LUDLUM MODEL 43-65

ALPHA SCINTILLATOR

March 2012

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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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1. GENERAL

The Model 43-65 Alpha Scintillator is a detector (probe) designed for alpha radiation survey when used with general purpose survey meters, ratemeters, and scaler instruments. It utilizes a zinc sulfide scintillation crystal doped with silver [ZnS(Ag)] and a 3.8 cm (1.5 in.) diameter magnetically shielded photomultiplier tube (PMT).

The window is protected by a 79% open, 20-guage stainless steel 0.64 cm (0.25 in.) hex screen.

A plastic protective cover is provided for protection of the detector face against puncture of the metalized polyester when the detector is not in use. Pinholes in the window will cause light leaks and malfunction of the detector.

2. SPECIFICATIONS

WINDOW: two layers of 0.4 mg/cm^2 aluminized metalized polyester (10 gauge). When intended for outdoor use, an extra layer of metalized polyester is recommended (total of 1.2 mg/ cm^2 thickness).

WINDOW AREA: 50 cm^2 open
63 cm^2 active

EFFICIENCY (4π): 17% for ^{239}Pu; 17% for ^{230}Th

BACKGROUND: 3 or less counts per minute

SCINTILLATOR: ZnS (Ag)

PHOTOMULTIPLIER TUBE: 3.8 cm (1.5 in.) diameter

DYNODE STRING RESISTANCE: 100 megohm

OPERATING VOLTAGE: 500-1200 volts

CONNECTOR: Series "C" (others available)

CONSTRUCTION: powder coated, computer beige aluminum housing

SIZE: 10.2 x 10.2 x 24.9 cm (4 x 4 x 9.8 in.) (H x W x L)

WEIGHT: 0.5 kg (1.2 lb)

3. MAINTENANCE

Normally, causes of malfunction of the Model 43-65 are due to either light holes in the thin metalized polyester or a defective photomultiplier tube. The malfunction caused by light holes gives an increase in background noise up to complete saturation where the instrument may indicate zero counts. If a light leak is suspected, cover the probe face with an opaque material. By moving the opaque material to different areas of the face, a light leak should be detectable.

3.1 Operation

A plateau should be run with the probe in order to determine the operating voltage of the PMT. If possible, the plateau should be run with the instrument, which will be used with the probe during normal operation.

If the probe is required to operate at a pre-determined high voltage, the gain

potentiometer located underneath the set screw can be adjusted. This will change the pulse amplitude from the PMT and will allow it to operate at higher voltages.

During the use of the probe, daily source checks should be made to determine that the probe is operating correctly. If the instrument being used with the probe does not have an overload circuit, it is possible to induce a large enough light leak, which would saturate the PMT and cause a zero count reading. This could be mistaken for normal background. To prevent this from happening, source checks should be preformed on a routine basis, and also whenever a light leak is suspected.

3.2 Repair of Probe Face

To repair the face of the probe, perform the following steps: (Refer to Drawing 366 x 23 for assembly view.)

1. Remove protective window frame.

2. Remove protective screen.

3. Remove window with metalized polyester assembly from scintillation retainer face.

4. Remove aluminized metalized polyester from window frame and clean off old glue from the frame.

5. Inspect silicone gasket and replace if damaged.

6. Inspect scintillation retainer face for a complete coating of ZnS. Re-coat if necessary.

7. Re-glue two layers of 0.4 mg/cm^2 metalized polyester to the window frame. **See CAUTION.**

****CAUTION****

The thin metalized polyester is very susceptible to puncture. Extreme care should be exercised while gluing the aluminum metalized polyester to the window frame and when re-installing the window with metalized polyester assembly to the face of the probe.

8. Check to make sure the gasket is in place.

9. Re-install window with metalized polyester to face of probe.

3.3 Replacement of PMT

Malfunctions caused by the tube such as a zero count or an intermittent or a very reduced count may occur. After thoroughly checking for a light leak, replacement of the tube may be necessary. After removing the tube from the probe body, check the front of the tube face. A tube that has become defective may show clear through the face, instead of the dark amber color.

To replace the PMT, perform the following steps: (Refer to Drawing 366 x 23 for assembly view.)

NOTE: If the replacement is for an original "based" tube (Part No. 01-5001), refer to instructions included in the installation kit.

NOTE: When needed, use thermal strippers to strip the white Teflon high voltage/signal wire to prevent damaging the wire.

