*	SOCKET 1 1/8 in. PCB MOUNT	4435-103
W1	Wire-#22AWG WHT 9 65/40	21-8543
W4	Wire-#22AWG BLK 0 65/40	21-8552

Model 43-89, 43-90, 44-116 Alpha/Beta Scintillators
June 2024

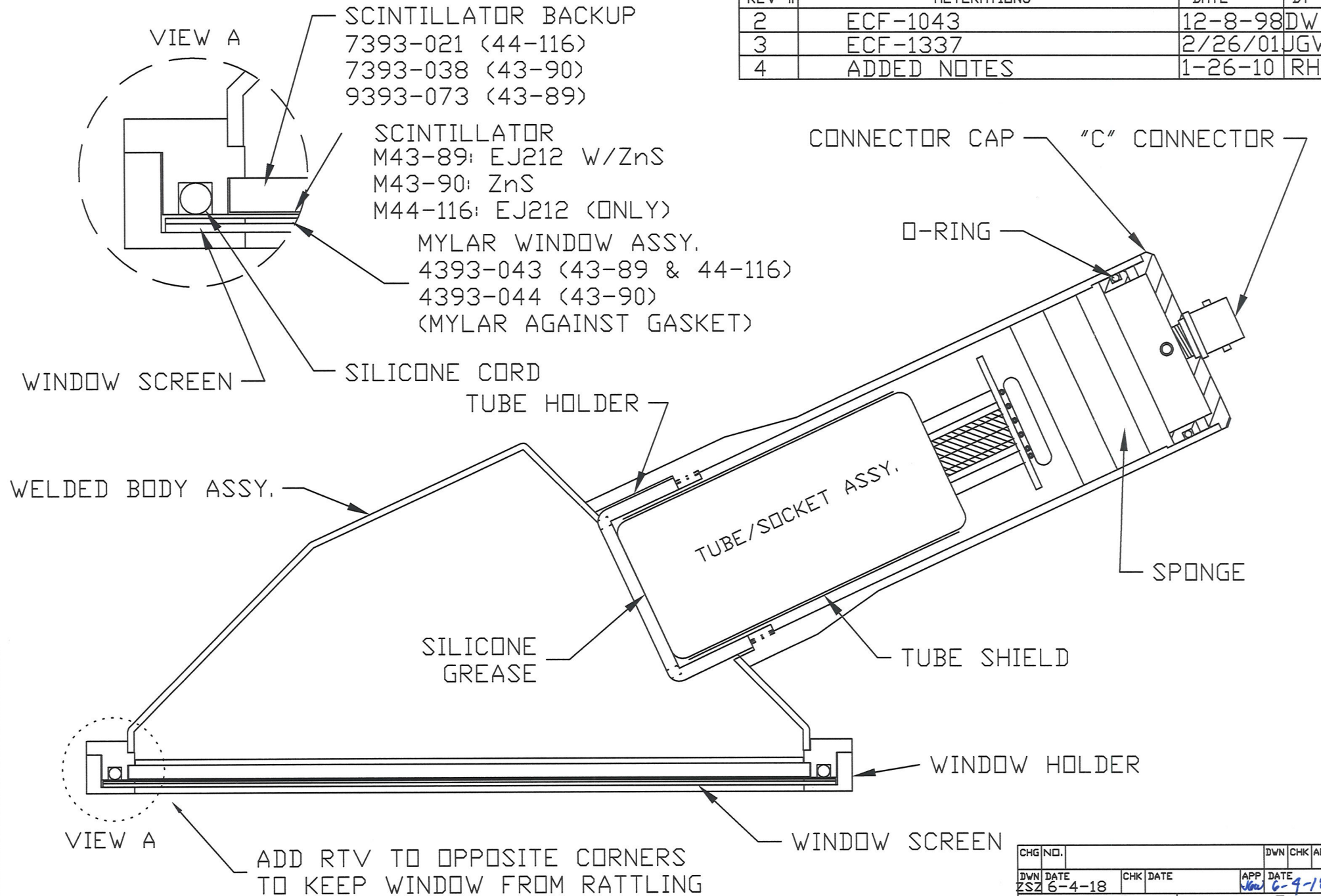
DRAWINGS AND DIAGRAMS