1. Unfasten connector end cap (removing four screws).

2. Slowly remove connector end cap and pull out as far as wires will allow.

3. Remove (de-solder) ground and high-voltage wires from connector end cap.

4. Remove sponges.

5. Remove photomultiplier tube assembly (including circuit board).

6. Light pipe may have to be removed from the other end in order to clean the old light coupling compound off.

7. Unplug ground and high-voltage wires from tube circuit board.

8. Remove metallic shield.

9. Slide the metallic shield over the new tube and tape to tube.

10. Plug in ground and high-voltage wires to appropriate connectors.

11. Apply optical compound to face of the PMT.

12. Place tube assembly into handle.

13. Install sponges.

14. Re-connect (solder) the high-voltage and ground wires to connector end cap.

15. Install connector end cap to complete final assembly.

16. After replacement of PMT, the Model 43-65 should be dark adapted, then plateaued to determine the operating voltage. Dark adapt for at least 12 hours before running the plateau. If time permits, allow up to 24 hours before plateau is run.

4. REPLACEMENT PARTS LIST

Ref. No.	Description	Part No.
UNIT	Completely Assembled Model 43-65 Probe	47-1441
1 EA.	1.5 inch Photomultiplier Tube Assembly	4002-510
1 EA.	Tube Shield	40-4006
1 EA.	Model 43-65 Cap W/Gain Adjust	7366-021
1 EA.	Adjustable Gain Cap Board	5209-019
1 EA.	Model 43-65 Mylar Window	4366-020
1 EA.	Model 43-65 Window Frame	7366-013
1 EA.	Model 43-65 Window Screen	7366-015
1 EA.	Model 43-65 Bottom Plexiglass	7366-025
1 EA.	Model 43-65 Rectangular Plexiglass	7366-011
1.125 FT.	Gasket (Silicone Cord 0.139)	22-9631
1 EA.	O-Ring-2-126	16-8281
4 EA.	Sponge	7002-029-05
1 EA.	Screw in Series "C" Connector UG706/U	13-7751

1.5 inch Voltage Divider, Drawing 2 x 317

Ref. No.	Description	Part No.
BOARD	Completely Assembled 1.5 inch Voltage Divider	5002-502
CAPACITORS		
C001	0.01µF, 2kV	04-5525
RESISTORS		
R001	10 MEG, ¼ W, 2 %	10-7106
R002	1 MEG, 1/8 W, 1 %	12-7844
R003-R006	10 MEG, ¼ W, 2 %	10-7106
R011	10 MEG, ¼ W, 2 %	10-7106
R101-R104	10 MEG, ¼ W, 2 %	10-7106
R111	10 MEG, ¼ W, 2 %	10-7106

Ref. No.	Description	Part No.
Adjustable Gain Cap Board, Drawing 209 x 18		
BOARD	Completely Assembled Adjustable Gain Cap Board	5209-019
CAPACITORS		
C1	0.0047μF, 3kV	04-5547
RESISTORS		
R1	100k Trimmer	09-6813