Assembly View, Drawing 393 x 19

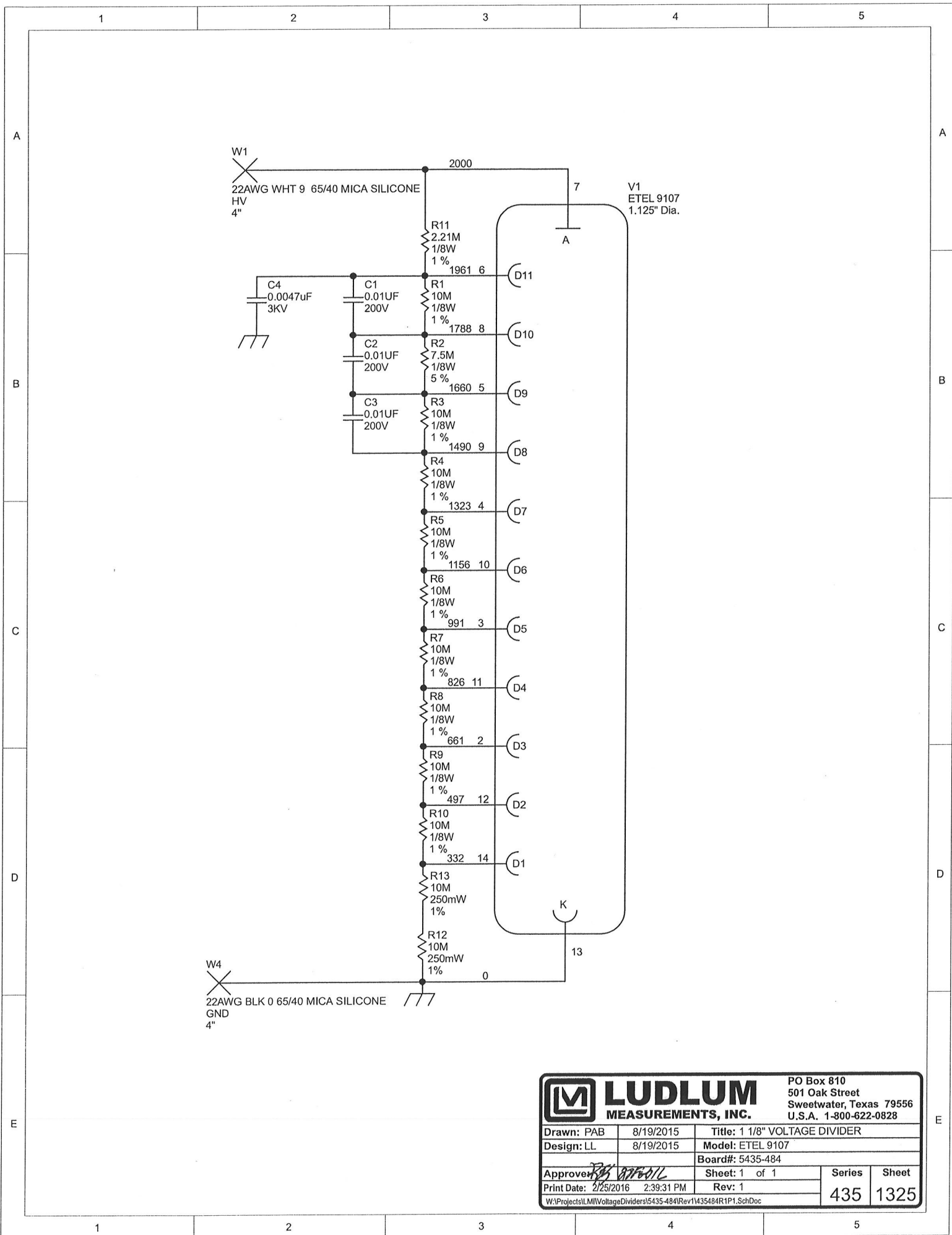
2.9 cm (1 1/8 in.) Voltage Divider Board (Part No. 5435-484), Drawing 435 x 1325

2.9 cm (1 1/8 in.) Voltage Divider Board Component Layout (Part No. 5435-484),
Drawing 435 x 1324 (2 sheets)

REV #	ALTERATIONS	DATE	BY
2	ECF-1043	12-8-98	DW
3	ECF-1337	2/26/01	JGW
4	ADDED NOTES	1-26-10	RHS



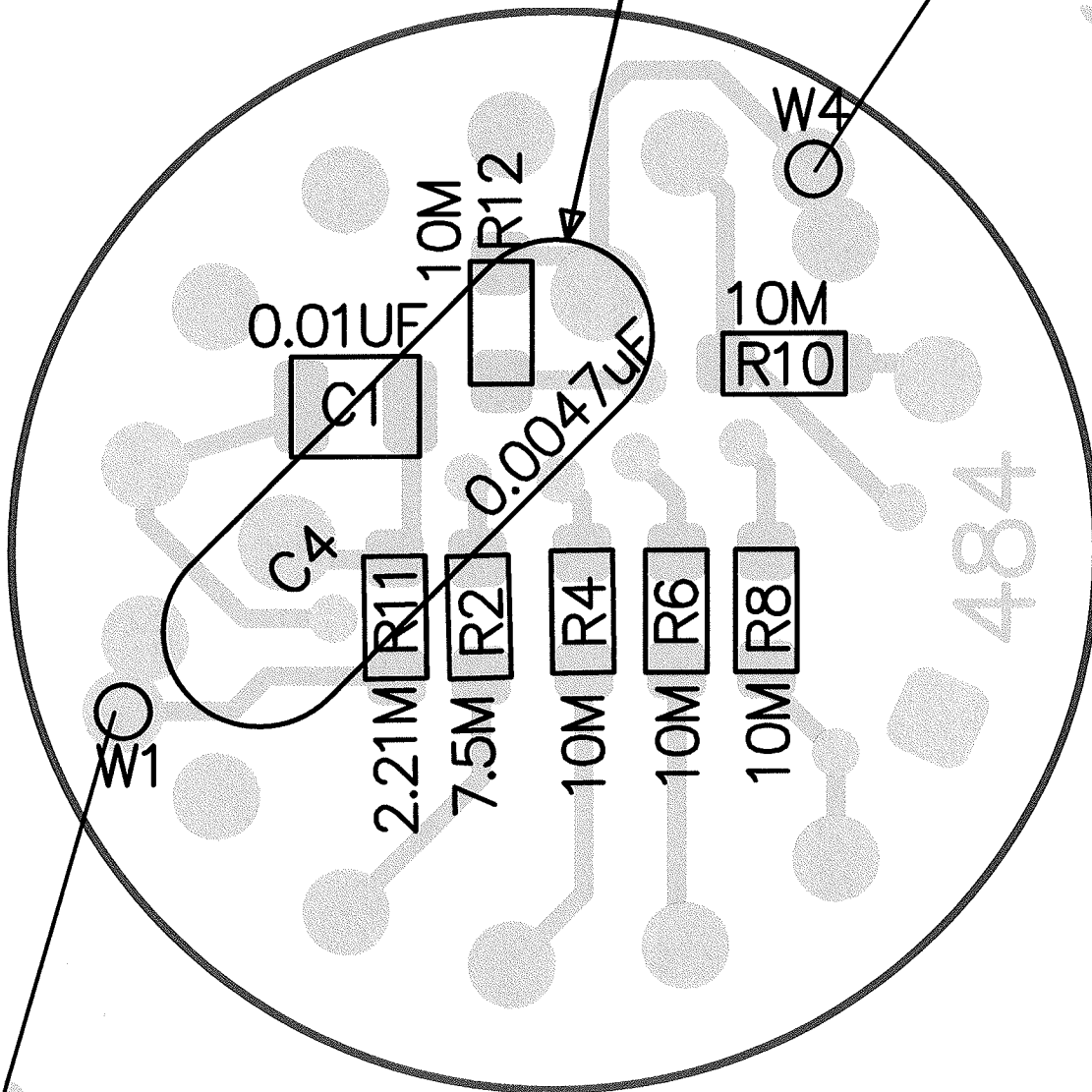
CHG NO.		DWN	CHK	APP
DWN DATE	CHK DATE	APP DATE		
ZSZ 6-4-18		June 6-4-10		
TOL: SHOP STD <input type="checkbox"/>	OTHER <input type="checkbox"/>	SCALE: FULL <input type="checkbox"/>	OTHER <input type="checkbox"/>	
TITLE: M43-89, 43-90, 44-116				
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556		SERIES 393	SHEET 19	



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		Drawn: PAB Design: LL	8/19/2015 8/19/2015
Approved: <i>[Signature]</i> Print Date: 2/25/2016 2:39:31 PM	Rev: 1	Sheet: 1 of 1	435 1325
W:\Projects\LMIIVoltageDividers\5435-484\Rev1\435484R1P1.SchDoc			