DRAWINGS AND DIAGRAMS

Assembly View, Drawing 366 x 23

1.5 inch Voltage Divider Board, Drawing 2 x 317

1.5 inch Voltage Divider Board Component Layout, Drawing 2 x 318

Adjustable Gain Cap Board, Drawing 209 x 18

REV #	ALTERATIONS	DATE	BY
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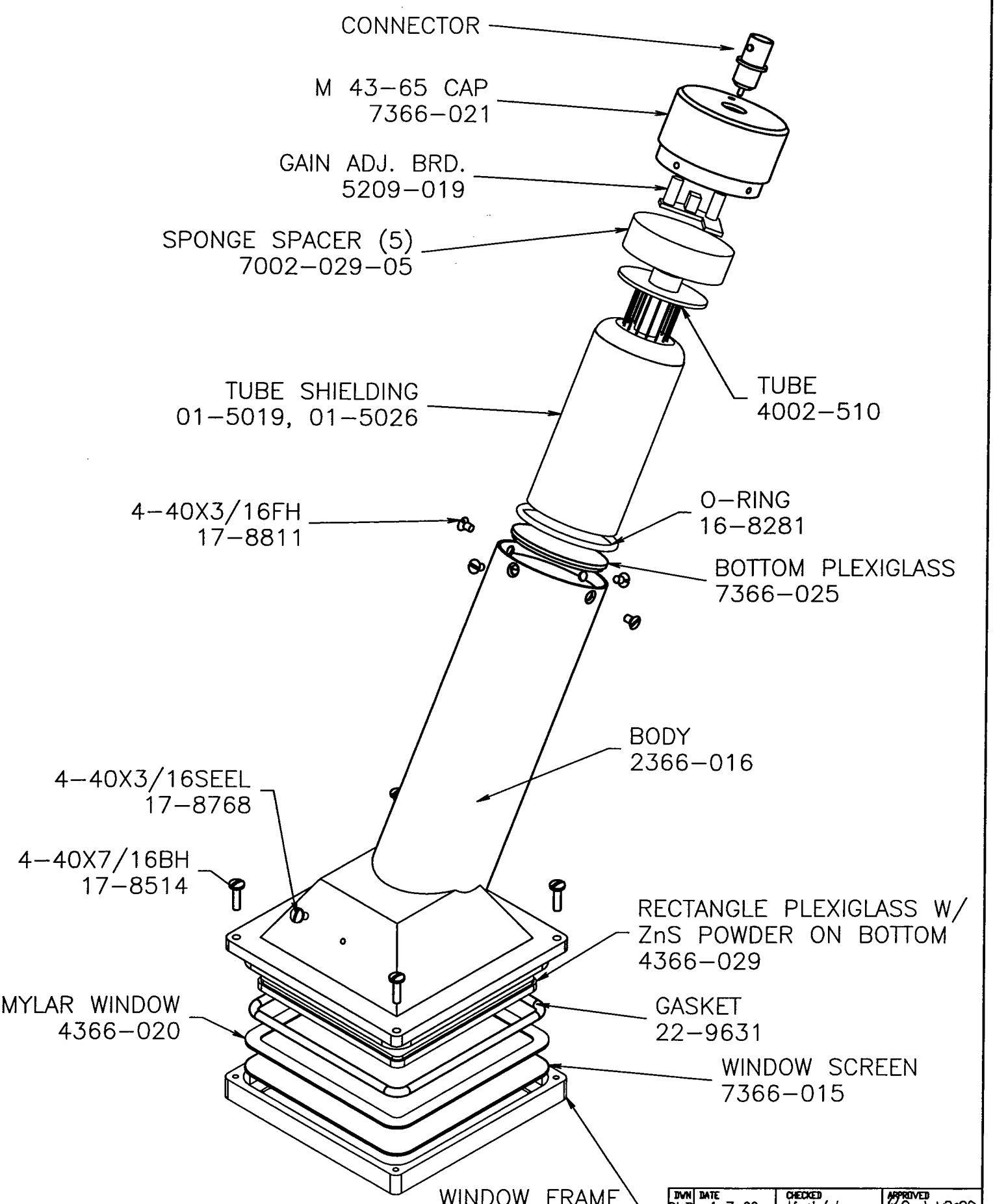