Bend C4 flat against board

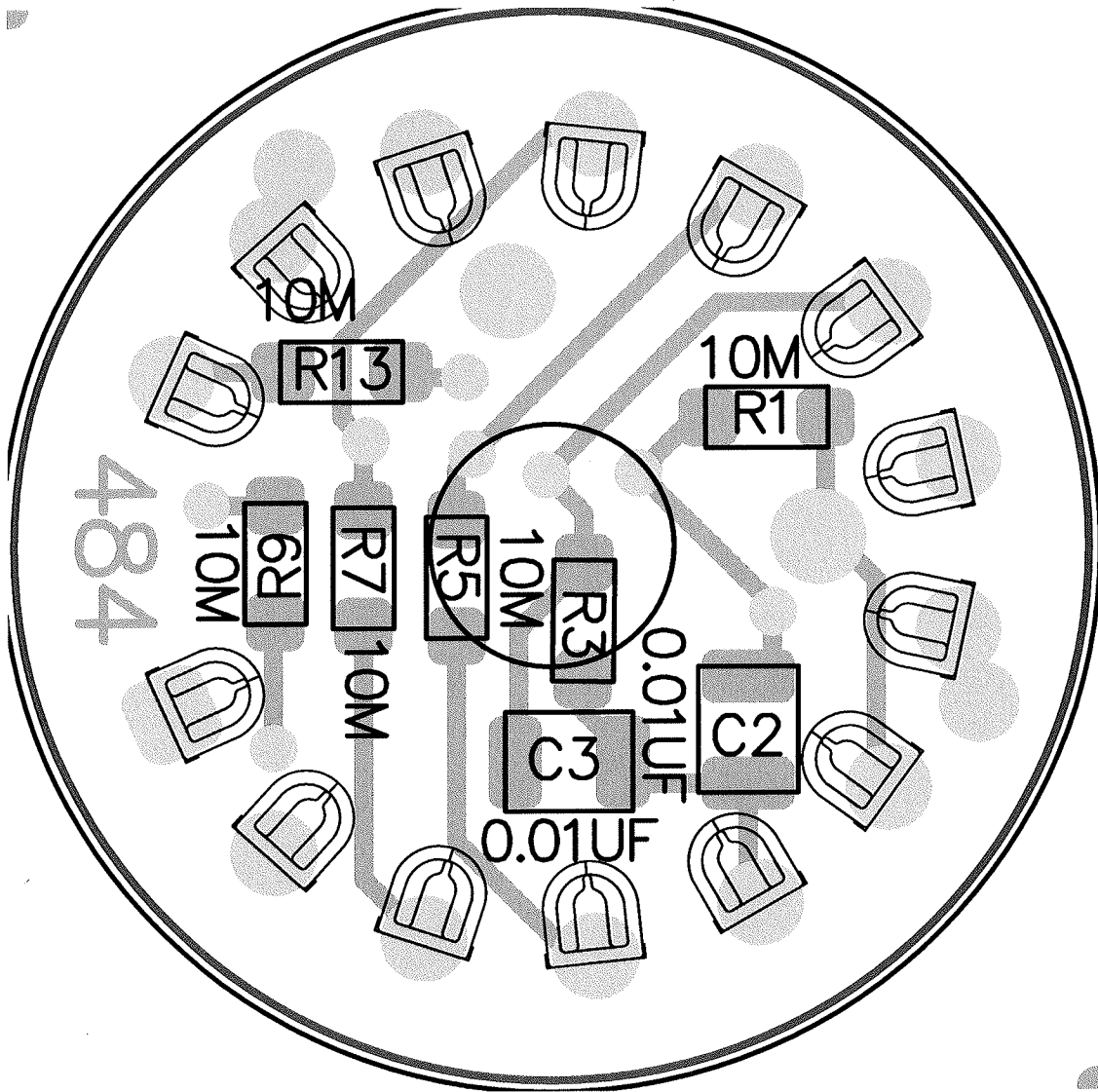
Black Wire



White Wire

2

		LUDLUM		PO Box 810	
		MEASUREMENTS, INC.		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:	<i>RDS</i>	<i>22-Jun-16</i>	Rev:	1	
PCBA Drawing			SCALE:	1.00	Series Sheet
Print Date: 6/22/2016 12:35:31 PM			Top Overlay	435	1324
W:\Projects\LL\MI\VoltageDividers\5435-484\Rev1\435484R1_Assy.PcbDoc					



484

2

		LUDLUM		PO Box 810	
		MEASUREMENTS, INC.		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:	<i>RJS</i>	<i>22 JUN 16</i>	Rev:	1	
PCBA Drawing			SCALE:	1.00	Series Sheet
Print Date:	6/22/2016	12:35:36 PM	Bottom Overlay	435	1324
W:\Projects\LMIVoltageDividers\5435-484\Rev1\435484R1_Assy.PcbDoc					