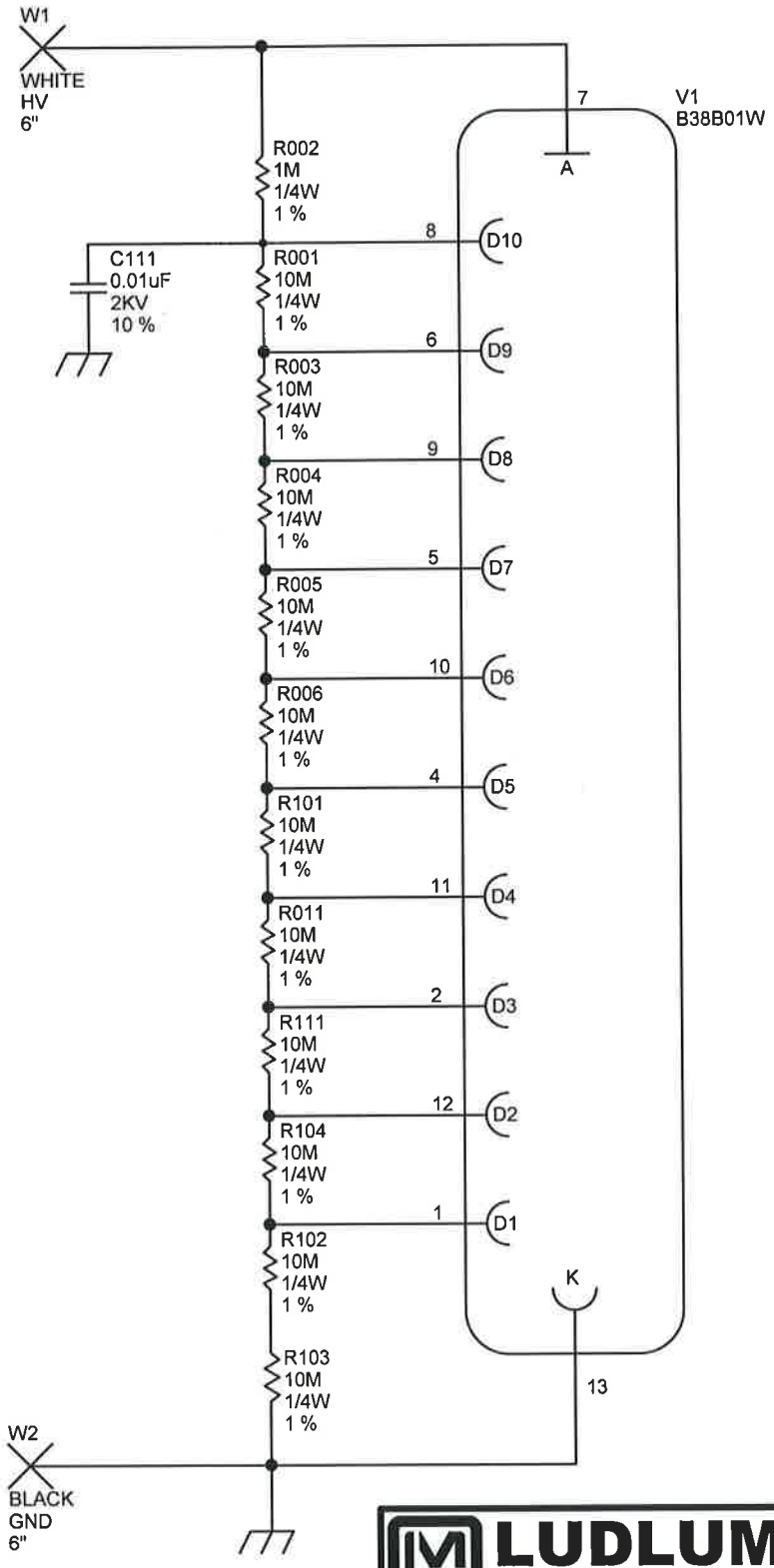
DWN	DATE	CHECKED	APPROVED
DLD	1-7-00	JGW 1-10-00	R.C. 1-10-00

TITLE: M 43-65

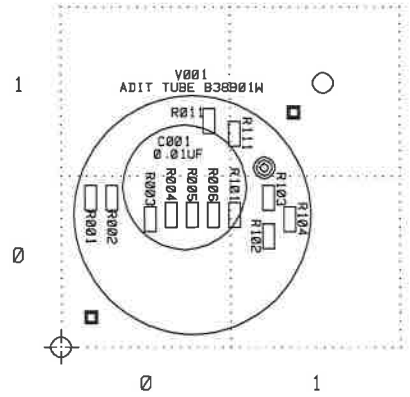
LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

SERIES	SHEET
366	23

4366-061.DWG



LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: CKB	25-JAN-07	Title: 1.5" VOLTAGE DIVIDER	
Design: DL	14-FEB-96	Model: VARIOUS	
Check:		Board#: 5002-502	
Approve:		Sheet: 1 of 1	Series 2 / Sheet 317
19:01:11	14-Feb-2011	Rev: 2.0	
002502R2P1.sch			



LUDLUM MEASUREMENTS INC. SWEETWATER, TX.			
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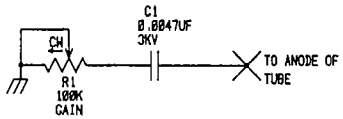
REVISIONS						
EFF	AUTHORITY	ZONE	LTR	DESCRIPTION	DATE	APPROVED



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DSGN	-		
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NEXT HIGHER ASSY.	-		
08:33:22	10-Feb-97		

LUDLUM MEASUREMENTS INC.

TITLE: MOUNTING-ADJUST GAIN/CAP BOARD

BOARD# 5209-019

SIZE	MODEL	SERIES	SHEET
C	VARIOUS	209	18

S0209019 SHEET OF 1